

ABSTRACTS 2013



# Undergraduate Symposium

Celebrating research,  
creative endeavor and  
service-learning



**WISCONSIN**  
UNIVERSITY OF WISCONSIN-MADISON



# Undergraduate Symposium 2013

*Celebrating research, creative endeavor and service-learning*

## Abstracts and Art Statements

University of Wisconsin-Madison  
April 18, 2013  
Union South

### **A Special Thanks!**

We would like to thank the faculty and staff for promoting academic and creative excellence and for making the Undergraduate Symposium possible through their roles as mentors and sponsors. We would like to acknowledge the student participants and the many individuals who have helped to organize this symposium. It has been a great team effort.

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#### **2013 Undergraduate Symposium Organizing Committee**

Jane Harris Cramer, Maya Holtzman, Svetlana T. Karpe, Kelli Keclik, Linda Kietzer, Laurie Mayberry, Janice Rice, Julie Stubbs, Beth Tryon and Grace Welham (coordinator).

*Cover photos provided by the Office of University Communications.*



# Undergraduate Symposium 2013

*Celebrating research, creative endeavor and service-learning*

***University of Wisconsin–Madison***

***April 18, 2013***

The 15th annual Undergraduate Symposium is a celebration of undergraduate students' accomplishments across the many schools and colleges at UW–Madison. This year, the Symposium celebrates 438 projects by 568 students in the form of talks, posters, performances and visual displays. These projects represent arts, humanities, engineering, and biological, physical and social sciences. Combined, these original works showcase the wide array of talent and creativity within the university's undergraduate student body.

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## **Congratulations!**

The Undergraduate Symposium is the premier campus-wide event showcasing our undergraduate students' incredible talents in research and scholarship, creative works, and community involvement. I congratulate each of you on your achievements, and I encourage you to celebrate your accomplishments and those of your colleagues. Browse through this abstract booklet and take a moment to appreciate the other works presented and displayed throughout the Union today.

We take great pride in you and what you have done, and take every opportunity to brag about you. Former Symposium presenters have gone on to brilliant careers in academia, law, medicine, business, arts, humanities and the sciences. We look forward to hearing of all your future accomplishments.

Again, congratulations and enjoy the day!

Christopher W. Olsen, DVM Ph.D.  
*Interim Vice Provost for Teaching and Learning*  
*Professor of Public Health*  
*University of Wisconsin-Madison*

## MATERNAL IRON STATUS ALTERS THE PRO-INFLAMMATORY ACTION OF GESTATIONAL ALCOHOL EXPOSURE.

Juna Abazi, Susan Smith (Mentor), Nutritional Sciences

Dietary prevention of gestational maternal iron deficiency (ID) lessens fetal alcohol spectrum disorders learning deficits. Our preliminary data suggests alcohol inhibits the fetus from correctly interpreting maternal iron status, thus preventing the proper homeostatic adaptations between the ID fetal brain and liver. We investigated this question using a 2nd trimester rat gestational prenatal alcohol exposure (PAE) model under conditions of maternal iron sufficiency (IS) and ID. We evaluated fetal brain, fetal liver, and maternal liver using real-time PCR for the expression of hepcidin and pro-inflammatory cytokines, interleukin-1B (IL-1B) and tumor necrosis factor-A (TNF-A). As a whole, our data suggest that PAE during maternal ID causes a more dramatic disruption of fetal iron metabolism and inflammation compared to maternal IS, magnifying the pro-inflammatory state.

## OCCUPATIONAL ERGONOMICS AND BIOMECHANICS LAB

Lauren Abrahams, Robert Radwin (Mentor), Biomedical Engineering

The Occupational Ergonomics and Biomechanics Lab researches the prevention of work-related musculoskeletal injuries. Repetitive motion and stressful postures such as pinching can cause injuries like carpal tunnel syndrome. Our lab wants to create video tracking algorithms to help measure repetitive motion of the hands and distinguish between pinch and grip. A simulated repetitive motion tasks is being created for volunteers to simulate different hand motions that will be video tapped. The lab will train these tracking algorithms by applying it to videos produced in the lab as well as videos of actual industrial workers sent to us from other labs. This tracking unit will potentially be used to record workers and help improve their work and also reduce repetitive strain and injuries.

## ECONOMIC EFFECTS OF COMMUNITY BASED ECOTOURISM IN COSTA RICA

Zoe Abrams, Jennifer Alix-Garcia (Mentor), Agricultural Business Management

This research measures the economic impact of community based ecotourism in Costa Rica. A stratified sample of nine communities was selected -- three with community based ecotourism, three with non-community based ecotourism, and three without ecotourism. Ten people from each town were interviewed to assess whether community based ecotourism provides more economic benefits than non- community based ecotourism. The results indicated that community-based ecotourism created more jobs, more asset growth, a consensus that the majority of money from ecotourism remained in the community, and higher inflation. The outcome suggests that community based ecotourism could be used as a development strategy.

## STUDENT EFFECTIVENESS IN GROUP PROJECTS

Jonah Aelyon, Loren Kuzuhara (Mentor), Management and Human Resources

In this research project I have sought out to discover the strategies that an effective team are comprised of. Management and Human Resources 300 is a class offered in the Wisconsin School of Business and all students in the business school are required to take it as a core requirement. After reading books, journals, and articles on effective leadership qualities and strategies as well as what makes a good team work, I wrote a literature review on all of the research I had found. I now have developed a survey using the qualtrics website that I will distribute to the 250 person MHR 300 class. The end result should help draw conclusions on how to teach undergraduate students how to work effectively in teams.

## ADULT NUMBER SENSE

Harim (Lydia) Ahn, Brian Brito, Catherine Finedore,  
Percival Matthews (Mentor), Department of Educational Psychology

Students' fraction knowledge is a strong predictor of future math achievement. Unfortunately, many people have difficulties understanding fractions. Some argue this is because fractions have no perceptual foundation, whereas whole numbers correspond to numerosities (visually perceived discrete sets). We hypothesized that non-symbolic fractions (e.g. the ratios between the lengths of two line segments) can function as perceptual anchors for fraction knowledge. To explore this potential, we had undergraduate participants give numerical estimates for the magnitudes of non-symbolic fractions. Preliminary results indicate participants can accurately map from non-symbolic fractions to symbolic numbers (i.e. regression shows that estimates are linear with slopes near one). This study will have implications for whether fraction concepts are compatible with basic human cognitive structures.

## CHILDREN'S UNDERSTANDING OF NUMERACY

Harim (Lydia) Ahn, Brian Brito, Catherine Finedore,  
Percival Matthews (Mentor), Educational Psychology

Children's early number knowledge provides the foundation for the development of later mathematical skill. Recently, number line estimation in particular has gained considerable attention because of its ability to predict future mathematical achievement. We, however, have questions about interpretations of number line performance and what it says about children's numerical understanding. In these experiments, we used multiple measures concurrently to help us clarify the nature of student number knowledge. We asked kindergarten and first graders to complete four numeracy tasks (counting, number identification, comparison, and a number line task). Results suggest that the typical way of learning and interpretations of number line performance should be altered to account for children's limited symbolic knowledge.

## AGRICULTURAL SUPPLY CHAIN ANALYSIS: MAINSTREAM COMMERCIAL VS PERSONAL PRODUCTION IN VEGETABLES

Maxwell Albrecht, Tyler Lark (Mentor),  
Center for Sustainability and Global Environment

An agricultural supply chain is the movement of agricultural products from their initial production to their final consumption. Growing environmental concern regarding food production questions the environmental impact of agricultural supply chains. Using analyses of environmental impact studies, agricultural statistics from the USDA, and information from the Economic Research Service, this project seeks to quantify as well as qualify the environmental impact of different agricultural supply chains. Specifically, we compare the environmental impact of mainstream commercial vegetable supply chains and alternatives such as home and community gardening to assess the advantages and disadvantages of each system. Preliminary results identify key areas of the supply chain where there may be potential gains in efficiencies associated with shifting the method and location of production.



## EXPLORING CHARACTERISTICS OF HUMAN SWEET TASTE RECEPTOR CYSTEINE RICH DOMAIN

Maxwell Alexander, Fariba Assadi-Porter (Mentor), Molecular Biology

The heterodimer of human taste receptor type 1, number 2 and human taste receptor type 1, number 3 (hT1R2-T1R3) allows the human body to detect and respond to sweet substances, including sugars and other artificial sweeteners. This project aims to better understand the qualities of the hT1R3 protein's cysteine rich domain (CRD) and how it contributes to the sweet-taste sensing action of the sweet taste receptor protein. Upon expression of mutant hT1R3-CRD through *Escherichia coli*, purification techniques will be utilized to isolate mutant proteins for further study. Through saturation transfer difference (STD) NMR, ligand-binding activity may be tested, and as a result, the importance of certain proteins of interest can be determined in regards to the overall activity of the entire hT1R2-hT1R3 protein.

## CRC GLOBAL 2012 DOMINICAN REPUBLIC SERVICE LEARNING CONNECTION

Colleen Althoff, Emma Becher, Brian Drout, Monica Ruppert, Gwynneth Schell  
(Mentor), Student Academic Affairs

In the spring of 2012, CRC Global, a semester long service-learning course, traveled to Jaibon in the Dominican Republic. Our analysis of the experience has centered on connection, and how this central theme plays out as a link between people, ideas, environment, and self. The principle method of analysis has been intentional conversations and reflective exercises before, during, and after the trip. They continue today. Our findings suggest great diversity in participant experience, with changes in perception of self and world. While some experienced a profound sense of fulfillment and connection with purpose, others experienced equally powerful realizations of privilege and cultural dissonance. We conclude that shared experiences produce divergent individual stories in understanding that experience, revealing connections individuals have with themselves and the world.

## THE ROLE OF DNA METHYLATION IN PROSTATE DEVELOPMENT

Helene Altmann, Chad Vezina (Mentor), Department of Comparative Biosciences

While it is acknowledged that prostate development mimics cancer development, little is known about DNA methylation's role in prostate development. Mouse urogenital sinuses (UGS) were analyzed before, during, and after prostate development. Mice were used, because mouse prostate development is similar to human prostate development and mouse UGSs generally develop consistently. After the mouse UGS is collected, In situ hybridization is used to visualize genes related to DNA methylation during prostate development. An image is then taken to analyze the expression patterns of the DNA methylation genes in the UGS. This information can help future research on why these genes are activated and their specific role in prostate development.

## ELEMENTAL VACANCY DIFFUSION DATABASE FROM HIGH-THROUGHPUT FIRST-PRINCIPLES CALCULATIONS

Thomas Angsten, Tam Mayeshiba (Mentor), Materials Science Program

This work demonstrates how databases of diffusion-related properties can be developed from high-throughput ab initio calculations. The formation and migration energies for vacancies of all adequately stable pure elements in both the face-centered cubic (FCC) and hexagonal close packing (HCP) crystal structures were determined using ab initio calculations. Energy barriers were successfully calculated for forty-nine elements in the FCC structure and forty-four elements in the HCP structure. These data were plotted against various elemental properties in order to discover significant correlations. This culminates in a simple semi-empirical expression that predicts the vacancy migration energy from the lattice constant and bulk modulus for FCC systems, yielding estimates with errors of approximately 30%.

## LAND DEALS FOR AGRICULTURAL INVESTMENT IN ETHIOPIA: A CLOSER LOOK

Alexandra Arriaga, Sarah Stefanos (Mentor), Environment and Resources Program

This project serves to research issues in Ethiopia related to the issue of land deals that are used for agricultural investment. The research involves transcription of audio between a PhD student, Sarah Stefanos, and various Ethiopian officials who shed light on why the government is interested in promoting agricultural investment - and leasing large tracts of land for that purpose. The government wants to earn foreign exchange from such land deals for agricultural investment to support the country's industrialization. To date, however, there have been problems associated with these land deals associated with displacement of some communities, insufficient compensation for laborers, deforestation, and some unsustainable agricultural practices. Sarah and I are continuing to work together to better understand what these land deals mean for development in the twenty-first century.

## MULTICELLULARITY IN YEAST CAUSED BY PMT4 MUTATION - GROWTH IN THE PRESENCE OF E. COLI CONTAMINATION

Jacklyn Artymiuk, Daniel Lador (Mentor), Chemistry

The transition which caused multicellularity and cell specialization to arise from unicellular organisms is an evolutionary feat which remains poorly understood. Promotion of noncooperation among unicellular organisms is favored to ensure the proliferation of genotypes most fit to survive. However, this brings into question the evolution of multicellularity since it decreases the overall fitness of the individual in unicellular organisms<sup>1</sup>. A mutation in the Protein O<sup>2</sup> Mannosyltransferase (PMT4) gene may cause a deficiency in mannosylation of cell wall glycoproteins. The undermannosylation present in pmt4 mutants results in weakened integrity of the cell wall and a decreased ability for mother-daughter cell separation resulting in multicellular formations, or "clumps"<sup>2,3</sup>. We observed that while growth of the mutant strain was slower than the wild type in uncontaminated, nutrient rich media, the mutant strain experienced faster growth and greater longevity when growing in the presence of bacterial contamination. Thus, we show that the pmt4 mutant is a beneficial adaptation in the presence of bacterial contamination, providing clues to the potential of increased fitness for cell cooperation through multicellularity.

1. Ratcliff WC, et al. (2012) Experimental evolution of multicellularity. *PNAS* 109(5):1595- 1600.

2. Lengeler KB, et al. (2008) Protein-O-mannosyltransferases in virulence and development. *Cellular and Molecular Life Sciences* 65(4):528-544.

3. Olson GM, et al. (2007) Role of Protein O-Mannosyltransferase Pmt4 in the Morphogenesis and Virulence of *Cryptococcus neoformans*. *Eukaryotic Cell* 6(2):222-234.

## PROVOKING PEACE: THE PRECARIOUS INTERSECTION OF POST-CONFLICT POLITICS AND UNITED NATIONS 'DDR'

Paul Atwell, Michael Schatzberg (Mentor), Political Science

The signing of peace agreements is the first of many possible interventions needed to reshape a post-conflict political landscape. Highlighting dissonant concepts developed in United Nations disarmament, demobilization, and reintegration (DDR) procedures, this study explores issues in the official standards of DDR and the associated consequences in African peacekeeping. Analysis begins by documenting efforts to typify the post-conflict environment and political motivations of conflict. After problematizing these concepts with evidence from Sierra Leone and the DR Congo, secondary analysis assesses how a "second-generation" reform of the policy has and has not ameliorated implementation in the ongoing mission to the DR Congo. The study then examines the core principles of DDR, while also testing how the policy is adapting to its mission.

## CLINICAL PERSPECTIVES OF THERAPEUTIC CHANGE: TESTING THE GENERIC MODEL IN EARLY SESSIONS OF THERAPY

Sara Austin, Gregory Kolden (Mentor), Psychology

The generic model of psychotherapy is a transtheoretical model describing how universal change processes influence treatment outcomes. Despite empirical support from patient-rated measures, there has been no research exploring model predictions from the therapist's perspective. The current study evaluates change in early sessions of therapy using therapist-rated measures. Utilizing data from outpatient cognitive and interpersonal psychotherapy sessions involving 97 patients and 31 therapists, therapist perspectives of patient progress were measured early in treatment and compared with multidimensional, patient and therapist-rated indicators of intermediate treatment outcome. This research yields a better understanding of therapist contributions to the understanding of patient change processes. In addition to providing further empirical validation for the generic model, it illuminates how therapist's views of the change processes reflect patient progress.

## HRS AND SNX5 INTERACT AND REGULATE EGFR DEGRADATION

Mele Avilla, Andrew Hedman (Mentor), Cellular and Molecular Pharmacology

Epidermal growth factor receptor (EGFR) is an important regulator of cellular functions. Improper regulation of EGFR signaling has pathogenic effects in a variety of cancers. Therefore, EGFR signaling must be regulated by endocytosis and degradation of the receptor to prevent over activation. A novel regulator of EGFR signaling has been discovered, a splice variant of the type I phosphatidylinositol phosphate kinase gamma, PIPKI $\gamma$ 5, which is found at endosomes and produces phosphatidylinositol 4,5 bisphosphate (PIP2). PIPKI $\gamma$ 5 interacts with the trafficking regulator, Sorting Nexin 5 (SNX5). PIPKI $\gamma$ 5, SNX5 and Hrs are required for EGFR degradation, and more recently, SNX5 was found to associate with Hrs. The objective of this study was to examine in-vitro direct binding of SNX5 and Hrs.

## THE EFFECTS OF METHADONE ON THE NEURAL MECHANISM OF DECISION-MAKING IN HEROIN DEPENDENCY

Adam Awe, Joseph Blustein (Mentor), Ophthalmology and Visual Sciences

The aim of this research is to investigate the neural mechanisms involved in methadone's correction of decision-making and criminal behaviors in heroin-dependent individuals. Methadone is a synthetic drug used to treat heroin-dependency. The decision-making process (DMP) is a balance between reasoning and impulsivity. The brain structures responsible for the DMP are the orbitofrontal (OFC) and the anterior cingulate cortices (ACC) for reasoning, and the mid-brain for impulsivity. In the normal adult's brain the reasoning aspect of DMP dominates impulsivity. Heroin-dependency affects neural functioning by usurping the decision-making process. The heroin-dependent brain becomes hypoactive in the OFC and ACC and hyperactive in the mid-brain. The heroin-dependent brain's DMP impulsivity dominates, promoting criminal behaviors. This aberrant DMP in the heroin-dependent brain is corrected with methadone.

## BRACHYTHERAPY ROBOTICS RESEARCH PROJECT

Jennie Aylyng, Emily Keuler, Bruce Thomadsen (Mentor), Medical Physics

Brachytherapy is the use of small, encapsulated radioactive sources for the treatment of soft-tissue cancers, as an alternative to external-beam radiation. The development of an autonomous brachytherapy robot would make the treatment of prostate cancer much more efficient, safer and more accurate than the procedure as currently performed by hand. Building and programming a robot to perform this procedure has been the subject of our research this past year. We have focused on developing a design that is fully functional, compact and optimized. A prototype previously built has been a template for the future robot that will be much smaller, more accurate, and more advanced. The future of this project looks promising as we move on to the constructing stage.

## "IT"

Amy Bahr, Samantha Blank, Amy Gottlieb, Evelyn Sadowski,  
James Stauffer (Mentor), Theater Arts

"IT" is a ten-minute play written, directed, and featuring undergraduate students. It was originally written for a ten-minute play festival that was produced by the students of the graduate and undergraduate theatre departments. The arts are an important part of education. Our play is simple, funny and received a lot of recognition when performed at the play festival in early February.

## LEARNING IN THE MAKING: STUDYING AND DESIGNING MAKERSPACES

Maria Bakker, Erica Halverson (Mentor), Curriculum and Instruction

Little is known about how and what people learn from their participation in makerspaces. Learning in the Making: Studying and Designing Makerspaces attempts to understand what is known about effective studio teaching and learning, and to understand how to support youth to become competent, creative, and reflective producers with technologies. My work involves two related assignments, encoding both MAKE magazine and Sector 67 Google group. MAKE magazine brings the do-it-yourself mindset to all the technology in your life. Focusing on the projects, I researched which tools were used and I discovered that most of the tools were commonly known. Sector 67 is a real makerspace in Madison, Wisconsin. By researching Sector's Google group gives us insight to how the makers interact with each other and also how projects develop.

## SELECTABLE ENDOTRACHEAL LIDOCAINE APPLICATOR

Katherine Baldwin, James Dorrance, Terah Hennick, Alyssa Mitchell,  
Mitchell Tyler (Mentor), Biomedical Engineering

Laryngoscopy is a procedure to view the vocal fold and sub-glottal region of a patient. Applying lidocaine, a topical anesthetic, with an endotracheal lidocaine applicator along the laryngeal and endotracheal walls blunts the effects of coughing and gagging upon extubation during laryngoscopies. Our goal is to design an endotracheal lidocaine applicator to be used with both direct and indirect laryngoscopy. The device should to switch between a distal (straight out of the end) only spray pattern and a spray pattern that incorporates both radial (full coverage around the long axis) and a distal spray. Our design utilizes a selectable stopcock and multi-lumen catheter tubing. This allows for safe application of lidocaine while switching efficiently between the two spray patterns. Testing proved this concept is viable.

## NUTRIENT RECOVERY FROM WASTEWATER: AN ECONOMIC AND ENVIRONMENTAL OVERVIEW

Carolyn Barker, Molly Bodde, Justin Helley, Phillip Barak (Mentor), Soil Science

The purpose of this research is to explore the economics of recovering phosphorus and nitrogen from wastewater treatment plants (WWTP). Phosphorus and nitrogen are the main components of commercial fertilizer. Currently, phosphorus is mined from phosphate rich rocks. Demand for this non-renewable resource will soon overwhelm available supplies. Fertilizer nitrogen is synthesized via the Haber-Bosch process which requires high energy inputs. WWTP's have been identified as having high amounts of phosphorus and nitrogen which, if captured, could assure a renewable and affordable source of fertilizer. We will conduct an analysis of the nutrient and flow capacities of Wisconsin wastewater treatment streams to put a dollar value on the nutrients available for capture.

## IMPROVING CYCLE LENGTH OF LITHIUM ION BATTERIES VIA STUDIES INTO THE SURFACE CHEMISTRY OF SILICON

Richard Barltrop, Joseph Yeager (Mentor), Chemistry

Batteries provide us with a mobile source of power that makes many modern conveniences possible. Lithium ion batteries are the most widely used rechargeable batteries, in which lithium ions migrate between two electrodes. Silicon has a far greater capacity for lithium and could replace current carbon-based electrodes in lithium ion batteries, thus improving the length of charge cycles. When using silicon-based electrodes, however, the problem of poor cyclability arises due to large volume expansion associated with 3.75 mol of Li reacting with 1 mol of Si. In this study, a number of tests were created to help understand the surface chemistry of silicon electrodes, which could provide explanations on how to effectively use silicon as a material for electrodes in lithium ion batteries.

## ONE WEEK IN DOMINICAN TIME: A LIFETIME OF LEARNING

Megan Bartkowskim, Edith Flores, Aleah Kuchta, Katie Kuecker, Corin Menuge,  
Meghan O'Dell, Gwynneth Schell (Mentor), Student Academic Affairs

One year ago, approximately 40 students came together through CRC Global 2012: a service-learning experience formed with one week of teaching and cultural immersion in the Dominican Republic as the centerpiece. Study of Dominican culture prior to the week abroad prepared us for the realities we would be exposed to, the week itself connected us with Dominican people and ways of life, but nothing could have entirely prepared us for the aftershock upon our return. The ongoing learning CRC Global 2012 engendered in all of us has helped us learn to live intentionally, and to think critically about how and for what we are living. Join the ebb and flow: the tides of learning that continue to wash over us to this day.

## ETHNICITY IN POLITICAL ADVERTISEMENTS

Kristopher Bass, Jack Edelson (Mentor), Political Science

This research will provide assistance with understanding the standpoint of the candidate in more than just actions during the campaign and the image that they want to portray but in how they interact with the people that are around them. This study may be a way to close the proverbial gap between voters and their representatives. It will also show how ethnicity is used in American politics in an unbiased light, as well as give insight into some of the targeting techniques that are used.

## A DESCRIPTIVE INVESTIGATION OF INAPPROPRIATE ANTIBIOTIC USE IN SKILLED NURSING FACILITIES

Laura Bayer, Christopher Crnich (Mentor), Division of Infectious Diseases

Antibiotic resistance is one of the major threats to human health. Driven primarily by overuse of antibiotics, the spread of antibiotic resistant organisms leads to infections that are more costly to treat and increase patient morbidity and mortality. Considering the vast amount of antibiotics prescribed in skilled nursing facilities and the substantial occurrence of unnecessary and suboptimal use, there is great opportunity to intervene, conceivably limiting the spread of antibiotic resistant organisms. Ultimately, the purpose of this study is to develop innovative interventions for improving antibiotic prescribing practices in SNFs. This investigation focuses on the documentation of indication for infection and the ordering of cultures as variables of influence over inappropriate use of antibiotics.



## CHARACTERIZATION OF BUDS IN CRANBERRY (VACCINIUM MACROCARPON AIT) FOR THE PREDICTION OF YIELD

Emily Beaver, Rebecca Harbut (Mentor), Horticulture

Error in current yield estimation methods of cranberry, involving visual examination of bud development, can exceed 15%. Hence, an improved understanding of the role of buds in yield estimation is necessary. Buds were collected over the 2012 growing season from four cultivars. Buds were measured and dissected to determine presence of flowers. Larger buds were more likely to contain flowers than smaller buds. Bud width was different between cultivars. 'Crimson Queen' and 'HyRed' tend to have larger buds than 'Stevens' and 'Searles.' Biennial bearing assumptions were not well supported due to the high proportion of rebud. More research must be conducted to learn why these phenomena occur. It can be concluded that alternative methods of yield estimation should be investigated.

## THE CHANGING FACE OF SELF-DETERMINATION: A CATALONIAN CASE STUDY

Alexander Beck, John Zumbunnen (Mentor), Political Science

Understandings of the legitimacy of self-determination movements have shifted since the beginning of the 20th Century. Two of the most influential theories to emerge regarding the right to sovereignty are the Primary Right and the Remedial Right of self-determination. The discourse of these two opposing theories is examined through the contemporary Catalanian secession movement.

## POTATO ENRICHMENT: THE PRESENCE OF PATHOGENIC BACTERIA IN WASH LINE SAMPLES

Alyssa Beck, Kimberly Cowles (Mentor), Plant Pathology

The presence of salmonella on animal products is a topic well understood. However, the mechanisms for bacterial colonization on produce have yet to be uncovered. We screened samples collected from the wash lines of potato-producing farms for Salmonella and pathogenic Escherichia coli using enrichment in tryptic soy broth, with shaking at 42°C, to encourage heat-tolerant bacterial growth. Samples were frozen in 10% glycerol. Diluted 1ml water to 2 microliters stock, PCR samples also included 2x master mix, primers and water for gel electrophoresis, which determined Salmonella presence with a band between 200 and 300 bp. Optimization of the screening was required for PCR to be effective. Results confirmed the existence of S. enterica, but not pathogenic E. coli, in seven out of seven glycerol stocks.

## EXOGENOUS INTERFERONS REDUCE RHINOVIRUS REPLICATION AND ALTER AIRWAY INFLAMMATORY RESPONSES

Tess Becker, Daniel Jackson (Mentor), Pediatrics

Human rhinoviruses (HRV) are the most common cause of asthma exacerbations. In airway epithelial cells, the primary site of HRV infection, decreased production of interferons (IFNs) may result in greater susceptibility to HRV and worsened symptoms. Thus, exogenous IFN could supplement the innate immune response and provide a treatment for virus-induced asthma exacerbations. Furthermore, the effects of exogenous IFN could be type-specific, in part due to the cellular distribution of type I and type III IFN receptors. We therefore investigated the effects of exogenous IFNs on HRV replication in bronchial epithelial cells (BECs). Frozen stocks of primary human BECs from healthy donors were cultured in monolayers, pre-treated (24h) with either 0.1 ng/mL, 1 ng/mL or 10 ng/mL doses of IFN- $\alpha$ , - $\beta$ , - $\lambda$ 1 or - $\lambda$ 2, and infected with HRV-1A. Viral replication was quantified using real-time RT-PCR and cytokine/chemokine secretion 24 hours post-infection was measured by multiplex ELISA. Compared to untreated samples, IFN- $\alpha$ , IFN- $\beta$ , IFN- $\lambda$ 1 and IFN- $\lambda$ 2 (0.1 ng/mL) significantly reduced HRV replication following high- ( $p < 0.02$ ) and low-dose inoculation ( $p < 0.05$ ). Similar effects were seen in 1 ng/mL and 10 ng/mL doses of IFN, where HRV replication was significantly decreased in both high ( $p < 0.0001$ ) and low-dose inoculation ( $p < 0.00001$ ). Treatment with IFNs also enhanced HRV-induced IP-10 secretion ( $p < 0.005$ ). Finally, treatment with either IFN- $\lambda$ 1 or IFN- $\lambda$ 2 significantly increased HRV-induced secretion of RANTES ( $p < 0.05$ ), but not IL-1 $\beta$  or VEGF. These findings suggest that exogenous IFNs, IFN- $\lambda$ 1 in particular, warrants further study as a potential therapy for virus-induced asthma exacerbations.

## RECOGNITION MEMORY PROCESSES IN NOVEL NOUN GENERALIZATION

Rachel Beletti, Nikki Key, Rachael Wooten,  
Haley Vlach (Mentor), Educational Psychology

Previous research has hypothesized a link between certain memory processes and the long-term ability to generalize information during categorical learning. The current study aimed to elucidate the information that is returned and related to category learning. Participants were presented with both a novel noun categorization task and five memory recognition tasks. After a brief delay period, participants displayed varying memory retention for each type of recognition memory. However, only the performance of the visual object recognition task demonstrated a significant relationship to performance on the category learning. Future research should further investigate the influence of visual object recognition memory on categorical learning performance across development.

## POSTPARTUM DEPRESSION AND CHILD PSYCHOSOCIAL OUTCOMES AT SCHOOL AGE

Jake Berkvam, Roseanne Clark (Mentor), Psychiatry

The primary focus of this follow-up study is to determine the contributions of maternal postpartum depression and several key mother, child, and family stressor/protective factors on child psychosocial outcomes at school age. Mothers were randomized to one of two 15 week treatments 1) a mother-infant relational therapy group (M-ITG) or 2) Individual Interpersonal Psychotherapy (IPT) for treatment of major depression in the postpartum period (PPD) in the initial phase of this longitudinal study. This follow-up study promises to contribute knowledge to the fields of developmental psychology and developmental psychopathology by further elucidating the mechanisms by which maternal depression, co-morbid conditions, and maternal behavior may contribute to the development of emotion, behavior and attention regulation/dysregulation in children and the contextual risks and buffers that may moderate the impact of maternal depression on the developing child. My project is focused on the contributions of maternal and family factors on internalizing and externalizing behaviors of children at school-age. Child behaviors were assessed by parent-, teacher-, and self-report measures.

## CHONDROCYTE PRIMER OPTIMIZATION

Allison Berman, Quyen Tran (Mentor), Biomedical Engineering

Stem cells have the potential to be used for regenerative therapies due to their immense self-renewable and differentiation capabilities. For example mesenchymal stem cells (MSCs) have been shown to differentiate into osteoblasts, adipocytes, chondrocytes, cardiomyocytes, and a number of other cell types. However, our greatest challenge in utilizing stem cells in clinical application is our ability to obtain a pure and mature cell population. It is therefore important to identify markers of these cell types to better identify the lineages that are present in the cell population. This poster outlines the optimization process for developing a primer set for Sox9 and collagen II, two proteins that are expressed in the early and late stages of chondrocyte differentiation.

## HOW DO ADULTS PERCEIVE THE SPEECH OF CHILDREN WITH COCHLEAR IMPLANTS?

Sara Bernstein, Jan Edwards (Mentor), Ann Todd (Mentor),  
Communication Sciences and Disorders

Speech of children with cochlear implants (CIs) may be less intelligible than that of their normal hearing (NH) peers due to the auditory signal degradation of the CI. Previous research has found that children with CIs produce less acoustic contrast between correct productions of "s" and "sh" than NH peers. The current study was designed to determine if this acoustic difference is perceptible to adults. Reaction time for an identification task and visual analog scale (VAS) ratings were collected from 36 adult naive listeners for productions of "s" and "sh" by children with CIs and with NH. Differences between child groups were found with the VAS task, demonstrating that adult listeners are sensitive to subtle differences in "s" productions of children with CIs.

## EXPERIMENTAL ARCHAEOLOGY

Marissa Beste, Jonathan Kenoyer (Mentor), Anthropology

This project involved the ancient ceramic artifacts of the Indus Civilization, of Pakistan and India, dating to between 2600-1900 BC. Analysis of pottery, terracotta bangles and beads, as well as figurines provides a unique window into the daily lives and practices of ancient societies. The detailed study of these artifacts reveals the use of different types of clays and also different manufacturing techniques that include hand forming as well as wheel throwing. Selected artifacts were replicated to determine the stages of production and the possible cultural choices involved in their manufacture and use. Through this experimental process I have been able to identify specific ways in which ancient Indus craftspeople may have used technology to create valuable objects that have both functional and ritual importance.

## ENERGY HUB ELEMENTARY SCHOOL OUTREACH: FOSTERING THE NEXT GENERATION OF ENERGY THOUGHT AND ACTION

Ashwini Bharatkumar, Hong-En Chen, Meinuo Chen,  
Craig Benson (Mentor), Geological Engineering

UW Energy Hub is a student run organization that brings together students of diverse disciplines who are passionate about energy. The goal of Energy Hub is to educate students about energy and connect students to industry, innovation, and research. Energy is an integral economic, political, and social factor, and human attitude and understanding towards energy usage is essential. Funding from the Wisconsin Idea Fellowship and collaboration with the Office of Sustainability allowed Energy Hub to develop, modify, and implement a hands-on outreach curriculum for elementary school students in 3rd through 5th grade that fosters a future generation of innovators.

## GENERATING STABLE CELL LINES OF HPV16-E6 MUTANTS IN HUMAN TONSIL EPITHELIAL CELLS USING VECTORS

Divya Bhat, Randall Kimple (Mentor), Human Oncology

**ABSTRACT Purpose:** Human Papillomavirus 16 (HPV-16) encodes the viral oncogene E6 that facilitates HPV-associated carcinogenesis. We developed a panel of Human Tonsil Epithelial (HTE) cells harboring various HPV-16 E6 mutants to understand the role of HPV-16 E6 in modulating the response of HNC to radiation. **Procedure:** Using agar plates infused with ampicillin, we plated bacteria harboring particular mutant HPV-16 genomes. After confirming protein expression of isolated bacteria colonies through transient transfection, such transfection procedures are performed on the cells stably expressing each HPV-16 E6 mutation. **Results and conclusion:** Generation of a panel of HPV-16 E6 mutant HTE cells will provide us with a model system to extend our ongoing studies investigating the role of HPV oncoproteins in regulating the response to radiation.

## THE ROLE OF FRAGILE X MENTAL RETARDATION PROTEIN IN DIFFERENTIATION OF HUMAN FRAGILE X STEM CELLS

Ismat Bhuiyan, Xinyu Zhao (Mentor), Department of Neuroscience

Fragile X syndrome (FXS) is an inherited learning disability caused by the lack of the fragile X mental retardation protein (FMRP). Despite extensive studies, how FMRP deficiency affects human neuronal development is unclear. We hypothesize that FMRP plays a crucial role in regulating neuronal differentiation of human neural progenitors (NSCs). We will use FXS patient-derived NSCs (FXS-NSCs). In this study, FXS-NSCs and control NSCs will be infected with lentivirus expressing red (mCherry) and green (GFP) fluorescence proteins, respectively, mixed, and then transplanted into immune-deficient (SCID) mice. We will then use histological analyses to determine whether FMRP-deficiency impairs the survival and neuronal differentiation of transplanted cells. The results of this study will unveil the functional of FMRP in human neuronal development.

## H-ALPHA EMISSION IN AWM AND MKW POOR GALAXY CLUSTERS

Adam Birenbaum, Daniel Hesse, Michael Ramuta,  
Eric Wilcots (Mentor), Astronomy-Physics

A grasp of the life-cycles of large-scale structures is critical to understanding the Universe. This can be accomplished through the study of poor clusters-- that is, younger clusters that are likely evolving to another state. The selected clusters are significant in that they are poor but also possess a type-cD galaxy that is not located in the center of the cluster. This brighter central galaxy suggests that these clusters may be dynamically evolved and are potential candidates for fossil groups. In order to more fully understand the structure and behavior of poor galaxy clusters, 12 clusters were selected and analyzed. Using data from the Sloan Digital Sky Survey, we analyzed the H-alpha emission and spectral ratios to determine star formation behavior and nuclear activity in the galaxies.

## THE ROTATION CURVE OF THE MILKY WAY GALAXY

Adam Birenbaum, Ryan, Bossler, Tenzin Choedak, Felipe Gutierrez,  
Daniel Hesse, Briana Indahl, Claire Murray, Nathan Oster, Jessie Otradovec,  
Pooja Rawat, Snezana Stanimirovic (Mentor), Department of Astronomy

We have measured the speed at which stars and interstellar gas orbit the Galactic Center of the Milky Way at different radii—the Galactic Rotation Curve—using the 2.3 diameter Small Radio Telescope (SRT) located on the roof of Sterling Hall, probing the existence of dark matter. We measured the amount of neutral hydrogen (HI) emitted from Tangent Points located on the Galactic Plane as a function of radial velocity and estimated the orbital velocity and galactocentric distance at each point. Our results show a relatively constant rotation curve of roughly 200-240 km/s across our measured radii of 2.9 to 8.2 kpc, and we estimate the mass of the Milky Way within 8.2 kpc to be  $\sim 10^{11}$  solar masses.

## ILLUMINA MISEQ ANALYSIS OF RHESUS MACAQUE CLASS I MAJOR HISTOCOMPATIBILITY COMPLEX

Patrick Bohn, David O'Connor (Mentor), Pathology and Laboratory Medicine

The rhesus macaque model enables thorough studies of infectious diseases and evaluations of novel vaccines and therapies. Major histocompatibility complex class I (MHC-I) genes encode proteins that play key roles in recognition of pathogens and activation of immune defenses. The O'Connor laboratory provides MHC genotyping services, enabling assembly of cohorts of comparable macaques for vaccine trials and pathogenicity studies. Compared with pyrosequencing methods, the Illumina MiSeq DNA sequencing platform offers increased throughput and reduces the cost of genotyping substantially. In this project, I adapted Fluidigm PCR primers for amplification of MHC-I templates in the genomic DNA (gDNA) of over 1000 rhesus macaques from multiple primate breeding facilities and genotyped the animals using a MiSeq instrument.

## MOVING DAYS: AUGUST MOVE-OUT WASTE DIVERSION EFFORTS

Andy Bose, Frank Kooistra (Mentor), Office of Sustainability

Between August 14–16, thousands of UW-Madison students move from one apartment to another. Three hundred to five hundred tons of excess waste is generated. Moving Days is an annual operation to divert as many useful discarded items as possible towards reuse/recycling and away from the landfill. In 2012, we continued existing operations, with several adjustments to improve results, and introduced a pilot program called Donate&Take. We also expanded an operation with Goodwill that was piloted in 2011. The program as a whole ran August 10-16. We diverted approximately 24 tons from the landfill, eight tons in recycled electronics, 16 tons in donations. A "user guide" was developed for future Moving Days interns to use so that planning and operations can run more smoothly and effectively in each future year.

## GENETIC DIVERSITY OF VACCINIUM MACROCARPON AND VACCINIUM OXYCOCCOS IN WILD POPULATIONS

Tierany Bougie, Aidee Guzman, Juan Zalapa (Mentor), Plant Breeding and Genetics

This study aims to characterize and compare the genetic variability in natural populations of *Vaccinium macrocarpon* and *V. oxycoccos* using microsatellites or simple sequence repeat (SSR) markers. The genetic information derived from this study will be useful for future studies on cranberry genetic diversity and population structure of wild populations and the identification and preservation of genetic diversity useful for breeding programs. New cranberry types can potentially be generated from crosses between *V. macrocarpon* and *V. oxycoccos* with different phenotypic traits. Therefore, in the future a genetic fingerprint will be developed for both *V. macrocarpon* and *V. oxycoccos* allowing us determine genetic diversity and pedigrees of natural and breeding populations.

## INFUSION OF NK CELLS EXPANDED EX VIVO WITH IL-15 AND 4-1BBL INDUCES GVHD AND ABROGATES GVT EFFECTS

Brittany Bowen, Thomas Esposito, Sara Kelm, Christian Capitini (Mentor), Pediatrics

NK cell biology after allogeneic bone marrow transplant (alloBMT) is mainly drawn from studies infusing unmanipulated NK cells. We studied the impact of activating murine NK cells with the co-stimulatory molecule 4-1BBL during expansion with IL-15 ex vivo, and then infused these cells to determine safety and efficacy after alloBMT. NK cells were harvested from Balb/c (H-2d), DBA/2 (H-2d), or CB6F1 (H-2d x H-2b) spleens and cultured with IL-15 in the presence of irradiated artificial APCs transfected with or without 4-1BBL. The addition of 4-1BBL+ cells to IL-15 expanded NK cells decreased yields by up to 50%. The combination of 4-1BBL/IL-15 completely abrogated cytotoxicity against Yac-1 lymphoma, whereas IL-15 alone led to augmented IFN $\gamma$  production and cytotoxicity. No differences were noted in the expression of CD69 or Ly49D activation markers. After T cell depleted (TCD) MHC-mismatched alloBMT (CB6F1 $\rightarrow$ Balb/c), recipients of allogeneic NK cell infusions expanded with IL-15/4-1BBL showed weight loss in a dose-dependent fashion and increased lethality from GVHD. Similar results were also seen with CB6F1 $\rightarrow$ C57BL/6. In addition, graft-versus-tumor (GVT) effects against rhabdomyosarcoma were abrogated when infusing NK cells expanded by 4-1BBL/IL-15 when compared to NK cells expanded with IL-15 alone. After TCD MHC-matched alloBMT (DBA/2 $\rightarrow$ Balb/c), infusion of NK cells expanded with IL-15 or IL-15/4-1BBL did not cause GVHD, implying MHC discrepancies between donor NK cells and GVHD target tissues contribute to the enhanced alloreactivity induced by 4-1BBL. Infusing NK cells expanded with IL-15 alone is safe and effective after alloBMT, whereas the addition of 4-1BBL to the expansion process leads to GVHD induction and decreased GVT.



## IMMIGRANT FAMILIES: LITERACY AND IDENTITY DEVELOPMENT OVER TIME AND SPACE

Aaliyah Boyd, Catherine Lilly (Mentor), Curriculum and Instruction

This is a longitudinal study currently in its fourth year that focuses on how children from immigrant families form their identities and develop literary skills. This is measured through interviews and analysis of artifacts, (i.e. drawings, written work and photographs). The results found by the study are interpreted in relation to space and time. This study started by following four families with children in first grade and has now expanded to 15 families. The study hopes to follow the students through twelfth grade. The results of this study will be very helpful to educators. The results will help educators disprove negative expectations about children from immigrant families and help them to capitalize on and integrate into the school the unique culture that immigrant families provide.

## GROWTH INHIBITORY, ANTIANGIOGENIC AND PROAPOPTOTIC EFFECTS OF DELPHINIDIN IN HUMAN MELANOMA CELLS

Brendan Boylan, Jean Chamcheu (Mentor), Dermatology

Melanoma afflicts primarily young adults and is the deadliest form of skin cancer accounting for 75% of the United States skin cancer deaths. One way to reduce the mortality associated with melanoma is to develop agents that could inhibit primary melanoma angiogenesis and metastasis. Here, we investigated the growth inhibitory, antiangiogenic, and pro-apoptotic effects of delphinidin, a major anthocyanidin abundantly found in pigmentary fruits and vegetable in moderate (G361) and highly (A375) aggressive human melanoma cells. Delphinidin treatment of these cell lines resulted in a dose-dependent inhibition of cell growth, viability and induction of apoptosis associated with pro-apoptotic caspases activation, cell cycle arrest and an inhibition of angiogenesis markers. These data suggest that delphinidin could be developed as a novel dietary agent against human melanoma.

## PHARMACOLOGICAL STUDIES OF THE G-ALPHA-Z-COUPLED E PROSTANOID RECEPTOR

Harpreet Brar, Michelle Kimple (Mentor), Medicine

In the pancreatic beta-cell, the heterotrimeric G-protein alpha subunit, G-alpha-z, acts to block insulin secretion by coupling to the EP3 isoform of the E prostanoid receptor. A specific agonist of the EP3 receptor, sulprostone, significantly blocks insulin secretion when all other inhibitory G-proteins are inactivated. Thus, we expected sulprostone would have no effect in the absence of G-alpha-z. This was not the case: sulprostone actually promoted insulin secretion. Two hypotheses to explain these results are: (1) sulprostone is acting through a different E prostanoid receptor in the absence of G-alpha-z; and (2) one of the EP3 splice variants couples to a different G protein in the absence of G-alpha-z. We are currently testing these possibilities in the lab, and have generated some interesting preliminary data.

## NANOSCALE COPPER PROTECTION WITH ALUMINA OVERCOATING

DuCharme Brett, James Dumesic (Mentor), Chemical and Biological Engineering

The problem with nanoparticle copper is that copper atoms rapidly leach into mainstream industrial solvents such as butanol and water. The degradation of copper causes a continual need to replace copper parts and components. The main goal of our research is to decrease copper leaching by creating an alumina overcoat deposited by atomic layer deposition to protect the copper. The research on our alumina overcoat has shown promise and has limited the degradation of copper in flow reactors. The decrease in leaching/degradation of copper could lead to more widespread use of copper in industrial applications and also open new branches for further research in nanomaterial technologies.

## TESTING THE ASSUMPTION OF DIETARY SPECIALIZATION IN BLACK-FOOTED FERRETS USING STABLE ISOTOPES

Katrina Brickner, Jonathan Pauli (Mentor), Wildlife Ecology

Black-footed ferrets (*Mustela nigripes*) are widely regarded as both a habitat and dietary specialist of prairie dogs (*Cynomys* spp.) The near extinction of ferrets has been linked with the decline of prairie dogs throughout western grasslands. However, all published accounts of ferret dietary habits are from scat analysis or casual observations, which are significantly biased. Thus, the degree to which ferrets are specialized predators of prairie dog and their reliance on other small mammal species remains unknown. To better understand the dietary specialization of this endangered species, I quantified the diet of free-ranging black footed ferrets in Shirley Basin, Wyoming using stable isotope analysis of 321 ferrets and potentially important prey items (e.g., mice, ground squirrels, rabbits and prairie dogs).

## THE ROLE OF G-PROTEIN COUPLED RECEPTOR EP3 IN INSULIN SECRETION

Allison Brill, Michelle Kimple (Mentor), Endocrinology, Diabetes and Metabolism

Diabetes, or elevated blood glucose, results from insufficient insulin secretion from pancreatic  $\beta$ -cells. G-Protein Coupled Receptors (GPCRs) at the  $\beta$ -cell membrane are essential features in the signaling pathways that regulate insulin secretion. We previously showed that a specific GPCR, EP3, is upregulated in the diabetic pancreas and negatively regulates insulin secretion. What are not known are the precise signaling mechanisms that are responsible for this effect. In my work with a mouse  $\beta$ -cell line (Min6), I demonstrated significant expression of EP3 signaling partners with low expression of EP3 itself. I will introduce exogenous, tagged EP3 splice variants to determine which of the splice variants is responsible for coupling to inhibitory G-proteins. Next, I will explore the impact of the different splice variants on  $\beta$ -cell function.

## CROSS-SPECIES AMPLIFICATION OF MICROSATELLITE MARKERS IN THE GRAY JAY (PERISOREUS CANADENSIS)

Logan Brock, Kurt Reed (Mentor), Pathology and  
Laboratory Medicine/Anatomic Pathology

Gray Jay (*Perisoreus canadensis*) population numbers have recently declined in the Fraser Experimental Forest (FEF), Colorado in association with disrupted forest connectivity from a severe mountain pine beetle infestation. It is unknown how Gray Jay family structure was affected by this sudden ecosystem change. We took advantage of cross-species amplification of previously identified Siberian Jay (*Perisoreus infaustus*) microsatellites to develop a multiplex genotyping protocol applicable to Gray Jays. Twelve loci were identified that consistently exhibited strong PCR amplification and were polymorphic. Additionally, a Z-linked marker was identified and verified by PCR analysis. This microsatellite protocol will be valuable in determining the population genetic and family structure of Gray Jays in FEF and allow comparison of results with populations from areas with undisturbed habitats.

## MIXED SEXUAL OFFENDERS: THE RELATIONSHIP BETWEEN PSYCHOPATHY AND SEX OFFENDING

Allison Brown, Monika Dargis, Alex Mattern, Michelle Tsonis,  
Joseph Newman (Mentor), Psychology

Past research has revealed that sex offenders who commit both a child molestation and sexual assault (Mixed offenders) earn higher total and Factor 2 (i.e., impulsive-antisocial traits) scores on the Psychopathy Checklist-Revised than child molesters, assaulters, and non-sex offenders. Additionally, the Factor 1 scores (i.e. interpersonal-affective traits) of Mixed offenders are higher than Child Molesters. Using data from 2,242 male prisoners, we attempted to replicate and clarify these findings. Mixed offenders earned higher PCL-R total and Factor 2 scores than Assaulters, Child Molesters, and Non-Sex offenders. They also earned higher Factor 1 scores than the other three groups. Contrary to previous findings, these relationships were not mediated by criminal versatility, impulsivity, or sexual deviance, as measured in this study.

## NOVEL METHOD FOR ACCELERATED BIENNIAL VEGETABLE CROP SEED PRODUCTION

Lauren Brzozowski, Gregory Vogel, Irwin Goldman (Mentor), Horticulture

Biennial vegetable crops, like beets (*Beta vulgaris*), carrots (*Daucus carota*) and onions (*Allium cepa*), have a lifecycle that spans two growing seasons, and are hence time and resource-intensive to breed and to harness for seed production. It is currently unknown if environmental conditions can be manipulated to shorten some developmental stages, resulting in faster seed production. In our experiment, we examined the feasibility of rendering young seedlings competent to flower, instead of the traditional method of giving mature plants flowering competency. We grew the seedlings in an unheated greenhouse in autumn, and compared their flowering competency the following spring with plants that went through the traditional two-season breeding cycle. The study had promising results that could be useful to seed companies, farmers, and plant breeders.

## MITOCHONDRIAL ENERGETICS AS AN ANTI-AGING TARGET

Albert Budhipramono, Rozalyn Anderson (Mentor), Medicine

Defects in energy metabolism has been implicated in various diseases. PGC-1 $\alpha$ , a transcriptional coactivator, regulates mitochondrial energy metabolism by regulating gene expression. GSK3 $\beta$ , another protein involved in energy metabolism, affects PGC-1 $\alpha$  protein stability. However, the effect of this interaction on PGC-1 $\alpha$  activity is not well-studied. To further understand PGC-1 $\alpha$  regulation in energy metabolism, we study the mechanistic interplay between GSK3 $\beta$  and PGC-1 $\alpha$ , and the functional consequences. We hypothesize that GSK3 $\beta$  regulation of PGC-1 $\alpha$  protein stability changes PGC-1 $\alpha$  gene target specificity such that genes involved in energy metabolism are activated preferentially. Our experiments will determine how altered GSK3 $\beta$  levels affects PGC-1 $\alpha$  stability, localization, and activity; they will show how PGC-1 $\alpha$  gene targets are affected. This knowledge can help identify new targets for diseases of metabolic dysregulation.

## WISCONSIN LAND CODES INTO PROTEGE

Genevieve Burgess, Nancy Wiegand (Mentor), Space Science and Engineering

The objective of this project is to put codes from seven different land use coding systems in Wisconsin into a formal ontology language. Land-use coding systems in Wisconsin differ between regional planning commissions, counties, or even cities. To find a land use across the state, the different terms need to be resolved and compiled. A Word document was already created that merged all the codes. Now, we are putting the codes into a standardized formal language so that software tools and query languages can be used to search for specific terms. The Protege ontology editor is being used to enter code information and create an OWL file. The OWL file will be put into an ontology repository for anyone to use.

## WHO REALLY IS THE BOSS?

Emily Butrym, Debra Holschuh-Houden (Mentor), Family Business

Succession of a family business takes elaborate and extensive planning even for the most organized of businesses. A critical issue that arises in the succession of family businesses is the passing of power, decision making, and authority onto the new management, many times being children and younger relatives. For this case study, I will look to examine different types of situations in which succession has gone smoothly, and not so smoothly, and what the key elements were to success. Viewing 2-3 different family business and pinpointing areas and steps that had conflict, and what steps needed to be implemented for the correction of such issues can give insight into such elements. There will also be significant focus on "Who really is the boss?" An in depth analysis of whether the retired family members really let go control of the business and how this impacts the company.

## STUDYING THE MECHANISM OF THE DRUG PRAMLINTIDE WITH THE DIABETES DISEASE PROTEIN hIAPP

Wenting Cai, Martin Zanni (Mentor), Chemistry

The aggregation of human IAPP is thought to be responsible for Type II diabetes. Pramlintide is a synthetic hIAPP analogue that is an FDA approved drug as a hormone supplement for type II diabetes patients. Pramlintide is identical to hIAPP except for three proline substitutions at residues 25, 28, 29, which are thought to act as  $\beta$ -sheet blockers. We hypothesized that the 3 prolines of pramlintide would inhibit amyloid fibril formation by disrupting  $\beta$ -sheet formation and stacking in residues 1-18 of hIAPP. Residue-specific isotope labeling and two-dimensional infrared spectroscopy were employed, and we found that pramlintide folded slower than hIAPP, while it inhibited the fibril formation of the latter significantly. On the other hand, pramlintide folded similarly to hIAPP, with  $\beta$ -sheet region formed around 13Ala.

## PATIENT-CENTERED HAND HYGIENE

Rachell Caniza, Nasia Safdar (Mentor), Medicine

Many studies have been conducted to investigate the extent to which health care workers wash their hands; however, there is limited research in patient-centered hand hygiene. This survey was designed to investigate the extent to which patients follow hand hygiene protocols and explore barriers to hand hygiene in the hospital. Results of this survey showed that patients wash hands significantly less prior to eating and after using the restroom while in the hospital as compared to while at home. Many patients questioned had mobility issues that were a barrier to hand hygiene in the hospital. A suggestion to improve hand washing among patients was to provide hand sanitizer at patients' bedside and to provide disinfectant wipes on food trays.

## KEEPING IT "IN THE BLOOD"

Alex Canter, Debra Holschuh-Houden (Mentor), Family Business

The focus of the research done for this symposium is on the pros and cons of keeping a family business "in the blood". In depth research will provide an understanding of the complications involved in both businesses run by blood-related family members and businesses that aren't family owned and operated. There will be an emphasis on inter-generational operated businesses to exemplify the complexity of shift. Academic research, case studies, and data collection will uncover various dynamics and differences among methods of operation. The research utilizes surveys, interviews, and questionnaires to gather data specifically on communication and conflict. Research focused on communication and conflict is necessary and helpful to anyone who is an employee. Understanding what is beneficial and what is unconstructive will improve business efficiency.

## RESTORING THE FUNCTION OF P53 THROUGH TREATMENT WITH PRIMA-1 IN HPV POSITIVE CELL LINES

Ebony Carson, Randall Kimple (Mentor), Department of Human Oncology

**Purpose:** The Human papillomavirus (HPV) E6 protein promotes cell proliferation by degrading the tumor suppressor protein p53. We sought to determine whether a drug that can reactivate mutant p53, Prima-1, would stabilize and restore p53 function in HPV-positive cells. **METHODS:** Four HPV-positive cell lines were tested for response to PRIMA-1. Cell growth, viability, cell cycle progression, and apoptosis were assessed after PRIMA-1 treatment. **RESULTS:** Cell cycle distribution of HPV+ cells following PRIMA-1 treatment will be determined. **CONCLUSIONS:** PRIMA-1 shows promising efficacy in HPV+ cells that warrants additional study.

## SEBENE: THE INTEGRATION OF ELEMENTS IN W. AFRICAN MUSIC WITH THE EURO-AMERICAN ORCHESTRAL TRADITION

Iris Ceulemans, Stephen Dembski (Mentor), Music

This composition for orchestra, entitled Sebene, integrates social and musical aspects of the Euro-American orchestral concert tradition with aspects of West African music. The instruments of the orchestra, the conductor, and the stage are all used from the Euro-American tradition. Composition techniques from this tradition include micro-textures, found in the music of Ligeti, and the combination of pitches very close together to produce one unique timbre, such as in the music of Penderecki. These techniques are combined with various aspects of West African music, such as vocal voice-leading and counterpoint norms, call and response techniques, an energetic pulse, and an element of choice and individuality between the performers, where the orchestra is the whole interactive community.

## UNDERSTANDING SINGLE-WALLED CARBON NANOTUBE CLONING

Tou A Chang, Michael Arnold (Mentor), Material Science and Engineering

The study is to understand single-walled carbon nanotube (SWCNT) cloning with uniform diameter in order to control their properties. SWCNTs are one-dimensional structures consisting of sp<sup>2</sup>-bonded network of carbon atoms. They have attracted attention due to their unique mechanical, electrical, and thermal properties; however, their applications have been limited by the inability to grow SWCNTs with controllable diameter. The effects of parameter such as temperature, precursor flux, and pressure were studied to understand their effect on the resulting SWCNT diameter. The study of SWCNTs cloning will aid future studies in producing SWCNTs with tailored properties for specialized applications.

## DESIGN OF ALPHA/BETA-PEPTIDE MIMICS FOR EVALUATION OF ANTIBODY BINDING PROMISCUITY

Ross Cheloha, Tong Wang, Samuel Gellman (Mentor), Chemistry

Recent work has shown that synthetic molecules known as  $\alpha/\beta$ -peptides can participate in a variety of biological interactions. These  $\alpha/\beta$ -peptides, composed of  $\alpha$ - and  $\beta$ -amino acids, are attractive candidates for the creation of peptide vaccines due to their ability to mimic peptide epitopes while resisting proteolytic degradation in vivo. Here, I propose the use of sequence-based design to incorporate  $\beta$ -residues into existing peptide epitopes in order to create custom antibodies. These  $\alpha/\beta$ -peptides will then be tested on the created antibodies through ELISA to further understand the binding propensities of  $\alpha/\beta$ -peptide mimics in immunological systems.

## PUBLIC AWARENESS OF PRESCRIPTION DRUG MONITORING PROGRAMS

Dan Chen, Jeanine Mount (Mentor), Social and Administrative Pharmacy

Prescription Drug Monitoring Programs (PDMPs) are statewide initiatives to collect patient- and provider-specific data regarding controlled substances prescribing and dispensing. Though initiated 30+ years ago in some states, little is known about public awareness or perceptions of these programs. Analyzing popular media (e.g., newspaper, magazines, blogs) throughout the U.S. enables gauging the public's level of awareness and perspectives held. Systematic identification and content analysis of articles in Lexis/Nexis provide data for this study. We identify trends in the number of articles across states and the policy-relevant issues that they address. Specifically, we hypothesize that more articles pertinent to PDMPs appear in a state around the time of PDMP implementation. We discuss implications of PDMPs for addressing current public health problems related to prescription drug poisonings.

## THE ROLE OF IMMUNE REGULATOR NF-KB IN SLEEP

Yiming Chen, Jerry Yin (Mentor), Department of Genetics

Sleep is vital for survival but its functions or mechanisms are still mysterious. In our study we used *Drosophila melanogaster* as a model system to investigate the molecular mechanisms of sleep regulation. We asked whether NF- $\kappa$ B, a transcriptional factor, is important in sleep regulation and sleep homeostasis. Combining various genetic tools to control gene expression with spatiotemporal specificity, we first asked if NF- $\kappa$ B activities are important for sleep regulation. Taking the advantage of the high temporal resolution of luciferase reporter, we investigated the circadian of NF- $\kappa$ B activity. As our preliminary data indicated the involvement of astrocytes, we also used similar approaches to study astrocyte in sleep regulation. Taken together, our research helped us understand the mechanisms of sleep.



## THE EFFECT OF FOLIC ACID ON AXONAL REGENERATION IN THE PRESENCE OF CSPGS AFTER CNS INJURY

Anaita Chindhy, Bermans Iskandar (Mentor), Neurological Surgery

Victims of spinal cord and head injury, stroke, and other neurodegenerative disorders face grim prognoses of neurological recovery. Although a majority of Central Nervous System (CNS) neurons lose their ability to grow and regenerate shortly after birth, our studies showed that the capacity to extend axons can be recovered, at least partially, with folic acid (FA) supplementation. The magnitude effect of FA on CNS repair is dramatically superior to any other experimental intervention published to date. Although its effect appears to be mostly neuronal, its effect on glial scar composition is unknown. The formation of glial scar after injury is the major physical and chemical barrier to regenerating neurons. Chondroitin sulfate proteoglycans (CSPGs) are found to be the primary molecules in the glial scar inhibiting axonal regeneration after injury. Based on our in vitro observation with FA, we hypothesize that FA could circumvent the inhibitory effect of CSPGs. We will create an inhibitory in vitro environment with CSPGs to mimic in vivo conditions, which will enable us to examine whether FA can overcome the inhibitory effect of CSPGs. This will provide new insight into FA-induced regeneration after injury.

## AIRLINE PROJECT

Dimitri Chironis, Phillip Kim (Mentor), Management and Human Resources

The success rates of the airline industry, less than 1%, are significantly lower than any other large scale industry; such reasons are currently not clear. This project studied the factors contributing to their failure and the factors that have allowed others to survive in the airline industry. We analyzed the airline's vision justification documents (applications for certification) and its specific characteristics (areas of operation and plane body type), and performed ONET coding document (individual employment). Applicants to the airline industry fit into two categories, those with low risks involved and those with high risk. The one's fitting into the low-risk category have been much more successful in continuing their airline business.

## PHOTORHABDUS LUMINESCENS IN ANTIBIOTIC PRODUCTION AND PATHOGEN INHIBITION

Joonho Choe, Jerald Ensign (Mentor), Bacteriology

*Photorhabdus luminescens* is an insect-killing bacterium that is symbiotic with the nematode *Heterorhabditis*, and is a known producer of antibiotics. With growing numbers of drug-resistant bacteria, the development of novel approaches to discovering these antibiotic product(s) will be of great benefit to the medical community. The focus of this research study is to investigate different strains of *P. luminescens* for antibiotic activity, isolate their antibiotics, as well as discover the effects that different growth conditions have on antibiotic production. Thus far, we have isolated a promising antibiotic, but have not yet determined its structure and molecular weight. If it is in-fact a newly discovered antibiotic, the possible implications it could have are great due to its potential medical use.

## ASSOCIATIONS BETWEEN INTERNET USE AND PHYSICAL ACTIVITY AMONG COLLEGE STUDENTS

Dimitri Christakis, Elizabeth Cox, Jens Eickhoff, Natalie Goniou,  
Lauren Jelenchick, Rosalind Koff, Philip Giampietro (Mentor),  
Megan Moreno (Mentor), Henry Young (Mentor), Pediatrics

This study examined associations between college students' daily Internet use (DIU) and physical activity. Undergraduate students completed 43 text message surveys over 7 days, to measure DIU, and the International Physical Activity Questionnaire. Among 190 participants (response rate 69.6%), 58.8% were female, 90.5% were Caucasian. The mean age was 18.9 (SD=0.9) years. The median DIU time was 66 minutes (IQR 30-135); the average vigorous physical activity (VPA) was 2.9 (SD=2.0) days per week (DPW). Greater DIU was associated with fewer DPW of VPA ( $p<0.001$ ). Students whose DIU focused on academics reported more DPW of VPA compared to those whose DIU focused on Facebook ( $p<0.001$ ). Future efforts could reframe college students' DIU guidelines around both Internet use and activities, which may help increase physical activity.

## PREFERENCE FOR TOPICAL ANESTHESIA PRIOR TO PAINFUL NEEDLE PROCEDURES

Brian Christenson, Michael Kim (Mentor), UW Hospital

The purpose of this research is to evaluate the prevalence of anxiety and fears associated with painful needle sticks and assess the desire for topical anesthesia use in needle procedures. We hypothesize that there will be a significant percentage of adult population that would like an option of topical anesthesia offered. Our goal is to understand the needs for pain free needle procedures among adults and to develop a program that can widely implement widely applicable pain free needle programs. Methods of procedure entailed surveys from four different locations consisting of 100 participants from each location. Data analysis shows around 50% of the population would like to know about anesthesia and 10% would like the option before needle procedures.

## EFFECTIVENESS OF BENTONITE AS AN ANNULAR SEAL IN MONITORING WELLS

Cole Christiansen, Sabrina Bradshaw (Mentor), Geological Engineering

The objective of this study is to determine if the Wisconsin Groundwater Monitoring Well Requirements for sealing the annular space in wells describe an adequate method for preventing unwanted vertical flow of contaminants. The current method employs bentonite clay to prevent migration of fluid between contaminated and uncontaminated aquifers and from the ground surface to the screened portion of a well. Previous studies suggest that bentonite seals may fail under certain conditions. Physical models were constructed to simulate different hydrogeologic conditions. A dye system will be used to identify cracks and voids in the seal, along with the evolution of contaminant penetration. The results will identify if current material and installation procedures are adequate, or if modifications need to be made to the annular seal system.

## ACCOUNTING FRAUD IN FAMILY BUSINESSES

Ronnie Christopher, Debra Holschuh-Houden (Mentor), UW Family Business Center

Accurate accounting practices are crucial for the survival of family businesses. Without a sound accounting system, there is a great potential for fraud within the business. Not only is fraud detrimental to a family business, if the fraud is committed by a family member, it raises questions about trust within the family dynamics. This study will first look at different incidents of accounting fraud in family businesses. Examination of these various cases will include a focus on differences between the fraud committed by family members and non-family members. The conclusions drawn from this research will determine the extent to which fraud can affect family dynamics within the business and whether it is occurring more in family businesses than non-family businesses.

## CHRONIC KIDNEY DISEASE AND GROUP VISITS

Irene Chung, Henry Young (Mentor), Social and Administrative Pharmacy

Management of Chronic kidney disease (CKD) can often be challenging for health care providers due to time constraints and the volume of patients. Recently, nephrologists at the University of Wisconsin Kidney Clinic have implemented group visits, or shared medical appointments. Group visits are an innovative approach that brings patients with common medical conditions together with one or more health care providers. To explore the impact of group visits on patients, we will examine CKD patients' quality of life before and after implementation of the group visits through data collected from surveys. The presumable advantages of group visits include social support amongst patients and a platform for sharing information.

## COLLAGEN SUBTYPE AND HEMODYNAMIC FUNCTION OF PULMONARY ARTERIES RELATED TO PULMONARY HYPERTENSION

Jayden Cline, Zhijie Wang (Mentor), Biomedical Engineering

It is known that collagen accumulation plays a large role in arterial stiffening, which is important to the progression of pulmonary hypertension. However, it is not known how collagen types I and type III individually contribute to disease progression. To answer this question we are using a mouse model, harvesting the lungs after euthanasia, solubilizing the collagen, and finally analyzing the samples using ELISA. We hypothesize that type III collagen will be dominant in the pulmonary arteries during the development of pulmonary hypertension. In the future, these results could help to find more effective treatments for patients with pulmonary hypertension.

## QUALITATIVE PROGRAM EVALUATION OF THE ESCHOOLCARE PROJECT

Michaela Cline, Alexa Horn, Megan Koller, Emily Kunst,  
Cissy Ondoma, Lori Anderson (Mentor), Nursing

eSchoolCare is an innovative iPad-based educational program that provides on-the-go support for school nurses, as they are the primary professional in educational settings to provide care for children with chronic health conditions (CCC). The overarching goal of this project is to improve the health and educational outcomes of children with chronic conditions and to decrease the negative impact the child's chronic condition has on their family. Interviews and focus groups provided qualitative data, which was analyzed using content analytic techniques and provided insight into how/what circumstances the app and iPad were used, barriers, and changes in practice. Predicted outcomes include increased school nurse job satisfaction, increased knowledge and confidence regarding care of CCC, improved health and educational outcomes of CCC.

## SCAFFOLDS FOR INTRACEREBRAL GRAFTING OF NEURAL PROGENITOR CELLS AFTER CEREBRAL INFARCTION

Laura Cohen, Matthew Jensen (Mentor), Neurology

Intracerebral grafting of neural progenitor cells (NPCs) has potential to improve recovery after stroke, but the structural disruption of brain tissue is unfavorable for graft survival. To overcome this obstacle, scaffold materials have been used to provide structural support for the transplanted cells. We performed a systematic review of the available evidence supporting specific scaffolds for intracerebral grafting of NPCs after stroke. We found reports of the use of scaffolds composed of polyglycolic acid, poly[lactic-co-glycolic acid] particles, hyaluronan-heparin-collagen hydrogel, Matrigel, and extracellular matrix derived from porcine brain and urinary bladder. Multiple scaffolds appear promising for NPC grafting after stroke, but further research is needed to compare scaffolds and optimize this approach. Therefore, we have designed our own set of experiments to test these scaffolds.

## DISTRIBUTION OF 5-HT<sub>4</sub> RECEPTORS IN THE CENTRAL NERVOUS SYSTEM

Leslie Cohen, Courtney Lamondin, Mark Brownfield (Mentor), Comparative Biosciences

The serotonin receptor 4 (5-HT<sub>4</sub>R) is a protein encoded by a gene belonging to the G protein receptor superfamily. Its downstream effects are mediated by cAMP inducing physiological effects in the nervous system where it controls the release of neurotransmitters of target neurons. 5-HT<sub>4</sub>R can be mapped in the brain by two methods in our lab. The first method to determine its distribution is by using an antibody generated against the receptor, and immunocytochemistry to localize the receptor protein. The second is by using immunocytochemistry to identify specific 5HT<sub>4</sub> agonist induced fos expression in target neurons. Our goals are to begin generating a 5-HT<sub>4</sub> antibody and use of selective agonists to target 5-HT<sub>4</sub> expressing neurons by the expression of fos subsequent to agonist binding.

## THE GUIDEBOOK TO BYZANTINE HISTORIOGRAPHY

William Conlin, Leonora Neville (Mentor), History

The Guidebook to Byzantine Historiography project intends to clarify existing information pertaining to Eastern Roman histories and historians. Additionally, it seeks to uncover lesser-known facets of each medieval history, and to aggregate these findings in a comprehensive work. Methodology for this undertaking is primarily database and library searches, utilizing existing scholarship to augment personal findings. Once information is collected, a section is compiled for each historian within the scope of the project. These sections will preface a series of references for further study, should the reader desire it. As a finished product, this particular project will serve as an introductory guide to any who wish to enrich their own knowledge of the chronicles of Byzantium, and a useful reference volume for advanced scholars.

## HOMELESSNESS, SCHOOLS AND COMMUNITIES

Rebecca Cooks, Peter Miller (Mentor), Educational Leadership and Policy Analysis

It appears that homeless students have lower school performance because of changing or volatile situations outside of the classroom. We are examining how the increase of homelessness in America affects the community response to new problems concerning homeless school children and their families. Therefore, we are collecting data from schools on potential relationships between student performance and factors such as race, surroundings, or other "out-of-school" variables. School faculty and homeless families are also being interviewed to understand what resources families seek to combat their situations?such as transportation, child care, or food?and how they find them. The ultimate goal is to present our discoveries to researchers, practitioners, and policy makers who deal with homelessness so they may better assist students, families, and the community.

## WOLLERSHEIM WINERY: A FAMILY HISTORY

Romain Coquard, Debra Holschuh-Houden (Mentor), Business Outreach

Knowing the origins of a family business with centuries of family history and how it progressed to the present day is important for the current generations to uncover in order to further their legacy and understanding. Uncovering the truth and gathering details on this matter can help the current family members better understand their past and the challenges overcome by previous family members in the industry lending knowledge on how to overcome similar challenges today. In this age of media and marketing, family stories play a vital role in drawing customers into a family business and can be a large competitive advantage for the family business if used effectively. Through family interviews and research in genealogy information databases, the family business origins and stories will be uncovered. The manner in which these family stories are used to promote and benefit my family business can be used as an example to all family businesses on the benefits of gathering and using this type of information to promote the business.

## RATIONAL MOLECULAR MULTI-TARGETING IN ANGIOSARCOMA

Kelsey Corrigan, Genevieve Kozak (Mentor), Human Oncology

Angiosarcoma is a malignant, aggressive cancer with current poor prognosis. Previous studies have demonstrated that certain cytotoxins have a synergistic effect on angiosarcoma tumor growth. This study investigated a combination of three cytotoxin drugs, Paclitaxel, Rapamycin, and 17AAG, in angiosarcomas. We hypothesized that Triolimus, the three drug combination, would display greater effect against aggressive angiosarcomas as opposed to the cytotoxic drugs by themselves. Through in vitro and in vivo studies we examined the role of Triolimus on SVR and MS1-VEGF cell lines. Our results thus far suggest that the combination Triolimus has a more synergistic effect in vitro than any of the three drugs alone.

## EFFECTS TRANSITIONING TO COLLEGE HAS ON FACEBOOK USE

Kelsey Cousland, B. Bradford Brown (Mentor), Educational Psychology

This study examines students' transition into their first year of college, especially how they present themselves on Facebook once entering college. Through surveys, interviews, and analysis of Facebook pages of over 200 first-year students, the researchers are assessing how and why people change their behavior and how they present themselves to others when they go to a university. At this point all the data has been collected and, using a grounded theoretical approach, the researchers are coding the common themes in the surveys and interviews. Relating these themes to measures of social and psychological adjustment will provide a clearer idea of adaptive ways to negotiate the social transition to college and achieve a clear sense of identity in this new social context.

## THE BIG BUSINESS OF FAMILY: THE PROBLEMS HISTORICAL BIG BUSINESSES EXPERIENCED

Stephanie Covelli, Debra Holschuh-Houden (Mentor), UW Family Business Center

Though there are a number of reasons why the study of history is important, one is to examine past political, social, and economic mistakes in the hopes of avoiding history repeating itself in those ways. It is important to use history as a way to learn how to better work in or run a family business. Examining the familial lives and businesses of JP Morgan, Cornelius Vanderbilt, and John D. Rockefeller show how business can become tumultuous when mixed with family. JP Morgan had bitter fights with his father regarding the future of finance and industry, the son of Cornelius Vanderbilt had a nervous breakdown while acting as vice-president of one of the railroads prompting Cornelius to send him away, and John D. Rockefeller's son resigned from the company following allegations of bribery and scandal. Exploring these troubling aspects of the business will reveal the issues that can arise when mixing business, ownership, and family. Research about the issues these businesses faced can help to reveal some recurring problems and allow us to determine ways to avoid them by utilizing the lens of history.

## THE ROLE OF MOH1 IN SACCHAROMYCES CEREVISIAE IN A ZINC DEFICIENT ENVIRONMENT

Jonathan Criter, Michael Bucci (MDTP student),  
David Eide (Mentor), Nutritional Science

The transition metal zinc is an essential component in many proteins as a co-factor for numerous biochemical processes. Although necessary, zinc in excess is toxic to cell survival. As a result, all organisms rely on mechanisms to maintain a healthy cytosolic zinc environment. Zap1, a gene-regulating protein, controls zinc homeostasis. One of many genes that Zap1 regulates in zinc-limiting environments is MOH1, which has an unknown function. The Moh1 human homologue has shown involvement in apoptosis and associates with cancer diseases. A greater understanding of Moh1 function in *S. cerevisiae* could lead to beneficial insight into cancer therapy. The objective was to gain insight into the relationship of a zinc-limiting environment and Moh1. To achieve this the Yeast 2-Hybrid Method was used to identify interacting library proteins, and future split yellow fluorescent protein analysis to confirm the interactions. Preliminary results have identified three prospective Moh1-protein interactions: KRE11, Hmg1 and SSZ1.



## MINING THE CARBOHYDRATE-ACTIVE ENZYME DIVERSITY IN THE SEQUENCED MICROBIAL GENOME COLLECTION

Andrew Cunningham, Garret Suen (Mentor), Bacteriology

The ability of microbes to degrade cellulose found in plant cell walls is critical to the success of almost all food webs on earth. This important physiological property is considered a key step in the ability to produce renewable energy in the form of cellulosic biofuels. Accessing this renewable energy source requires the deconstruction of plant cell wall polysaccharides into simple sugars using enzymes present within bacteria. A major challenge in biofuel research lies in how to best identify enzymes with the most promising cellulolytic properties. Current approaches include the categorization of carbohydrate-degrading enzymes through the Carbohydrate-active enzyme (CAZy) database, which classifies enzymes based on their enzymatic properties. Importantly, individual enzymes may contain multiple CAZy domains that influence their cellulolytic abilities. Here, we mined the CAZy database and show that microbes use only a limited number of enzymes with different CAZy domain combinations, relative to the total possible theoretical combinations available. At the organismal level, we also investigated the total CAZy profiles for the sequenced microbial genome collection show that some lineages of bacteria have a CAZyme signature that may reflect their cellulolytic capabilities. We also found that novel CAZymes are discovered more rapidly in cellulolytic microbes, as expected and show that sequencing the genome of a novel cellulolytic genus has the potential to reveal new CAZymes at a higher rate than sequencing the genome of a species for which other species of the same genus exist. This work contextualizes our understanding of the distribution of carbohydrate-degrading enzymes in microbes and suggests priorities for future sequencing strategies for the discovery of novel enzymes.

## DIAZO COMPOUNDS FOR CATALYSIS-FREE ESTERIFICATION AND POTENTIAL USES IN HIV PROTEASE INHIBITORS

Amy Davis, Nicholas Mcgrath (Mentor), Chemistry

In modern chemical biology, chemoselective reactions that target biologically relevant functional groups are of critical importance. This research investigates the new reactivity of moderately stabilized diazo compounds with carboxylic acids and the resultant ester formation. This reaction occurs in aqueous systems and can be tuned to yield specific reactivity. The reaction potentially provides a way to esterify carboxylic acids *in vivo*, targeting a vast array of carboxylic acids, including those present in aspartic or glutamic acid-rich proteins. As a result, it may be possible to introduce diazo moieties into current drugs that target aspartic acid-rich enzymes to strengthen the binding interaction of the drug. One such use would be in HIV protease inhibitors, which target the aspartic enzyme HIV protease and delay virus particle maturation.

## CHARACTERIZING THE BACTERIAL COMMUNITY AND PREVALENCE OF VERTICAL TRANSMISSION IN SWITCHGRASS

Nicole Davis, Cameron Currie (Mentor), Bacteriology

Our study will examine the bacterial community residing within *Panicum virgatum* (switchgrass), and study the dynamics of bacterial transmission from one plant generation to the next. We will use 454 DNA pyrosequencing to characterize the bacterial communities in *P. virgatum* samples taken from agricultural fields in Arlington, WI. We will also sequence a second generation of *P. virgatum* grown in a sterile greenhouse environment. By comparing bacterial communities from field leaf, seed, and greenhouse leaf samples, we will also determine the prevalence of bacterial vertical transmission. Data from this experiment may further inform studies of microbial-plant ecology in *P. virgatum* and may also supply the literature with information on general bacterial vertical transmission in plants.

## ELECTROPHYSIOLOGICAL MASKING-LEVEL DIFFERENCE IN OLDER LISTENERS

Alejandro Delgado, So Eun Park (Mentor)

We often have a bias that all people who appear old to us need to be spoken to a little louder than how we speak because of their hearing loss. However, as we become older, it takes our brain longer to process what is being said. Our lab tested a young and old age group to test for hearing loss. By sending certain tones through their headphones, we analyzed how their brain responded to them. The young group had a normal hearing loss and the older group had near-normal hearing.

## COGNITIVE AND PHYSIOLOGICAL CORRELATES OF STRESS IN HEALTH AND DISEASE

Stephanie Derr, Natasha Mason, Benjamin Weis, Marcia Slattery (Mentor), Psychiatry

Stress is known to contribute to deleterious mental and physical health problems. The hypothalamic-pituitary-adrenal (HPA) axis is the primary physiological stress response system; alterations in HPA function contribute to many of these adverse outcomes. Considerable research has begun to focus on what causes stress and hence, activates the HPA. Growing evidence supports a transactional model of stress i.e. how individuals differ in their cognitive perceptions of day-to-day experiences as stressful, and the relationship to activation of the HPA response. This presentation will focus on stress research undertaken in our laboratory regarding the assessment of individual differences in cognitive stress appraisal and alterations of physiological HPA function at home and in the laboratory. Translational clinical implications will be discussed, with emphasis on treatment and preventive interventions.

## EMOTIONAL INTELLIGENCE AND FAMILY BUSINESS

Stephanie Dhein, Debra Holschuh-Houden (Mentor), UW Family Business Center

Emotional Intelligence (EQ) is an issue that deals with an individual's skill to be able to recognize one's own feelings and those of others as well as the ability to manage one's emotions and relationships with others. Through a survey study of three different family businesses I examined the difference between a family's view of their EQ and a non family member's view of the family business's EQ to see if having a direct relationship in the family made a difference on the business's emotional competence. The aspects of this study explore the advantages and disadvantages of the effects of EQ to outside, non-family management, and the inside family management members. The study will focus on the effects that EQ has on a family business for members and non members as well as conflict resolutions that help to improve a family's EQ.

## THE ROLE OF SALVADORAN WOMEN DURING THE CIVIL WAR

Jessica Diaz-Hurtado, Florencia Mallon (Mentor), History

I examine and explore the different roles of women, from guerilla fighter to refugee, and how they have contributed or were affected during the brutal domestic conflict in El Salvador. The country of El Salvador had a constant battle with the ruling powers and its constituency regarding class, race, and gender. During the early 1980s to early 1990s, the civil war conflict that had been building up for decades broke out. Examining this historical event is vital to our nation's population and social issues, as many Salvadorans have immigrated to the United States in a large influx during these years to escape warfare and search for the promised American dream. It helps us examine the immigration patterns of this population. The role of women is equally as vital. As a marginalized population in all corners of the colonized world, it is imperative to understand and learn how they went about and processed this war. I examine socially constructed behaviors that impacted their actions. As well, I research how their oppressed history have affected their position during the war, and examine their decisions, if they had any, in that time period. It also plays out in the political realm in El Salvador's current governing party. I focus on a refugee and guerilla status of women in the context of their urban and rural location to the United States and other parts of Latin America.

## FEASIBILITY PILOT USING IPADS FOR SYMPTOM MANAGEMENT DATA COLLECTION

Sara Dickey, Karen Kehl (Mentor), Nursing

Symptom management is one of the key components of hospice care. There is little data on the symptoms in the days prior to death especially from home hospice. This study aims to determine the feasibility of collecting daily symptom management information from caregivers using a standardized assessment on an iPad. Patient/caregiver dyads will be recruited from a local hospice. I will be following one dyad with weekly calls. If caregivers find this an acceptable method of collecting symptom data, a larger study will be planned to obtain information on symptoms and their patterns which can be used to improve symptoms management by caregivers in hospice. Improved symptom management can reduce suffering and costs of care while increasing caregiver confidence.

## SUBJECTIVE SLEEP QUALITY AND COGNITION [WISCONSIN SLEEP COHORT DATA]

Andrew Dickman, Cynthia Phelan (Mentor), GRECC VA-Madison

A strong relationship has been established between obstructive sleep apnea (OSA) and reduced neurocognitive performance as measured by polysomnography (PSG). While the relationship between objective measures (PSG) has been established, the relationship between subjective sleep measures and diminished neurocognitive functioning has not been examined. This is important as OSA is underdiagnosed; individuals with OSA may be completely unaware they have a sleep disorder that could compromise daily cognitive performance. The aim of this secondary data analysis of the Wisconsin Sleep Cohort Study (N=717; mean age 61.7) was to examine the relationship between subjective sleep measures and neurocognition in adults with OSA as compared to normal controls. Results of the study are pending and will be available to review by March 8.

## THE EFFECTS OF NEUTRAL BEAM INJECTION ON MOMENTUM TRANSPORT AND MODE SUPPRESSION IN A RFP

Tom Dobbins, Mark Nornberg (Mentor), Physics

Global magnetic reconnection events (sawteeth) in the RFP are characterized by rapid transport that flattens both the plasma current and parallel flow profiles. The tangential neutral beam on the MST is a source of momentum injection into the plasma that has also been observed to suppress the core-most magnetic mode in the plasma. Ensembles of multiple sawtooth events with and without the NBI were performed over a variety of plasma conditions to observe any effects of the NBI on sawtooth crashes. Past observations of both mode rotation and impurity emission Doppler shifts have shown an increased toroidal rotation associated with the neutral beam. In this work, the suppression of the core-most mode was verified for a broad variety of plasma conditions. Furthermore, for some plasma parameters the NBI brings a mode into resonance that is not resonant without the NBI. This is the first evidence of the NBI's effect on the plasma current profile. Finally, a statistical comparison of mode locking, which shows that co-injection greatly reduces the mode locking, while counter-injection slightly increase mode locking, will be presented. This work supported by the US DOE.

## EFFECTS OF ALZHEIMER'S DISEASE RISK FACTORS ON BRAIN MICROSTRUCTURE IN COGNITIVELY HEALTHY ADULTS

Samuel Doran, Sharon Lu, Barbara Bendlin (Mentor), Medicine

Alzheimer's disease (AD), a neurodegenerative condition, is the most common form of dementia. Little is known about the earliest brain changes that occur before memory deficits become apparent. This cross-sectional study aimed to assess the effects of two well-known AD risk factors, parental family history and APOE4 genotype, on white matter microstructure in cognitively healthy adults. 343 participants from the Wisconsin Registry for Alzheimer's Prevention underwent diffusion tensor imaging and were grouped as middle aged and young-old. Both risk factors were associated with significant differences in white matter integrity for the young-old group only, suggesting different trajectories of white matter alteration over time between risk and non-risk groups to result in significant, detectable differences at an older age and laying foundation for future longitudinal studies.

## HOW CHILDREN EVALUATE INDIVIDUALS FROM HIGH AND LOW SOCIOECONOMIC BACKGROUNDS

Leah Dornbusch, Kristin Shutts (Mentor), Psychology

Previous research reveals that children use social categories to make sense of their social world. Socioeconomic status (SES), a salient aspect of children's environments, has been widely studied in adults, but less so in children. The purpose of this study is to investigate whether children use SES information to guide their social preferences and prosocial behaviors. I presented 5-8-year-old children from high- and low-SES families with photographs and verbal descriptions of unfamiliar children who varied in SES. Participants were asked to rate how much they liked each child, and were also given the opportunity to distribute toys to each child. My study will enrich our understanding of the development of children's early sociological reasoning.

## IRON: A POSSIBLE LINK BETWEEN OBESE PREGNANCIES AND ASTHMA PREDISPOSITION AT BIRTH

Natalie Dosch, Pamela Kling (Mentor), Pediatrics

Maternal pre-pregnancy obesity is associated with early asthma diagnosis in offspring, yet no clear mechanism behind this association has been described. Chronic inflammation caused by obesity may play a role by blocking maternal-fetal iron transport. Resulting fetal iron deficiency may alter inflammatory processes to predispose for asthma. We explored the hypothesis that asthma biomarkers at birth were related to maternal obesity and newborn iron deficiency. Umbilical cord blood from obese and non-obese pregnancies was analyzed for iron status and cytokine dysregulation, a known asthma biomarker. We found that iron status altered some cord blood cytokine patterns and that patterns were directly related to poor newborn iron status and maternal obesity. The study findings have the potential to impact future childhood asthma research and detection.

## PSYCHOSOCIAL NEEDS OF COLLEGE STUDENTS LIVING AWAY FROM A PRIMARY CAREGIVER WITH CANCER

Hannah Draayers, Julie Hantschel,  
Kristine Kwekkeboom (Mentor), Academic and Student Services

Extensive research has examined the effects of a parental cancer diagnosis on school aged children, but little research has been done on the traditional college student age group living away from home while their parent faces a cancer diagnosis. Experiencing competing demands, these students may be at an increased risk for psychosocial distress and have more unmet psychosocial needs. The purposes of this online survey-based study were to (1) describe the psychosocial needs of college students ages 18-25 living away from home while a parent or primary caregiver experienced cancer, and (2) to explore relationships between young adults' demographic characteristics and their psychosocial needs. Results will be discussed with respect to development of resources to assist with the psychosocial needs of this population

## INTERACTIONS OF THE F BOX PROTEIN JETLAG IN CIRCADIAN CLOCKS

Jerdon Dresel, Laurence Loewe (Mentor), Genetics

Circadian clocks are a key biological function that controls our internal timekeeping. Much is known about the genetic functionality of these clocks but there are still important questions that remain unanswered. One example is how the Jetlag (JET) F box protein interacts with the photoreceptor Cryptochrome (CRY) to degrade a central clock protein, Timeless (TIM), in our model organism *Drosophila melanogaster*. TIM is thought to control daily resetting of circadian clocks in a light-dependent environment via conformational changes in CRY that allow for the binding of JET to initiate degradation. We are integrating various alternative mechanisms for this process into systems biology models with the aim of exploring how simulations can help determine which alternatives better explain observed data and the clock as a whole.

## TIC GENE EXPRESSION IN HUMAN INDUCED PLURIPOTENT STEM CELLS UPON NEURAL DIFFERENTIATION

Megan Duffey, Samuel Gubbels (Mentor), Department of Surgery

Hearing loss is generally due to cochlear hair cell death; these sensory cells do not spontaneously regenerate in mammals. There are few reports of successful generation of hair cells from human induced pluripotent stem cells. Doing so would allow for an improved understanding of development, disease and drug testing. During development, the neural and auditory systems develop co-dependently. We hypothesized that when induced to become neurons, a small subset of human pluripotent stem cells will differentiate into inner ear (otic) progenitors. We show that upon neural differentiation, otic gene and protein expression occurs and follows a time course that matches that which is seen during inner ear development. Ongoing studies include optimizing the generation of otic progenitors and long-term differentiation into hair cells.

## IN ARTISTIC COLLABORATION: UNTITLED (LIVE)

Arianna Dunmire, Jacqueline Thelen, Katherine Corby (Mentor), Dance

The piece Untitled (live) is a combination and transposition of two pieces choreographed by Arianna Dunmire and Jackie Thelen. Dunmire and Thelen embarked on a collaborative choreographic process including two musicians and three additional dancers. This project stemmed from similarities they found in each others' work and their desire to explore what it means to be collaborative in choreography and music. A common thread between Dunmire and Thelen's approach to choreography is the desire for input from the dancers through improvisational scores. This form of collaborative teamwork yielded a piece built upon structures and choreography from the original two pieces, ultimately creating an entirely new work. The final piece is a product of the refraction and amplification of ideas that comes with collaboration.

## FAMILY BUSINESS ANALYSIS: WALMART

Michael Ebener, Debra Holschuh-Houden (Mentor), UW Family Business Center

This symposium project explores Walmart's effect on communities and how the company benefits and hurts its local customers and associates. Through this analysis, the figures and research show that since the passing of Sam Walton, poor communities and local family businesses in particular have been affected greatly by the retail giant. Because of the large social divide between the billionaire Walton family and its working class customers, communities are being exploited by capitalist inequality in its effect on wages and local competition while also giving the community the advantages of low-cost products through its discount retailing. By weighing the costs and benefits to poor communities and comparing Walmart to other family businesses, this research gives a transparent outlook on the corporation's effect on American culture.



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## MARKETING AS A FAMILY RESTAURANT

Benjamin Ehlers, Debra Holschuh-Houden (Mentor), Family Business Center

Marketing is important for every business to make their product or service known to potential customers. In the marketing realm, family businesses have a unique advantage. As a service industry, a favorable reputation drives success in restaurants. In addition, family businesses are viewed in a positive light because customers are able to relate family values such as trust and loyalty to the business. If both of these statements hold true, marketing as a family restaurant should help drive future growth of the business. I will examine multiple family restaurants to discover whether or not marketing themselves as a family business helps give them an advantage over non-family restaurants.

## THE PRECISION OF MEMORY ITEMS RETAINED INSIDE AND OUTSIDE THE FOCUS OF ATTENTION

Adam Eichenbaum, Bradley Postle (Mentor), Psychology

Working memory (WM) is the ability to transiently maintain information no longer present in the environment. Recent findings indicate that as more items are maintained in WM, the fidelity, or precision, of those memories decreases. We sought to determine whether precision varies between memory items held inside and outside the focus of attention. Participants performed a free recall memory task in which they were cued to direct their attention towards one of two motion directions held in WM. We modeled participants' responses in order to obtain estimates of the precision of attended and unattended memory items. Our results suggest that attention does not affect the precision of items held in WM.

## POSTMENOPAUSAL HORMONE REPLACEMENT THERAPY CONTROVERSY AT THE BIOCHEMICAL LEVEL

Samuel Ekstein, Craig Atwood (Mentor), Medicine

Hormone replacement therapy (HRT) is highly debated in healthcare. The Women's Health Initiative study, a large-scale study to determine risks of HRT, was halted early due to the increased risk of breast cancer. Women in the study explicitly used non-bioidentical HRT; either conjugated equine estrogens (CEE; Premarin) alone, or together with medroxyprogesterone acetate (MPA; PremPro), the most widely prescribed HRT medications in the U.S. However, mounting evidence suggests that these non-bioidentical hormones have detrimental effects when compared to bioidentical HRT that uses hormones normally produced by the body. This review examines the biochemical and physiological differences between HRT using bioidentical or non-bioidentical hormones in vitro and at a pre-clinical in vivo level. These data suggest that bioidentical hormones are a safer alternative for postmenopausal healthcare.

## A COMPARISON OF THE KIR MATCHED/MISMATCHED ANTI-TUMOR BENEFIT OF HUMAN NK CELLS

Megan Elsenheimer, Paul Sondel (Mentor), Human Oncology

The antitumor effects mediated by natural killer (NK) cells may be influenced by the combinatorial expression of inhibitory killer cell immunoglobulin-like receptors (KIRs) and corresponding human leukocyte antigens (HLAs). Individuals whose KIR repertoire is "mismatched" to their own HLA may show improved treatment responses. I developed a flow cytometry assay to compare anti-tumor responses of healthy donor NK cells with various KIR/ HLA expression patterns. My goal is to see if "mismatched" NK cells have better anti-tumor responses than "matched" cells. Preliminary results are somewhat consistent with this hypothesis, and suggest that some individual KIR/HLA relationships may have dominant effects. More donors must be studied in order to be able to better characterize these interactions and apply this research toward maximizing anti-tumor responses.

## B-CATENIN IS A REGULATOR OF PARACRINE SIGNALING IN THE PROSTATE

Erik Elton, Chad Vezina (Mentor), Comparative Biosciences

Our goal is to determine how prostate cell proliferation is regulated. We are specifically examining a paracrine mechanism, a mode of cell-cell communication that involves one cell inhibiting proliferation of another nearby cell. We genetically engineered mice to overexpress  $\beta$ -catenin (CTNNB1) in a patchy subset of fetal prostate epithelial (FPE) cells. FPE cells nearby CTNNB1 over-expressing cells were less likely to proliferate than those located distally. We tested the hypothesis that CTNNB1 over-expressing mouse FPE cells would reduce proliferation of human adult prostatic epithelial cells. We grew human adult prostate epithelial cells with control or CTNNB1 over-expressing fetal mouse prostate cells in a collagen matrix and measures cell proliferation. We expect to identify CTNNB1 as a regulator of paracrine signals that control prostate cell proliferation.

## ANALYSIS OF ENZYMES FOUND TO CAUSE PRION DEGRADATION USING INHIBITOR AFFINITY CHROMATOGRAPHY

Eric Englin, Christopher Lietz (Mentor), Chemistry

The purpose of this study is to investigate the identity of a newly discovered enzyme found in compost that is capable of degrading the prion protein (PrPSC) from soil samples under normal conditions. If successfully identified, this enzyme can offer a practical way to degrade prion proteins found in farmlands all around the world without being detrimental to the farmland itself. To accomplish this, I will be using the compost given to me by my collaborator, Joel Pedersen, here at the University of Wisconsin-Madison. When the class of enzyme is identified by my collaborator, I will be in a position to develop an inhibitor affinity chromatography method. The method will be optimized using previously known enzymes of the same class. Using this optimized method, I will be able to run the sample in the Synapt G-2 mass spectrometer which will allow me to see protein sequences from the enzymes found in the compost and match these with an enzyme derivative identified using an online proteomics database. My method will be optimized according to the confidence rating provided by the statistical data of the online database.

## IMMORTALIZATION AND CHARACTERIZATION OF VOCAL FOLD EPITHELIAL CELLS

Gabrielle Enos, Elizabeth Levendoski (Mentor), Surgery

Our research is focused on establishing a way to successfully immortalize vocal fold epithelial cells by transfecting the cells with telomerase reverse transcriptase (hTERT). The immortalization of human vocal fold epithelial cells (hVFE) can help us further understand the innate biological defense mechanisms that are essential for vocal fold health. We will isolate and culture plates of VFE from various pig larynges, since hVFE are hard to come by. Upon insertion of hTERT into the cell lines, we will observe and analyze the cells in order to monitor their health and well being as well as detect signs of immortalization. We expect, by using similar but slightly modified methods used to immortalize vocal fold fibroblast cells (VFFs), we will eventually generate an immortalized VFE strain.

## NEEDLE PHOBIA AMONG COLLEGE STUDENTS

Ethan Farris, Michael Kim (Mentor), Medicine

No matter what age, many of people loathe their annual shots. Is it a learned fear, or a behavioral one? Needle phobia, also know as trypanophobia, has an estimated prevalence of 4%-10% among the population. We have interviewed over 300 patients of ages to 18-22 to determine where this fear comes from. The short list of questions we ask our patients helps us discover trends. We also want to determine the desire for topical anesthesia among college students. There are certain creams that if applied, may reduce pain and swelling. We desire to recognize if one gender despise needles more than the other, or if the fear diminishes with age. We are interested in the proportion of colleges students who have needle phobia.

## MADISON'S PARKING AND CONGESTION PROBLEM

Martha Ferris, Thomas Rutherford (Mentor), Agricultural and Applied Economics

In Madison, there are two main options for parking cars: metered street parking and parking ramps. When searching for a street spot, vehicles tend to circle, emitting exhaust and contributing to the congestion problem, whereas vehicles that choose parking ramps tend to spend less time circling, and thus less time congesting. We will first explore economic incentives to convince drivers to use parking garages over street parking and thus reduce congestion. We will build a general equilibrium model to understand the pricing and sorting effects of different parking policies, extending prior work of Rutherford and colleagues on a model based in Zuerich, Switzerland to data that we will collect and implement for a Madison based model. Subsequent to this, we will develop and use a simple Agent-based model to validate and visualize our results. In addition, we will incorporate other ways of greening Madison's parking into our existing model and help policy makers visualize the effects of certain parking policy decisions, using cloud-based visualization tools such as the NEOS web server based at the Wisconsin Institute of Discovery. This project is a unique interdisciplinary combination of Mathematics, Computer Science and Economics.

## IDENTIFYING 3'UTR BINDING SITE OF BICAUDAL-C

Thomas Feustel, Michael Sheets (Mentor), Biomolecular Chemistry

Bicaudal-C (Bic-C) is an RNA binding protein relevant to the study of embryology and of human polycystic-kidney disease. Bic-C negatively regulates gene expression during oogenesis and embryogenesis by binding to the 3'UTRs of genes coding for various proteins. The exact binding site on 3'UTRs is currently unknown. In order to gain a better understanding about how Bic-C functions, the 3'UTRs of genes that are regulated by Bic-C will be separated into smaller portions. A protein assay using *Xenopus laevis* as a model will be conducted using the 3'UTR portions to determine where on the 3'UTR Bic-C binds to. Ultimately, finding the binding site will allow Bic-C to be studied in more detail and potentially identify Bic-C regulated mRNAs from adult tissues, such as the kidney.

## 'IGGY AND THE INHALERS:' AN ACADEMIC INTERVENTION FOR CHILDREN WITH ASTHMA.

Sara Filali, Alex Thomas (Mentor), Pediatrics

**RATIONALE:** Asthma education is critical in the control of the disease. One-on-one asthma education is not usually available in the UW Health system. "Iggy and the Inhalers" is an educational program consisting of a video, comic book and trading cards that teaches kids about asthma. We hypothesize that this project will improve asthma education compared to the current interventions utilized. **METHODS:** We will be performing pre and post-intervention educational testing in asthmatic children from the UW Allergy Clinic, 20 South Park Clinic and American Family Children's Hospital. Using a Time-Series design, recruiting 270 children 6-13 years, the intervention will consist of watching the video during the initial doctor visit as well as going home with trading cards and comic books. Post-testing will occur two weeks later.

## SYMBOLS STUDY

Catherine Finedore, Percival Matthews (Mentor), Educational Sciences

Some researchers argue that abstract symbols can lead to deeper understandings of certain material when compared to concrete symbols. This is potentially due to prior knowledge associated with concrete symbols. This experiment compared learning a complex mathematical domain with instructions using abstract symbols (in this case, black 2-D shapes) and instructions using Arabic numerals (0, 1, and 2). Arabic numerals were thought to be more concrete because of participants' prior knowledge of numbers. Preliminary results revealed that participants learned on a deeper level when taught with abstract 2D symbols than with the numbers. This is one case in which meaningless abstract symbols seemed to promote a deeper learning of a mathematical domain than what was promoted by numbers.

## ATTACHMENT OF A CARBON MONOLAYER ON $\text{SnO}_2$ FOR INCREASED STABILITY IN ELECTRONIC APPLICATIONS

Connor Firth, Rebecca Putans (Mentor), Chemistry

We are attempting to attach a monolayer of carbon to the surface of  $\text{SnO}_2$  through a series of steps based on basic organic reactions, "click chemistry", and thiol-ene coupling. The ultimate applications we have in mind is to make a solar cell, and so our purpose in depositing this monolayer of carbon is to somewhat stabilize the  $\text{SnO}_2$  so that under harsh conditions, it will not deteriorate. Our preliminary data has been promising. We have used techniques such as IR, Raman, and X-ray photoelectron spectroscopy to characterize our surface. We are excited about pursuing this project and hope to get more conclusive results soon.

## SEQUENCING GENES ON CHROMOSOMES 1 AND 17 TO FIND MODIFIERS OF HEPATOCELLULAR CARCINOMA

Emily Fischer, Andrea Bilger (Mentor), Oncology

Hepatocellular Carcinoma is one of the leading contributors to cancer deaths world-wide. The study of this disease in mice has determined many chromosomal regions that likely contain tumor-inducing genes, two of which are located on chromosomes 1 and 17<sup>1</sup>. Locus Hcf1 of chromosome 17 affects the production of tumors, and females of the C57Br/cdJ (BR) strain are much more susceptible than those of the C57BL/6J (B6) strain<sup>2</sup>. Multiple genes in this region are being sequenced so that strains can be compared, starting with Btl2, a gene that regulates T-cell activation<sup>3</sup>. The sequencing of BR will be done using PCR and Sanger Sequencing. Once known, it will be compared to C3H/HeJ (C3H), a resistant strain, to determine if the sequence of DNA in BR is unique.

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## “HIP-HOP ACROSS THE OCEAN:” STOCKHOLM AND NEW YORK CITY— TOGETHER BUT SEPARATE

Chelsea-Leigh Flucus, Scott Mellor (Mentor), Scandinavian Studies

Hip-Hop originated in New York City during the 1990s. From the early days of Questlove and the SugarHill Gang to more recent artists such as Talib Kweli and Mos Def, hip-hop has given a voice to those who would not otherwise have one. No two ethnicities share the same history, cuisine, clothing, or vernacular and hip-hop strives to celebrate these distinctions. As a native New Yorker, I have always wondered how people in other parts of the world experienced Hip-Hop. On the surface, the idea of Hip-Hop in Sweden seems very strange and out of place. My research seeks to explore the similarities and differences of this music in two distinct parts of the world and illustrate that it is not as different as one may think.

## OXIDATIVE STRESS DETECTION IN BRONCHOPULMONARY DYSPLASIA

Kaitlyn Fochs, Christine Sorenson (Mentor), Pediatrics

Bronchopulmonary dysplasia (BPD) is a disease resulting in the arrest of normal lung development, and it is a significant cause of morbidity and mortality in premature infants. When infants are born prematurely, they are exposed to a high-oxygen (hyperoxic) environment in order to maintain an open airway. While this exposure is necessary, it causes oxidative stress disrupting lung development. We are using a mouse lung model to analyze effects of the bcl-2 protein, a protein that may play a protective role in lung tissue undergoing oxidative stress. We predict results that will demonstrate the protective effects of bcl-2. These implications would result in a better understanding of the pathways and mechanisms that cause BPD as well as the function of bcl-2 in lung vasculature.

## DRAFTING DERBY: FORGING PERSONAS AND SHATTERING THE MOLD

Amy Freeberg, Tim Frandy (Mentor), Comparative Literature and Folklore Studies

Roller derby had its beginnings as a co-ed skating endurance competition but virtually disappeared at the end of the 1970s after falling prey to the exploitative and outrageous production antics of televised roller derby. Roller derby made a comeback in 2003, which jump-started the formation of roller derby leagues all over the world. Since its revival, roller derby has evolved into a highly athletic and competitive sport. However, shadows of what roller derby once was still linger. Through personal interviews with skaters from the Mad Rollin' Dolls, the women's flat-track roller derby league of Madison, Drafting Derby attempts to shed light on the evolution of roller derby as an empowering and athletic sport for women, as well as delve into the creative aspects of the derby culture such as derby names and uniforms.

## STIMULATING IMAGINATION IN VIRTUAL REALITY

Vito Freese, Dana Paz, Patricia Brennan (Mentor), Industrial and Systems Engineering

As health care moves into the home and community, improving the capacity of people to devise innovative and creative responses to health challenges is essential. The belief of the Living Environment Laboratory is that exposing people to an open, playful space in the CAVE (a 6-sided virtual reality room) will stimulate their imagination, which will encourage better healthcare behaviors. A pilot study was done to test the feasibility of a virtual reality imagination experience and the validity of a Two-factor Imagination survey that assesses the spontaneity of a person's imagination. Nine participants completed various surveys and interacted with two virtual scenarios for 15 minutes apiece. Results indicated a positive relationship between a person's imagination spontaneity and the activity level reported in the CAVE.



## CYTOPLASMIC INTERACTIONS OF THE ANTI-VIRAL PROTEIN APOBEC3G WITH HIV-1: A VISUAL APPROACH

Stephanie Fricke, Nathan Sherer (Mentor), Oncology

In order to generate infectious virions, HIV-1 must traffic its genomic RNA to virion assembly sites at the plasma membrane. The cellular machineries regulating this process are poorly defined. APOBEC3G (A3G), a cellular anti-viral protein, is trafficked with genomes to assembly sites. Therefore, we have studied how the trafficking of A3G fused to YFP changes in response to HIV-1 genome expression during the post-transcriptional stages of the virus life cycle. Using live and fixed cell imaging, we observed that expression of genomic RNA induced A3G re-localization to cytoplasmic ribonucleoprotein complexes known as stress granules, which are involved in the cytoplasmic antiviral stress response. These findings have prompted us to further investigate the role of the stress response in the HIV-1 life cycle.

## THE MAKING OF A HORN TRIO: TEAMWORK THROUGH MUSIC

Amanda Fry, Dan Hively, Kyle Pompei, Daniel Grabois (Mentor), School of Music

As we journey along the path to become musicians, there comes a time in which teamwork is necessary. Together we will learn to make passionate music and develop important techniques to progress our studies. Some of the assets we hope to achieve include: leadership, patience, and communication. These assets can also be applied to many other fields of study. Using the skills developed by working together, we will be able to present music that demonstrates how important it is to build these skills early in our careers to become successful after we graduate.

## THE SECRET LIFE OF KNIVES FORKS AND SPOONS; A STUDY OF EATING UTENSILS AT UNION SOUTH

Michael Gan, Robert Kantrowitz, Abigail Mindock, Chung Nga Moy,  
Steven Pentler, Catherine Middlecamp (Mentor), Nelson Institute

As a part of the senior capstone project for ES600, we did a study on Union South's plan for switching to reusable silverware from disposable silverware. Specifically, we investigated the material energy consumption as well as the associated costs for washable silverware compared to disposable ones. We came up with some surprising results and we look forward to discussing them with everyone.

## GLOBAL ELECTION VIOLENCE DATASET

Ruben Garcia, Marissa Jaramillo Inken Von Borzyskowski (Mentor), Political Science

The purpose of this research is to record instances of electoral violence globally from 1990 to 2012. Election violence is a form of civil conflict that causes harm or threat of harm to any person or property anytime during the election process. We collect data on national elections (presidential, parliamentary, or referenda) over the entire period, from six months before the election, Election Day violence, and violence that continues three months after the election. Only violence that is related directly to elections is recorded. We exclude all other forms of conflict that happen to occur during the election period (for example ongoing ethnic strife, drug violence). After the data is collected it is coded into an excel file.

## SILENCING OF TET ENHANCES IN VITRO SPINAL AXON REGENERATION WITH INCREASING DOSES OF FOLIC ACID

Wil Gibb, Joslyn Strebe Bermans Iskandar (Mentor), Neurosurgery

The intrinsic regenerative capacity of the adult central nervous system (CNS) is limited. Recent studies from our laboratory show that folic acid enhances axon regeneration in injured adult rat spinal cords. The effect is mediated by DNA methylation and is biphasic, optimizing at 80?g/kg of folic acid and declining at higher doses. We hypothesized that the loss of effect at higher doses is related to demethylation mechanisms. We have shown that the expression of TET (ten-eleven-translocase) enzymes, responsible for DNA demethylation, follows a parallel biphasic curve in response to folic acid. In promising preliminary studies, we show that silencing of TET improves CNS regeneration both at 80?g/kg as well as at higher doses.

## CELL FIXATIVE OPTIMIZATION FOR EXTRACTION OF NUCLEIC ACIDS FROM CIRCULATING TUMOR CELLS

Benjamin Gibbs, Joshua Lang (Mentor), Medicine

Circulating Tumor Cells (CTCs) are rare tumor cells found in the blood of patients with cancer. We have reported a technology to isolate CTCs. However, current molecular assays utilize transfer, dilutive and centrifugation processes that promote sample loss, limiting the ability to analyze these rare cells. We have overcome this limitation with an immiscible exclusion process to purify nucleic acids. However, to perform intracellular protein studies, the CTCs must be fixed thus resulting in nucleic acid degradation. This project analyzed, a variety of cell fixatives, including alcohol-, formaldehyde- and zinc-based (ZBF) fixatives for the optimization of nucleic acid purification and analysis. We demonstrate the superiority of ZBF compared to traditional formalin for nucleic acid extraction for further research in oncology, immunology and medical diagnostics.

## UNITED NATIONS FAILURE PROJECT

Matthew Glattfelder, Mitchell Oelke, Emily Skovran,  
Nadav Shelef (Mentor), Political Science

The team's research project is to determine the effect that failure has upon states, concerning application to the United Nations (U.N.). The U.N. has long been the de-facto "legitimizer", and potential states know that they will have a greater chance if recognized by the U.N. The first phase of the project has consisted of tracking acceptances and rejections to the U.N., with special attention given to failed applications. As the database used for this tracking is large, not all applications have been logged. The second phase of the project is the exploration of the political consequences of failure and the logics of application. This research will provide a greater understanding of international relations and the effect of legitimacy.

## INCREASED RISK FOR ANXIETY AMONG COLLEGE STUDENTS WITH ADHD

Natalie Goniou, Philip Giampietro (Mentor), Pediatrics

This study aimed to determine whether college students who screen positive for ADHD are more likely to exhibit anxiety. Undergraduate students enrolled in an introductory communications class at a state university completed an online survey that included the Adult ADHD Self-Report Scale (ASRS-v1.1) and Generalized Anxiety Disorder Scale (GAD-7). Of 270 participants (73% response rate), 62.96% were female and 90.74% were Caucasian. The mean age was 18.9 (SD=1.1) years. 57 (21.5%) participants and 141 (52.2%) participants met criteria for ADHD or anxiety, respectively. Meeting criteria for ADHD was associated with an increased risk of meeting criteria for anxiety (OR=3.3; 95% CI (1.7-6.4),  $p<0.001$ ). This relationship suggests universities should consider screenings and interventions that encompass both ADHD and anxiety.

## ELEVATED TEMPERATURE INFLUENCES FOLIAR NITROGEN CONTENT IN SPRUCE AND FIR

Camille Gonzalez, Mary Jamieson (Mentor), Entomology

The purpose of this project is to better understand the effect of climate warming on plant-insect interactions. The overall project focuses on the effect of climate warming on tree resistance traits and nutritional quality as food for herbivores. For my research, I am investigating warming effects on spruce and fir foliar nitrogen content, as an index of protein availability for herbivores. Specifically, I quantified the percent foliar nitrogen from juvenile trees grown in plots under ambient or elevated temperatures. Warming can enhance photosynthesis rates and affect plant physiology, and thus may influence foliar nitrogen levels. Therefore, our research will provide valuable information about how increased temperature affects a key plant nutrient for herbivores.

## UNCOVERING THE MECHANISMS OF MSC-BAFF MEDIATED CD4+ T CELL SUPPRESSION

Claudia Goodsett, Debra Bloom (Mentor), Medicine

Recent research on mesenchymal stem cells (MSCs) has focused on MSC "licensing": the stimulation of MSCs with IFN- $\gamma$  to facilitate T lymphocyte suppression. We focus on B cell activating factor (BAFF), which is highly expressed by MSCs following activation with IFN- $\gamma$ . BAFF is mostly known for its pro-inflammatory role, but our preliminary data has shown that MSC-derived BAFF can suppress CD4+ T cell proliferation. We propose to investigate whether MSC-derived BAFF acts in a paracrine or autocrine manner. To test this, we will analyze MSCs lacking BAFF expression for suppression factors and the expression of three different BAFF receptors. Understanding the mechanisms of the suppression of CD4+ T cell proliferation by MSC-derived BAFF is applicable in treating autoimmune diseases linked to BAFF dysregulation.

## EFFECT OF BILINGUALISM ON PRAGMATIC FUNCTIONING

Sara Gotlieb, Margarita Kaushanskaya (Mentor), Communicative Disorders

Our knowledge regarding how the mind works is almost exclusively based on monolingual speakers; however, this does not accurately represent the fact that most people in the world speak multiple languages. Previous research has shown that bilingualism influences non-linguistic executive function (the set of higher-order regulatory skills). However, we know very little about how bilingualism affects other higher order cognitive functions, such as pragmatic functioning (the social use of language). The goal of the present study is to fill in the research gap by examining the effect of bilingualism on pragmatic functioning.

## EYEWITNESS IDENTIFICATION PROCEDURES: ASSESSING ALTERNATIVE APPROACHES TO REFORMING POLICE PRACTICES

Clara Graber, Keith Findley (Mentor), Law School

Recent increase in research on wrongful convictions has determined eyewitness error to be the leading cause of wrongful convictions. The process of misidentification has been identified and a more effective series of police practices has been established to reduce erroneous identification. Adoption of these practices however has been delayed and policies of departments that have made adaptations vary greatly between jurisdictions within and between states. The objective of this study is to explore states' current witness identification procedures and assess different methods for reforming these procedures. Policies from the 600+ jurisdictions in Wisconsin are being collected and analyzed to determine which parts of the policy have been most widely adopted.

## URBAN AGRICULTURE: THE FUTURE OF AQUAPONICS IN MADISON, THE MIDWEST AND INTERNATIONALLY

Wally Graeber, Sabrina Bradshaw (Mentor), Office of Sustainability

A centuries old water conserving method of agriculture called aquaponics has the potential to feed millions of people with varied population densities and climatic areas, without fertile soil or adequate water supplies. This project demonstrates the implementation of research from over a dozen University of Wisconsin-Madison departments while integrating specialties not conventionally related to growing vegetables symbiotically with native Wisconsin fish. Aquaponics produces food that is rich in essential vitamins, minerals, and protein. The resulting urban agriculture installation provides a prototype housed at the Wisconsin Institutes for Discovery (WID) Town Center with anticipation of bringing aquaponics technology into Madison classrooms as a foundation for urban agricultural techniques and STEM learning standards. Ultimately this technology has the potential to be deployed to combat rising levels of hunger and water quality issues in India and around the globe.

## LAND USE ACCESSIBILITY OF THE BAY-LAKE REGIONAL PLANNING COMMISSION

Samuel Grosenick, David Hart (Mentor), UW Sea Grant Institute

Land use data is a great resource; it can tell the user information about spatial locations such as areas that contain agriculture, commercial, residential or other types of land use. This data can be used to make spatial decisions, but can be difficult for everyday users to find. To make this data easier to obtain, I converted county level data of the Bay-Lake Regional Planning Commission (BLRPC) into Keyhole Markup Language, a format employed by user-friendly Google Earth. This data was then brought to the Wisconsin Coastal Atlas where it can be shared with BLRPC members. The citizens of northeast Wisconsin can use this data to make sustainable coastal land management decisions.

## THE IMPACT OF FACT-CHECKING

Pamanisha Gross, David Wise (Mentor), Journalism and Mass Communication

Political fact-checking seeks to determine the validity of public statements related to politics. It is a form of research by media professionals through organizations such as PolitiFact and FactCheck.org. My research focuses on how fact-checking impacts the opinions of people with different political opinions and views on media. Subjects will be surveyed and shown a political ad about a Republican or Democratic politician accused of a financial scandal and a fact-check rating the ad as true, half-true or false. We expect that the acceptance of the ad's claims will depend on the fact-check ruling and whether subjects' political party matches that of the politician targeted in the ad and how much subjects trust the media.

## ATMOSPHERIC SIMULATION CHAMBER FOR THE MEASUREMENT OF VOLATILE ORGANIC COMPOUND OXIDATION

Hannah Grossberg, Jennifer Kaiser (Mentor), Chemistry

Atmospheric pollutants such as ozone and secondary organic aerosol (SOA) have a significant effect on human health and climate change. The photo-oxidation of volatile organic compounds (VOCs) contributes to the formation of SOA and ozone. We studied the oxidation of two VOCs using a Teflon chamber, a proton-transfer-reaction mass spectrometer (PTR-MS), and a laser-induced fluorescence formaldehyde instrument. The oxidation of 2-methyl-3-buten-2-ol (MBO) was used to validate our experimental methods. We are now studying the oxidation of a hydroxyl-hydroperoxide (ISOPPOOH), which is hypothesized to contribute to SOA formation. The determination of VOC reaction pathways as a function of anthropogenic influence will provide insight into what emission control policies should be implemented to reduce such pollution.

## THERMODYNAMICS AND BIOPHYSICAL ECOLOGY OF INTERGLACIAL MAMMALS

Alex Gruber, Gabriel Valdes, Annie Yang, Warren Porter (Mentor), Zoology

We constructed models that include visual aspects, thermodynamic properties, diet, and activity of extinct animals from the Pleistocene period. First we designed 3D replicas in ZBrush4.0 of a Smilodon (sabertooth tiger), Mastodon, and Nothrotheriops (giant ground sloth). Computational Fluid Dynamics Software was used to determine their heat transfer coefficients to the air, their surface area, volume, and mass. Faunmap localities of the species allowed correlation of natural habitats to climate details from the specific interglacial period. We solved thermodynamic steady-state algorithms to determine diet and activity levels required for the animals to maintain homeostasis. Other discovered information includes where the species may have otherwise existed, where they would have expanded in the case of population growth or environmental changes, and why the species became extinct.

## LONGITUDINAL STUDY OF THE IMPACT OF EARLY SIBLING WARMTH AND CONFLICT ON ADOLESCENT PSYCHOPATHOLOGY

Chelsea Gruenwald, Dana Sorensen, Nicole Schmidt  
(Mentor), Hill Goldsmith (Mentor), Psychology

Sibling relationships provide early socialization and influence social and emotional development. Using a unique same age sibling design (n=684 twin pairs), we examined the relationships between sibling warmth and conflict during first grade and behavior symptoms during adolescence. Preliminary analyses showed an inverse correlation between adolescent self-reported externalizing symptoms and early sibling warmth ( $r=-0.129$ ,  $p<.01$ ) and sibling conflict ( $r=-0.101$ ,  $p<.01$ ). Gender was associated with boys having more externalizing symptoms than girls ( $r=0.132$ ,  $p<.01$ ). We will examine the association of sibling warmth and conflict with internalizing symptoms and test the effects of SES and receptive vocabulary on both internalizing and externalizing symptoms. We will also examine the unique predictive power of sibling warmth and conflict by controlling for covariates.

## CLIMATE WARMING EFFECTS ON NUTRITIONAL CHEMISTRY IN ASPEN AND BIRCH LEAVES

Elizabeth Gryzmala, Mary Jamieson (Mentor), Entomology

The basis of this research is to investigate the influence of climate warming on plant ecological chemistry. We are conducting chemical analyses to determine how biotic and abiotic factors affect defensive and nutritional components of tree foliage. Specifically, I am weighing, grinding, and analyzing plant tissues to measure the carbon and nitrogen content of foliage for two tree species, aspen (*Populus tremuloides*) and birch (*Betula papyrifera*), which were grown in one of three temperature treatment plots (ambient, +1.4C, +3.7C). We found that warming alters foliar nitrogen in unexpected ways. Results indicate climate change may affect food quality for herbivores, and thus may have an impact on ecological interactions between plants and their herbivores as well as ecosystem productivity.

## BIOMEK 3000 LABORATORY AUTOMATION WORKSTATION

Jon Guay, Peter Geiger (Mentor), Surgery

In their fight against cancer scientists, use many different techniques. One of these techniques, quantitative polymerase chain reactions (qPCR), involves using a three by five inch 384-well plate. Distributing reagents into these tiny three millimeter diameter wells can be a very excruciating process. Many problems can occur doing this by hand: human pipetting errors, distractions, low consistency between different scientists, and time are some examples. The Biomek 3000 Laboratory Automation Workstation is a robotic pipetting platform that can improve the reliability and give the scientist more consistent qPCR results. With sufficient programming to the machine, the workstation has the ability to eliminate a lot of human errors. The elimination of these errors will help in finding the cure to cancer.

## THE STORY OF ADAM AND EVE: PARALLELS BETWEEN ISLAMIC AND CHRISTIAN LITERATURE

Claudia Gupta, Uli Schamiloglu (Mentor), Languages and Cultures of Asia

This paper explores the parallels between Islamic and Christian literature in the story of Adam and Eve. The relation is drawn between "Stories of the Prophets" by Al-Rabghuzi and "Paradise Lost" by John Milton. Multiple aspects between the two works are analogous, suggesting that the two religions are more alike than one may believe. By highlighting similar themes and motifs, this paper exhibits how two religions that appear opposite rather have much in common.

## BRIDGING THE GAP: OLDER ADULT EXPERIENCE

William Haack, William Haack, Mike Luebke, Maddie Mittelstadt, Hannah Mueller,  
Katelyn Paul, Tara Pizer, Alea Precourt, Maddie Rapisarda, Kari Rognlien,  
Inna Rybakova, Brooke Sarver, Heather Schwartz, Sarah Shudlick, Jenna Stoike,  
Justene Wilke, Audrey Williams Van Dijk, Yvette Egan (Mentor), Nursing

The age of patients in hospitals and communities is increasing and it is essential that healthcare professionals are aware of the dynamic qualities of adults over 65. It is important for caregivers to be cognizant of their attitudes related to aging and older adults. As nursing students, we recognize that we will be working with this population and it is vital to gain insight into the reality of older adult lifestyles in order to be effective caregivers.



## CEREBRAL INFART VOLUME STUDY

Crystal Hall, Matthew Jensen (Mentor), Neurology

Measuring the cerebral infarct volume is done so that the stroke can be evaluated for what type of treatment may be performed. The way of measuring the infarct is still behind in advancement. Currently, the procedure calls for someone to manually trace each hemisphere and use calculations to determine the volume. This method includes human error but it was effective enough to conclude the treatments. We have performed a search to find the best histological method to quantify the cerebral infarct volume. This is an under studied topic and the results used a wide range of techniques. Most studies compared the experimental technique to the current manual tracing. No experiment clearly redefined the process. More research is needed in order to conclude the best method.

## THE EFFECTS OF 1,25-VITAMIN D3 ON THE PROGRESSION AND DEVELOPMENT OF DEMYELINATING DISEASE

Sam Hall, Julie Olson (Mentor), Neurosurgery

Multiple sclerosis (MS) is a demyelinating autoimmune disease in the central nervous system (CNS). One environmental risk factor for the development of MS is low sunlight exposure, which is linked to decreased vitamin D3 production. In this study, Theiler's murine encephalomyelitis virus (TMEV) was used as a mouse model of MS. The purpose of this research was to determine the effect that 1,25-vitamin D3 has on the innate immune response of virus-infected mice. The inflammatory response in the CNS was measured by specific cytokine concentrations and the infiltrating immune cells were determined by flow cytometry. TMEV-infected mice administered with 1,25-vitamin D3 had decreased pro-inflammatory and increased anti-inflammatory cytokine expression and reduced numbers of infiltrating immune cells. This early beneficial mediation of the immune response may have important implications on development and progression of the disease course.

## MYD88 PLAYS AN IMPORTANT ROLE IN THE IMMUNE RESPONSE TO VIRUS-INDUCED DEMYELINATING DISEASE

Samuel Hall, Scott Stauder, Joshua White, Julie Olson (Mentor), Neurological Surgery

Multiple sclerosis is an immune-mediated disease, causing demyelination and neurological dysfunction. The adapter protein MyD88 plays an important role in signaling through Toll-like receptors during the innate immune response. Theiler's murine encephalomyelitis virus (TMEV) is a mouse model infection that introduces demyelinating disease. Our goal was to determine the role of MyD88 in the immune response by investigating TMEV progression in mice lacking MyD88. MyD88 deficient mice did not have significant differences in innate immune cytokine expression compared to wild type mice. However, we observed reduced infiltration of CD4+ and CD8+ T cells. This suggests that MyD88 plays an important role in the innate immune response activation of the adaptive immune response during TMEV infection, which leads to susceptibility to demyelinating disease.

## SOIL PRACTICES, PLANT NUTRIENTS, AND MYCORRHIZAE AFFECT OVIPOSITION OF OSTRINIA NUBILALIS TO CORN

Crystal Hanson, Eileen Cullen (Mentor), Entomology

To test if *O. nubilalis* vary oviposition response to corn grown in different soils, moths were released into cages with corn grown in three different soil types: soil balance (BAL), standard organic (STD), and conventional (CONV). Total number of eggs and egg masses were recorded for each plant. Soil and plant tissues were analyzed for nutrient content and root samples assessed for mycorrhizal colonization. Moths laid the most eggs on BAL plants and the fewest on CONV. This seems to oppose the balanced soil approach which claims that modifying Ca/Mg ratios aids with nutrient uptake, maximizing yield and reducing insect damage. However, the oviposition response of *O. nubilalis* appears to be correlated with multiple factors, with only a few that seem associated with soil type.

## FLYING HIGH: EXPERIENCE AND OPTIMISM IN THE AVIATION INDUSTRY

Matthew Hardy, Phillip Kim (Mentor), Management and Human Resources

I explored how failure is dealt with in business through the lens of the Airline Industry. When a company fails, how does it respond to failure? Does the Airline come back with a new and improved idea or does it just call it quits? This thought provoking question has many layers and my research dealt with sorting through those layers to figure out what exactly caused the initial failure and did the Airline bounce back? To answer these research questions, I searched through Airline companies' financial records, their Department of Transportation coding information, and what particular markets the Airlines were trying to target. Through this process, I was able to determine that financial troubles are the most likely cause of failure, and the companies were faced with the problem of refinancing in order to get approval.

## A SIMPLE THEORY OF ALLOSTERY IN THE GABA(A) RECEPTOR

Alexander Haroldson, Mathew Jones (Mentor), Neuroscience

The GABA(A) receptor is a key component in the central nervous system that modulates clinically relevant effects, such as sedation and sleep. We hypothesize that structural changes induced by perturbations at one binding interface are propagated throughout the receptor, and as a result the kinetics underlying binding at other interfaces are altered. Using GABA, THIP, and  $\beta$ -alanine as "molecular calipers" to detect changes in binding/unbinding at the  $\alpha/\beta$  interface, agonist and inverse agonist binding at the  $\gamma/\alpha$  interface increases the affinity and decreases the affinity at the  $\alpha/\beta$  interface, respectively. By quantifying the effects on the binding rates of GABA, THIP, and  $\beta$ -alanine in the presence of modulators, we will be able to more closely relate functional characteristics to structural characteristics at the GABA(A) receptor.

## ROLE OF BRAIN STEAROYL-COA DESATURASE-1 IN METABOLISM, OBESITY AND DIABETES

Kristin Harrington, James Ntambi (Mentor), Biochemistry

The prevalence of obesity, and its potential to develop into serious health issues reveals it is a significant health problem. Mechanisms by which adipose tissue can lead to insulin resistance involve saturated fatty acids (SFA) or monounsaturated fatty acids (MUFA) in the brain and liver. In this proposed study, fatty acids in the brain will be investigated using a stearoyl-CoA desaturase 1 (SCD1) brain-specific knockout mouse model (BKO). SCD1 is involved in regulating endogenous SFA and MUFA levels. I hypothesize that high-fat diet (HFD)-fed BKO mice will have significantly lower levels of brain MUFA, reduced body weights and enhanced glucose tolerance in comparison to controls. The methods I propose include measuring body weight and food intake, performing fatty acid lipid analyses, and glucose tolerance tests.

## DECEPTION, DETECTION, DEMEANOR AND TRUTH BIAS IN FACE-TO-FACE AND COMPUTER-MEDIATED COMMUNICATION

Brennan Harris, Lyn Van Swol (Mentor), Communication Arts

We interpreted data for experiments in deception in computer-mediated communication. One participant in a pair, the allocator, received a sum of money to divide however he chose with the other participant, the recipient. Participants interacted via computer text chat to decide how to share the money the allocator received. The experiments observed whether the allocator would be truthful about the amount received and divide it fairly or lie about the amount received and trick the recipient in order to keep more for himself, and then if the recipient could detect the lie. Transcripts of the text chat were read for whether the allocator was truthful or lying, and for the lies, to distinguish the lying technique.

## PATTERNS AND FITNESS CONSEQUENCES OF LABORATORY- ADAPTATION IN CULEX PIPIENS MOSQUITO FLIGHT BEHAVIOR

Charles Hartley, Christina Newman (Mentor), Comparative Biomedical Sciences

Much of the research conducted in mosquito biology, evolution, and vectorial capacity has been done with laboratory-adapted mosquito colonies. In order to develop a better understanding of the consequences of laboratory colonization on *Culex pipiens* mosquitoes, we recorded the flight activity patterns and measured the wing lengths (a proxy for body size and an indicator of fitness) between a laboratory strain of *Culex pipiens* from Iowa and a wild strain of *Culex pipiens* from Chicago. Initial analyses suggest similar patterns of activity frequency, with the Chicago strain exhibiting greater flight intensity. In addition, the average wing lengths for the Chicago strain were significantly longer than those for the Iowa strain. Overall, our data suggests that differences may exist between wild and laboratory-colonized mosquito strains.

## ADOLESCENT DEVELOPMENT AND FACEBOOK USE

Onika Hartwell, Bradford Brown (Mentor), Educational Psychology

This research project explores associations between late adolescent development and social media use, namely Facebook. The transition from high school to college is exciting but challenging for most students. Facebook can be instrumental in negotiating social aspects of the transition, including finding new friends and acquainting people with one's identity. These factors were explored through coding Facebook pages, conducting interviews, transcribing and analyzing their meanings by identifying emerging themes and comparing them. Through identification, we expect to discover more about how college freshmen present themselves on Facebook and how they are affected by audience feedback (comments, others post on their Facebook page). Findings should be informative for University programs aimed at fostering successful student adjustment.

## THE NUMERICAL BRAIN

Jennifer Hathaway, Christina Tran, Edward Hubbard (Mentor), Educational Psychology

This study explores the relative contributions of educational experiences and biological maturation to children's early math skills. We will take advantage of the school "cut-off" date (September 1), to evaluate children who are close in age (50 older kindergartners and 50 younger first graders) but who receive different educational experiences. We will collect standardized test and fMRI data to measure children's math skills and brain responses in Fall 2013 and Spring 2014. We expect that first graders will show larger improvements than kindergartners in math skills and greater changes in parietal regions involved in math. These results will demonstrate the impact of educational experiences on the brain, how these experiences contribute to children's learning success, and perhaps even lead to improved teaching methods.

## DATA INDEPENDENT ACQUISITION AND QUANTITATION OF ISOTOPICALLY LABELED NEUROPEPTIDES

Kevin Hayes, Claire Schmerberg (Mentor), Pharmaceutical Sciences Division

Tandem mass spectrometry (MS/MS) is an important tool in biological sample identification and quantification, particularly with neuropeptides (NPs). Using MS/MS the functions of various NPs can be deduced by quantifying changes in their relative tissue concentrations over varying environmental conditions. Data-independent acquisition (DIA) allows identification and quantification of compounds in a single instrument run by fragmenting all precursors and cycling between collection of precursor and fragment spectra. Integration of fragment ion extracted ion chromatograms (XICs) that align with the correct precursors permits selected-reaction monitoring (SRM)-style quantification. Incorporation of an isotopic labeling strategy increases the validity of quantitative comparison. DIA MS together with isotopic labeling allows for quantification of changes in NP concentrations in tissues from *Cancer irroratus* subjected to temperature stress.

## HISTOLOGICAL METHODS FOR EX VIVO AXON TRACING

Cassie Heilingoetter, Matthew Jensen (Mentor), Neurology

Axon tracers provide crucial insight into development, connectivity, and function of neural tissue. A tracer can be characterized as a fluorescent or pigmented substance that laterally diffuses from one neuron to another, highlighting the pathway of the neural tissue. Axon tracers have previously been used exclusively in in vivo studies; however, due to advancements in previous decades, axon tracing methods can also be applied to ex vivo studies. Ex vivo techniques have multiple potential advantages over in vivo studies. An array of techniques for axon tracing has been established to achieve axon traced tissues; these techniques involve a variety of lipophilic dyes and pigments. We sought to compare the available evidence to determine the best histological method for ex vivo axon tracing.

## PRELIMINARY CLASSIFICATION OF POTENTIAL BARRIER SOILS FOR LOW-LEVEL RADIOACTIVE WASTE FACILITIES

Michael Heiman, James Tinjum (Mentor), Geological Engineering

Preliminary soil classification provides a basic understanding of soil behavior. In this study, four soils were classified based on their physical and chemical properties. Soil properties explored include grain size distribution, plasticity index, and cation exchange capacities. The four soils studied include WCS Andrews, Houston Brown, Albany Red, and Kamm Clay, which have been used in barrier systems for waste facilities throughout the country. The results from these experiments will aid in determining how soils behave as barrier materials in low-level radioactive waste facilities when in contact with varying concentrations of radionuclides.

## THE RIPPLE EFFECT OF SERVICE LEARNING

Amanda Held, Greta Huff, Nate Miller, Andrew Mlsna, Eric Obscherning,  
Megan Osowski, Gwynneth Schell (Mentor), Student Academic Affaris

Our service-learning class culminated with a weeklong volunteer experience at an orphanage in the Dominican Republic. We partnered with the organization, Outreach360, which is dedicated to transforming communities through education of disadvantaged children. Our role was twofold: (1) teaching environmental sustainability basics in resource-limited, classroom settings to children; (2) aiding in the planting of banana seedlings on the orphanage's sustainable plantation. This experience enhanced our global citizenship through a more informed, evidence-based perspective on poverty, American societal values, and the importance of face-to-face relationships. We continue to learn about and challenge the disparities we witnessed with a renewed passion for creating sustainable change and serving others. We hope that our experiences will act as a spark of inspiration to serve abroad and expand global connections.

## THE EFFECTS OF TESTOSTERONE AND ESTRADIOL ON THE PROSTATIC ANATOMY OF MALE MICE: A NOVEL BPH MODEL

Zachary Helmen, Tristan Nicholson (Mentor), Department of Urology

Benign Prostatic Hyperplasia (BPH) and other urogenital diseases are common in older men and pose inconvenient behaviors and lifestyles. Historically, animal modeling of BPH involved inducing symptoms of the disease; recently, androgens and estrogens have been shown to induce BPH like symptoms. The goal of this study is to use computational 3D modeling to determine how testosterone and 17 $\beta$ -estradiol treatment affects the prostatic ductal anatomy in mice and if it accurately models new glandular growth, characteristic of BPH in humans. Results indicate increased prostate ductal volume and branching, increased seminal vesicle volume, and decreased urethral volume, all of which align with BPH observed in humans. Consequently, hormonal induction of BPH in mice may become the new gold standard for modeling BPH and developing BPH treatments.

## WHAT EYE LEARNED: ECOLOGICAL AND PHYLOGENETIC INFLUENCES ON VERTEBRATE EYE MORPHOLOGY

Lauren Hennelly, Peter McIntyre (Mentor), Zoology

The vertebrate visual system has long been recognized as an evolutionary marvel. Despite their gross similarities, eyes show a great diversity in morphology, which can give insight into evolutionary patterns across diverse ecological contexts. I used comparative approaches to examine how vertebrate eyes vary in the context of evolutionary relatedness between species. This involved measuring eye morphological characteristics from 497 species in the Comparative Ocular Pathology Laboratory of Wisconsin's collection, building an ecological database, and constructing a phylogenetic super-tree to infer evolutionary patterns using phylogenetic comparative analysis. The impact of light environment, trophic strategy, habitat, and sensory modality on eye micro-morphology can emphasize the constraints and opportunities for morphological adaptation of the visual system across vertebrate evolutionary history.

## MASK FOR NTOMO

Lauren Hennelly, Freida Tesfagiorgis (Mentor), Department of Afro-American Studies

The exhibition of African art within museums plays a critical role in both preserving and communicating the individual objects and the people who have created them. This artwork portrays the rich history and meaning behind an African object on display at the Art Institute of Chicago. The art piece depicts a nearly life-size Ntomo mask for ritual festivals made by the Bamana people of Mali located in Western Africa. The Ntomo Society is the first of six fraternal age-grade societies for young Bamana boys to learn agricultural practices. The horns and antelope on the mask refer to the agricultural lifestyle and primordial seeds sown by God in the creation of the universe, as seen in the colorful displays in the sky.

## THE GABBY DOUGLAS EFFECT: POLITICS OF PERSONAL PRESENTATION FOR AFRICAN-AMERICAN AND LATINA WOMEN

Gethsemane Herron-Coward, Alice Goffman (Mentor), Sociology

My research project is a continuation of my research in the fall of 2012: observing and critiquing personal choice in the appearance and the presentation choices of African-American and Latina American women. Anchoring my research is an observation of a phenomena I call "The Gabby Douglas Effect." The effect in question derives from the Summer 2012 London Olympics where Gabby Douglas, a 16-year-old female bodied gymnast of African-American ancestry, competed. While competing, Douglas came under fire. The subject was less about the quality of her skill as an athlete, but about her appearance. In analyzing the naysayers, I noticed that many were African-American; and that when representing your community, your appearance must be flawless. The message demonstrated is that when you are a black girl, it is not enough to be exceptional, that we must always be proving our worth to people within your community, but outside of it, i.e. white people. That worth is subsequently supported with our actions and our appearance choices (hairstyle, clothing). I became interested in how gender and ethnicity intersect regarding the comments and interactions African-American women had with each other and with the "mainstream" i.e. white world we operate in, to hueism to body type, what made us beautiful? Not beautiful? How did we determine that? My research later grew to include Latin American women and multiracial women because I noticed some similarities in what was considered beautiful (skin color, hair texture, body type) in some of my multiracial and Latina friends. My research is a presentation of qualitative research via interviews on beauty's intersection between ethnicity and gender and how it influences interactions between people within and outside of one's ethnicity.



## WATER LEVEL DECLINE DECREASES COBBLE HABITAT AND INCREASES PREDATION ON INVASIVE RUSTY CRAYFISH

Emily Hilts, Mark Vander Zanden (Mentor), Zoology

The invasive rusty crayfish (*Orconectes rusticus*) disrupts lake ecosystems. From 2001 to 2008, removal efforts in Sparkling Lake, Wisconsin resulted in a 95% population decline. Simultaneously, water levels dropped 0.52 meters, stranding cobble habitat that served as refuge from fish predation, potentially contributing to the population decrease. We used a geographic information system to quantify habitat loss. We estimated predatory fish abundance and predation rates on crayfish in cobble and sandy habitats using distance sampling and tethering experiments. Predation rates were highest in sandy habitat, and since cobble decreased by 40%, increases in fish predation during the removal period were critical to population reduction. Given increasing drought-like conditions associated with climate change, these results demonstrate how loss of littoral habitat may alter predator-prey dynamics.

## DOES PARTICIPATING IN ELECTORAL POLITICS MODERATE RELIGIOUS POLITICAL PARTIES?

Tyler Hitzeman, Nadav Shelef (Mentor), Political Science

This project seeks to test the proposition that participating in electoral politics leads to religious political party moderation. There are three phases to this research: (1) identifying the political parties worldwide that run in national elections, (2) identifying the "religious parties," and (3) analyzing their "moderation." Phase one is accomplished by finding each country's election data; phase two requires researchers to code the "religiousness" of a party; phase three is achieved by coding gender and religious pluralism throughout time. The results of this project will provide systematic evidence about religious party moderation and have implications of the nature of religious politics. My work to date has focused on the second phase of the project; I have coded parties in Bulgaria, Costa Rica, Cyprus, and Mauritius.

## ESTRADIOL, AND NOT INCREASED CALORIE INTAKE, DETERMINES SEXUAL BEHAVIOR IN FEMALE MARMOSSET MONKEYS

Karli Hochstatter, David Abbott (Mentor), Obstetrics and Gynecology

The objective of this study was to determine the effects of estradiol and high-calorie diet on female sexual behavior. We used common marmosets (*Callithrix jacchus*), a well established nonhuman primate model for studying female sexual behavior. Fifteen female marmosets, housed with a single adult male as part of a larger study, were ovariectomized to remove the influence of the ovarian cycle on sexual behavior and implanted with silastic capsules that were either empty (control, C) or filled with estradiol (E). Four treatment groups were designed: E-capsule and normal calorie diet, E-capsule and high calorie diet, C-capsule and normal calorie diet and C-capsule and high calorie diet. Two observation sessions were performed after 2 and 5 months on treatment during which sexual and affiliative behaviors were recorded. Findings were most pronounced at 5 months, when females receiving E, regardless of diet, showed higher ( $p < 3 \times 10^{-6}$ ) frequency of acceptance of male mounts (receptivity) compared to C females. In females receiving E but not C, and regardless of diet, there was a positive correlation ( $p < 0.007$ ) between total mounts by males and female receptivity. In contrast, in C but not E females, total mounts by males correlated positively ( $p < 1.8 \times 10^{-5}$ ) with female rejection of mounts. In all females combined, female receptivity correlated positively ( $p < 0.036$ ) with uterine weight (a biomarker for E) harvested at necropsy 1 month after observations. The supportive effects of estradiol on female sexual behavior and reproductive tract appear unaltered by high calorie diet.

## DIFFERENCES IN LIPOCALIN-2 EXPRESSION AND SUSCEPTIBILITY TO MAMMARY CANCER IN ACI AND BN RAT STRAINS

Lauren Hoffer, James Shull (Mentor), Oncology

Lipocalin-2 (LCN-2) is a secreted extracellular matrix (ECM) protein that forms heterodimers with ECM remodeling proteins called MMP's. In previous studies, LCN-2 was displayed to be a biomarker for human breast cancer and was shown to promote breast cancer progression. This project studies LCN-2 expression in the ACI rat model of 17 $\beta$ -estradiol (E2)-induced mammary cancer. In this model, the ACI rat mammary gland that is highly susceptible to the development of breast cancer when treated with E2 shows little to no expression of LCN-2. In contrast, the resistant BN rat mammary gland shows higher expression of LCN-2 relative to the ACI rat. This interesting observation of differential expression of LCN-2 was further explored through western blot analysis of the first generation (F1) progeny of ACIxBN and BNxACI to determine if the observed phenotypes are heritable. It is hypothesized, based on mRNA data, that the F1 rats will demonstrate a co-dominant inheritance pattern for LCN-2 expression. ACI mammary tumor tissues were also analyzed and showed no expression of LCN-2, therefore we can conclude that LCN-2 is not a biomarker for breast cancer in this rat model of E2 induced mammary cancer. Further studies will analyze which cells in the mammary gland of the BN rat express LCN-2 and will also look at congenic lines to see if LCN-2 expression is regulated by any of the estrogen induced mammary cancer (Emca) loci that have already been mapped and linked to reduced susceptibility to E2 induced breast cancer.

## A SUCCESSFUL BUSINESS AND FAMILY PLAN ON HOW TO ADD ON A SECOND-GENERATION FAMILY MEMBER

Chris Hoffman, Debra Holschuh-Houden (Mentor), UW Family Business Center

A family business is defined as two or more family members having financial control over the operations of the company. Some family businesses start off with two or more family members, but others bring on a second-generation family member years after the company has been established. I look to create a business and family plan, in the field of financial planning, which will aid in successfully adding on a new family member. With an emphasis on communication and capital distribution, I will create surveys and use interviews to produce the primary research. I will also research how successful and unsuccessful businesses proceeded on making a working plan for the transition to a family business.

## REDUCTION OF WIRELESS INEFFICIENCIES

Jamie Holt, Parameswaran Ramanathan (Mentor), Electrical and Computer Engineering

The demand for increasingly fast internet and improved wireless network access is consistently growing. Current wireless networks suffer from bandwidth fluctuations due to packet loss, cross traffic, and network handovers. This project aims to address data transfer degradation by implementing a local mobility management framework on the WiMAX (Worldwide Interoperability for Microwave Access) base stations that have been set up on campus. Data collection will soon be in progress, and the results will be used to develop a handover sequence within the mobility management scheme. When implemented, the new mobility scheme will improve wireless network performance by managing handovers in order to reduce data loss.

## COMPARISON OF EXPOSURE TIMES TO ESTRADIOL ON [Ca<sup>2+</sup>]<sub>i</sub> OSCILLATIONS IN PRIMATE GnRH NEURONS

Samantha Holten, Ei Terasawa-grilley (Mentor), Pediatrics

It is known that the ovarian steroid estradiol induces negative feedback influence on GnRH release. However, recent studies in this lab indicate that a brief (10-20 min) exposure of GnRH neurons to estradiol (E2, 1 nM) induces a rapid excitatory action. In this study, we examined whether a longer (60 min) exposure to E2 causes a different effect to GnRH neurons. The results indicated that while exposure of cultured GnRH neurons for 10 min induced an increase in the frequency of [Ca<sup>2+</sup>]<sub>i</sub> oscillations for 40-60 min returning control levels, the exposure for 60 min increased the frequency of [Ca<sup>2+</sup>]<sub>i</sub> oscillations for only 20 min, which was followed by suppression. Therefore, the exposure period to E2 is very important for the action of E2.

## MECP2 ORGANIZATION OF AVP THROUGH PROMOTER BINDING

Patricia Horvath, Anthony Auger (Mentor), Psychology

Methyl-CpG-binding protein 2 (MeCP2) is a protein that is critical for normal brain function. MeCP2 deficiencies are found in several neurodevelopmental disorders, such as Rett syndrome and possibly autism. A transient reduction in MeCP2 within the amygdala during early postnatal life produces a lasting decrease in the expression of arginine vasopressin (AVP) in the male, but not female, rat brain. Because MeCP2 binds directly to the AVP promoter region in the hypothalamus to regulate gene transcription, I hypothesize that MeCP2 binds to the promoter region of the AVP gene in the developing male rat amygdala along with the co-activator transcription factor CREB1. These data will help elucidate some of the mechanisms by which MeCP2 regulates gene expression during development.

## DISCHARGING PATIENTS FROM THE HOSPITAL TO SKILLED NURSING FACILITY: NURSES' PERSPECTIVE

Melissa Hovanes, Barbara King (Mentor), Academic and Student Services

Poor quality care transitions are costly and lead to serious negative patient outcomes including re-hospitalization. Little research has examined the quality of transitional care for the >5 million patients discharged from hospitals to skilled nursing facilities (SNFs) annually. This qualitative study utilized individual/group interviews with Registered Nurses employed at an urban hospital to examine the work processes used to facilitate hospital-to-SNF transitions. Interviews were analyzed using Grounded Dimensional Analysis, a variant of Grounded Theory. Findings highlight hospital nurses' inability to provide detailed information needed by SNF staff to promote safe transitions due to time constraints, lack of control, and challenging SNF placements. This is the first study that reports on hospital nurses' barriers in facilitating safe hospital-to-SNF transitions, which is essential to designing appropriate solutions.

## LEUKOCYTE TYPE IN CHRONIC INTERMITTENT HYPOXIA AND ALLERGEN INDUCED LOWER AIRWAY INFLAMMATION

Pei-Ning Hsu, Mihaela Teodorescu (Mentor), Pulmonary Medicine

Obstructive sleep apnea (OSA) has been associated with worse asthma outcomes. Through a rat model, we tested the effects of chronic intermittent hypoxia (CIH) on allergen-induced lower airway inflammation, which can lead to more targeted treatments of patients with OSA and asthma. The rats are placed in four groups: CIH (30/h, 10h/day for 30 days) vs. normoxia, and ovalbumin (OVA) vs. vehicle (saline) aerosol challenges. Bronchoalveolar lavage (BAL) was collected to quantify the infiltrating leukocyte subtypes. We observed a decrease in %eosinophil and an increase in %neutrophil in CIH-OVA rats. Understanding the pathways underlying this cellular switch may springboard new therapies for asthma patients with OSA.

## WEATHER-CONSCIOUS COCKLES: THE RELATIONSHIP BETWEEN CLIMATE AND EVOLUTIONARY TEMPO AND MODE

Graham Hummel-Hall, Ray Ostrander (Mentor), Geoscience

Evolution is the morphological and physiological change a species experiences as time passes. This change can be characterized by how rapidly it occurs (its tempo) and by the patterns it follows (its mode). The purpose of this study is to test whether global environmental conditions affect the tempo and mode of evolution by observing the rates at which cockles (Class Bivalvia, Family Cardiidae) in the warm Cretaceous and cold Neogene periods altered their size and shape. We expect that in warm climates more specialized organisms will evolve gradually, whereas in colder climates more generalized organisms will exhibit a static evolution punctuated by relatively short bursts of great change. The results of this research will shed new light on the relationship between evolution and the physical environment.

## NORMATIVE LINGUAL PRESSURE STUDY AND 3D TONGUE MODEL DESIGN

Naomi Humpal, Joanne Robbins (Mentor), Gastroenterology and Hepatology

Minimal data exist indicating how different regions of the tongue function to generate pressure maximally or when swallowing fluids, or how lingual pressures relate to age and gender. This normative lingual pressure study using the Madison Oral Strengthening Therapeutic (MOST) device (U.S. 7238145) examines the effects of age and gender on pressure generation at five locations in the mouth during a maximal whole tongue press and swallows of different bolus types and volumes. These normal data will facilitate development of a 3D physical model of the tongue, mouth, and pharynx, currently in progress. The 3D model will be utilized for education and by clinical researchers to understand implications of bolus type and volume under normal conditions and with different simulated pathologies resulting in dysphagia.

## EFFECTS OF ANXIETY AND DEPRIVATION UPON DECISION- MAKING AFTER EXTENDED DAILY MARIJUANA USE

John Idlas, John Curtin (Mentor), Psychology

In the present study, two groups of daily marijuana smokers (deprived and non-deprived) and a control group participated in a decision-making task where they chose between certain and probabilistic monetary rewards, to assess relative preferences towards certain rewards. Participants also experienced unpredictable and no-shock blocks intended to elicit anxiety throughout the experiment (Grillon et. al. 2004). The aims of this study were to: 1) replicate findings that deprived marijuana users show greater anxiety (as measured by startle potentiation to uncertain shock), 2) to establish whether or not marijuana deprivation leads to increased bias for certain rewards and, 3) examine increased anxiety as a mechanism for shifts in reward valuation associated with increased preference towards certain rewards in deprived marijuana users.

## DETECTOR CHARACTERIZATION FOR THE ROBERT STOBIE SPECTROGRAPH-NEAR INFRARED ARM FOR SALT

Briana Indahl, Marsha Wolf (Mentor), Astronomy

The development of infrared spectrographs for astronomical research is essential for the advancement of understanding of star formation and stellar evolution. At the heart of an infrared spectrograph is the detector system. The characterization of the detector to optimize performance characteristics is vital to the performance of the instrument. The more the performance characteristics are optimized the fainter the objects can be for an infrared spectrograph to be able to detect. I have implemented methods to characterize the 2048 x 2048 pixel Hawaii-2RG HgCdTe detector for the Robert Stobie Spectrograph Near Infrared Arm being built by UW-Madison for the 11-meter Southern African Large Telescope. To properly characterize the detector I analyzed the frequencies, magnitudes, stability, and spatial dependence on the detector array of the noise.

## SUSTAINABILITY: COMPOST AND RECYCLING AT UW-MADISON

Sinnott Isaac, Sabrina Bradshaw (Mentor), Civil and Environmental Engineering

My research project is focused on researching the feasibility of adding an outdoor recycling route to the UW–Madison campus, which has over 360 outdoor waste receptacles on campus. Over 95% of these are garbage cans and 5% are recycling. UW-Madison has a number of trash barrels that are underused because of either limited foot traffic or a lack of visibility. The research project assesses the feasibility of adding a recycling route without straining the operational resources of Physical Plant, by converting infrequently used garbage cans into recycling bins, and relocating them to accompany garbage bins in high traffic areas. We have implemented a pilot program on Park Street by converting eight garbage barrels into recycling bins.

## HUMAN ENDOMETRIAL EPITHELIAL CELLS ARE PERMISSIVE FOR IN VITRO INFECTION WITH LISTERIA MONOCYTOGENES

Katilee Jacobs, Thaddeus Golos (Mentor), Comparative Biosciences

The facultative gram-positive bacteria *Listeria monocytogenes* (LM) may have detrimental effects on pregnancy, such as stillbirth, miscarriage, premature birth and neonatal infection. To test if the uterine glandular epithelium initiates an infection in pregnancy, epithelial cell lines were infected with LM strains WS1 and 10403s with MOI between 0.1 and 10. After 1, 6, 12 and 18-hour time points, cells were stained using Diff-Quik to visualize infection, and the level of bacterial invasion and replication was assed in cells lysed and plated on blood agar plates. The results have shown that invasion primarily occurs via LM's Internalin-A binding to the cell's E-cadherin, but cells may be able to endogenously control bacterial replication.

## IRON-DEPENDENT REGULATION OF MITOCHONDRIAL FORM AND FUNCTION

Athavi Jeevananthan, David Pagliarini (Mentor), Biochemistry

Mitochondria play vital roles in cellular metabolism and signaling, and their composition and function must change in response to environmental conditions and nutrient demands. The signals that initiate this mitochondrial adaptation remain obscure. Our matched genomic and proteomic analyses reveal that proteins involved in iron homeostasis are coordinated with mitochondrial biogenesis and that iron deprivation alone results in a systematic loss of mitochondrial transcripts and proteins. Moreover, we determined that the reintroduction of iron to iron-deprived cells resulted in the complete recovery of mitochondrial transcripts, proteins and respiratory function. This indicates that our observed mitochondrial response to iron deprivation is a calibrated adaptive response and not merely irreversible cellular damage. Our results reveal that iron deprivation drives an adaptive transformation of mitochondrial form and function.



## A CLOSER LOOK AT SLEEP

Haley Jelinski, Erika Hagen (Mentor), Population Health Sciences

The Wisconsin Sleep Cohort Study has evaluated participants since 1989 through sleep diaries, surveys, and overnight studies in sleep labs. In the overnight sleep labs, polysomnography (PSG) equipment measure physiological attributes, including brain waves and muscle movements. The results, along with other health lifestyle data collected, give an idea of how sleep apnea- diagnosed or undiagnosed- affects people. The sleep diaries and surveys are used to gain insight into the volunteer's health history, sleep habits, and lifestyle and look at possible connections between certain characteristics and sleep habits and problems. The results obtained are used to expand current knowledge of sleep habits, sleep apnea, and other sleep problems in the general population through presentations, academic conferences, and papers published in medical literature.

## THE EFFECTS OF A SPLIT BETWEEN A FAMILY BUSINESS INTO TWO SEPARATE BUSINESSES

Brett Johnsen, Debra Holschuh-Houden (Mentor), Family Business Center

The separation of a family business into two separate businesses can be caused from several factors. Whether it is from conflict between top family executives or is a thought out decision by the family to keep the business prosperous. Researching into the effects this split has on the newly formed family businesses and factors that give each business a better chance of survival after the split will show what actions family businesses need to take and which ones have a better chance of being successful. For example does a family business that was split between two brothers have a better chance of being successful over a family business that split between top executives being from different generations?

## EXPLORING THE CELLULOLYTIC ABILITY AND MICROBIAL COMMUNITY COMPOSITION OF THE LEAF CUTTER ANT-FUNGUS SYMBIOSIS

Amanda Johnson, Cameron Currie (Mentor), Bacteriology

In almost every environment, microbial communities constantly recycle carbon, including cellulose. Research on this topic hopes to utilize the power of cellulose degrading organisms to create a sustainable biofuel source. I have investigated the ability of environmental microbes to degrade cellulose. I compared the cellulolytic capability of microorganisms associated with the leaf cutter ant-fungus garden symbiosis, focusing on analyzing the differences in microbial degradation capacity across the stratified refuse dump of the ant, *Atta colombica*. I tested degradation ability using two cellulose filter paper assays and analyzed the microbial community with 16S rRNA pyrosequencing. There was no significant difference in cellulolytic ability between each layer of the ant dump. Pyrotag analysis will show the differences in cellulolytic communities across dump layers and across cellulolytic ability.

## THE ORIGINS AND EVOLUTION OF THE UNITED STATES AFRICA COMMAND

Kathryn Johnson, Scott Strauss (Mentor), Political Science

The U.S. Africa Command (AFRICOM) was created in 2007 and met with intense criticism around the world from activists, scholars, and politicians alike. This study examines the creation of AFRICOM, as well as how and why AFRICOM has changed in its five brief years of existence. Drawing upon scholarly sources, news articles, government documents and legislation, and interviews conducted with AFRICOM personnel at the headquarters in Stuttgart, Germany, this study shows that AFRICOM has shifted from a multi-faceted developmental focus to a strict military focus to increase its world reputation. Ultimately, the goal of the study is to contribute to our understanding of U.S. policy towards Africa and how it evolves over time.

## THE ROLE OF COLLAGEN IN CHRONIC HYPOXIA- INDUCED PULMONARY VASCULAR REMODELING

Rebecca Johnson, Naomi Chesler (Mentor), Biomedical Engineering

Pulmonary hypertension (PH), or high blood pressure in the lungs, is characterized initially by vascular narrowing and later vascular stiffening. Collagen is a protein that contributes to arterial stiffness, which is a predictor of mortality in PH. To investigate collagen's role, we exposed mice to hypoxia, which creates PH. I hypothesized that hypoxic exposure would cause an initial increase in collagen, which would remain high with continued exposure. After hypoxic exposure, we harvested the lungs, pulmonary artery, and right ventricle. The tissue was fixed in formalin and exposed to different histological stains. A semi-quantitative analysis of the tissues was performed using large fields of view. With this research we hope to gain insight into the regulation of collagen synthesis and degradation in PH.

## CHANGES IN THE SLEEP EEG DURING ADOLESCENCE: A POSSIBLE INDICATOR OF CEREBRAL CORTEX DEVELOPMENT?

Benjamin Jones, Aaron Nelson (Mentor), Psychiatry

It has been hypothesized that the decline of EEG sleep slow waves during adolescence reflects synaptic pruning. However, it remains untested because in humans it's not possible to quantify synapses in vivo. In an attempt to test this hypothesis, we first characterized the baseline sleep EEG of young mice from early adolescence to adulthood. We then performed short periods of chronic sleep restriction to determine how sleep regulation changes during adolescence. Throughout the experiment we mimicked real life situations of many adolescents. EEG recordings were done throughout the entire adolescent period, and the EEG data were used to observe the changes in sleep slow wave activity (SWA). Our data demonstrate that in mice, as in humans, SWA during NREM sleep declines in the course of adolescence.

## SCREEN FOR MODIFIERS OF NLAZ IN REGULATION NMJ GROWTH BY DEFICIENCY SCREEN

Bowon Joung, Barry Ganetzky (Mentor), Genetics

The neuronal functions are processed through a communication between neuronal circuits, which are composed of synaptic connections of neurons. We focus on studying the mechanism of synaptic development using Neuromuscular Junction(NMJ) in *Drosophila Melanogaster* as a model. NMJ is the of motoneuron synapse forming on the surface of skeletal muscle fibers. Our goal is to dissect the underlying pathways in which Neural Lazarilloin(NLaz), a lipocalin protein, functions to regulate NMJ development. Previous study in the lab shows that NLaz negatively regulates NMJ development in *Drosophila*. Loss of NLaz causes NMJ overgrowth phenotype. Here we propose experiment to screen for modifiers, either enhancer or suppressors, of NLaz in synaptic regulation. A Suppressor of NLaz will suppress the NMJ overgrowth phenotype in NLaz loss of function mutants. An enhancer will enhance the NMJ overgrowth phenotype. Dissecting the genetic pathway of NLaz in regulating synaptic development is essential to further our understanding of regulation of synaptic development.

## CHILDREN'S WORD LEARNING FROM TOUCH SCREENS

Danielle Joyce, Heather Kirkorian (Mentor), Human Development and Family Studies

The "video deficit" is the tendency for children under 30 months to learn less from a video presentation than from an equal real-life presentation. The purpose of the study was to determine whether toddlers 24-30 months learned a new word from an interactive touchscreen as well as 30- to 36-month-olds did watching an equivalent video presentation. Subjects were randomly assigned to a non-contingent (video) or a contingent (interactive) condition. Preliminary results show young toddlers in the contingent condition did significantly better than chance at choosing the correct object (labeled "toma" in video) on their first try, and learned at the same statistical significance as older toddlers. Thus, this study supported the hypothesis that an interactive touchscreen would reduce the video deficit in young children.

## EVALUATION OF COLLABORATIVE PUBLIC HEALTH NURSING PRACTICE MODEL

Maggie Joyce, Karen Paulsen, Susan Zahner (Mentor), Nursing

The Wisconsin Public Health Nursing Practice Model (PHN Model) was created through a statewide academic-practice partnership in Wisconsin, known as Linking Education and Practice for Excellence in Public Health Nursing (LEAP Project). Objectives of the study were to assess model dissemination, use, and value, as well as to identify suggestions to improve the model. LEAP Project participants were recruited via e-mail to complete an anonymous online survey. Analysis was descriptive with comparisons by professional role (academic or practice). The most frequent reported uses of the model were to educate students and orient new staff. Respondents were generally positive about the model, finding it useful in their work, in teaching, in explaining public health nursing to others, and in integrating key aspects of public health nursing.

## PROGNOSTIC INDICATION FOR REFERRAL INTO PALLIATIVE CARE

Harrell Julia, Courtney Erb, Ana Schaper (Mentor), Nursing

Background: A goal of the Advanced Disease Coordination (ADC) program is to promote appropriate referrals of patients with advanced disease early in the disease process. Research has shown that clinicians overestimate survival and referrals occur late in the disease trajectory. Purpose: This study is to determine if referral to the ADC program from a primary care provider versus during hospitalization has an effect on life expectancy. Method: A retrospective chart review was conducted using data from an electronic medical record and included patients enrolled in the Palliative Care Demonstration Project between 9/1/2010 and 9/1/2011. Results: Data from this analysis will be displayed on charts and used to enhance the ADC program at a large Midwest medical center.

## THE EFFECT OF VITAMIN D ON INNATE IMMUNITY AND THE PROGRESSION OF MULTIPLE SCLEROSIS

Stephanie Kalogiropoulos, Julie Olson (Mentor), Neurological Surgery

Multiple Sclerosis is a demyelinating disease associated with an inflammatory response in the Central Nervous System in which the myelin sheath around axons are damaged. Previous research shows that sunlight exposure, a mechanism that increases vitamin D levels, lowers the risk of developing MS. The purpose of this research was to study the effect vitamin D has on innate immunity and how this altered immune response plays a role in the progression of MS. We used mouse subjects and injected them with a version of MS called Theiler's Murine Encephalomyelitis Virus, along with a vitamin D treatment. After studying the brains and spinal cords of these mice we found that vitamin D has favorable effects on both innate immunity and the development of MS.

## CLIMATE CHANGE IMPACTS ON RANGES OF AVIAN SPECIES

Aviv Karasov-Olson, James Berkelman (Mentor), Forest and Wildlife Ecology

Climate change is a force influencing plant and animal communities, as well as entire ecosystems worldwide. Common climate changes posited to impact wildlife include an increase in global temperatures, and in particular minimum temperatures in temperate regions, and a decrease in precipitation in subtropical regions. Based on previous studies, these changes have led to two main range changes in numerous avian species, greatly increasing the risk of species extinction: poleward range shifts observed in temperate species and upward elevational shifts observed in montane species. Many species already face extinction risk due to a restricted range from habitat loss or a topographical limitation, and based on this literature review, it is clear that these risks are only exacerbated by forced range shifts due to climate change.

## SUCCESSION IN FAMILY MANAGEMENT

Michelle Kass, Debra Holschuh-Houden (Mentor), Family Business Center

Many family businesses pass ownership through a succession plan to the next generation. However, when a family does not own the business, but instead has the management, how does this succession plan differ? This study will look at the difference between succession plans for family owned business and family managed business. The aspects of this study will explore the complications that can occur with family managed business and how they differ in succession with family owned. Case studies, interviews, and outside research will reveal any complications dealing with family management succession versus family ownership succession. Based on these results, a succession plan for the Kass Family's management of JCC Rainbow Day Camp will be completed.

## ADOLESCENTS' DISPLAYS OF DEPRESSION AND STRESS ON SOCIAL MEDIA WEBSITES: THEIR CALL FOR HELP

Erin Kelleher, Philip Giampietro (Mentor), Pediatrics

Depression is a common disease that often goes undiagnosed in adolescents. The purpose was to identify references to depression and stress from social networking sites to find ways to identify them. We hypothesized adolescents who are depressed would likely post their feelings on Facebook. Previous work supports that individuals feel more comfortable communicating online. To test this, fifty Facebook profiles were coded for depression. Their friends who commented were examined to determine how close their relationship was. Out of the 49 profiles, 28.57% displayed depression or stress references. Out of those, 28.57% displayed depression, 28.57% stress, and 42.86% displayed both. The most common way of support were comments and likes. Professionals will be able to apply methods to identify adolescents experiencing depression.

## SUSTAINABLE COLLABORATION: THE FOUNDATION AND FIRST YEAR OF THE SUSTAINABILITY COUNCIL

Meredith Keller, Sabrina Bradshaw (Mentor), Geological Engineering

The Office of Sustainability is a new initiative on campus that aims to make UW-Madison “a living model for sustainability.” To this end, the Office established the Sustainability Council in November 2012. The Sustainability Council is a great example of effective student collaboration and integration with UW Operations. This project will explain the process of founding the Council and how the use of “sustainable leadership practices” (for example, integrating with campus operations, creating common webspace for updates, etc) will ensure the Council's efficacy into the future. The Council is composed of representatives from sustainability-oriented groups on campus in the realms of society, economy, and the environment. In just the last three months, council members have created partnerships (facilitated by the Council) for campus campaigns. For example, NET IMPACT, a program for MBA students that champions corporate responsibility, recently called on Slow Food UW to cater one of its events. Similarly, WISPIRG and REthink are working together on a plastic bottled water ban on campus. This Council is already proving an essential tool for effecting change on campus.

## TAMING TO TEACH: THE COMMON CONSERVATION LEGACY OF THE WI GAME FARM AND MACKENZIE ENVIRONMENTAL CENTER

Meredith Keller, William Cronon (Mentor), History

Since the 1930s, the 500 acres outside of Poynette known today known as the State Game Farm and MacKenzie Environmental Education Center has been the epicenter for conservation and hunting education in Wisconsin. By claiming that the area exhibited "wild" animals and plant life, the Farm and Center became a popular state attraction. The Game Farm / MacKenzie Center relationship encapsulates one of the great ironies of the Progressive-Era conservation movement: it was sport hunters and timber harvesters that initially sounded the alarm about the depletion of wildlife and natural resources in the West and advocated a return to the so-called "wilderness." The history of the farm and center—partners in environmental education—reveal how the early 20th century conservation movement and game hunting created an artificial, "tame" environment in which Wisconsin students could learn about "the wild."

## BETWEEN TWO SISTER CITIES: A COMPARATIVE ANALYSIS OF FREIBURG AND MADISON ENVIRONMENTAL GOVERNANCE

Meredith Keller, Nils Ringe (Mentor), Political Science

Freiburg im Breisgau, Germany, made a name for itself in 2000 when its SolarRegion Freiburg project earned a place at the 2000 World Expo. Its prominence as a sustainable city has been growing ever since, fueled by unwavering political will at the local level, an unrivaled Green Party at the city level with the environment at the forefront of their platform, and a general support for environmental programs at the state, national, and EU level. The cities of Madison, Wisconsin and Freiburg, Baden-Wuerttemberg, Germany, official "Sister Cities" since 1988, share a comparable population-to-space-ratio, culture of activism and high political participation, and geography, facts that indicate a similar potential for renewable energy innovation and greenhouse gas-reducing environmental policies. Despite these wide-ranging similarities, however, Madison lags far behind in energy conservation, public transportation innovation, waste disposal, and other municipal environmental policies leading to far greater greenhouse gas emission than its sister city in Germany. This thesis in Environmental Studies and Political Science analyzes the policy mechanisms and history that determine each city's environmental policies contributing to greenhouse gas emissions (particularly, transportation, construction, energy and waste), and then compares those findings to isolate those elements common to both. Data collected includes interviews of city policy official in both Freiburg and Madison, as well as environmental metrics and environmental governance theory. The overall findings suggest that it is Freiburg's electoral policy (as well as the electoral systems at the state and national levels), in tandem with the city's historical memory of nuclear power protests in the 1970s, that has propelled it ahead of most other cities in greenhouse gas emission reduction.



## THE EVOLUTION OF POST-STARBURST GALAXIES AND THEIR AGN

Mikayla Kelley, Marsha Wolf (Mentor), Astronomy

My project explores the evolution of merging galaxies, focusing on the post-starburst or "E+A" phase. The main goal is to place a time line on star formation and supermassive black hole growth and to describe further the processes affecting both using spectra obtained with a telescope. Through the use of the program Pyraf, I reduced the data by trimming images, removing cosmic rays, getting rid of contributions from the telescope's instruments, and applying standard star images to remove the effects of the Earth's atmospheric transmission on the galaxy images. Analysis of data is still in progress and will be done using extracted spectra from these calibrated galaxy images, making careful reduction imperative. It is intended that through spectral analysis of post-starburst galaxies, the processes of galaxy evolution will be more precisely defined by determining the ages of the stars throughout the galaxies.

## TRAINING THE DANCER AS AN ATHLETE

Rebecca Kesting, Katherine Corby (Mentor), Dance

Research has demonstrated that dance training does not provide adequate conditioning for dancers without additional training. For my Senior Honors Project in the Dance Department, I am creating and teaching a cross training protocol to a group of dancers. I will measure strength and flexibility before training and will repeat measurements following training. Changes for the participants will be compared to students exposed to dance alone. Injury rates will also be tracked. The results will demonstrate if the training protocol was effective in improving strength and flexibility. Through this research, I will learn how to effectively train dancers as athletes and my participants will learn healthy training practices.

## ACTIVATED EOSINOPHILS INTERACTING WITH PERIOSTIN, A PROTEIN FOUND IN ASTHMA

Manav Khanna, Mats Johansson (Mentor), Biomolecular Chemistry

Eosinophils are blood cells that contribute to asthma by migrating selectively from the blood-stream into the airways. Eosinophils can only migrate if they become activated and polarized, that is, develop a front and a rear. Cell polarization starts with mediators binding to cells and activating adhesion receptors that help cells to adhere to and migrate on cells lining the blood vessels and extracellular matrix (ECM). Activated eosinophils form adhesive structures called podosomes ("foot bodies") that degrade ECM proteins. We are studying the distributions of different surface proteins in activated eosinophils that are attaching to periostin, an ECM protein that is found in greater amounts in the airway tissue in asthma. I am using immunofluorescence microscopy to detect surface proteins with fluorescent dyes coupled to antibodies.

## USING GIS TO UNDERSTAND HIV PREVALENCE AND COMMUNITY VIRAL LOAD IN MILWAUKEE COUNTY

Lauren Kidd, Ryan Westergaard (Mentor), Medicine

Antiretroviral therapy prevents death due to AIDS, and, through lowering individual patients' HIV viral load, prevents transmission of infection. Reducing community viral load (CVL), defined as the total or average HIV viral load within a geographic area, has therefore become an important goal to reduce the spread of HIV on a population level. This project investigated the determinants of community viral load in Wisconsin communities. We used Geographic Information Systems (GIS) software to measure correlations between neighborhood level characteristics, HIV prevalence and community viral load. Neighborhood variables included socioeconomic and demographic characteristics obtained through the 2010 US census for Milwaukee County. These data may help public health programs to allocate resources more effectively in order to reduce the burden of HIV in Wisconsin.

## WHAT ARE OLDER ADULTS' KNOWLEDGE AND BELIEFS REGARDING OSTEOPOROSIS?

Katharine Kieler, Juliette Carr, Diane Lauver (Mentor), Nursing

Although osteoporosis is common and consequences can be serious, adults are unlikely to take preventive measures for it. According to behavioral theories, knowledge and beliefs affect the likelihood of adults taking preventive measures. Our study purpose was to assess adults' knowledge and beliefs about osteoporosis to guide selection of content for future interventions. Using a cross-sectional, descriptive design, mostly female (80%) adults (N=51, mean age=77) were recruited in Wisconsin. Participants completed established questionnaires on osteoporosis and its prevention. Most had accurate knowledge about osteoporosis and associated nutrients. Participants lacked knowledge about sources of Vitamin D and calcium and prevention through physical activity. Their beliefs about personal risk of osteoporosis and disease prevention were inaccurate. Findings will guide future psycho-educational interventions to prevent osteoporosis.

## STELLAR KINEMATICS IN LATE TYPE GALAXIES

Steffi Klawiter, Eric Wilcots (Mentor), Astronomy

Optical data of three morphologically similar galaxies will be analyzed for their kinematics. Specifically, we are interested in the stellar bar, which is a main characteristic in categorizing galaxies. NGC 4123, NGC 2537, and IC 1727 are classified as either loosely bound spiral barred galaxies (SBc) or Magellanic spiral galaxies (SBm). From the data, we will determine precisely the systemic velocity, the velocity that each galaxy is moving with respect to the Earth. We will determine a value for the stellar velocity dispersion, which can be thought of as the motion of each star perpendicular to the galactic plane. And finally, we can estimate the mass distribution of the galaxy. With these three numbers, we can say if there is a correlation between the galaxy morphology and the galaxy kinematics. This is part of a larger attempt to quantitatively categorize galaxies based on kinematics, to explain the origin of the single arms in SBm galaxies, and to understand the origin of the stellar bar.

## INHIBITION OF THE SERINE/THREONINE KINASE IN STAPHYLOCOCCUS AUREUS

Ben Knight, Robert Striker (Mentor), Infectious Disease

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a gram-negative bacterium that is resistant to beta-lactam antibiotics, including the commonly used penicillins and cephalosporins. Every year it infects roughly 880,000 people per year in the United States, with 5% of those infected dying from the disease. Recently, it was shown that a MRSA strain with its Serine/Threonine Kinase (Stk1) knocked out regained sensitivity to cephalosporins, suggesting that this kinase could be a target for new drugs. Using molecular modeling and in vivo analysis, we identified a crucial residue (F183) in the MRSA kinase active site which prevents the binding of staurosporine, a ubiquitous kinase inhibitor. Additionally, based on molecular modeling, we tested 12 drugs in vivo to look for increased sensitization to cephalosporins. Ultimately, we hope to find a drug that effectively inhibits the Stk1 and subsequently restores beta-lactam antibiotics as a treatment option for MRSA infection.

## SOCIOEMOTIONAL WEALTH AND ITS EFFECT ON FAMILY BUSINESS VALUATIONS

Andrew Knighton, Debra Holschuh-Houden (Mentor), UW Family Business Center

The influence of socioemotional value on the internal valuation of family businesses has been well documented. Family business leaders attach emotional value to their companies, which both increases its value and can affect the issuing or valuing of shares. In this study, the monetary increase in the overall valuation associated with socioemotional value will be examined. Surveys will be administered to participants measuring the specific effect that socioemotional value has on the monetary valuation of their business. The effect of socioemotional value is expected to significantly increase the overall value of the business. This will help future family business leaders understand the difference between what their business is worth to the outside world and what it is worth to them.

## DRIVING THE BUDGET: THE POLITICS OF BUS TRANSPORTATION IN MADISON, WISCONSIN

Kelly Kohrs, Jessica Shen, Katherine Vosburg, William Gartner (Mentor), Geography

Public transportation, beneficial to citizens directly and indirectly, is dictated by the political sphere, localized budgets, and urban demographics. This study seeks to isolate the characteristics of who is riding the bus in the city of Madison, Wisconsin and how they will be affected by the contemporary fiscal climate as it acts upon transit policy. Methods of participant observation, surveys, photography and an interview assess ridership and attitudes on proposed bus fare increases. Riders of routes 80 and 6 do not parallel the demography of the metropolitan and campus communities, but do illustrate the geographic pattern of households. Demand for public transportation will not be adversely affected by fare increases.

## THE MUSIC OF FRANCOIS BORNE

Tatiana Koike, Stephanie Jutt (Mentor), Flute

Francois Borne was a flutist and composer from the Romantic period. He wrote several pieces for the flute, but only one survives in standard repertoire. My project will explore the almost unknown works of Borne. I have discovered five titles of his works, and obtained the sheet music for three: two of which are still in print, and the others are rare and out of print, one was found at the Yale library and the other in the Netherlands. I will perform excerpts from these works, which are written for flute with piano accompaniment. I will then talk about his general compositional style during the era of salon music, his contributions to modern flute playing, and a brief summary of his biography.

## INGESTION OF BANANAS AND HUMAN ATTRACTIVENESS TO MOSQUITOES

Nicholas Konwinski, Susan Paskewitz (Mentor), Entomology

Mosquitoes are vectors for malaria as well as viruses and because of this have an enormous impact on global health. Mosquitoes find humans and other hosts through chemical cues in human's breath and skin emanations. Understanding these cues and the sensory mechanisms that determine host preference are critical goals in medical entomology as they may lead to new ways to repel mosquitoes. Although a number of human odors have been identified as attractive to some species, very little is known about how these may change as a result of a person's diet. Interestingly, a common home remedy to reduce one's attractiveness to mosquitoes is to limit bananas in one's diet. This advice has been tested with trials using an assay that measures the landing rates of mosquitoes before and after a subject eats a banana. Results strongly support the hypothesis that the ingestion of bananas increases attractiveness of human subjects to an important malaria vector, *Anopheles stephensi*. The *Anopheles gambiae* and *Aedes aegypti* species were also tested. Results are quite comparable with these species, however the attraction is not as strong. Current research is focused on volatile substance(s) associated with the skin that change after ingestion of bananas and may cause the observed increases in attraction.

## YOUNG CHILDREN'S OBJECT RETRIEVAL LEARNING FROM TOUCHSCREENS

Emma Kosciolk, Alexandra Nicholas, Laura Pierpont,  
Heather Kirkorian (Mentor), Human Development and Family Studies

The purpose of this study was to determine if toddlers could successfully locate an object from a hiding spot more often when interacting with a touchscreen than from watching a noninteractive video. Toddlers were randomly assigned to a non-contingent (just watch video) or contingent (touch screen to advance video) condition. Preliminary results showed that subjects between 24 and 32 months only scored above chance in the contingent condition. Subjects between 33 and 42 months scored above chance in both conditions. These findings suggest that very young children might learn better from interactive screen media than from non-interactive television.

## CHOLESTEROL BIOSYNTHESIS PATHWAY: MODEL DEVELOPMENT

Cassandra Kozak, Laurence Loewe (Mentor), Genetics

Cholesterol is an undeniably essential part of every human being and of various other organisms. It plays roles in membrane structure and function as well as being a precursor for the synthesis of important hormones. The cholesterol biosynthesis pathway is a series of enzyme-catalyzed reactions that transform the common metabolite Acetyl-CoA into cholesterol. Building on a previous model, we investigated specific enzymes that help or hinder the production of cholesterol to quantify the effects they exert of the corresponding reactions in the cholesterol biosynthesis pathway. Besides expanding and reviewing the earlier model, we aim to contribute to designing a system that makes it easy to document and review metabolic models in general.

## CHANGES IN FAMILY SYSTEMS: IS IT EVER FOR THE BETTER?

Madalyn Krueger, Debra Holschuh-Houden (Mentor), UW Family Business Center

Family systems are a key in the effective functioning of family businesses. For this project, the researcher is going to evaluate what happens when there is a change in the family business. She will be considering the changes that occur when someone wants to gain more power in the family business or when someone wants to opt out of the family business. The researcher believes that changes will occur in both occasions and the severity will range for both scenarios based on the family system. She also believe that the changes in the family system will be the most severe when there is struggle about the change and not everyone in the family system agrees about the change. Through case studies, interviews with family members in family businesses, and her own outside research, the researcher will look at the long-term effects of a change in the family systems with varying severity. Her research will allow her to better understand the dynamics of changes to family systems and how the change affects the outcomes of the family business.

## ATTACHMENT RELATIONSHIPS AND BEHAVIOR PROBLEMS IN YOUNG CHILDREN WITH INCARCERATED PARENTS

Ashley Kubly, Julie Poehlmann (Mentor), Human Development and Family Studies

The current study investigates the association between security in the child-caregiver attachment relationship and children's behavior problems in young children with a jailed parent. The data was collected by the Parent-Infant interaction lab at the Waisman Center as part of the NIH-funded Young Children of Jailed Parents study. Parents were enrolled from the Racine, Dane, and Sauk county jails, and home visits were conducted with children (age 2-6) and their caregivers. The measures used include the Child Behavior Checklist, which is completed by the parent and caregiver, and the Attachment Q-sort, which is completed by trained observers based on the child and caregivers' interactions in the home.

## SUCCESSION IN FAMILY BUSINESS

Daniel Kuzia, Debra Holschuh-Houden (Mentor), Family Business

A major issue in family businesses is answering the question of who should take over the company after the first generation of the business is ready to pass it on. Succession is a very important process for a business and is influential on the future of the company, so the successor must be the right person for the job, not just the most convenient. This project will focus on how to choose a good successor while paying particular attention to the stereotypical roles of children in succession such as primogeniture; and how the roles of children should actually be to ensure the success of a family business.

## THE USE OF BIOMOLECULAR GRADIENTS TO STIMULATE AND GUIDE NEURONAL GROWTH INVITRO

Susanna Kwok, Matthew Jensen (Mentor), Neurology

Brain injury, such as stroke, causes loss of neurons and is a major cause of disability. Regeneration of neurons in the adult brain is limited; the use of artificially created neuron grafts is an attractive means to stimulate brain recovery. Neuron grafts may be improved by using a gradient of molecules that guide directionality of neuronal growth, as occurs during development. Our goal is to compile scientific literature on gradient generation methods and critique their features by means of systematic review. There are many ways to generate biomolecular gradients suitable for the creation of neuron grafts; these gradients feature growth through scaffolding and week-long sustainability. Future studies that directly compare these methods will need to be performed to obtain a better comparison of these methods.

## WHAT IS THE BEST METHOD TO MODEL REACTIVE ASTROCYTOSIS IN VITRO?

Jin Hwan Kwon, Matthew Jensen (Mentor), Neurology

After a central nervous system injury, astrocytes migrate, proliferate, and form a glial scar, possibly for the purpose of mechanically reinforcing structurally disrupted tissue. The glial scar formed by reactive astrocytes may be a physical and biochemical barrier inhibiting the growth of axons following injury, which may impair recovery. We are testing and modeling reactive astrocytes to provide testing substances that might promote axon regeneration by overcoming the barrier provided by Glial Scar. In these experiments, there are various methods of modeling reactive astrocytes in vitro. We are comparing each of their limitations and advantages to determine which method is the best method to model reactive astrogliosis in vitro. In vitro modeling of reactive astrogliosis would speed research of mechanisms and treatments, but it is unclear what methods might be optimal for this purpose. We performed a systematic review of available evidence for methods to model astrogliosis in vitro, and found the advantages of individual methods based on particular astrogliosis study.

## DOUBLESEX GENE IN Aedes Aegypti

Miranda LaCroix, Eric Sanson, Que Lan (Mentor), Entomology

In the *Aedes aegypti* mosquito, the doublesex (dsx) gene is the double-switch gene that determines the gender by an on-and-off switch at birth, which is usually located on the sex chromosome. However, *Aedes aegypti* does not have sex chromosomes; therefore, the mechanism of dsx gene regulation is unknown. To find how this gene is controlled, dsx needs to be cloned, using a PCR/cloning approach to create dsx cDNA. Then, it will be inserted into bacteria plasmid DNA, cloned, and sequenced using DNA electrophoresis. Gel electrophoresis detected corresponding forms of dsx isoforms from PCR products. They were cloned into *E. coli* bacterium and obtained colonies. There are no results; however, the next steps are to insert the cDNA into the mosquitoes to see their reaction.



## ANXIETY SYMPTOMS AND GENE-GENE INTERACTIONS IN THE SEROTONERGIC SYSTEM

Daniel Lancour, Harold Goldsmith (Mentor), Psychology

Anxiety is a heritable symptom of multiple behavioral disorders. However, gene X gene and gene X environment interactions complicate the prediction of anxiety from specific genotypes. We used generalized linear models to predict multi-informant anxiety assessments from genotyping data on 500 Caucasian children. Polymorphisms included in the analyses were TPH2(rs4570625), HTR1A(rs6295), HTR2A(rs6313), HTR2C(rs6318), all of which affect availability or activity serotonin in the CNS. We evaluated main effects and two-way interactions of these SNPs as predictors of anxiety symptoms.

## KINETIC TRAPPING OF THE MONOMERIC STATES OF A MODEL PROTEIN UNDER PHYSIOLOGICAL CONDITIONS

Jon Lang, Silvia Cavagnero (Mentor), Chemistry

To understand how proteins can reproducibly fold into functional structures, a thermodynamic hypothesis was proposed by Anfinsen and his collaborators in 1974. Though Anfinsen's thermodynamic hypothesis is applicable to the native and unfolded states of proteins, it does not take into account the possible presence of intermolecular interactions that lead to aggregation under identical conditions as those that support the bioactive state. We propose that these aggregated states are always present but rarely populated due to high kinetic barriers separating them from non-aggregated conformations. This project explores the free energy landscape of a model protein, and finds that the native folded, intermediate, and unfolded states are kinetically trapped relative to at least two types of soluble aggregates, under physiologically relevant conditions.

## RACIAL TARGETING IN POLITICAL ADVERTISING

Nicole Lang, Jack Edelson (Mentor), Political Science

The question my research seeks to answer is, "When candidates appear to be reaching out to minorities, are they actually trying to reassure racially liberal whites that they are not racists, or are they actually targeting minorities?" To investigate this, I have noted the races, ages, and relative presence of minorities in a wide variety of American campaign advertisements from the year 2000. I will illustrate the trends in racial diversity that I have observed in these commercials as candidates vary. Additionally, I will share the findings of various studies that investigate how whites respond to different images of racial inclusivity and discuss if these images activate racist feelings or encourage whites to sympathize with the candidate's displays of tolerance.

## CONTROL OF POTATO VIRUS Y IN SEED POTATO PRODUCTION

Kyle LaPlant, Amy Charkowski (Mentor), Plant Pathology

Vegetative seed potato production is regulated to control the spread of diseases, including potato virus Y (PVY). Minitubers grown from tissue culture plants in hydroponic culture are used to reduce the initial inoculum present in seed tuber production. Increased production of seed from minituber plants can contribute to higher control of PVY spread; however, research is needed to maximize production from minituber plants. This experiment studies PVY incidence in plants grown from minitubers and traditional seed under different growing conditions, including method of irrigation, plant arrangement, and mulch. Yield, seed piece quality, and time to maturity were measured, and the harvested tubers were screened for PVY incidence. The data show no significant difference in PVY incidence among treatments and higher tuber yield from traditional seed.

## SYMBIOTIC PATHWAYS IN RICE

Joey Lara, Pierre-Marc Delaux (Mentor), Department of Agronomy

Plant symbiosis is important to plant growth, and understanding its mechanisms could help humanity manipulate plants to increase their yield. We are investigating common genes between the symbiotic pathways of rice associations with mycorrhizae and rhizobia. For this we must grow rice plants in vitro. We then extract RNA from the roots, amplify cDNA made from this RNA using PCR, and run a gel electrophoresis test on the sample. We found that the AM11 and AM3 genes are upregulated during both associations, supporting the hypothesis that the two pathways are similar. With this knowledge, we may eventually modify plants that are unable to form highly beneficial associations with nitrogen fixing bacteria, to do so, producing plants with higher yields and less need for fertilizers.

## THE EFFECTS OF TGFB ON ANAPLASTIC THYROID CARCINOMA CELLS

Carolina Larrain, Ricardo Lloyd (Mentor), Pathology

Epithelial-mesenchymal transition (EMT) causes cells to progress from an epithelial to mesenchymal phenotype and can be induced using transforming growth factor beta (TGF $\beta$ ). We hypothesize that EMT plays a major role in thyroid carcinomas becoming more undifferentiated. This study focuses on the effects of TGF $\beta$  on an anaplastic thyroid carcinoma (ATC) cell line (THJ-16T) over 21 days. RNA was extracted at regular intervals to examine changes in EMT biomarkers. The preliminary results show a decrease in E-cadherin and increase in SLUG, suggesting that these cells underwent EMT and that EMT plays a major role in the progression of carcinomas becoming more aggressive. By further studying the role of EMT in ATCs we hope to better understand its mechanism, leading to better treatment of thyroid carcinomas.

## SLOW FOOD EDUCATIONAL OUTREACH AND SOCIAL JUSTICE INITIATIVE

Victoria Law, Maddy Levin, Margaret Nellis (Mentor), Interdisciplinary Studies,  
School of Human Ecology and University Health Services

The South Madison community has traditionally been considered a food desert, an area where fresh produce and healthy groceries are not readily available. For several years, University of Wisconsin-Madison students involved in Slow Food-UW have partnered with community organizations in South Madison to promote local and sustainable agriculture. This is done through engaging youth in weekly activities focused around gardening, cooking, and eating good, clean, fair food. It is within these efforts that the children's families can be reached so that in coming years, food sovereignty will no longer be a privilege but a realizable and affordable right to the community.

## RELATIVE TIMING OF GOLD AND SILVER MINERALIZATION EVENTS AT THE BARRICK REN PROPERTY, NEVADA, U.S.A.

Matthew Ledvina, Philip Brown (Mentor), Geoscience

The development of Carlin-type gold deposits has made the state of Nevada a world leader in gold production. First recognized in the 1960s, Carlin-type deposits occur along the Carlin Trend, a 100km NW-SE oriented mining district in Northeastern Nevada. Typical Carlin-type gold ore is characterized by gold-bearing pyrite disseminated in hydrothermally altered sedimentary host rock. The REN property is an atypical site where silver-rich zones occur in close proximity to typical Carlin-type gold mineralization. The relative timing of gold and silver mineralization events at the REN property was determined through microscopy, drill-core examination, and the use of geochemical data. Reconstructing mineralization events at the REN property advances the study of the regional geochemical processes responsible for forming world-class ore deposits in Northeastern Nevada.

## HIRING INSIDE THE FAMILY; CULTURES AND TRUST

Hlee Lee, Debra Holschuh-Houden (Mentor), UW Family Business Center

The hiring process for a small family business has different values behind it for management or owners to hire workers. A big issue with the process would be culture and trust that owners have in their business. In depth, this research would be based on specific reasons behind hiring inside the family rather than outside members. Who do people hire to begin with; their family members or those outside of the family is the question. Results would be based on interviews and survey questionnaires which would be answered by individuals who own or run a small business themselves. Also, background information would derive from peer-reviewed articles. Results of the research would allow for a better understanding of small family businesses and their motive to hire.

## EVOLUTIONARY RESPONSE OF THE COPEPOD EURYTEMORA AFFINIS TO CRUDE OIL TOXICITY

Kristin Lee, Carol Lee (Mentor), Zoology

The 2010 Deep Horizon Oil Spill in the Gulf of Mexico was the largest offshore shore oil spill in history. As support for offshore drilling is increasing, it is critical to assess the impacts of future oil spills. Understanding the evolutionary response to crude oil that enables populations to avoid extinction is a critical component of this assessment. This study uses the copepod *Eurytemora affinis*, a dominant member of the Gulf of Mexico food web, to determine (1) the ability of *E. affinis* to adapt to crude oil toxicity and (2) evolutionary tradeoffs that might occur as a result of adaptation. These goals are addressed by comparing fitness between copepod populations selected for tolerance to oil toxicity relative to non-selected control lines.

## BYZANTINE HISTORIOGRAPHY

Pashoua Lee, Leonora Neville (Mentor), History

The Byzantine Empire is the Roman Empire after the collapse of the Western half from the 5th century to the 15th century. There is extant information about the Byzantine Empire, but the sources are not readily accessible and rarely provide general information for those new to the Byzantine historiography. As a result, this research studied medieval texts concerning the Byzantine Empire. For example, George Akropolites's Chronicle, is a text heavily relied on for our understanding of the 13th century as it spans from 1204 to 1261. A bibliography was constructed about the texts and then read to determine its reliability. From there, the works will be selected and compiled to construct a book as an introductory guide to Byzantine Historiography.

## EFFECTS OF MINDFULNESS PRACTICES ON HIGH-RISK PRESCHOOLERS

Pilline Lee, Matthew Zabransky, Julie Poehlmann (Mentor),  
Human Development and Family Studies

The purpose of this pilot randomized controlled trial was to examine the effects of a mindfulness curriculum on high-risk preschoolers. Application of this curriculum may increase children's school readiness skills, which is especially important in high-risk populations. Data collectors, who were blind to treatment condition, collected data in three preschools prior to and following implementation of the mindfulness curriculum. Measures assessed children's self-regulation, attention, empathy, and compassion. We expected to see higher levels of empathy, compassion, and self-regulation in the treatment group.

## INVESTIGATING THE ROLE OF MEDICAGO TRUNCATULA ROPGEFS IN LEGUME-RHIZOBIA SYMBIOTIC SIGNALING

Sarah Lee, Muthusubramanian Venkateshwaran (Mentor), Agronomy

**Abstract:** Symbiotic relationship between legumes and nitrogen-fixing rhizobia results in the formation root nodules. Molecular mechanism of legume-rhizobia symbiotic signaling is poorly understood. Upon perception of rhizobia symbiotic signals (Nod factors), plants produce reacting oxygen species (ROS) as one of the early responses, which might play a potential role in symbiotic signaling. We hypothesize that ROP GTPases and RopGEFs (Guanine Nucleotide Exchange Factors) are required for the Nod factor-induced ROS production and subsequent symbiotic signaling. Hence we utilized RNAi-based gene silencing strategy to functionally characterize RopGEFs in model legume, *Medicago truncatula*, for their role in legume-rhizobia symbiosis. Functional analyses of different MtRopGEFs suggest that MtRopGEF2, MtRopGEF5 and MtRopGEF14 play role in symbiotic signaling.

## ENGINEERING HYPERACTIVE ANGIOGENIN: VARIANT ANGIOGENIN EVADES INHIBITOR, INCREASING ACTIVITY

Stephen Leeb, Trish Hoang (Mentor), Biochemistry

Human angiogenin protein functions include helping with blood vessel formation and protection of motor neurons. Angiogenin has low activity in cells due to a tight binding with ribonuclease inhibitors. The engineering of a hyperactive angiogenin would protect motor neurons from degeneration in amyotrophic lateral sclerosis (ALS) patients. Specific amino acids in angiogenin will be changed using site-directed mutagenesis. Stability, catalytic, and competitive binding assays will test the engineered angiogenin and how it compares to wild-type angiogenin. We expect to see increased angiogenin activity in cells while also creating a stable and functioning protein, capable of avoiding the ribonuclease inhibitor. This project will add to the information about angiogenin and ALS and will aid in developing treatments to protect motor neurons in ALS patients.

## BEHAVIOR PROBLEMS IN CHILDREN OF INCARCERATED PARENTS

Mykenzie Lemberger, Julie Poehlmann (Mentor),  
Human Development and Family Studies

The purpose of this research is to examine children's scores on the Child Behavior Checklist (CBCL), a parent-report questionnaire assessing various behavioral problems in children. Using a sample from a study of young children whose parents are in jail, we will investigate reports from the jailed parent and primary caregiver of the child. We will also use the CBCL to examine if children show significant behavioral problems compared to national norms based on children's age and gender. With this research, we hope to gain a better understanding of families of young children with an incarcerated parent including how families cope with children's behaviors.

## HISTOLOGICAL QUANTIFICATION OF ANGIOGENESIS AFTER FOCAL CEREBRAL INFARCTION: A SYSTEMATIC REVIEW

WaiYin Leung, Matthew Jensen (Mentor), Neurology

Ischemic stroke is a leading cause of disability, and current treatments to improve recovery are limited. Part of the natural recovery process after brain injury is angiogenesis. The formation of new blood vessels around the infarct appears to be important for restoration of adequate perfusion to allow for healing of brain tissue. Many potential restorative treatments may affect, and be affected by, angiogenesis, so accurate quantification of this outcome is needed. We performed a systematic review of histological methods to quantify angiogenesis after cerebral infarction. We found reports of the use of a variety of histological and general and immunostaining techniques in conjunction with a variety of analysis methods. We found no direct comparison studies and conclude that more research is needed to optimize the assessment of this important stroke outcome.

## INVESTIGATION OF THE EFFECTS OF MUTATIONS IN U4/U6 SNRNA

Hong hong Liao, Samuel Butcher (Mentor), Biochemistry

Small nuclear RNAs (snRNAs) are non-coding RNAs that are found in every eukaryotic cell. U4/U6 is a di-snRNA that associates with proteins to form a very large and complex cellular enzyme called the spliceosome. The spliceosome is responsible for the important cellular process of pre-messenger RNA (pre-mRNA) splicing. Splicing is a key step between transcription and translation. Mutations in snRNAs can be very deleterious to cell growth at low temperatures in yeast. In humans, mutations in one form of U4 snRNA causes Taybi-Linder syndrome that results in low postnatal survival. This undergraduate research project demonstrates how U4/U6 stability is affected by point mutations in order to study assembly of the spliceosome. This knowledge will extend our fundamental understanding of eukaryotic gene expression to possibly impact the treatment of genetic disease.

## CHARACTERIZATION OF THE CARBOHYDRATE BINDING MODULE (CBM2) FROM STREPTOMYCES SP. SIREXAA-E (ACTE)

Sungsoo Lim, Brian Fox (Mentor), Biochemistry

*Streptomyces* sp. SirexAA-E (ActE) is an aerobic bacterium associated with the invasive pine-boring woodwasp *Sirex noctilio*. This microorganism is known for its cellulolytic ability, deconstructing crystalline cellulose into soluble sugars. Deconstruction process involves the synergistic activities of secreted glycoside hydrolases, carbohydrate esterases, polysaccharide lyases, and carbohydrate binding modules. In this study, we have characterized the dominant family 2 carbohydrate binding module (CBM2) of ActE in its ability to bind to two unique crystalline forms of cellulose; namely cellulose I (the naturally occurring allomorph of cellulose in plant cell walls) and cellulose III (a non-native crystalline form of cellulose obtained during chemical processing of cellulosic biomass for biofuel production). After PCR amplification of the CBM2 sequence (SACTE\_0236 gene locus) from the ActE genomic DNA, the gene fragment was cloned into a pQE plasmid vector. The plasmid vector was derived from pQE80 currently used for high-throughput structural studies at the UW Madison Center for Eukaryotic Structural Genomics. The pQE\_(His)6\_GFP\_CBM2 and pQE\_(His)6\_CBM2 plasmids were transformed into Z-competent BL21 (DE3) cells for heterologous expression of both GFP\_CBM2 and CBM2. Both proteins were over-expressed as insoluble inclusion bodies for several expression conditions tested. The inclusion bodies were dissolved using 8 M urea and the protein was refolded by rapid dilution. The soluble protein was isolated by Ni-NTA affinity chromatography and further fractionated by gel filtration to remove a minor fraction of aggregated proteins. Binding assays were carried out using the purified proteins on cellulose I and cellulose III to determine the binding parameters of CBM2 (binding capacity and association constant). Future studies include characterization of binding parameters and catalytic activity of other CBMs and GHs from ActE on cellulose III.



## STUDYING THE GLIAL CONTRIBUTION TO RETT SYNDROME PATHOGENESIS USING PATIENT-SPECIFIC IPSCS

Benjamin Lin, Emily Cunningham (Mentor), Genetics

Rett syndrome (RTT) is an autism spectrum developmental disorder caused by mutations in the X-linked MECP2 (methyl-CpG binding protein 2) gene. Because mouse models are limited in their ability to mimic human RTT mutations, induced pluripotent stem cells (iPSCs) have been generated from RTT patients as an in vitro human model to validate and extend knowledge obtained from mouse studies. Currently, all studies involving RTT iPSCs have focused on studying neuronal pathologies in the absence of astrocytes. However, there is strong evidence, from work in RTT mouse models, that defective mutant astrocytes play a critical role in disease progression. Better understanding of the glial contribution to RTT pathology will not only provide insight into disease mechanisms, but also lay the groundwork for future drug screens using RTT iPSC-derived neurons and/or astrocytes. We have demonstrated that astroglial progenitors and their subsequent astrocytes can be efficiently differentiated from iPSCs and maintain their isogenic status over time. In addition, RTT iPSC-derived astrocytes and their conditioned media have been shown to have adverse effects on wild type neuronal morphology when grown in a co-culture.

## MUNC13-1 C2A DOMAIN REGULATES PROTEIN LOCALIZATION

Emily Lingeman, Thomas Martin (Mentor), Biochemistry

Dense core vesicle exocytosis is essential for the secretion of hormones, neurotransmitters, and biogenic amines. In neuroendocrine cells, the priming proteins Munc13-1 or ubMunc13-2 are essential for Ca<sup>2+</sup> regulated dense core vesicle fusion. Long isoforms of Munc13 are large (220 kDa) proteins comprised of three C2 domains, a phorbol ester-binding C1 domain, and two Munc homology domains. The activity of Munc13 has been reported to be regulated through C2A dimerization. However, it is unclear if this regulation occurs in vivo. Here, we monitored the function of the C2A domain in mediating stimulus-dependent translocation of Munc13 to the plasma membrane. The protein lacking the C2A domain exhibited enhanced localization at the plasma membrane in resting neuroendocrine (PC12) cells. In addition, mutation of lysine 32 to glutamine (K32E) in the C2A domain, which was shown to prevent homodimerization of C2A in vitro, resulted in increased association of Munc13 with the plasma membrane in resting and stimulated cells. Taken together, these initial results suggest that homodimerization prevents Munc13 translocation to the plasma membrane under resting conditions.

## AN INCREASE IN MICROBIAL ACTIVITY CORRELATES WITH PLANT BIOMASS IN SUB-ARCTIC HEATHLAND

Alexandra Linz, Madeline Raudenbush (Mentor), Ecology

Soil microbes can affect plant growth in nutrient-poor ecosystems through nutrient cycling in the soil. Microbes transform unavailable nutrients in detritus into forms available to plants. We hypothesized that increased microbial activity would correlate with increased plant biomass in subarctic heathland. To test this hypothesis, soil samples were collected from plots across a gradient of plant productivity in Myvatn, Iceland. No correlation was found between plant biomass and microbial respiration in the duff across a gradient of plant productivity; however, a significant correlation was found between plant biomass and microbial respiration in the mineral soil. This confirms the hypothesis that plant productivity and microbial activity are related in sub-arctic heathland, and suggests that microbial activity may be important for the production of plant biomass.

## INVESTIGATION OF REDOX REGULATION IN DAHP SYNTHASES OF ARABIDOPSIS THALIANA

Jacob Litman, Hiroshi Maeda (Mentor), Botany

The shikimate pathway is a crucial anabolic mechanism by which many organisms generate aromatic compounds such as alkaloids, phenylpropanoids, and lignin. The first reaction of this pathway is catalyzed by 3-deoxy-D-arabinoheptulosonate-7-phosphate (DAHP) synthase; regulation of this enzyme is not fully understood in plants. DAHP synthases respond positively to reducing power. Two target cysteine residues have been pinpointed. I aim to use genetic and biochemical techniques to characterize *A. thaliana* DAHP synthases and to investigate the role of their redox regulation in the regulation of the shikimate pathway. At present, I have used *E. coli* to isolate recombinant AtDHS1 (and should soon have AtDHS3), and isolated homozygous T-DNA lines for AtDHS3. I am currently analyzing these plants' growth phenotype, shikimate concentration, and transcript levels.

## 4',5,7-TRIHYDROXYFLAVONE (APIGENIN) SELECTIVELY INHIBITS CYP1B1

Menglin Liu, Colin Jefcoate (Mentor), Cell and Regenerative Biology

Dietary flavonoids are major plant compounds with anticarcinogenic and antioxidant properties. They have been studied with respect to inhibition of the cytochrome P450 1 family (CYP1A1, CYP1A2, CYP1B1). In addition to the model flavone, alpha-naphthaflavone, 4',5,7-trihydroxyflavone (apigenin) selectively inhibits hCYP1B1 over hCYP1A1 in an ethoxyresorufin-o-deethylation assay (unpublished results), while the corresponding 4',5,7-trihydroxyflavanone (naringenin) does not inhibit. To assess the role of apigenin we will investigate NF-kB inhibition and antioxidation. We will use the RAW 264.7 macrophage cell line with a stable NF-kappaB-GFP-Luciferase (NGL) reporter. NF-kappaB can be initiated in these cells both by bacterial pathogens, lipopolysaccharide (LPS), and oxidative stress, mediated by hydrogen peroxide. We show that selected flavonoids will not initiate NF-kappaB expression and we hypothesize apigenin and naringenin will have similar antioxidant properties.

## VISUAL ANONYMITY: AUTOMATED HUMAN FACE BLURRING FOR PRIVACY-PRESERVING DIGITAL VIDEOS

Zihao Liu, Zexi Liu, Shanpeng Mu, Feng Wang,  
YuHen Hu (Mentor), Electrical and Computer Engineering

To protect the privacy of people in videos for safety and legal concerns, an algorithm that automatically detects and blurs faces will be developed. The algorithm is developed based on the Violas John's face detector, which is provided in software library called OpenCV. This tool will enable expanded application of video-based behavioral observation research while protecting the identity of the participating subjects. The objective performance metrics include false alarm and miss ratio of human face detection in all video frames, while the cost is measured by the processing speed. An Android based application (APP) will be developed to demonstrate the usefulness of this tool. The eventual goal is to use this APP to perform the video capture and face blurring at real time.

## STUDYING FUNCTIONS OF RODENT VOCALIZATIONS: A FRESH APPROACH TO AUDIO CONTENT ANALYSIS

Steven Loria, Catherine Marler (Mentor), Psychology

Little is known about the communicative functions of different vocalization types in rodents. A major obstacle is that current systems for categorizing rodent vocalizations use arbitrary boundaries based on visual inspection of the spectrogram and are thus prone to researcher bias. Fortunately, techniques from the field of music information retrieval (MIR) hold promising applications in bioacoustics that might elucidate the information-bearing acoustic parameters intrinsic to rodent vocalizations. Drawing from techniques used in MIR, I developed a method for audio content analysis that can be used to identify a novel vocalization in the California mouse. I also posit that the new call type is involved in conveying sexual incompatibility to members of the opposite sex.

## CHARACTERIZING INHERENT DIFFERENCES BETWEEN HEALTHY AND CANCER CELL MIGRATION USING SYNTHETIC ARRAYS

Sam Loveland, William Murphy (Mentor), Biomedical Engineering

Cancer is a result of transformed cells that have undergone genetic alterations resulting in unregulated behavior, such as irregular and invasive cell migration. HT-1080s are a transformed cell line that is commonly used to study tumor cell migration. However, very few studies have made direct comparisons between HT-1080s and healthy human cells to clearly identify changes in cell migrations related to oncogenesis. Here, we used a highly controllable synthetic array in combination with time lapse microscopy to investigate differences in HT-1080 and human dermal fibroblast (hDF, a healthy primary cell) migration. Using this approach, we identify previously unrealized differences in hDF and HT-1080s attachment and migration to provide new insight into the mechanisms that govern cancer cell behavior.

## STONE BEADS OF BESIK TEPE AND TROY: MANUFACTURE AND TECHNICAL ANALYSIS

Geoffrey Ludvik, William Aylward (Mentor), Classics

Understanding ancient bead technology can address important issues in archaeology, including trade and chronology. This study investigates drilling technologies from stone beads in the Bronze Age Eastern Mediterranean world surrounding Troy, Turkey. By analyzing drill hole impressions under a scanning electron microscope (SEM), microscopic traces of drill use can be identified and compared to experimental samples. This allows drills to be identified with high confidence. Stone beads from Troy and nearby Besik Tepe represent a useful reference point for the wider region. A sample of beads from these sites will be analyzed and compared to beads from elsewhere in the Eastern Mediterranean. The results indicate chronological and regional variation in drill choice as well as broad similarities in production technologies across the Aegean-Near Eastern interface.

## INCREASED AGGRESSION AND DEVELOPMENT AMONG CADDISFLY LARVAE IN RESPONSE TO DESICCATION STRESS

Jessica Lund, Barbara Peckarsky (Mentor), Zoology

Global climate change will likely result in warmer, dryer environments. *Asynarchus nigriculus* is a species of caddisfly whose larval stage lives in temporary ponds and must respond to rapid drying. This species engages in cannibalism to supplement their nutrient-poor diet with protein. If decreasing water level and increased larval density are cues of impending pond drying, it was hypothesized that caddisfly larvae will respond by engaging in more cannibalism to obtain more protein and develop faster to emerge before pond drying. The results demonstrated that aggressive behavior, a precursor to cannibalism, was highest in both kinds of drying simulations and pupation was accelerated in high larval density. This study aids in the understanding of how aquatic invertebrates and other animals respond to ongoing environmental changes.

## BATTLING INFANT MORTALITY AND 'MATERNAL IGNORANCE': THE EDUCATION OF MOTHERS IN EDWARDIAN BRITAIN

Bryce Luttenegger, Daniel Ussishkin (Mentor), History

This project examines the new construction of motherhood in Britain that developed between the turn of the twentieth century and the First World War. Drawing on contemporary advice manuals, commentaries and social surveys, this research demonstrates how and why varying groups and individuals such as legislators, charity workers and medical practitioners projected their idealized constructs of motherhood upon the working classes of urban Britain. By striving to educate women in the art and science of maternal practice as well as ensuring that mothers kept abreast with medical advances in childcare specifically, these actors laid the foundations for modern expectations of parenting more generally by revealing that 'proper' motherhood was in fact a skill that had to be learned.

## LOSS OF THE PLANT-ARBUSCULAR MYCORRHIZAL FUNGI SYMBIOSIS

Nathalie Ly, Pierre-marc Delaux (Mentor), Agronomy

Arbuscular mycorrhiza (AM) is a symbiosis between plants and the fungi Glomeromycota. There are symbiotic plant genes that are required for AM to occur. The purpose is to investigate if there is a correlation between genes and the ability to perform AM. Some genes that were found in the plants that were able to interact with AMF were missing in the plants that weren't interacting with AMF. Cleomaceae was tested and was not able to interact with the AM fungi. No symbiotic genes were found in the Cleomaceae either. Currently, other plant families are being tested for correlation. If the symbiotic genes are known, plants that cannot interact with AM fungi may be able to interact with AM in the future.

## INVESTIGATION OF TRANSFERRING SINGLE-WALLED CARBON NANOTUBES VIA STAMPING

Jesse Lybianto, Michael Arnold (Mentor), Materials Science and Engineering

Semiconducting single-walled carbon nanotubes (s-SWCNTs) are one-dimensional structures that exhibit remarkable electronic and optical properties including tunable bandgaps, ultrafast charge mobilities and strong absorption. These properties render s-SWCNTs as supreme candidates for next-generation electronics. Stamping procedure promotes a more convenient method in fabricating devices and here we demonstrate a scalable stamping method allowing the transfer of sub-monolayer s-SWCNT films onto ultra-thin films. An iterative adaptation of this work will lead to novel carbon nanotube devices and would represent a powerful new paradigm for nanoscale electronics.

## MIXTAPE CULTURE AND POWER

Eli Lynch, Christopher Walker (Mentor), Dance

This project analyzes the social position and relevance of mixtape culture in contemporary society. Information and ideas discovered by studying the works of communication scholars, historians, lawyers, philosophers, musicians, film-makers and contemporary artists informed the creation of: 1) a seven-page paper titled *The Power Struggle of Mixtape Culture*, 2) a thirteen-track mixtape titled *Ill Intentions*, 3) *Monsanto*, a single track in direct response to findings. *Monsanto* draws comparison between the controversial views of cultural and intellectual property rights exalted by corporations, with that of a contemporary and ever evolving recording industry. All three products address and support the viewpoint that mixtape culture often holds a low social standing because it threatens established power structures in the world of art creation and consumption.

## DETECTION OF $\Gamma$ -CARBOXYGLUTAMIC ACID IN PERIOSTIN

Hanqing Ma, Douglas Annis (Mentor), Biomolecular Chemistry

Periostin is an extracellular matrix (ECM) protein found in increased amounts in the ECM of lung tissue of patients with asthma. It has been noted that periostin made in cell culture has  $\gamma$ -carboxyglutamic acid (Gla), a post-translational modification that requires vitamin K. We used immuno-blotting to test for the presence of Gla in periostin after differential extraction from mouse and human lung tissues. Anti-periostin recognized several bands with relative molecular weights (rMWs) appropriate for known periostin splice variants. Bands of similar rMW were detected by anti-Gla. This congruence suggests that Gla is in lung periostin. However, because other proteins in the extracts also have  $\gamma$ -carboxylation, further tests are needed to confirm the periostin bands we detected are  $\gamma$ -carboxylated.

## EFFECTS OF GDNF DELIVERED BY HMSC ON THE SURVIVAL OF TERMINAL SCHWANN CELLS IN ALS RATS

Corey Macrander, Masatoshi Suzuki (Mentor), Comparative Biosciences

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease that affects the motor neurons in the spinal cord and brain stem. As a novel therapeutic approach for ALS, we recently proposed to use human mesenchymal stem cells (hMSCs) to deliver glial cell-line derived neurotrophic factor (hMSC-GDNF) into the skeletal muscle of ALS model rats. Intramuscular transplantation of hMSC-GDNF could protect innervation of neuromuscular junctions (NMJs) in the grafted limb muscles, leading to increase motor neuron survival in the spinal cord. In this study, we hypothesize that GDNF increased the survival of terminal Schwann cells (TSCs), supporting cells to maintain proper function of NMJs. By immunohistochemistry, we assessed the survival of the TSCs in the skeletal muscle of the ALS rats following hMSC-GDNF injections.

## CHARACTERIZATION OF A NEW MBD1 CONDITIONAL KNOCKOUT MOUSE LINE FOR STUDYING EPIGENETIC REGULATION

Daniel Magyar, Xinyu Zhao (Mentor), Waisman Center

MBD1 is a methyl-CpG binding protein that binds methylated DNA leading to gene expression changes. Alteration of MBD1 gene has been shown to be associated with Autism. To better study the function of this gene, a mouse line in which we can knockout MBD1 activity in a cell-type and developmental stage-specific manner is needed. Inserting FLAG tags into the endogenous gene allows for protein isolation and analysis. Generation of this mouse line started with a targeting vector, having exons 3-6 floxed by LoxP sites, that was electroporated into mouse embryonic stem cells. Positive clones were identified and used to generate the MBD1-cKO line. The floxed Mbd1 allele and FLAG tagging of endogenous MBD1 protein in these mice have been validated by genotyping and western blot respectively. MBD1-cKO mice allow for Cre-based deletion in future studies.



## HYPOTHERMIA MODEL IN MICE

Stephanie Lyn Marquez, Pelin Cengiz (Mentor), Pediatrics

Twenty thousand newborns suffer from hypoxia and ischemia (HI) related brain injury annually in the USA. One third of these newborns develop chronic illnesses including cerebral palsy, mental retardation, and learning disabilities. Currently, other than therapeutic hypothermia, there are no therapies that improve neurodevelopmental outcome in neonates after HI. Our research focuses on finding neuroprotective strategies that decrease the neurodegeneration and neurodevelopmental disabilities after HI. Our laboratory showed that activation of tyrosine kinase B (TrkB) receptors with its selective agonist 7,8 dihydroxflavone (7,8-DHF) in the hippocampus of newborn mice after HI results in significant improvement in learning and memory in adult life. We hypothesize that hypothermia will increase the effective treatment window of 7,8 DHF mediated TrkB receptor activation in the hippocampus after neonatal HI.

## ANALYSIS OF INTERNATIONAL SHARK MANAGEMENT STRATEGIES: A CASE STUDY OF PUERTO LOPEZ, ECUADOR

Laura Martinelli, James Berkelman (Mentor), Forest and Wildlife Ecology

Shark conservation is of increasing concern globally. Current minimum estimates indicate that 61 million sharks are harvested annually, which does not include illegal-catch or impacts of artisanal fishermen on this apex predator. The true human-caused mortality rate of sharks is unknown and debated. However, scientists agree that the numbers of these marine species taken each year are unsustainable. Hence, some populations of sharks have declined by as much as 90%. After seeing this decimation first-hand while working on a shark conservation project in Puerto Lopez, Ecuador, I plan to analyze my experience in the context of various international shark management strategies. Following this analysis, I will evaluate possible management solutions for Puerto Lopez's shark population ranging from market-based conservation to community-based conservation to rule-based conservation.

## METHADONE AND SUDDEN DEATH

Lissette Martinez, Joseph Blustein (Mentor), Ophthalmology

Methadone, a synthetic opioid, was developed to treat pain in the 1940's. In recent years, methadone has become increasingly popular for treating chronic pain due to its long half-life and low cost. Concurrent with the increased use of methadone is an increased mortality rate. Methadone can cause electrical abnormalities in the heart and may progress to fatal arrhythmia and sudden death. In 2009, 2,437,163 deaths occurred in the United States. Approximately, 350,000 of these deaths were due to sudden cardiac arrest. In 2009, more than 15,500 deaths were due to an overdose on methadone. An overdose death is either respiratory or cardiac. My research looked at the association of methadone overdoses and sudden death.

## TRACKING NATURAL KILLER CELLS AFTER HAPLOIDENTICAL HEMATOPOIETIC STEM CELL TRANSPLANTS USING 19F

Michael Martinez, Lauren Reil, Erbay Salievski Myriam Bouchlaka (Mentor),  
Pediatric Hematology and Oncology

The University of Wisconsin Carbone Cancer Center (UWCCC) is one of the few FDA-approved centers allowed to administer natural killer (NK) cells after haploidentical hematopoietic stem cell transplant (haploHSCT) to children with progressive or refractory, metastatic solid tumors. The anti-tumor effects of this however have not been sufficient to cure these patients. Some patients develop graft versus host disease (GVHD), which is when donor cells attack the host's tissues. The development of GVHD impedes conclusive results on the efficacy of NK cell infusions. In addition, it is not known if NK cells traffic directly to tumors and mediate cytotoxicity, or if they traffic to other tissues and stimulate other effector cells, thus indirectly eliminating the tumor. Therefore, investigators in my lab propose to optimize the non-toxic tracer agent 19F using magnetic resonance imaging (MRI) to track NK cells in vivo. Previous studies have shown the use of 19F as a noninvasive method of tracing murine and human dendritic cells. It not only successfully tracks but also quantifies the number of apparent cells in a region of interest. This proposal would allow us to monitor the fate of NK cells post their infusion.

## WHAT MOTIVATES US TO DO SERVICE WORK?

Ruby Martinez, Stephen Quintana (Mentor), Counseling Psychology

The goal of this research project was to find out what motivates people to do service work. The reason this is useful is because we can use what we learn from this research to motivate more people to do more positive acts in the future. Our method of research was to make a chart on level of maturity by an aspect of motivation. Then we interviewed students who had gone on a social justice trip. We have analyzed what they said by using our graph, and have adjusted the graph accordingly to fit our new information. So far this has led us to begin to form a broader understanding of the motivation behind service work, and we will soon yield more answers on this topic.

## THEY CAME FROM THE EARLY UNIVERSE: SIMULATIONS OF ANISOTROPIES IN THE COSMIC MICROWAVE BACKGROUND

David Marulli, Peter Timbie (Mentor), Physics

The universe is expanding. Tomorrow our cosmos will be bigger than it is today. Yesterday, it was smaller. Five trillion days ago--the time of the Big Bang, the birth of our observable universe--the hundreds of billions of galaxies that populate the heavens today were on top of one another, forming a hot, dense plasma. The remnant glow of this plasma, called the cosmic microwave background (CMB), exhibits faint temperature and polarization patterns that cosmologists study to learn about the properties of the early universe. I have been working on creating a graphic interface for UW - Madison's Observational Cosmology research group that will allow users to toggle hypothetical physical conditions in the early universe and simulate images depicting the resulting patterns in the CMB.

## TOTALLY NONNEGATIVE MATRIX PERTURBATIONS

Evan Marzion, Mingzhong Cai (Mentor), Mathematics

The minimal sets of entries that must be changed to perturb a totally nonnegative matrix to a totally positive (TP) matrix are studied. These sets are studied in the particular case of the matrix  $J$  (of all ones). Such sets are developed for  $J$  of size  $m \times n$  where  $m, n < 8$  or  $m = n = 8$ . The study of these minimal sets gives two asymptotic bounds: (1) the number of equal entries in a square totally non-singular matrix is  $O(n^{3/2})$  and (2) the number of equal entries (and the number of equal  $(n + 1) \times (n + 1)$  minors) of a square TP matrix is  $O(n^{4/3})$ . Moreover, certain matrix patterns are shown not to be TP completable.

## VISUAL AND QUANTITATIVE SYSTEM TO EVALUATIVE HIV-1 TRAFFICKING AT VIROLOGICAL SYNAPSES

Eric Mauer, Nathan Sherer (Mentor), Oncology

Retroviral transmission can occur through cell-free spread but is 18,000-fold more efficient if transmitted through direct cell-cell contacts, called virological synapses (VS). Murine leukemia virus (MLV), a mouse oncoretrovirus, preferentially assembles at the VS, i.e. undergoes polarized assembly. It is still unclear whether or not human immunodeficiency virus type 1 (HIV-1) undergoes polarized assembly or uses an alternative mechanism. To better understand the molecular details underlying HIV-1 cell to cell transmission, we have established a visual system and quantitative methodologies to directly compare MLV and HIV-1 trafficking across the VS in real time.

## STUDYING INVASION/METASTASIS IN HUMAN OVARIAN CANCER VIA NANO/MICROFABRICATED MODELS OF THE ECM

Tyler Max, Paul Campagnola (Mentor), Biomedical Engineering

Changes within the extracellular matrix are understood to directly correlate with malignant tumor initiation and progression in the ovary and breast. To better understand this correlation, a thorough understanding of invasion and metastatic events of the specific malignant tumors is essential. Various in vitro models have been developed to investigate these events. In the current lab, we fabricate models of the extracellular matrix using multiphoton excitation photochemistry that have high relevance to in vivo biology. We then seed ovarian and breast cancer cells in these models to observe key cellular events associated with cancer metastasis such as migration speeds. In doing so, I have learned extensive cell culture techniques, which allows me to use healthy, reliable cells to establish validity of these models.

## VISIBLE FECAL MATTER AS AN INDICATION OF PERIRECTAL SWAB QUALITY IN C. DIFFICILE SURVEILLANCE

Kelly McDermott, Nasia Safdar (Mentor), Department of Medicine

*Clostridium difficile* is an anaerobic, toxin producing bacterium that has proven difficult to control due its ability to form hardy spores that resist normal antiseptic measures. As a known threat in various health care settings, perirectal swab surveillance is one tool used to detect and monitor *Clostridium difficile* infections. But little attention is paid to the quality of the swab before it proceeds to classification by PCR or culture media. We studied whether or not visible fecal matter correlated with results from toxigenic *Clostridium difficile* PCR assays. The pooled sample consisted of 369 perirectal swabs from an ICU. This study will show whether PCR results correlate with the presence of visible fecal matter on those swabs.

## INEQUALITY, INSIDE AND OUT: A SURVEY OF BLACK WISCONSIN'S HEALTH AND SOCIOECONOMIC DISPARITIES

Joseph McDonald, Rick Strickland (Mentor), UW Comprehensive Cancer Center

During WWII, thousands of Black families migrated to northern-American cities, like Milwaukee, to work an abundance of factory jobs. However, the economic transition of the 1970s bankrupted factories and left many families jobless. This enabled preexistent socioeconomic disparities to thrive, as supported by a racial caste system. As a result, many socioeconomically determined health disparities developed in the Black community. While race-based disparities tend to be larger in urbanized areas, seldom recognized urban-rural disparities also exist in Wisconsin. The current study explored how health, socioeconomic, and racial factors have interacted in Wisconsin from 1990-2010. I predicted that, over time, health and socioeconomic outcomes within groups would improve, Black-White disparities would persist, and health disparities would be largest among behaviorally determined health outcomes.

## EVALUATION OF MULTIFUNCTIONAL IRON NANOPARTICLES FOR THE TARGETED TREATMENT OF NEUROBLASTOMA

Meghan McElreath, Bryan Menapace, Mario Otto,  
Dana Baiu (Mentor), Pediatrics/ Hematology/Oncology

Neuroblastoma is the most common extracranial solid tumor of childhood and its aggressive treatment can be harmful to children's development. Therefore, new, targeted treatment options are needed. One potential target is GD2, a molecule highly expressed on the surface of neuroblastoma cells and with minimal expression on normal cells. In the lab of my mentor, Dr. Otto, various iron-based nanoparticles that have been conjugated to hu14.18K322A, a humanized anti-GD2 antibody, are being studied for tumor targeting, imaging and therapy. The objective of this project is to identify the best anti-GD2 nanoparticle candidates for neuroblastoma targeting. The results of this project will be added to other researchers' results of magnetic resonance imaging and nanoparticle therapy, to select the best nanoparticle product for use in preclinical studies.

## INVESTIGATION INTO THE BINDING OF ANTIBODY-COUPLED SPIO NANOPARTICLES TO NEUROBLASTOMA

Meghan McElreath, Bryan Menapace, Mario Otto, Dana Baiu (Mentor), Pediatrics

Neuroblastoma (NB) is the most common extracranial pediatric solid tumor seen in infancy and adolescence. Current treatments, including surgery, chemotherapy, and radiation, induce significant side effects and patients with advanced-stage NB have an exceptionally low prognoses. Therefore, more specific and effective cancer therapies are urgently needed. This project tests a novel cancer-targeting biocompatible nanoconstruct produced by coupling superparamagnetic iron oxide nanoparticles (SPIOs) to a humanized monoclonal antibody (hu14.18K322A) that specifically recognizes the GD2 antigen (disialoganglioside expressed significantly and nearly exclusively on tumors of neuroectodermal origin, including NB). The SPIOs were used in vitro and in vivo for molecular targeting of human NB xenografts in mice in order to investigate the optimal conditions (particle characteristics, dosage, timing) that permit tumor recognition with the highest selectivity.

## THE EFFECTS OF CHRONIC INTERMITTENT HYPOXIA AND INHALED ALLERGEN CHALLENGES ON AIRWAY DYSFUNCTION

Linda Mei, Mihaela Teodorescu (Mentor), Medicine

Obstructive sleep apnea (OSA) and asthma are co-morbid diseases, with OSA exacerbating the effects of asthma; however, the mechanisms by which OSA accomplishes this have not been explored. To elucidate this question, our study developed a rat model in which hallmark features of OSA and asthma can be mimicked. Chronic intermittent hypoxia (CIH) was used to mimic OSA and ovalbumin (OVA) was used to sensitize the rats. Rats were subjected to either CIH or normoxia (NORM) and challenged weekly with aerosolized OVA or vehicle. Pulmonary function tests were performed after 30 days. Preliminary data suggests that OVA and CIH do exacerbate airway dysfunction. The information gained from this study can be used to acquire a deeper understanding of the correlation between these diseases in humans.

## THE EFFECT OF AMMONIUM ON THE HYDRAULIC CONDUCTIVITY AND CATION EXCHANGE OF SODIUM BENTONITE IN GCLS

Amara Meier, Sabrina Bradshaw (Mentor), Civil and Environmental Engineering

Sodium bentonite has a low hydraulic conductivity, and is a primary component of geosynthetic clay liners (GCLs), a material commonly used to line municipal solid waste (MSW) containment facilities. Studies have shown that sodium cations can be replaced with other cations in bentonite over time, resulting in increased hydraulic conductivity. This study investigates the extent that ammonium, a cation found in MSW leachates, plays a role in increasing the hydraulic conductivity. Four permeameters were used to simulate natural conditions of a GCL as a landfill liner, each permeated with a different ammonium concentration. The hydraulic conductivity and chemical characteristics of the effluent was routinely recorded until hydraulic and chemical equilibrium were observed. A correlation between ammonium and the hydraulic conductivity is expected through further analysis.

## SEXUAL SATISFACTION IN CANCER SURVIVORS: A SECONDARY ANALYSIS OF MIDUS II DATA.

Kaylee Meilahn, Kristen Abbott-Anderson, Kristine Kwekkeboom (Mentor), Nursing

Cancer can negatively impact sexuality, and current research lacks a focus on dimensions of sexuality beyond sexual function. A secondary analysis of MIDUS II data was conducted using a sample of 461 participants with a history of a variety of cancer diagnoses to compare intimacy, perceived importance of sexual expression, and sexual satisfaction between cancer survivors and participants who had no history of cancer. While ratings of intimacy and perceived importance of sexual expression were similar between groups, the cancer survivors rated their sexual lives as significantly less satisfying than those who had no history of cancer ( $p < 0.001$ ). Findings support the importance of addressing sexuality among cancer survivors in health care settings.

## ISOLATION AND IDENTIFICATION OF WILD YEAST IN MADISON AREA AND OREGON, WITH A FOCUS ON TEMPERATURE.

Russell Mendez, Christopher Hittinger (Mentor), Genetics

Yeasts are single-celled fungi lacking hyphae. Yeast lifestyle has evolved multiple times from filamentous fungi. Yeasts typically reproduce asexually. Most species also have a sexual component of their life cycle where they produce spores. Only 7% of fungal species have been described. Many fungi are capable of digesting cellulose, producing antibiotics, among other potential biotechnological applications. This means that there is an unimaginable untapped potential for information. A 6-step enrichment and isolation process was used on organic samples. The samples were grown in glucose with antibiotics, plated, and individual yeast cells were isolated and cryopreserved. Their rDNA was sequenced to identify the specific species by comparing it to the fungal "DNA barcode" database using BLAST. Fifty-six samples were collected from the Madison and Oregon. Forty-one were determined to be yeast and were sequenced. With so many unknown species, we hypothesize that there are many species of yeast that are yet unidentified.

## GENETIC CONTROL OF BEHAVIOR: MAPPING DECISION-MAKING DROSOPHILA MUTANTS

Nathan Menninga, Julius Adler (Mentor), Biochemistry

Decision-making is the behavioral output due to the summation of multiple afferent stimuli. The root of such behavior can be difficult to pinpoint because of confounding factors and complex connectivity. Using the fruit fly *Drosophila melanogaster*, it may be possible to genetically dissect this behavior. Mutants that appear to have decision-making defects have been isolated, characterized, and are currently being mapped. We are also attempting to better understand this behavior by use of enhancer trap lines and previously isolated mutants.



## REAL TIME PCR: A TESTING METHOD TO MEASURE BACTERIA IN CLINICALLY DIAGNOSED MASTITIS COWS

Kathryn Merriman, Laura Hernandez (Mentor), Dairy Science

The most common economic loss and health problem in the dairy industry is mastitis. The current goldstandard method for identifying mastitis-causing pathogens is by bacterial culture. However, culturing is not the most reliable method to find the pathogens because 25-45% of milk samples yield no bacterial growth (NBG) even after 48 h of incubation. A quicker more specific testing method would be real-time PCR. To date, PCR has become a basis in clinical diagnostics but has yet to be applied in mastitis testing. The objective of this study is to determine if real time PCR detects mastitis-causing pathogens that were not detected in standard milk culturing, NBG. Milk samples were collected from 51 cows that were diagnosed with clinical mastitis at Wisconsin dairy farms. These milk samples were freshly plated onto blood agar (100ul) and MacConkey agar (10ul) and incubated at 37 C and read at 24 and 48 hrs of incubation. All samples showed NBG. DNA was extracted from all milk samples using QIAamp? DNA Stool Mini Kit. The DNA from each sample was assessed by real time PCR for 9 different primers. The delta delta Ct method was used to calculate the fold difference between a control sample, which was classified as positive for those specific bacteria, and a universal primer used as the housekeeping gene. All 51 milk samples were tested under each primer. When tested for ST, the DNA from all milk samples showed an average fold change of 32. Regardless of the samples being NBG, the real time PCR technique was able to detect specific bacteria in the milk. By this method we can detect lower concentrations of bacteria present in the milk and find which organism is causing the problem more effectively than milk culturing.

## EXPLORING MAGNETIC FIELDS AROUND TERRESTRIAL EXOPLANETS AND POTENTIALLY HABITABLE EXOMOONS

Karissa Metko, Eric Wilcots (Mentor), Astronomy

The existence of a planetary magnetic field plays a crucial role in the creation and survival of life. A magnetic field is generated by a magnetohydrodynamic dynamo in the core of a planet and shields a planet's surface from harmful charged particles in the stellar wind. One consideration is whether the field is strong enough to maintain itself against the pressure of the stellar wind. Too strong a stellar wind or too weak a field can cause a planet's magnetic field to collapse, exposing its surface to the cosmic rays. We are studying how particular planetary properties affect the strength of a planet's magnetic field and what range of stellar winds such a field can withstand. We assume that a planet generates a dynamo in its core and compute the intensity of the magnetic field created for a range of densities, planetary and core radii and volume of a convecting shell in the mantle. From this we determine what stellar wind pressures the magnetic field can withstand. We compute fields for both terrestrial exoplanets and potentially habitable exomoons around so-called "hot Jupiters".

## EFFECTS OF 2-DEOXYGLUCOSE ON MESC AND MEB ATTACHMENT, SURVIVAL, AND MORPHOLOGY

Samantha Metz, Jayne Squirrell (Mentor), Biomedical Engineering

Stem cell therapy utilizes pluripotent stem cells to heal injured tissue, but not enough is known about stem cell biochemistry. The energy for stem cell function is commonly thought to come from glycolysis, though whether this is a need or a preference is uncertain. To determine whether stem cells require glycolysis, mouse embryonic stem cells (mESCs) were provided with different metabolic substrates: 2-deoxyglucose (2DG), glucose, and pyruvate. The survival of mESCs and mouse embryoid bodies (mEBs) was examined. 2DG, an analog of glucose, inhibits the function of glucose-binding enzymes, including those utilized by glycolysis. 2DG had a detrimental effect on survival as both mESCs and mEBs died in the presence of 2DG. This indicates a requirement for glycolysis or glucose for stem cell survival.

## DISSECTING PLANT VIRAL TRANSLATION IN OAT PROTOPLAST

Nicole Mihelich, Aurelie Rakotondrafara (Mentor), plant pathology

The Potyviridae family is the largest and most agronomically influential group of plant viruses. Better knowledge of the mechanism of viral infection can be a basis in advancement of protecting crops. Viruses have evolved unique strategies to take over the cellular protein synthesis machinery for efficient infection. This project focuses on the development of living plant cells called protoplasts to dissect the mechanism of translation of the newly discovered Triticum Mosaic Virus in its natural context, when compared to the in vitro system. Translation in protoplasts will provide a more accurate depiction of the competition for host factors that takes place between a Potyviridae virus and the host, which cannot be reproduced through an in vitro system.

## PERSONAL AND SOCIOTROPIC FRAMING AND RISK AVERSION

Alexander Miller, David Wise (Mentor), Journalism and Mass Communication

This study is looking to see whether people are more or less risk averse when a political scandal involving money is framed as a sociotropic or personal issue. This will be done by changing the phrasing of a stimulus and questions from personal pronouns to group pronouns and asking whether respondents are more likely to take risks socially, economically and politically. We hope that our findings will lead to better understanding of how people will react to scandals in the future.

## FLYING HIGH: EXPERIENCE AND OPTIMISM IN THE AVIATION INDUSTRY

Amelia Miller, Phillip Kim (Mentor), Management and Human Resources

Starting a business in the airline industry requires optimism. The people in charge and the business itself have to pass countless tests and prove through past careers and education their qualifications to run their airline. Even then, there is no guarantee of success. This research tries to address what motivates people to try to succeed in this specific industry in spite of past failures and a very low probability of success. What characteristics create more or less successful airlines? Sifting through a database of airlines, which provides one of the most comprehensive pictures of a large group of airlines in the US, we looked at individuals' resumes, who did or did not approve the applications, and the potential airline type to find peoples' motivations.

## DEVELOPING COHESIVE SELF AND SOCIETAL AWARENESS ABROAD

Nathaniel Miller, Gwynneth Schell (Mentor), ADMINISTRATION

International Studies 320 involved students traveling to the Dominican Republic via an organization named Outreach 360. Being a part of this class, I stayed at an orphanage in Jaibon and was a part of a week-long camp in the local communities that our group led. The lessons I learned have extended far beyond that of the Dominican people's history and cultural identity. I've developed a greater awareness of my place in the world as well as a more developed ability to relate to my peers. Most importantly, I've learned how to come away with a greater satisfaction with my daily lifestyle. This video attempts to encapsulate just one of these lessons.

## WHOLE TISSUE ANTIBODY STAINING OF EMBRYONIC MOUSE HEARTS FOR EXTRACELLULAR MATRIX PROTEINS

Katharine Molinarolo, Jayne Squirrell (Mentor),  
Laboratory for Optical and Computational Instrumentation

Following cardiac infarction, cellular therapy using fabricated tissue could aid in tissue repair. To examine the 3D structure of the murine hearts, a combination of antibody staining of whole tissues and confocal techniques can be used to efficiently create 3D reconstructions of the extracellular matrix of the murine embryonic heart. For this study, confocal was used to visualize type IV collagen in the embryonic murine heart labeled using immunohistochemical techniques with indirect staining using excitation wavelengths in the far-red spectra to reduce autofluorescence. Following imaging, 3D reconstructions were created. Similar experiments with other extracellular matrix proteins, such as fibronectin and type I collagen, will be conducted, ultimately generating a template to be used for fabrication of a synthetic extracellular matrix for cellular therapies.

## SCENARIO-BASED LEARNING FOR THE IMPROVEMENT OF GI INSTRUCTION

Jaime Mortier, Sumona Saha (Mentor), Section of Gastroenterology and Hepatology

Low self-evaluations on the diagnosis and treatment of women's gastrointestinal (GI) health from GI fellows prompted the development of a didactic teaching method that is superior to direct patient care. We created an electronic simulation of clinical cases using a case scenario building tool through the DoIT Tech Department at UW Madison. We will implement this scenario based electronic learning (SBeL) tool and evaluate its effectiveness compared to standard curriculum. The SBeL follows a realistic clinical case, with accurately portrayed patient-doctor interaction. Like direct patient care, this interactive tool engages the learner; however, unlike direct patient care, it consistently creates a safe decision making environment and allows GI fellows to treat disease long term, receive optimal feedback, and experience various GI diseases.

## AUTOMATING KNITTING: FROM HAND TO MACHINE

Kathryn Muench, Lori Bakken (Mentor), UW Extension

There is a great need in our society to develop curriculum that makes learning about the STEM areas fun and interesting. Knitting offers a wide variety of opportunities to teach the different areas of STEM (science, technology, engineering, and math). The purpose of the project is to develop and evaluate a curriculum that uses knitting as a method to teach girls in middle school about engineering and its related careers. We use knitting as a way to demonstrate how engineers take a hand process and turn it into an automated process. This approach provides the girls with hands on experience and problem-solving approaches used by engineers. We hypothesize that because knitting is popular among young girls and it aligns with their identities, it will be an effective method to teach them about engineering.

$\alpha$ -MANGOSTIN, A NON-TOXIC DIETARY ANTIOXIDANT DERIVED  
FROM PERICARP OF GARCINIA MANGOSTANA L, INHIBITS  
PANCREATIC TUMOR GROWTH IN A XENOGRAFT MOUSE MODEL

Ala Mustafa, Bilal Hafeez (Mentor), Human Oncology

Aim: Pancreatic cancer (PC) is the most aggressive malignant disease, ranking as the fourth most leading cause of cancer related death among men and women in the United States. In this study, we provide evidence of chemotherapeutic effects of  $\alpha$ -Mangostin, a dietary antioxidant isolated from the pericarp of *Garcinia mangostana* L against human PC. Results: The chemotherapeutic effect of  $\alpha$ -Mangostin was determined using three human PC cells (PANC1, BxPC3 and ASPC1).  $\alpha$ -Mangostin resulted in a significant inhibition of cell viability without having any effects on normal human pancreatic duct epithelial (HPDE) cells.  $\alpha$ -Mangostin showed a dose-dependent increase of apoptosis in PC cells. Also,  $\alpha$ -Mangostin inhibited expression levels of pNF- $\kappa$ B/p65Ser552, pStat3Ser727, and pStat3Tyr705.  $\alpha$ -Mangostin inhibited DNA binding activity of NF- $\kappa$ B and Stat3.  $\alpha$ -Mangostin inhibited expression levels of MMP9, cyclin D1, and gp130, however increased expression of TIMP1 was observed in PC cells. In addition, i.p administration of  $\alpha$ -Mangostin (6 mg/kg body weight, 5 days a week) in athymic nude mice beginning 3 days post-implantation of ASPC1 cells resulted in a significant ( $p < 0.0033$ ) inhibition of both tumor weight and volume.  $\alpha$ -Mangostin treatment inhibited biomarkers of cell proliferation (ki67 and PCNA) in the xenograft tumor tissues. Importantly, no sign of toxicity was observed in any of the mice administered with  $\alpha$ -Mangostin. Innovation: We present for the first time, that dietary antioxidant  $\alpha$ -Mangostin, inhibits the growth of PC cells in vitro and in vivo. Conclusion: These results suggest the potential therapeutic efficacy of  $\alpha$ -Mangostin against human PC.

PLANT DEFENSES AGAINST *R. SOLANACEARUM*

Melanie Mustful, Caitilyn Allen (Mentor), Plant Pathology

*Ralstonia solanacearum* causes bacterial wilt, a fatal disease where that causes plants to wilt as if under-watered. The bacteria essentially clog the plant's water transport system. Without water transportation, plants quickly wilt and die. But plants don't roll over and give up; they try to fight back. Plants produce a toxic molecule called, ferulic acid, to kill the invaders. Outsmarting the plant, *R. solanacearum* breaks down this toxin and thrives in the plant, a place too hostile for most microbes. The interaction between the bacteria and the plant is a constant battle. We are seeing at determining when this bacterial counter-attack is important during disease.

## THE EXPRESSION PATTERN OF SYMBIOTIC GENES IN BASAL LAND PLANTS

Sunita Nadendla, Pierre-marc Delaux (Mentor), Agronomy

Basal land plants have the ability to establish a symbiotic relationship with Arbuscular mycorrhiza (AM) fungi, which enhances the plants' uptake of nutrients. These basal land plants along with their symbiotic genes have evolved throughout time; from plant lineages including liverworts to mosses to lycophytes, respectfully. The identification of these symbiotic genes are done by collecting RNA from the tissues of the basal land plant shoots and roots; converting the RNA to cDNA, amplifying the genes by polymerase chain reaction, and finally conducting a gel electrophoresis to monitor the gene expression. The evolution of these symbiotic genes will then be studied by mycorrhizizing *Selaginella moellendorffii* and comparing the symbiotic gene expression in that lycophyte to symbiotic gene expression in angiosperms AM association.

## THE EFFECT OF ACCENT AND EMOTIONAL RESPONSE ON CHILDREN'S FOOD SELECTION

Sarah Nagel, Ashley Jordan (Mentor), Psychology

Previous research shows children's reasoning about new foods includes factors such as appearance and texture (Shutts, Condry, Santos, and Spelke, 2009). However, eating is oftentimes a social experience so kids may look beyond a food's properties when making selections. Accent, as a social distinction, has been shown to influence kids. For example, children preferentially select native- over foreign-accented speakers as informants for the use of novel objects (Kinzler, Corriveau, and Harris, 2010). The present study examined how accent affects food selection. Children, ages 3 to 6, viewed video clips of a native- and a foreign-accented speaker displaying conflicting emotional responses (positive, negative) to trying food. Children then selected a food to try. Knowledge gained from this study may inform interventions aimed at improving children's eating behaviors.

## INTERACTIONS BETWEEN PROLACTIN AND PROGESTERONE IN HUMAN BREAST CANCER CELL LINES

Sarah Nagel, Linda Schuler (Mentor), Comparative Biosciences

A number of studies have been conducted on the roles of hormones, such as prolactin and progesterone in the mammary gland. The roles of each hormone in mammary development have been well studied and evidence has been found that each is involved in mammary carcinogenesis. However, little research has been done on the cross-talk between the two hormones in mammary cancer. I will investigate the hypothesis that adding prolactin in addition to progesterone will further increase progesterone transcriptional activity. Using human breast cancer cell lines, I will test the effects of prolactin and progesterone co-treatments to activate a transiently transfected progesterone-responsive enhancer with a luciferase assay. Based on these findings, I will focus on specific target genes using real-time polymerase chain reactions to study the effects on levels of transcripts for endogenous genes.

## CYSTIC FIBROSIS: GENETIC ADVANCES AND IMPLICATIONS FOR NURSING

Stephanie Nakano, Audrey Tluczek (Mentor), Nursing

Cystic fibrosis (CF) is a multisystem autosomal recessive genetic condition that produces morbidity and premature mortality. The lungs are most frequently and seriously affected. Recent genetic breakthroughs are altering the diagnosis and treatment. New genetic discoveries offer a better understanding of the phenotypic variability of CF, but complicate the diagnostic process. New drug therapies, e.g., VX-770, also show promise for interrupting the physiological mechanism that causes symptoms. These advances in understanding CF may serve as a model for other single-gene recessive conditions. It is essential for nurses to be knowledgeable about these developments. This systematic literature review came from 3 sources: research over the last 10 years in CINAHL-Plus and PubMed, selected on-line evidence-based sources, and consultation with selected experts in CF genetics from nursing.

## TREATMENT OF EOSINOPHILS WITH IL-5 AND EOTAXIN COOPERATIVELY INCREASES POLARIZATION IN VITRO

Kavya Nallamothe, Mats Johansson (Mentor), Biomolecular Chemistry

Eosinophils are white blood cells involved in asthma and allergies. Activated eosinophils become polarized, increasing their migratory capability in the airway. Eosinophils are activated by cytokines and chemo-attractants, including interleukin-5 (IL-5) and eotaxin, respectively. Increased forward-scatter associated with polarization was measured via flow cytometry, following treatment with IL-5 and/or eotaxin. Effects were dose-dependent and evident at concentrations greater than 1 ng/ml of either agent. We proposed that co-treatment with IL-5 and eotaxin causes greater polarization than either individual treatment. IL-5 and eotaxin co-treatment increased polarization of cells from some, but not all, donors in a synergistic manner. Our findings may elucidate the mechanism of eosinophil activation *in vivo*, where IL-5 and eotaxin at low concentrations may cooperate to induce eosinophil polarization in asthma patients.

## PROVIDING MADISON'S YOUTH WITH STRONGER ENVIRONMENTAL EDUCATION PROGRAMS

Lizzie Needham, Robert Beattie (Mentor)

The purpose of this project is to investigate the ways that providing middle school students with an environmental studies and sustainable agriculture after-school program can foster a greater understanding of environmental issues, an outlet to apply academic knowledge, individual creativity, and healthy relationships between peers. The afterschool program is held at Spring Harbor Middle School in Madison, WI; an environmental charter school that currently uses a schoolyard garden as a method to educate students. The program gives students an exciting opportunity to become more involved with the schoolyard garden, with a mission to strengthen overall student interest in and academic rigor of the garden. The project has demonstrated that students use the program as an opportunity to take initiative in environmental action and commitment to the schoolyard garden. Through outreach and sharing their knowledge with their peers and families, students in the club become another resource for communities to learn about environmental issues, sustainable agriculture, and healthy eating practices. Upon program completion, I will be able to determine effective ways to implement engaging and successful after-school environmental and gardening programs for middle school students.



## INVESTIGATING THE ENDO- AND ECTO- MYCORRHIZAL SYMBIOTIC SIGNALING IN POPLAR

Lina Nguyen, Junko Maeda (Mentor), Agronomy

More than 80 percent of land plants can establish a mutualistic relationship with arbuscular mycorrhizae (AM), while many woody perennials can establish symbiotic relationship with ectomycorrhizae (ECM). Genetic studies in model crops have identified several genes required for the establishment of AM, among which CASTOR, POLLUX and DMI3 are conserved in several land plants. However, very little is known about ECM symbiotic signaling in woody perennials. In this study, we aim to investigate whether poplar homologs of CASTOR, POLLUX, and DMI3 are required for the establishment of AM with *Glomus intraradices* and ECM with *Laccaria bicolor*. Utilizing RNAi-based gene silencing, we characterize the role of these genes in AM and ECM associations. We expect that silencing these genes will result in abolition of AM and ECM associations in poplar.

## MORTALITY IN MALI

Mark Nicola, Jeremy Foltz (Mentor), Applied Economics

The lab I am working for deals with data from Mali, in western Africa. The Institut d'Economie Rurale, collected variables such as age, rainfall from a region, Sikasso, in southern Mali. I took two variables, gender and age, and looked at the correlation with mortality. To determine the correlation between these variable I graphed the data. The analysis shows that little correlation lay between gender and mortality. The under 5 group has the highest mortality while the over 25 holds the next highest. The 5 to 25 group holds the lowest mortality. Future research could show why mortality lies high or low for a variable in any year. Through this more complete investigation we can see what causes mortality in years such as 1998 or 2001.

## EVALUATION OF VOC TRANSPORT PARAMETERS THROUGH EVOH GEOMEMBRANE USING DCC DIFFUSION TEST

Eric Niebler, Sabrina Bradshaw (Mentor), Civil and Environmental Engineering

Enhanced geomembranes were developed to increase performance characteristics as a chemical barrier for use in landfill cover and liner applications. The co-extruded geomembrane contains outer layers of high-density polyethylene (HDPE) and an inner core of ethylene vinyl alcohol (EVOH) film intended to reduce migration of contaminants through the membrane. In this study, transport parameters (i.e. partition and diffusion coefficients) of two volatile organic compounds, trichloroethylene (TCE) and toluene (TOL), were estimated experimentally with the use of double compartment column diffusion tests. This test simulates the transport process expected in the geomembrane liner of a landfill in actual conditions. The measured partition and diffusion coefficients for TCE and TOL suggest that the EVOH geomembrane would induce less migration of these compounds than the HDPE geomembrane alone.

## PROMOTING THE CRAFT OF ARTIST'S BOOKS THROUGH EDUCATION

Lindsay Nigh, Jim Escalante (Mentor), Art

This research focuses on the promotion of artist's books, including the production of a time-line of their history. Artist's books are books or objects that have the appearance of a book, whose primary intention is not to function solely as a book, but as a work of art. We hope to promote knowledge of this long-standing art, and bring attention to how accessible an art form it is. We experimented with still photography and video editing in order to demonstrate the essence of book arts, as well as packaging our information in an aesthetically pleasing avenue for the more casual browser. Our purpose is to provide a free, readily accessible, educational resource to anyone wishing to learn the craft of artist's books.

## AXISYMMETRIC DYNAMOS IN DIFFERENTIALLY ROTATING SPACETIMES

Jesse Nims, Benjamin Brown (Mentor), Astronomy

Accretion onto black holes is widely believed to drive jets and outflows when magnetic fields are present, as well as to be affected by magnetic fields through mechanisms such as the MRI. Unfortunately the source of magnetic fields in accretion disks is still not well understood. Shear amplification of magnetic fields from tidally disrupted stars far from the black holes is probably insufficient to drive jets, but in or near the ergosphere amplification may become significant. Amplification of magnetic fields in plasmas is termed dynamo action. In a flat spacetime axisymmetric dynamo action cannot occur. This well known result is commonly referred to as Cowling's anti-dynamo theorem. However, in the Kerr spacetime around a rotating black hole violations of this theorem may be possible and the differential rotation of spacetime itself may be able to drive a dynamo. We examine the kinematic dynamo problem for a general relativistic magnetohydrodynamic (GRMHD) dynamo near a rotating black hole using a 3+1 foliation of spacetime. We seek physically acceptable growing modes and discuss effects deriving from the generalized GRMHD Ohm's law.

## THE EFFECTS OF ALTERATIONS TO THE DISCRIMINATOR REGION AND THE SIGMA 70 SUBUNIT ON RPO STABILITY

Michelle Nimz, M. Thomas Record (Mentor), Biochemistry

The interactions between DNA and RNA polymerase, as well as the initiation steps of transcription have been studied by the Record lab for over 35 years. Recently, a model for the mechanism of transcription initiation in *Escherichia coli* has been developed. Currently, experiments such as dissociation assays and association assays are being conducted in the lab in order to support our model and to discover more about how RNA polymerase functions. Manipulating the discriminator region of *E. coli* promoter T7A1 and conducting dissociation assays has demonstrated that there is a significant relationship between the discriminator region and the lifetime of the open complex, RPO. In addition, alterations in the  $\sigma 70$  region 1.1 of RNA polymerase, including deletions of the entire subunit or portions of the subunit, are currently being investigated through association assays in order to establish trends in rate constants that control the regulatory steps of transcription initiation. The mechanisms associated with DNA transcription initiation, as well as the trends that occur when influencing factors are altered must be understood in order to regulate this process in a favorable manner. Fully understanding the process of initiation of transcription will provide future research with valuable insight as well as opportunities to combat particular diseases and disorders.

## GENOME-WIDE CONCORDANCE ANALYSIS IN ARABIDOPSIS THALIANA

Stenz Noah, Cecile Ane (Mentor), Department of Statistics

Genome-wide molecular alignments for hundreds of species have become available in recent years, and this accessibility will only increase in the future. As such, the development of computing pipelines has become necessary to streamline any genetic analysis. One such example is the analysis of phylogenetic concordance. This pipeline begins with a minimum description length analysis to locate breakpoints along a genomic alignment where the genes on either side have a different genealogical history, i.e. a different phylogenetic tree. Bayesian concordance analysis then seeks to quantify the discrepancies between the genes' histories, and to estimate the dominant phylogenetic history. This presentation will provide an overview of the development of a scripting framework which facilitates the concordance analyses of genome-wide datasets, applied on 170 Arabidopsis Thaliana accessions.

## ENABLING IN-SILICO EXPERIMENTS OF GRANULAR MATERIAL DYNAMICS

Spencer O'Rourke, Dan Negrut (Mentor), Mechanical Engineering

The goal of this research project is to investigate computational methods for the simulation of the dynamics of large-scale, multibody granular systems. Conventional methods of simulation use sequential computing and direct collision detection and contact force resolution; however, in using such methods, when the number of elements in the system being modeled grows very large, the computation time scales disproportionately. The proposed research is intended to provide an alternative approach to modeling a variety of large-scale rigid-body mechanical systems such as grain in a silo, potential terrain encountered by Mars rovers, or sand on a beach. Multi-CPU parallel processing will be used, leveraging the Message Passing Interface (MPI) system of inter-processor communication, in a spatial division approach to granular dynamics problems. This approach will improve simulation capabilities in terms of feasible problem size and solution speed.

## GOAL ATTAINMENT FOLLOWING INTRATHECAL BACLOFEN AMONG CHILDREN WITH CEREBRAL PALSY AND THEIR CAREGIVERS

Olakemi Olarinde, Jennifer Evans, Ruth Benedict (Mentor), Occupational Therapy

The purpose of this study is to evaluate changes in performance of and satisfaction with self-identified functional goals among caregivers following the placement of an Intrathecal Baclofen pump (ITB) in an individual with cerebral palsy. ITB has been shown to aid pump recipients with improvements in physical status that may affect the quality of life of the individual or the caregiver. The effects of ITB management on specified goals were explored using the Canadian Occupational Performance Measure and Structured Interview. Caregivers scored performance of and satisfaction with goals at initial, 6, 12, and 24 month visits. Each goal was classified according to type of care task. Changes in performance and satisfaction across time are analyzed with and across participants.

## THE EFFECTS OF PARTIAL SCAT COLLECTION ON DIET ANALYSIS OF GREY WOLVES (CANIS LUPUS)

Lucas Olson, Timothy Van Deelen (Mentor), Forest and Wildlife Ecology

Scat analysis is a common method for determining the diet of elusive carnivores. However, for many species scat is used to mark territorial boundaries. Some researchers collect only partial scat samples in order to minimize impact associated with scat collection, but partial collection may bias results. We collected grey wolf (*Canis lupus*) scats from Central and Northern Wisconsin to determine the effects of collecting partial scat samples on diet composition, especially for rare species. We divided each scat into quarter subsamples, processed and analyzed each subsample independently, and compared the species compositions and frequencies between subsamples from single scats. We hypothesize that if only half scat samples are collected, rare species may be overlooked, but relative presence and abundance of common species will remain unimpacted.

## THE RELIABILITY AND VALIDITY OF THE OVERHEAD SQUAT TEST

Matthew Olson, David Bell (Mentor), Kinesiology

The overhead squat test (OHS) is a common screening exam that quickly identifies poor movement patterns. However, no studies have examined the reliability or validity of the OHS. Therefore, that was the purpose of this study. One hundred individuals were videotaped performing the OHS. Three certified athletic trainers rated subjects based on the presence or absence of knee valgus. Kappa coefficients were calculated to determine the level of agreement between and within raters. It was hypothesized that the OHS would have substantial levels of agreement ( $>.60$ ), a high level of sensitivity ( $>80\%$ ) and moderate specificity ( $>50\%$ ). This will aid in injury prevention by identifying individuals with poor neuromuscular control that would benefit from an injury prevention program.

## SPATIAL ANALYSIS OF FIRE ACTIVITY IN PROTECTED AREAS IN MALI, AFRICA

Masrudy Omri, Leif Brottem (Mentor), Geography

Most protected areas in Mali are located within the arid environment of Sahel region in Africa which is vulnerable to natural fires. However, most fire events are caused by groups of people who burned the vegetation to clear up the land for agricultural purposes. This research attempts to determine the spatiotemporal correlation between fire regime and anthropogenic/natural factors through application of spatial analysis and geographic information systems (GIS) techniques. The results will reveal how fire activity in 2000-2010 correlates with land elevation, as well as the distance to protected areas and agricultural land. Through this research, the relationship between the livelihood of indigenous communities and the continual changes in fire pattern can be carefully understood.

## IMMIGRANT FAMILIES: LITERACY AND IDENTITY DEVELOPMENT OVER TIME AND SPACE

Beth Parimanath, Catherine Lilly (Mentor), Curriculum and Instruction

This longitudinal study follows 15 immigrant children over several years in order to examine how children and their families make sense of relocation to the United States. In particular, this study examines the role of long-term relocation in language development and identity construction. Preliminary data is audio-recorded by the researchers and consists of observations of children in their home and at school, parent/student interviews, and conversations regarding student/researcher created artifacts. The audio is then transcribed onto a document, whereupon it is analyzed through discourse methods in order to explore and interpret children's experiences as they evolve through time and space.

## USING VERIFAST TO TEST THE VALIDITY IN CULTURING MODEL CELL CULTURES

Mark Park, Joshua Lang (Mentor), Carbon Research Center

Circulating Tumor Cells (CTCs) are cancer cells located in the bloodstream. It has been theorized to allow researchers to monitor a cancer's response to treatment and progression. However, locating and isolating CTCs from whole blood samples for research purposes has proven to be difficult because they are rare. We are currently optimizing a microfluidic device called the VerIFAST. The VerIFAST is a novel microfluidic device that enables cell isolation, extracellular staining, and downstream analysis. To differentiate prostate cancer CTCs from contaminating peripheral blood mononuclear cells (PBMCs) we stain for EpCAM(CTC) and CD45 (PBMC). Verifast is a gentle form of CTC isolation that we hypothesize will result in viable cells that will proliferate in culture. We are currently testing this with either LnCap or DU145 (prostate cancer cell line) as a model of the CTC cells. We will isolate cells using the VerIFAST, place them in culture and determine the viability relative to cells that were not isolated using the VerIFAST.

## TWO IS ONE

Sydney Parsons, Henry Drewal (Mentor), Afro-American studies

The Yoruba are an influential part of Africa's history and culture. Utilizing books, various journals, and Professor Drewal's help, I have discovered the cultural importance of Ibeji (twins) to the Yoruba and that the traditions surrounding them have been ever-changing. I have found chants and writings about the Ibeji and transferred these into recordings in both English and Yoruba. I created a piece of work about how the Ibeji are one soul with two bodies. As a writer, I preserve my history and the history of others. My research has informed my art so I am able to perpetuate the Ibeji and the Yoruba's historical and sacred arts.

## REGULATION OF AXON OUTGROWTH BY CALCIUM DEPENDENT-PROTEOLYSIS OF ADHESION PROTEINS

Kevin Patel, Patrick Kerstein (Mentor), Neuroscience

The development of the human nervous system requires the assembly of trillions of neuronal circuits required for the physiological and cognitive functions of the body. For this we must understand how nerve growth cones mediate the extension of axons to form these intricate neuronal networks. Specifically, this study will focus on how (Ca<sup>2+</sup>) influx into growth cones affects the rate and directionality of axonal outgrowth. Previously, we have shown calcium influx inhibits axon outgrowth through the activation of the protease calpain. Using immunocytochemistry, we identify the adhesion proteins talin, FAK, and paxillin as proteolytic targets of calpain. Furthermore, Ca<sup>2+</sup>/calpain activity reduces the signaling of these adhesion dynamics. Understanding this signaling pathway and growth cone motility may provide insight into the molecular mechanisms of neurodevelopmental diseases and neural regeneration.

## EXAMINING THE PROGRESSION OF BITING AND FORELIMB DEFICITS IN A TRANSGENIC MODEL OF PARKINSON DISEASE

Eunice Paul Rajamanickam, Michelle Ciucci (Mentor),  
Communication Sciences and Disorders

Oromotor dysfunction is common in Parkinson disease (PD) and affects quality of life; yet, the mechanisms underlying these deficits are not well characterized. The purpose of this study was to determine the onset and progression of biting and fine motor deficits during an eating task in a transgenic rat model of PD. Rats in this model show nigrostriatal dopamine depletion at 8 months of age, however current behavioral assays in rats are limited to gross motor skills that are likely dopamine-dependent and not sensitive to early pathologies. Rats with homozygous or heterozygous knock-out of PINK1 were evaluated at 4 and 8 months of age and compared to wild-type. We hypothesized that fine limb and biting deficits would appear early and be related to extra-striatal pathologies.



## STOCK MARKET INDICATOR

Cen Peng, Amir Assadi (Mentor), Mathematics

Stock prices are one of the main reflectors of the economy. Not only are investors interested in figuring out future stock values, but also are economists and researchers. The ability to forecast these prices is important because of the enormous potential benefit to businesses, traders, and governments. I am interested in investigating the indicators of the stock values that capture the behavior and response of the market for a particular sector over a certain time period. To look for the market indicators, time series data from several market sectors such as energy, health, and commodities is necessary. In this project, I develop and use a new method based on concepts of information in physics, statistical physics, and mathematical theory related to Catastrophe Theory. By utilizing these methods, the expected outcome is to have an algorithm that detects a good prediction from analysis of the market indicators to forecast an indicator in the future time window. These predictions are probabilistic and I provide an estimate of the probability of their accuracy.

## COMPARISON OF GLYCOSYLATED HEMOGLOBIN AND HEMOGLOBIN A1C METHODOLOGIES IN NON-HUMAN PRIMATES

Hannah Perelshtein, Heather Simmons (Mentor), Primate

Diabetes Mellitus (DM) has been monitored in human and non-human primates (NHPs) by evaluating hemoglobin glycosylation (GHB). Hemoglobin A1c (HbA1c) measures the specific percent of A1c glycated hemoglobin in the blood, whereas GHB measures the total percent of glycated hemoglobins. This results in test variance. HbA1C values obtained from an immunoturbidimetric method and affinity column measurement values (GHB) are reported for a total of [73] NHPs with and without DM at the Wisconsin National Primate Research Center (WNPRC). Analysis of these results will determine if a formula conversion between the hemoglobin methodologies is possible. The most accurate and relevant method for NHP research and colony health management will be selected.

## INVESTIGATING PATTERNS OF LATERALIZED HAND USE ON A FINE MOTOR TASK IN RHESUS MACAQUES

Chaney Perkins, Allyson Bennett (Mentor), Psychology

Performance advantages resulting from lateralized behavior and underlying functional cerebral asymmetry may play a role in the evolution of both population and individual-level handedness. In this study, as part of an ongoing fine-motor performance characterization in middle-aged rhesus macaques, we recorded multiple aspects of monkeys' performance when retrieving ring-shaped food rewards threaded along metal rods bent into patterns of varying complexity. Preliminary analyses did not reveal a group-level directional bias; however, the majority of individuals were lateralized to either the left or right. The direction of bias remained consistent across task difficulty phases, but was not correlated with retrieval speed. Further analyses will investigate the effects of the spatial positioning of the food reward, and the differences between bimanual and unimanual strategies on task performance.

## THE EFFECTS OF SECTOR SPECIFIC FOREIGN DIRECT INVESTMENT ON INTERNATIONAL TREATY LAW

Allison Perlin, Jason Yackee (Mentor), International Law

The Foreign Direct Investment from the United States alone totals at over 4 million dollars per annum. My research focuses on a sector segregated analysis of foreign direct investment, particularly from the perspective of the United States and respective partners. I primarily looked at UNCTAD BIT Database and the Bureau of Economic Analysis Data and specifically comprehending the difference between benchmark and non-benchmark years. Resulting from specified attention to outward stock of investment is a potential trend between the number and importance of United States treaty signatures and the amount of foreign direct investment from the United States to a partner country.

## THE GOAL-CENTERED THEORY: A NEW WAY TO ANALYZE POLITICAL REVOLUTIONS

Allison Perlin, Erica Simmons (Mentor), Political Science

Fundamentally, the goal-centered theory has two contributing components to analyze and view a revolution: goals, which focus on adherence and flexibility, and emotions, which look to personal agency and responsibility among participants. Through this approach, revolutions may be analyzed from an interior perspective as opposed to the other approaches that either focus on broader context or a distinguished leader rather than on a goal that the majority of participants prescribe to. In creating this original political revolutionary theory I looked to previous theorizing as well as relevant literature on political movements along with interviews I conducted. In tracking the movement's progress, in testing the movement's internal pulse, an increasingly personal aspect of the revolution is revealed effectively informing where other theories fall short.

## CROSS-CULTURAL DIFFERENCES IN THE REGULATION OF NEGATIVE EMOTIONS: THE ROLE OF DIALECTICAL BELIEFS

Amelia Petermann, Yuri Miyamoto (Mentor), Psychology

I examined cross-cultural differences between European Americans and East Asians in their tendencies to regulate negative emotions. It was hypothesized that European Americans would have a greater tendency to improve their negative emotions compared to East Asians. As well, it was expected that these differences would be mediated by East Asian's support of dialectical beliefs. Participants were asked to recall a failure event and then rate their improvement and non-improvement motivations of their negative emotions. As hypothesized, East Asians were less likely to enhance their positive emotions and dampen their negative emotions. These differences were partially mediated by dialectical beliefs. Asians were more likely to support a positive view of negative emotions, seeing them as both motivational and something to learn from.

## TOMOGRAPHIC IMAGING OF THE TECTONIC TREMOR ZONE BENEATH THE SAN ANDREAS FAULT NEAR PARKFIELD, CA

Dana Peterson, Clifford Thurber (Mentor), Geoscience

Tectonic tremor is a weak but persistent shaking of the Earth that occurs below the deepest earthquakes in the Parkfield region of the San Andreas Fault (SAF). By studying these low frequency events (LFE's), which represent bursts of stronger tremor radiation, we are able to better understand deep Earth structure. We use P and S arrival and differential times from stacked seismograms of LFE's along with data from shallower microearthquakes to image the three-dimensional P- and S-wave velocity structure to ~20 km depth. Our results indicate the LFE's near Parkfield lie within or adjacent to zones with reduced velocity. The estimated  $V_p/V_s$  values are 1.85 to 1.95 in these zones, interpreted to reflect high pore fluid pressure and low effective stress.

## ANGIOTENSIN-II INDUCED CARDIAC HYPERTROPHIC RESPONSES IS ATTENUATED BY CAVEOLIN-3 IN CARDIOMYOCYTES

Laura Phelan, Ravi Balijepalli (Mentor), Medicine

Chronic angiotensin II (AngII) activation leads to cardiac hypertrophy via altered  $Ca^{2+}$  and NFAT signaling. In cardiomyocytes, caveolae-containing caveolin-3 (Cav3) localize many signaling proteins to regulates multiple signaling pathways. However, the role of Cav3 in pathological cardiac hypertrophy is unclear. To investigate the role of Cav3 we used in vitro and in vivo models of AngII induced cardiac hypertrophy. Four weeks of AngII infusion in WT mice resulted in cardiac hypertrophy demonstrated by a significant reduction in fractional shortening, ejection fraction and a reduced Cav3 expression but increased PKC $\alpha$  expression in cardiomyocytes. Patch clamp electrophysiology showed re-expression of T-type  $Ca^{2+}$  current ( $I_{Ca,T}$ ) in myocytes at 4 weeks of AngII infusion ( $1.6 \pm 0.2$  pA/pF). In contrast, Cav3 OE (cardiac specific overexpression) and sham mice had normal cardiac function and did not show reexpression of  $I_{Ca,T}$ . AngII treatment of neonatal myocytes resulted in significant increases in  $I_{Ca,T}$  (180%), cell size, and NFAT translocation into nucleus. Knockdown of Cav3 by siRNA further enhanced AngII induced PKC $\alpha$  mediated stimulation of  $I_{Ca,T}$  (460%). In contrast Cav3 overexpression prevented AngII induced PKC $\alpha$  mediated increase in  $I_{Ca,T}$  and NFAT signaling. We conclude that Cav3 mediates protective signaling in ventricular myocytes in the setting of pathological cardiac hypertrophy.

## CHARACTERIZING THE TURBULENT PROPERTIES OF MBM16

Nickolas Pingel, Snezana Stanimirovic (Mentor), Astronomy

Interstellar turbulence is a major constituent of the interstellar medium (ISM) and affects important processes like star formation and galaxy evolution. Understanding of how turbulence varies spatially in galaxies is of key importance. We investigate the spatial variations and characteristics of turbulence in the molecular cloud MBM16 by applying statistical methods to the neutral hydrogen (HI) column density image of MBM16. The primary method provides insight into the spatial hierarchy and scale of interstellar turbulence by deriving and analyzing the spatial power spectrum of the HI image.

## AMPA RECEPTOR, GLUA1, REGULATES THE MATURATION OF NEW ADULT HIPPOCAMPAL NEURONS

Eric Polich, Xinyu Zhao (Mentor), Neuroscience

The maturation of young neurons is the final step of neurogenesis and abnormalities in this process are frequently found in neurodevelopmental disorders. Our recent study has shown that deficits in RNA binding protein FXR2, leads to impaired neuronal maturation which is likely due to reduced mRNA stability of GluA1. However, the function of GluA1 in neuronal maturation is still unknown. Here, we found knockdown of GluA1 leads to impaired dendritic development which phenocopied the neuronal maturation deficit in FXR2 knockout mice. Reintroduction of GluA1 expression can rescue such deficit in those mice. Taken together, these results demonstrate that a novel regulating mechanism between FXR2 and GluA1 plays an important role in neuronal maturation and could be important for our understanding of neurogenesis and neurodevelopment disorders.

## THE DISCREET FREQUENCIES OF LANGUAGE

Dylan Pozorski, Anthony Albertin (Mentor), Mathematics

Benford's Law is a mathematical pattern that traces the frequencies of leading digits in random numbers of variable magnitude. Analogously, this project is pursuant of finding the natural frequencies that develop in the English language (i.e. the positional frequency of A's, B's...etc). For any semblance of accuracy, it's necessary to form a large data basis for the intent of normalizing any deviations. The complete texts of over 100 books were placed into a computer program that measured the frequency of each letter. The 100 books were part of the preliminary data (not yet analyzed), but there's a noticeable trend in positional frequencies. Implications of positive data could range from aid in deciphering coded messages to use in placing general dates on historical documents.

## INVESTIGATION OF 1/F FLUX NOISE IN SQUIDS AND SUPERCONDUCTING QUBITS

Antonio Puglielli, Robert Mcdermott (Mentor), Physics

Low-frequency  $1/f$  flux noise is a dominant source of dephasing in the Josephson phase and flux qubits. Recent work has revealed the presence of a high density of unpaired spins at the surfaces of superconducting thin films; it is now believed that these spins are the source of the noise, although the microscopic noise mechanism is not understood. We have recently shown that the dielectric encapsulation of the SQUID loop substantially impacts the noise magnitude and noise exponent. Here we describe experiments on SQUIDs and Josephson phase qubits designed to shed light on the underlying noise mechanism, and we describe efforts to develop Josephson phase qubits with reduced levels of  $1/f$  flux noise and improved dephasing times.

## ANTITUMOR EFFECT OF ANTI-CD40/CPG COMBINED WITH GEMCITABINE OR 5-FLUOROURACIL IN B16 MELANOMA MODEL

Xiaoyi Qu, Paul Sondel (Mentor), Pediatrics

Our previous studies demonstrated that anti-CD40 mAb (anti-CD40) can synergize with CpG oligodeoxynucleotides (CpG) to mediate antitumor effects by activating myeloid cells such as macrophages in tumor-bearing mice. Separate teams have shown that chemotherapy with Gemcitabine (GEM) or 5-fluorouracil (5-FU) can reduce tumor-induced myeloid-derived suppressor cells (MDSC) in mice. We asked if the same chemotherapy regimens with GEM or 5-FU will interfere with, or enhance, the antitumor effect of anti-CD40/CpG. Using the model of B16 melanoma growing intraperitoneally in syngeneic C57BL/6 mice, we show that GEM or 5-FU treatment regimens either did not change or reduced, respectively, the number of MDSC in the peritoneal cavity of tumor-bearing mice. In vivo, GEM or 5-FU chemotherapy regimens did not substantially affect antitumor effects induced by anti-CD40/CpG immunotherapy.

## HISTORY OF MADISON SUBURBS: A SPATIAL APPROACH

Margaret Raimann, Anna Andrzejewski (Mentor), Art History

Geographic Information Systems (GIS) is an emerging technology not only in its own field of geography, but also as an interdisciplinary tool for scholars to represent their research spatially. Even historians are beginning to see the advantages of using GIS to represent history both chronologically and spatially to reveal patterns that cannot always be seen through traditional historical presentation. Through combination of my undergraduate studies in Geography, Cartography, and GIS as well as my continuing research of Madison suburbs with Professor Anna Andrzejewski, I used geospatial technologies, including a Javascript-based mapping library (Leaflet), to bring a spatial element to the information that currently exists about Madison's suburban history.

## FILM MELODRAMA AND EMOTION IN CROSS-CULTURAL PERSPECTIVE

Andrea Rebolledo Viveros, Benjamin Singer (Mentor), Communication Arts

The purpose of the project is to evaluate cross-cultural aspects of film melodrama in various global filmmaking traditions. Films are evaluated by observing certain phenomena such as moral paradoxes, situations of impeded attachment, sacrificial altruism, and other elements associated with pathos. Analysis of narrative and emotional patterns in the films will aim to illuminate similarities and differences among popular filmmaking conventions in different cultural contexts.

## CHARACTERIZATION OF FRAGILE X SYNDROME NEURONS DERIVED FROM INDUCED PLURIPOTENT STEM CELLS

Rebecca Reese, Anita Bhattacharyya (Mentor), Waisman Center

Induced pluripotent stem cells (iPSCs) are created by genetically reprogramming skin cells to revert back into a state where they can differentiate into any cell type. In particular, iPSCs are very useful to study genetic disorders at a cellular and molecular level. This project aims to characterize iPSCs from patients with Fragile X syndrome, an inherited neurodevelopmental disorder. Previous studies in mouse and human suggest that Fragile X neurons have shorter neurites than unaffected neurons. Using immunofluorescence microscopy and computer software analysis, we will determine if neurite length in Fragile X neurons is significantly different from unaffected neurons. If so, then the results will provide evidence that the structure of the neurons may contribute to the symptoms of Fragile X syndrome.

## GEOGRAPHIC VARIATION IN THE PIGMENTATION OF DROSOPHILA MELANOGASTER

Keighley Reisenauer, John Pool (Mentor), Genetics

In a survey of *Drosophila melanogaster* population samples, diverse coloration traits were observed. A study was performed quantifying abdominal and thoracic pigmentation intensity, trident intensity, and stripe to segment proportionality in relationship to elevation. The study was conducted using photographic analysis programs, generating greyscale intensity and length values. Trends are yet to be calculated, but are expected to show a positive correlation between high altitude and pigmentation intensity. Further studies will pursue genetic basis of observed pigmentation differences. Genetic variation will be used to target natural selection in each dark population and to combine genetic mapping data, confirming which blocks of the genome are inherited with dark pigmentation. Transgenic approaches will formally test different natural alleles of a gene and specific variants by altering mutations.

## A FORWARD GENETIC APPROACH TO STUDY NEURAL DYSFUNCTION

Alexandra Rezazadeh, Barry Ganetzky (Mentor), Genetics and Medical Genetics

Neurodegenerative diseases are debilitating and prevalent, currently affecting more than 45 million people. Effective treatment of these diseases requires analysis and understanding of the underlying molecular pathways. Because many diseases are characterized by loss of neuronal function, *Drosophila melanogaster* mutants are a practical genetic and electrophysiological model for studying the connection between genes and neuronal function. A mutagenesis screen yielded the mutant 3-62 that exhibits diminished flight ability and shortened lifespan at 29°C. With the identification the gene that causes the neurologically-impaired phenotype in 3-62, we can employ current genetic tools to discern the associated protein's role in neural function. This will further knowledge of overall neuronal function, thus enabling more effective treatment of neurological diseases.

## SELENA QUINTANILLA PEREZ

Lauren Richards, Lauren Arndt, Debra Holschuh-Houden (Mentor), Family Business

Selena Quintanilla Perez was a Mexican American musician. Her music career was the family business. All immediate family members were involved in every aspect as far as performing, writing, and marketing. When Selena died, the family business did not move forward with the same amount of success. For this project, we want to examine how the family dynamics affected the prosperity of her career while she was alive, and how this dynamic changed when she passed away. Through case studies and analyzing the Selena movie we will observe how families overcome and handle the loss of a member in the family business, and how they manage to move forward. We will also examine families that successfully overcame the loss of a member of their business, and the importance of not placing too much responsibility on one person. To get a better idea of the Quintanilla family dynamic, we will place them under the Classic Profile Patterns in the DiSC assessment as well. The DiSC will help pinpoint the ways in which their personalities conflict, and also the ways where the personalities click, and the family works well together.



## LOSS OF ILPS LEADS TO NEURAL DEVELOPMENT ABERRATIONS IN DROSOPHILA MELANOGASTER

Brian Robichaud, Barry Ganetzky (Mentor), Genetics

With childhood obesity on the rise globally, understanding the insulin system is crucial to providing better health care and predicting challenges that come from a poorly-functioning pancreas. Understanding how insulin affects a developing body will allow adequate time to intervene and reduce the potential negative effects. One way to test what role the insulin pathway plays for proper brain development is by performing research on the insulin system in fruit flies and measuring the effect on the brain development of their larvae. Flies with a non-functioning gene for various parts of the insulin system will be observed in a background that is sensitive to these changes. We are hopeful that we will find some aspects of the insulin system that affect proper brain development.

## GERMPLASM ENHANCEMENT THROUGH THE CHARACTERIZATION OF MINERAL UPTAKE IN EPIPHYTIC RELATIVES

Jacob Roble, Shelley Jansky (Mentor), Horticulture

Germplasm enhancement has long been used to cross wild tuber-bearing potato relatives with domesticated potatoes to improve disease resistance, crop yield, and ornamental traits. In a study of 15 wild species, Dr. Jansky of the University of Wisconsin-Madison discovered high levels of some minerals in two wild potato species: *Solanum morelliforme*, and *Solanum clarum*. It was found that these *Solanum* species were epiphytic, the only known epiphytic relatives. To confirm these results, we are propagating three accessions each of *S. morelliforme* and *S. clarum* and comparing them to mineral levels in three successions of *Solanum chacoense*. This research hopes to identify genetically desirable traits to introduce into domesticated populations to increase mineral uptake, nutritional value, and profit for farmers by requiring less fertilizer.

## SEX RELATED DIFFERENCES IN NEUROPROTECTION AFTER 7,8 DHF TREATMENT IN PERINATAL MICE

Giovanni Rodriguez, Pelin Cengiz (Mentor),  
Division of Pediatrics Critical Care Medicine

In our current research, we are testing the hypothesis that the sex related differences in response to 7, 8 dihydroxyflavone (7, 8-DHF) treatment in mice after hypoxia ischemia (HI) could be attributed in part to the presence of the ER alpha-receptors in female brains. Previous experimental research has shown that the TrkB agonist 7, 8 DHF can be used as a treatment for HI in neonates. We will be using western blots and MAP2 staining to determine the amount of TrkB activation in female wildtype and ER alpha knockout mice. The completion of this study will provide new mechanistic information on the function of ER alpha-receptors in BDNF-TrkB signaling pathways to help understand sex related differences in response to 7, 8-DHF treatment after HI.

## MICROFLUIDICS

Heriberto Rodriguez-Gallo, Anne Gillian-daniel (Mentor), Materials  
Research Science and Engineering Center on Structured Interfaces (MRSEC)

My research project consisted of preparing an outreach activity with the purpose of enhancing public understanding of microfluidics devices and their applications. Microfluidics describes a device designed to show and understand the behavior of fluids at the micro scale. The study of microfluidics allows us to control fluids at the micro scale and also provides an effective approach to the study of microorganisms at their own (micro) scale. I designed a hands-on activity using microfluidics chambers. I tested the activity with 25 middle school students and found an increased understanding of these concepts. The feedback I received served as a key catalyst for the refinement of the activity, allowing me to make the necessary design changes to improve it.

## CRYPTOTEPHRA DETECTION IN A LACUSTRINE SEDIMENT CORE FROM SPICER LAKE, INDIANA

Brigitta Rongstad, John Williams (Mentor), Geography

Tephrochronology is a relative dating technique that utilizes discrete layers of volcanic ash to constrain dates of paleo-events detected within a rock record. Sedimentary records distal to volcanically active regions of the Quaternary do not exhibit visible layers of volcanic ash; however, cryptotephra (or invisible ash) layers may be used to create a chronology in distal areas. This study focused on (1) the creation of a suitable methodology for detecting cryptotephra, and (2) the processing and detection of cryptotephra for a lacustrine sediment core from Spicer Lake, Indiana. A methodology was identified through multiple sample rounds; and preliminary results show that cryptotephra is not present or identifiable from 600 cm-700 cm within the core. Continued research will focus on detecting cryptotephra within the core.

## EFFECTS OF DELETION OF THE PLUG REGION IN RNA POLYMERASE

Chayanne Rosado, Emily Ruff (Mentor), Chemistry

RNA Polymerase in *E. coli* contains five core subunits and a transcription initiation factor sigma subunit. The sigma subunit of RNA Polymerase is responsible for recognizing and interacting with the promoter region in DNA. We are looking at region 1.1 (res. 1-99) which lies within the RNA polymerase cleft in the absence of DNA. Res. 1-55 of this region, which we call the "plug" domain, are independently folded, while res. 56 to approximately 99 are unstructured and are termed the "chain" domain. While it is known that region 1.1 is very important for the transcription initiation mechanism, how is not currently understood. We are deleting the plug and looking at its effect on association, dissociation, and RPo structure using filter binding assays and DNase footprinting.

## FAMILY BUSINESS MARKETING AND SUSTAINMENT

Kimberly Rouze, Debra Holschuh-Houden (Mentor), UW Family Business Center

In today's society, businesses must take an active role in sustaining their companies. Products and services alone will not help their survival. Looking specifically at family businesses, they must find innovative ways to continue pleasing consumers. In this project, investigation into what makes the family business attractive to a consumer, the market's perception of the family business, and the qualities and ethics that make them more desirable will prove interesting. The information gathered will show what customers want from a family business. When using marketing focused around being a family business, companies can gain credentials putting themselves in a better position to continue serving customers throughout the years. Case studies, articles, and market research will prove valuable to determine how family businesses can market themselves better and determine which companies are doing this well and the others that need guidance. The research will give insight into what makes a family business desirable and how to promote the family business to consumers for effective sustainment.

## INCIDENTAL BRAIN FINDINGS IN HEALTHY NORMAL VOLUNTEERS UNDER NEUROIMAGING STUDY

Paul Rowley, Aaron Field (Mentor), Radiology

The use of magnetic resonance imaging (MRI) techniques in brain disorders has increased dramatically over the past 10 years, both for clinical and research purposes. Scans performed for volunteer neuroscience studies have revealed unexpected abnormal MRI findings in subjects with no prior history of neurological health concerns. However the true incidence and types of abnormalities have not been well established, and best practice for dealing with such findings is controversial. We therefore undertook this study to analyze abnormalities discovered by expert MRI readers in a large population of children and adults participating as research volunteers. I worked with Neuroradiologists to categorize and analyze the raw data from imaging reports and with biomedical statisticians to establish associations according to age, gender, and other factors.

## THERMAL RESPONSE TEST FOR GEOTHERMAL APPLICATION

Andrew Ruetten, Matt Walker,  
James Tinjum (Mentor), Engineering Professional Development

The efficiency of a ground source heating and cooling system relies on the ability of the subsurface medium to transfer heat to and from the installed ground loop. This heat flow is a function of thermal conductivity. One method that measures heat flow in a borehole is a thermal response test (TRT), which is the focus of this project. Water is circulated through the ground loop at a known flow rate, and a known amount of energy in the form of heat is added to the system at a constant rate. By establishing a temperature differential between the inlet and outlet of the TRT, thermal conductivity can be calculated. This test will be executed in 300-m-deep boreholes in Grand Marsh and Arlington, WI.

## THE DYNAMIC OF THE FAMILY BUSINESS IN CHINA

Joshua Ruskin, Debra Holschuh-Houden (Mentor), UW Family Business Center

Family has always played a special role in the Chinese culture and has a different dynamic than the typical American family. Yet despite these differences, and with the recent boom of the Chinese economy, both China and the US have an abundant amount of family businesses that both have proved to be successful. I aim to explore the dynamic of the family business in China, and specifically dive into the importance of family when conducting business in China. I plan to do independent research, as well as interview several members of multiple family businesses in China, and ask them questions concerning the subject matter. I hope to find that the way that the Chinese culture places emphasis on the importance of family will have an effect on the family business model.

## MARRYING INTO THE FAMILY BUSINESS

Ashley Ryan, Debra Holschuh-Houden (Mentor), UW Family Business Center

Many different factors come into play when a person is brought into a family business via marriage. This project will display the typical situations that take place when an outsider must become introduced and acclimated to the family business. The project will also explore the different emotions and potential conflicts that can arise throughout the family due to marriage and how that can affect the overall business. These factors will be tied together with examples from the Royal Family including the marriages of Diana Spencer and Kate Middleton. The project will conclude with recommendations on some of the most successful ways to bring a new member into the family business.

## SOMOS LATINAS PROJECT

Hector Salazar, Lydia Huck, Andrea Arenas (Mentor), Chican@ Latin@ Studies

Somos Latinas Project is an ongoing three year Community Based Research project, created to record Chicana activism in Wisconsin. Using qualitative research methodology, students gathered primary source data from Latina/Chicana activists over age 50. Teams conducted initial background research for each activist, creating interview questions unique to their activism, conducted video interviews, and collected archival materials. The interviews and archives were given to the Wisconsin Historical Society (WHS.) The WHS is creating a website so university affiliated and the public can access this project. Within the fall 2012 time frame for CLS 330, nine interviews and hundreds of archives were donated to the WHS. We are honoring Latina activists by adding their first-person accounts, expanding resources, and highlighting their ideas on social and political change.

## BEST PRACTICES OF FAMILY BUSINESS SUCCESSION

Daniels Sam, Debra Holschuh-Houden (Mentor), Family Business Center

Management and leadership development is widely accepted as a crucial factor for success in an organization. However, there are no uniform guidelines for succession planning. The best practices of family business succession will be explored to determine if commonalities of an ideal succession plan of family businesses can be found across industries, or if there are differing best practices that are unique to each industry. Also, it will be explored if the best practices are dependent on the size and number of previous generational turnovers. This process will take perspectives of both senior and junior generations to determine if best practice views are consistent across generations, while conducting literature research on family business leadership and conducting interviews of senior and junior generation family business leaders.

## COMMERCIALIZATION OF DISPOSABLE PADS CORRELATED WITH WOMEN'S ENTRANCE INTO MODERNITY

Amber Sandall, Karen Walloch (Mentor), Medical History

Menstrual care product manufacturers successfully sold their products in the early twentieth century due to Progressive cultural ideals of sanitation and scientific efficiency. Disposable pads prevailed not only because of the advent of the strong New Woman, but also because American culture perceived the female form as flawed. I analyzed 19 advertisements for menstrual care products that appeared in the Ladies' Home Journal between January 1921 and May 1941. I found that advertisers marketed menstrual care products as being technologically advanced, sanitary, and as a way for women to perfect their menstruating bodies. With consumption of these products, it became obvious that women strove to achieve what advertisers considered culturally normal, resulting in a surprising connection between women's entrance into modernity and their consumption.

## LOW COST MANURE SOLIDS SAMPLING DEVICE

Joseph Sanford, Tom Zimonick, Rebecca Larson  
(Mentor), Biological Systems Engineering

It has been observed that manure with total solids content less than 5%, when applied to fields with tile drainage, can easily find its way to local lakes, streams and water supplies via macropores. This can cause serious water quality issues. To reduce water contamination, applicators need a device that can easily test for total solids content in the field in order to determine whether or not manure should be applied above tile drainage pipes. A filtration based device was developed to allow for quick solid content results. The device is used by comparing initial and final volume of manure through the filtration device. After testing it has been determined that this device can accurately inform applicators if the solids content is above 5%.

## ASSESSMENT OF BLENDED LEARNING IN THE GRADUATE CLASSROOM

Kelsi Sarbacker, Elizabeth Rice (Mentor), Nursing

In the last ten years there has been a significant increase in blended learning in higher education. Blended learning is the fusion of face-to-face and online learning experiences (Garrison and Vaughan, 2008). An important aspect of blended learning is to ensure that in class learning engages students and requires them to engage with other classmates in meaningful activities (Bonwell and Elison, 1991). Students' learning is enhanced when they are intensely involved in their education and are asked to think about and apply what they are learning in different settings. The purpose of this qualitative study is to describe nursing graduate student learning gains, attitudes and satisfaction with a blended learning class experience. The sample for this study included fourteen graduate nursing students enrolled in a blended learning graduate policy class. Participants were interviewed and asked open-ended questions about their learning gains, engagement level with the course materials and overall satisfaction. Students reported significant learning gains in the course. They felt that the blended learning environment improved their engagement in their own learning. Themes identified include Enhanced Knowledge, Engaged Learning and Environmental Perspectives.

## CONVERSION OF ESTRADIOL BENZOATE TO ESTRADIOL

Misa Sato, Ei Terasawa-grilley (Mentor), Pediatrics

Recent studies in this lab indicate that estradiol (E2) synthesis and release in the hypothalamus play a significant role in regulation of GnRH release. During the studies, synthetic hormone estradiol benzoate (EB) was used. However, whether EB is converted to E2 in the hypothalamus is unknown. Results from in vitro studies suggest that EB was converted to E2 in primate CSF at a rate of ~0.22 % mol to mol at 60-80 min, whereas this was not the case in artificial CSF and plasma. Currently we are investigating whether exposure of hypothalamic tissue to EB induces a higher rate of E2 conversion than those observed in primate CSF. Collectively, conversion of EB to E2 in the hypothalamus appears to be very small.



## IMPULSIVITY AND OBESITY

Emily Schaefer, Kristin Javaras (Mentor), Psychology

Obesity has become a major health crisis in the United States. Although the majority of American adults are now overweight or obese, body composition varies considerably across individuals. Here, we focus on one potential contributor to these individual differences: personality, specifically impulsivity. Impulsivity is arguably a multi-faceted trait: Whiteside and Lynam (2001) have described several facets of impulsivity that include urgency, lack of premeditation, lack of perseverance, and sensation seeking (U-P-P-S). Thus, in the present study, we will investigate the relationship between the various facets of impulsivity (measured by self-report, other-report, and performance on a battery of neuropsychological tasks) and obesity-related outcomes including measures of obesogenic lifestyle.

## KNOWLEDGE OF RHODODENDRON USE BASED ON AGE, SEX AND LOCATION AMONG THE NAXI OF SOUTHWEST CHINA

Brendan Scherer, Elizabeth Georgian (Mentor), Botany

The Naxi are an ancient ethnic group in Yunnan, China. They have diverse knowledge and appreciation for their local flora, particularly plants from the genus *Rhododendron*. This study analyzes data from interviews with Naxi living in and around Lijiang city in Yunnan with linear regression and non-metric multidimensional scaling. These analyses aim to explore relationships between sex, location and age with varying degrees of knowledge of *Rhododendron* use. Thus far results suggest that practical knowledge decreases with distance from Lijiang, perhaps due to less demand from tourists.

## POSSIBLE APPLICATIONS FOR AN UPDATED MODEL OF THE DROSOPHILA MELANOGASTER CIRCADIAN CLOCK

Katherine Scheuer, Laurence Loewe (Mentor), Genetics

Circadian clocks give rise to rhythmic behavior and are present in all living organisms, including the model species *Drosophila melanogaster*. Studying this clock can provide valuable information about circadian rhythms in other species. Computer models have been used to simulate *Drosophila* clocks for more than fifteen years. These simulations can produce detailed predictions of clock behavior and can be conducted more quickly than wet lab experiments. Some portions of clock models are well supported, while other portions are more contentious. Our clock model builds on previous work by including more recently discovered proteins. The model could be used to explore controversial parts of the clock, including the influence of light, nuclear translocation of proteins, and the role of post-translational mechanisms in clock regulation.

## REDUCING WASTE IN THE FOOD SUPPLY CHAIN

Aaron Schroeder, Tyler Lark (Mentor), Nelson Institute Center for Sustainability and the Global Environment (SAGE)

America wastes approximately 40% of its food, sending 33 million tons of food to landfills each year. More than 20% of this waste occurs due to high retail standards and quality control. By circumventing these waste-intensive steps in the supply chain, personal production in home and community gardens may provide waste reduction benefits compared to mainstream supply chains. Using data from the USDA, primary literature, and industry and trade association papers and reports we quantify the impact of increased gardening on food waste generation and analyze the relationship between waste and the location and methods of production. Results will help identify opportunities to reduce waste and inform policy- and decision-makers about potential benefits of increased urban agriculture and production in home and community gardens.

## EFFECTS OF ADDICTIVE AMPHETAMINE-LIKE COMPOUNDS ON THE SIGMA-1 RECEPTOR

Amanda Schulman, Arnold Ruoho (Mentor), Neuroscience

The sigma-1 receptor (S1R) has been associated with the symptoms of drug abuse, most notably general excitability and hypermobility. The psychedelic drug, dimethyltryptamine (DMT) increased the open field hypermobility of sigma-1 wild type (WT) but not knockout (KO) mice. Three highly addictive compounds, structurally similar to DMT — mephedrone (MEPH), methyline (METH), and methylenedioxypyrovalerone (MDPV) — were chosen for WT vs. KO mouse hypermobility open field assays because they showed inhibition of radiolabeled drug binding to the S1R. The main purpose of this research is to determine whether MEPH, METH and MDPV are functional S1R regulators. Performing this research will give further insights into the mechanism of action of the S1R and validate its linkage to symptoms of drug abuse and addiction.

## ACADEMIC RESOURCE COALITION

Alex Schurman, Jean Heitz (Mentor), Zoology

Having trouble finding resources you need to succeed in your courses? The Academic Resource Coalition (ARC) is a newly developed search engine made by students for students. Students can use the website to find student organizations which provide small group learning opportunities as well as one-on-one tutors specific to your courses. All you need to do is type in a current course to find this information. The website also promotes student organizations and tutors by connecting them with future members. Our ultimate goal is for the site to become institutionalized for use by all students. If you want to check it out, the website is up and running now at [www.arcuw.org](http://www.arcuw.org)!

## EVALUATING THE FAMILY FEELINGS OF A JAILED PARENT TOWARDS CAREGIVER AND CHILD

Abbey Seidel, Julie Poehlmann (Mentor), Human Development and Family Studies

Currently the Infant Parent Interaction lab is studying young children whose parents are in jail. The present project focuses on jailed parents' feelings about their children and their children's caregivers, as reported on the Inventory of Family Feelings (IFF). The IFF consists of statements about relationships and the parent answers with either "agree, neutral or disagree" on each item. He or she does this for both the child and for the child's current caregiver. Correlations between the parent-caregiver relationship and the parent-child relationship will be examined. Group differences in jailed parents' reports of relationships will be examined in relation to parent gender, offense, and other characteristics.

## THE INFLUENCE OF CULTURAL IDENTITY ON THE FOOD AND RECREATION ENVIRONMENTS OF LATINO YOUTH

L. Isabelle Selep, Samuel Dennis (Mentor), Landscape Architecture

Latino youth are at greater risk for obesity compared to the general population, and interactions with their neighborhood environment contribute to this risk. However, little is known about the influence of culture beyond broad, and increasingly criticized, generalizations. This research examines the effects of cultural self-identification on interactions with the local food and recreation environments among Latino adolescents. A web mapping technology, Geoinquiry, will be used to understand spatial behaviors related to food and physical activity. Qualitative methods will be used to identify the cultural barriers and facilitators to healthy eating and physical activity that Latino youth may face. The results will contribute to a model of culture-environment interactions that may help improve the health of Latino adolescents.

## INVESTIGATING THE STRUCTURAL AND FUNCTIONAL PROPERTIES OF CRD-MT1R3 MUTANTS

Minaliza Shahlapour, Fariba Assadi-porter (Mentor), Biochemistry

A Cysteine-rich domain of the mouse taste receptor (CRD-mT1R3) is a 64-amino-acid protein with 9 Cysteine domains. Previous research comparing it to the human taste receptor has shown vast similarities. The CRD-mT1R3 protein expressed in the *E. coli* system is purified for in vitro study. Understanding the mechanics of the taste receptor is vital to potentially finding a non-caloric sweetener that activates the sweet taste receptor in a similar mechanism as caloric sweeteners, but without the consequences of excess sugar consumption. This experiment is designed to study six mutant forms of the mouse taste receptor. The proteins will be expressed, purified, and observed using HPLC and NMR. This will provide further insight as to various structural components of both the mouse and human taste receptor.

## ENHANCED PRODUCTION OF THROMBOSPONDIN-1 UNDER HIGH GLUCOSE PROMOTES THE DEATH OF RETINAL PERICYTES

Keegan Shallow, Nader Sheibani Karkhaneh (Mentor),  
Department of Ophthalmology and Visual Sciences

Hyperglycemia affects retinal vascular function and result in the pathogenesis of diabetic retinopathy (DR). We have shown that expression of thrombospondin-1 (TSP1) is increased in retinal pericytes exposed to high glucose. Pericytes are of great importance to vascular function and they are target of high glucose mediated loss in the retinal vasculature. Here we determined the impact of high glucose on wild type and TSP1-/- pericytes function. We showed high glucose inhibited the proliferation and migration of wild type and TSP1-/- pericytes. However, TSP1-/- cells were less migratory compared to wild type cells. High glucose rapidly induced apoptosis of wild type but not TSP1-/- pericytes. Thus, increased expression of TSP1 in response to high glucose may promote the apoptosis of pericytes and development of DR.

## GRAFFITI TO STREET ART: AN ARGENTINE TRANSFORMATION

Nathaniel Shay, Ksenija Bilbija (Mentor), Spanish and Portuguese

Generally, graffiti implies anonymous, and illegal personal expression in the form of tags and bombs meant to invoke negative reactions. In Buenos Aires, street art is a form of societal expression generally done at one's leisure, with permission, and is well respected. Buenos Aires has undergone a fundamental shift in the type of public expression covering its walls. As a result, a number of international street artists have traveled to Argentina to work and collaborate with local artists. In my research I will differentiate street art from graffiti art, discuss the ambiguous legalities pertaining to street art, and focus on two artists that use depictions of animals in their work as a means to critique society and social structure.

## BILINGUAL ADVANTAGE IN LEARNING MORPHOLOGICAL MARKERS

Enanna Sheena, Margarita Kaushanskaya (Mentor),  
Communication Sciences and Disorders

The goal of this project is to examine whether bilingual English-Spanish speaking school-age children have an advantage in learning an invented language rule over monolingual English-speaking children. The participants will be taught a novel morpheme rule in English and will further be tested to examine whether the rule was generalized. The prediction is that the bilingual children will learn the novel morpheme rule more quickly and accurately than the monolingual children.

## WISCONSIN WITH LOWER METHADONE OVERDOSE DEATH RATE THAN THE UNITED STATES

Michael Shinnors, Joseph Blustein (Mentor), Ophthalmology and Visual Sciences

Opioids are drugs prescribed primarily to treat pain. Methadone is a popular opioid due to its low price and long duration of action. Prescribed opioids are responsible for a growing number of overdose deaths in the United States. In 2009 there were over 15,500 opioid overdose deaths. In that same year, methadone represented 2% of the prescribed opioids but 30% of the opioid overdose deaths. Methadone overdose deaths have increased in both the United States and Wisconsin. The methadone overdose death rate is higher in the U.S. than in Wisconsin. I have identified five factors which may explain the difference in the overdose death rates. These factors are: income, other drug use, race, pain prescription, and age.

## HEALTH STREET THEATER IN RURAL KENYA: A HEALTH BY MOTORBIKE INITIATIVE

Joseph Shook, Kathleen Grabowski, Araceli Alonso (Mentor),  
Gender and Women's Studies

Thanks to the educational efforts of Professor Araceli Alonso and UW-Madison students, many women in the rural Kenyan region of Lunga Lunga, Perani, Mpekani, and Godo have developed a high level of health literacy since 2009. This Wisconsin Idea Fellowship seeks to expand this literacy to other community members through Health Street Theater. Women who have been trained by Dr. Alonso and students as health promoters are paid throughout the year to create and perform skits on topics such as malaria prevention, childbirth, and HIV/AIDS. This medium is a culturally accessible form of education that is intuitive, informative, and well-received in rural Kenya. Funds from the WIF pay for over thirty performers to travel among communities performing health literacy skits in public venues.

## UNDERSTANDING PERCEPTIONS OF INFECTION CONTROL PRACTICES IN ELDERLY PATIENTS WITH OR AT RISK OF CDI

Emily Shulkin, Nasia Safdar (Mentor), Infections Disease

*Clostridium difficile* Infection (CDI) plagues hospitals and assisted healthcare facilities worldwide. Upon infecting the body, it causes patients to suffer from frequent diarrhea, and can be deadly in severe cases. Evidence indicates that there is a strong correlation between hand-washing and CDI prevention. Although hand-washing and other infection control policies at UW-Hospital are heavily enforced, CDI remains problematic. Since elderly populations are most susceptible to acquiring infections during their hospital stay, we have created a survey to ask patients ages 60 and over about their hand-washing habits in the hospital compared to when they are at home, as well as their perceptions about infections and infection control practices in the hospital.

## MILLIMETER-WAVE ROTATIONAL SPECTROSCOPY OF PYRIDAZINE AND ITS ASTROCHEMICAL IMPLICATIONS

Joshua Shutter, Robert McMahon (Mentor), John F. Stanton (Mentor),  
R. Claude Woods (Mentor), Chemistry

While millimeter-wave rotational spectroscopy plays a key role in identifying polar species in the interstellar medium (ISM), its very nature precludes the study and identification of non-polar molecules like benzene and similar aromatic molecules. Such species are potential precursors to larger species, and their inherent aromaticity would provide them stability in the ionizing environment of the ISM. As a way to circumvent this problem, polar aromatic species represent a significant target for astronomical detection since they are likely to provide insights into the chemistry of their non-polar counterparts and the ISM as a whole. Toward this purpose, we report the rotational constants of pyridazine in both the ground and first nine vibrationally-excited states. Rotational constants for three isotopomers are reported as well.

## DEVELOPMENT OF GFP-EXPRESSING RECOMBINANT HUMAN RHINOVIRUS (HRV) TYPE 1A TO STUDY VIRUS SPREAD

Shakher Sijapati, James Gern (Mentor), Pediatrics

The human rhinovirus (HRV) is a major cause of the common cold and other respiratory tract diseases. HRV utilize intercellular adhesion molecule 1 (ICAM-1, major group) or low-density lipoprotein receptor (LDLR, minor group) to enter the host cells. Bronchial epithelial cells are more susceptible to infection with minor group HRV such as HRV-1A strain. We aimed at inserting the Green Fluorescent Protein (GFP) gene into the HRV-1A infectious clone to produce reporter virus. This task was done through PCR amplification of the GFP sequence (insert), cleavage of both the insert and HRV-1A encoding plasmid (vector) with restriction enzymes XcmI and KasI, and their ligation to give yield to the new HRV-1A-GFP plasmid. This plasmid will be used for RNA transcription and production of GFP-HRV-1A.

## A HIDDEN SCAR: THE 1962 GAY PURGE AT THE UNIVERSITY OF WISCONSIN-MADISON

Gina Slesar, William Jones (Mentor), History

In 1962, the University of Wisconsin-Madison's Department of Protection and Security and the Dean of Men's office investigated hundreds of male students and faculty members they believed were gay and expelled those who admitted to sexual relations with other men. Often overshadowed by the historically progressive image the University projects into today, the story of the 1962 Gay Purge is an overlooked and largely forgotten event in UW history. Though the interrogations of students in the 1960s are not isolated to the UW, there is little work published specifically citing the expulsions of homosexual students before the Stonewall Riots in 1969. This work aims to establish a case study through exploring the causes and implications of the Gay Purge at UW-Madison.

## ENGAGE CHILDREN IN SCIENCE: SERVICE LEARNING IN BIOLOGY

Tessa Sliwa, Albert Zygmunt, Dorothea Ledin (Mentor), Biology

The United States is falling behind the rest of the world in science education. We intend to solve this problem by providing a relaxed atmosphere to explore science and stimulate interest in science at a young age. We facilitated this through an after school science club at Schenk Elementary School. Over the past semester, we developed close relationships with the children and saw many of them develop a greater appreciation for science. It also taught us how to explore science alongside children, and how rewarding volunteering in the community is. We know that we are making a difference in the lives of these children by being co-explorers with science experiments, which will hopefully encourage future interest in science.



## WHERE IS DADDY?: A LOOK AT WHAT CAREGIVERS ARE TELLING CHILDREN WITH INCARCERATED PARENTS

Allison Smith, Kierra Pettit, Julie Poehlmann (Mentor),  
Human Development and Family Studies

Data were collected from 27 caregivers of children with an incarcerated parent. This project will focus on the caregiver's report to the child regarding the parent's current incarceration. During a face-to-face interview, each caregiver was prompted with the question, "What has the child been told about his or her parent's jail stay?". Qualitative responses will be transcribed and coded using a thematic content approach. Each response will be coded in one of four ways: honest explanations, developmentally appropriate explanations, distortions, or telling the child nothing about their parent's current incarceration. Statistical analyses will be implemented to determine what information caregivers are telling the child. The anticipated outcome is that most caregivers will be offering the child simple, honest explanations regarding their parent's current incarceration.

## PRECLINICAL EVALUATION OF CHEMORADIATION WITH CETUXIMAB IN HPV+ HEAD AND NECK CANCER

Molly Smith, Randall Kimple (Mentor), Human Oncology

Whether cetuximab, a monoclonal antibody to the epidermal growth factor receptor, should be combined with radiation in patients with human papillomavirus (HPV) positive locally advanced head and neck cancer (HNC) unknown. Currently available data are inadequate to address this therapeutic question and model systems have been insufficient to provide appropriate preclinical guidance. We sought to examine the ability of cetuximab to radiosensitize HPV+ HNC and to examine the mechanism of action of this combination in the unique subset of patients whose cancer is related to HPV. Using HPV+ HNC cell lines, radiation and cetuximab appear to be beneficial compared to either treatment alone. This combination is being further evaluated in a direct from patient tumorgraft model of HPV+ HNC to further understand predictors of response.

## DETERMINING THE EFFECT OF GESTATIONAL IRON DEFICIENCY ON NEPHROGENESIS

Zachary Smith, Pamela Kling (Mentor), Pediatrics

**Objective:** The objective of this study was to test the hypothesis that administering an iron deficient (ID) diet to pregnant rats would impair fetal growth, fetal and newborn blood and tissue iron status, and impair kidney development, programming a hypertensive state in adulthood. **Methods:** Sprague-Dawley rats were bred and fed either a normal (IS) diet or an ID diet, which consisted of 3% of the IS intake. Post birth, placenta tissue samples were taken and examined for transferrin receptor (TfR) expression. Blood and tissue samples were obtained from the offspring and examined from day of life (P) 2 to P10, at P15, at P30 and at P45. **Conclusions:** The offspring of the ID mothers were born smaller, ID and anemic. Lower iron levels and abnormal kidney development were observed in early pup life in the ID model. Hypertension was not observed in the ID rats by P45; however, continued research may be necessary to determine if hypertension occurs after P45.

## HEALTHY EATING FOR YOUNG DANCERS

Jordan Snider, Karen McShane-Hellenbrand (Mentor), Dance

83% of dancers have an eating disorder. This statistic is very upsetting and needs to lower over time. Because of this issue, I gave a presentation to young dancers about healthy eating for the dancer. Dancers have different nutrition needs than a normal person does and most dancers do not know this. Before giving this presentation I did research about nutritional needs for dancers and used the information I learned to create an interactive presentation. The presentation discussed what healthy eating consists of, major eating disorders, and movement experiences for both of these big ideas. At the Undergraduate Symposium, I plan on discussing my findings of what types of food are healthy for dancers and what happens if dancers are eating unhealthy. The audience will have an understanding of what dancers' needs are nutritionally to continue performing at their optimal level.

## RACIAL ENCODING IN YOUNG CHILDREN

Madeleine Spencer, Kristin Shutts (Mentor), Psychology

When meeting people for the first time, adults automatically notice and later remember people's racial group membership. In the present research, we assessed racial encoding in a sample of 24 8-year-old children using a memory confusion task. Participants first learned facts about unfamiliar children who varied in race and then were asked to remember which facts went with which people. We found that participants tended to mix up facts that had been previously associated with people of the same race, providing evidence for racial encoding. In ongoing research, we are testing whether introducing other information about group membership (e.g., that people are on the same team) may attenuate or exacerbate children's tendency to encode individuals' racial group membership.

## OVERCOMING RESISTANCE TO CETUXIMAB BY DUAL TARGETING OF HER FAMILY MEMBERS USING ANTIBODY THERAPY

Megan Starr, Mari Iida (Mentor), Human Oncology

EGFR is a key mediator of proliferation and progression in many human tumors. Strategies to inhibit EGFR signaling have emerged as promising approaches for cancer therapy. Numerous tumors show no response to EGFR inhibition however, and many that respond initially manifest cetuximab resistance eventually. Cetuximab-resistant clones show enhanced EGFR and HER3 signaling. To investigate the role of HER3 we treated these clones with RNAi and an anti-HER3 antibody (U3-1287/AMG888). siEGFR and siHER3 resulted in greater inhibition of cell proliferation than did silencing of either receptor alone. Combined EGFR and HER3 inhibition by either siRNAs or antibodies decreased the downstream signaling pathways of pAKT and pMAPK. Combined treatment with cetuximab and this anti-HER3 antibody may be a valuable option for tumors with acquired resistance to cetuximab.

## FUNCTIONAL CHARACTERIZATION OF \*392G>C SINGLE NUCLEOTIDE POLYMORPHISM IN CYB5R3 3' UTR

Dana Steffen, Lauren Trepanier (Mentor), Medical Sciences

Cigarette smoke contains two environmental carcinogens that are detoxified by cytochrome b5 (b5) and NADH cytochrome b5 reductase (b5R), 2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine (PhIP) and 4-aminobiphenyl (4-ABP). Genetic variation within CYB5A and CYB5R3, the genes encoding b5 and b5R respectively, contribute to individual differences in carcinogen detoxification. The purpose of this study was to functionally characterize the \*392G>C variant, a single nucleotide polymorphism in the 3' untranslated region (UTR) of CYB5R3. Wild-type and variant plasmids were constructed by inserting the respective 3'UTR CYB5R3 sequence into a pGL3 luciferase vector. Plasmids were generated in E.coli and transfected into HepG2 cells. A dual-luciferase reporter assay evaluated luciferase expression for each construct. The hypothesis is that the \*392G>C variant will have decreased expression relative to the wild-type.

## MUSIC IN ROMAN PANTOMIME

Crescentia Stegner-Freitag, Marc Kleijwegt (Mentor), History

One of the fundamental components of every culture is storytelling. It is usually integrated with other art forms, such as dance or music. My thesis discusses this relationship between dance, music, and storytelling in a specific instance: the Roman pantomime. This popular art-form is comparable to a modern-day ballet, but with an accompanying singer. However, I have yet to find any scholarly investigation into the musical aspect of Roman pantomime. I will address essential questions about the music, including how it was performed and how it conveyed the emotion and meaning of the pantomime's dance. In short, although music was an essential component of the performance, it was less important than the dance itself (much like the relation between a film score and the film).

## THE EFFECTS OF DIVORCES ON FAMILY BUSINESS

Tiera Stephen, Debra Holschuh-Houden (Mentor), UW Family Business Center

The rate of divorces in our society is continuously increasing amongst families. This unfortunate trend is also applicable to family owned business. As a result, this causes turmoil and disconnect not only between family members but the employee's of the company as well. This study will show how some family businesses are able to persevere through divorces and some do not. This study will also inform families of the effects of divorce within the family business and how to respond efficiently so the business is still able to succeed.

## OPTIMIZING LENTIVIRAL DELIVERY OF THERAPEUTIC GENES FOR TREATMENT OF GLAUCOMA

Rebecca Stern, Curtis Brandt (Mentor), Ophthalmology and Visual Sciences

Glaucoma is a major cause of vision loss and blindness. Our goal is to reduce the chronically elevated intraocular pressure that occurs with glaucoma by delivering genes that modify the physiology of the system using a lentiviral vector. My project is identifying promoters that drive gene expression in human trabecular meshwork (HTM) cells. We have cloned the promoter for the aniline gene and are cloning the pCAG promoter (hybrid CMV IE promoter and chicken  $\beta$ -actin). We have also tested the expression of proteins identified in microarrays to identify additional potential promoters. The aniline promoter is only expressed in dividing HTM cells but not in differentiated cells, thus it is probably not suitable. We continue to clone different promoters and test their expression in HTM cells.

## CHANGES IN ATTITUDES, INTENTIONS, AND BEHAVIORS TOWARD TOBACCO AND MARIJUANA DURING FRESHMAN YEAR

Mara Stewart, Philip Giampietro (Mentor), Pediatrics

Tobacco and marijuana are both commonly used by college students and have the potential for negative health outcomes. The purpose of this study was to understand how students' attitudes, intentions, and behaviors toward tobacco and marijuana change during their freshman year of college. Participants from two universities were interviewed the summer before college and after their freshman year. 275 participants completed both interviews. Participants were 57% female and 75% Caucasian. Attitudes towards both substances became more positive (tobacco=0.93 to 1.20;  $p<0.01$ , marijuana=1.87 to 2.31;  $p<0.01$ ). Intentions to use both substances increased during freshman year (tobacco=0.42 to 0.78;  $p=0.03$ , marijuana=0.68 to 1.12;  $p<0.01$ ). 12.2% of participants initiated tobacco use ( $p<0.01$ ); 13.5% initiated marijuana use ( $p<0.01$ ). Overall, students' attitudes, intentions, and behaviors toward both substances changed significantly.

## UNDERSTANDING CAMPAIGN ADS; WHO ARE THE REAL TARGETS

Haley Stoecker, Jack Edelson (Mentor), Political Science

The purpose of this research is to find if the presence of minorities in campaign ads is geared toward getting the minority vote or the socially liberal white vote. I summarize scholarly articles that give us an idea on how people perceive minorities in ads or candidates who appear with minorities in ads. I also code campaign stills. I distinguish whether there are minorities, speaking or non-speaking, in the ad, and whether the candidate is a minority or not. The patterns of these codes will allow for a larger understanding behind the psychology of campaigning and political science.

## ATOM TRAPPING USING A COMPACT ZEEMAN SLOWER

Georgios Stratis, Mark Saffman (Mentor), Physics

Atom trapping allows us to investigate phenomena prevalent in the atomic scale. In order to increase the amount of atoms trapped we are using a Zeeman slower, which takes into account the Zeeman effect in order to compensate for the Doppler shift of the moving atoms. Our design follows a different approach than the traditional one, which uses magnetic coils of different diameters and water-cooling. In our design we use permanent magnets, which makes our slower cheaper in the long run, more compact, and requires far less maintenance.

## MRI-DERIVED NUMERICAL BREAST MODELS SUITABLE FOR RAPID 3-D PROTOTYPE PRINTING

Adam Strebel, Susan Hagness (Mentor), Electrical and Computer Engineering

There currently exists a clinical need for a reliable, low cost, and safe screening modality for women at a higher risk of developing breast cancer. 3-D microwave imaging is being researched as the solution to this need. Pre-clinical validation of this technology requires the construction of 3-D printed anthropomorphic models derived from breast MRI. The breast models simulate the morphology and dielectric properties of human breast tissues, and include representation across all four-breast density classes. Work has been completed to translate MRI data into a binary form compatible with a 3-D printer. Iterative Gaussian blurring of data was performed to remove non-contiguous voids and floating plastic regions. Preliminary results obtained show the models retain physiologically realistic features from the MRI after modifications are completed.

## MRSEC: RAMAN SPECTROSCOPY ACTIVITY DEVELOPMENT

Yang Su, Anne Gillian-Daniel (Mentor), Materials Science and Engineering

The goal of my research was to develop an activity that introduced the public to Raman spectroscopy, a tool commonly used in material sciences. Raman spectroscopy is a technique that uses molecular vibration to distinguish between materials. In the activity different forms of carbon was used to help better explain how Raman spectroscopy worked. Pre- and post- assessments of 21 participants from ages 12-14 was taken to see the effectiveness of the activity and find areas that needed improvement. In the first trial of the activity, most of the participants seemed to retain information about carbon, but not much of Raman spectroscopy. The activity and assessment questions were then changed to better gauge the activity and hold the focus on Raman spectroscopy. Through my research, teachers and educational groups can use this activity to better explain Raman spectroscopy and supplement their science teaching with current research from materials science.

## SEXUALLY DIFFERENTIAL EFFECTS OF TRK-B SIGNALING AFTER NEONATAL HYPOXIA AND ISCHEMIA

Wendy Sun, Pelin Cengiz (Mentor), Pediatrics

Hypoxia Ischemia (HI) related brain injury is leading cause of morbidity and mortality among neonates. Currently, we are targeting a neurotrophin receptor called tyrosine kinase B (TrkB) receptor. Activation of TrkB receptors with its selective agonist 7,8-dihydroxyflavone (7,8-DHF) induces signaling pathways that stimulate survival of neurons in females. We are investigating a possible link between TrkB receptor activation with 7,8-DHF and survival of neuronal progenitor cells in the hippocampus after HI in the presence of estrogen receptor alpha after HI. Future studies will determine if the estrogen receptor modulates TrkB receptor activation thereby enhancing the female's response to 7,8 DHF and increasing survival of neuroprogenitor cells.

## IDENTIFICATION OF THE ROLE OF SUB2 DURING SPLICEOSOME ASSEMBLY

Yuliang Sun, Aaron Hoskins (Mentor), Biochemistry Department

Stable assembly of the spliceosome on a pre-mRNA requires the aid of various proteins. During yeast spliceosome assembly, a protein called Sub2 is believed to remove a protein complex called BBP-Mud2 attached to the pre-mRNA. This complex would otherwise inhibit proper spliceosome formation by preventing the assembly of other spliceosome components. I have expressed, purified, and conducted biochemical assays on Sub2 protein. Upon expression and purification of BBP and Mud2 proteins, I will employ electrophoretic mobility shift assay techniques to test if Sub2 is capable of displacing the BBP-Mud2 protein complex from the pre-mRNA and determine the kinetics of the displacement. The result of this study will contribute to a better understanding of gene expression through the clarification of a crucial step in spliceosome assembly.

## HELPING PARENTS TO MOTIVATE THEIR HIGH SCHOOL STUDENTS IN MATHEMATICS AND SCIENCE

Ryan Svoboda, Judith Harackiewicz (Mentor), Psychology

US students are not adequately prepared for careers in science, technology, engineering, and mathematics (STEM), and this problem begins in high school, when students choose not to take advanced math and science courses. Recently, researchers documented an increase in teens' STEM course-taking by using a simple utility value intervention with parents. We seek to extend this research by investigating how the intervention worked and who it worked best for. To do this, we analyzed the intervention group to find mediators of the intervention. In addition, we examined gender differences to better understand the effectiveness of the intervention.

## DETECTION OF PERTURBED METABOLIC PATHWAYS IN POLYCYSTIC OVARIAN SYNDROME BY ISOTOPE LABELING

Chin Huat Tan, Warren Porter (Mentor), Department of Zoology

Defects in organismal biochemical processes could serve as early reporters of a disease condition. Our research focuses on detections of metabolic aberrations in breath and plasma by using cavity ring-down spectroscopy and nuclear magnetic resonance spectroscopy in mouse diagnosed with Polycystic Ovarian Syndrome (PCOS). PCOS is a disease that causes obesity and infertility in female with malfunctioning ovaries. The change in glucose utilization in PCOS mouse results in metabolic dysfunction and it alters the normal enzymatic activities and hormonal functions of the body. Small changes in glycolysis affect pentose phosphate pathways that produce nicotinamide adenine dinucleotide (NADH) that is essential in fatty acid synthesis. The novel technology we develop could serve as strong diagnostics for early diseases in the future.



## CORRELATION BETWEEN ICE BREAKUP AND PRODUCTIVITY OF KING EIDERS IN THE CANADIAN ARCTIC

Win Sim Tan, David Drake (Mentor), Forest and Wildlife Ecology

The cause of the decline of king eiders (*Somateria spectabilis*) populations in North America is unknown. Strong evidence shows that the arctic climate is changing. King eiders breed in the Canadian arctic region. It is unknown how climate change will affect the productivity of the populations. In contrast to the early ice breakup pattern predicted in the arctic region, we observed a 22-year trend of later ice breakup at Karrak Lake. We found a strong, positive correlation between ice breakup and nest initiation date. Clutch size, egg survival and nest success of king eiders were negatively correlated to later nest initiation date. We concluded that delayed nesting due to later ice breakup is one of the causes of the king eider population decline.

## THE PROMISES AND CHALLENGES OF MICROFLUIDICS DIAGNOSTIC DEVICES IN 21ST CENTURY INDIA

Andy Tay Kah Ping, John Webster (Mentor), BME

A recent global healthcare survey revealed that although lifespans have increased across the world, many of those extra years are burdened with diseases. This is especially true in developing nations where millions continue to die from diseases such as malaria. Diagnostic devices are hence useful to these communities who experience poor access to healthcare due to geographical and financial challenges. Microfluidic diagnostic devices (MDD) that fulfil the ASSURED criteria, summarized as affordable, sensitive, specific, user-friendly, rapid and robust, equipment free and deliverable to end-user can help to improve the current healthcare system by facilitating early detection and treatment in developing nations. The promises and challenges of introducing MDD are also discussed with reference to India where there are competing medical options and large rural population.

## INVESTIGATING LEGUME-RHIZOBIA SYMBIOTIC SIGNAL TRANSDUCTION PATHWAY

Pich Tea, Muthusubramanian Venkateshwaran (Mentor), Agronomy

Rhizobia are bacteria that fix and supply atmospheric nitrogen to legume plants during symbiotic relationship, which is mediated by signal exchanges between both partners. Perception of rhizobia signals called Nod factors triggers responses in plants; one of them is nuclear calcium spiking or oscillations of calcium concentration in and around the nucleus. Genetic studies in model legume *Medicago truncatula* identified genes, such as NFP, DMI2, DMI1, DMI3, which play a major role in symbiotic signal transduction. While NFP and DMI2 are localized on plasma membrane and perceive Nod factors, DMI1 is nuclear ion channel required for the initiation of calcium spiking. Our studies report identification and characterization of new second messengers, which are involved in signal perpetuation and initiation of calcium spiking during symbiotic signaling.

## THE EFFECTS OF LOW MOLECULAR WEIGHT ETHYLENE GLYCOLS, ETHANOLS, AND POLYOLS ON NUCLEIC ACID FOLDING

Kyle Terry, Douglas Knowles (Mentor), Biochemistry

Nucleic acid folding occurs most efficiently as specific conditions are maintained within the human body. Altering these conditions disrupts nucleic acid folding processes and these effects can be observed as conditions are changed in a controlled environment. Disrupted nucleic acid folding is a cause of many neurodegenerative diseases such as Alzheimer's, bovine spongiform encephalopathy (mad cow disease), and Parkinson's. The wavelengths and absorbencies of the solutions subjected to ultraviolet visible spectroscopy are recorded to analyze any changes in the nucleic acid folding process resulting from the conditions associated with each solvent. Proper nucleic acid folding requires very specific conditions and this study serves to investigate these conditions in further detail.

## DISCUSSING END OF LIFE CARE IN THE HMONG COMMUNITY

Veronica Thao, Cameron Macdonald (Mentor), Sociology

In this study, we will assess the following question: How do aggressive end of life care treatments and western medical practices conflict with the cultural and religious values of Hmong elders? The intention behind the project will include understanding the underlying cultural and religious challenges that Hmong elders face in their experience with western medical practices, specifically assessing the relationship between elderly Hmong patients and their health care providers. By doing so, we hope to gain information regarding the Hmong community's view of end of life care options. The information is intended to help health professionals better understand Hmong cultural and religious beliefs associated with death, in order to prevent cultural and religious conflict when aggressive medical attention is needed in close-to death encounters.

## PRESENCE OF ELN AND COLI IN RELATION TO CARDIOMYOCYTE DEVELOPMENT IN MOUSE EMBRYONIC STEM CELLS

Terra Thimm, Jayne Squirrel (Mentor), Biomedical Engineering

Stem cell transplantation therapy includes the application of undifferentiated stem cells to repair damaged heart tissue. However, allowing stem cells to partially differentiate into cardiomyocytes in vitro prior to transplantation may improve therapy effectiveness. The extracellular matrix (ECM) plays a critical role in regulating cell differentiation. Elastin (Eln) and type I collagen (ColI) are two ECM proteins. Eln and ColI were examined in relation to cardiomyocyte formation in mouse stem cell development using second-harmonic generation, endogenous fluorescence and antibody labeling. Eln and ColI presence was negatively correlated with regions of high cardiomyocyte differentiation. The utilization of these ECM proteins in biosynthetic matrices has the potential to increase stem cell retention in damaged heart tissue, advancing transplantation therapies.

## DO PRECIPITATION PULSES DRIVE ANOMALOUS CARBON DIOXIDE ECOSYSTEM EXCHANGE IN TEMPERATE ECOSYSTEMS?

Austin Thomas, Ankur Desai (Mentor), Dept. of Atmospheric and Oceanic Sciences

Recent studies [Huxman et. al. 2004, Sponseller 2006] in semi-arid systems have identified that precipitation pulses can lead to increased emissions of carbon dioxide from the soil. However, this has not been demonstrated in temperate ecosystems. This study explores how positive or negative anomalies of net ecosystem exchange (NEE) of carbon dioxide are related to precipitation occurrence, magnitude, timing, whether these relationships are direct or lagged, and what are the likely mechanisms for any significant correlations. For both a northern hardwood forest and shrub wetland, NEE was found to increase (decreased uptake by biosphere / greater emissions to atmosphere) significantly, relative to average diurnal values, during and shortly after precipitation pulses of at least 2.5mm.

## ROLE OF CD11B+LY6C+ CELLS IN THE IMMUNE RESPONSE TO VIRUS-INDUCED DEMYELINATING DISEASE

Corinne Thornton, Julie Olson (Mentor), Neurological Surgery

TMEV is used as a virus-induced model of Multiple Sclerosis in SJL mice that causes autoimmune demyelination in the CNS. TMEV infection in SJL mice is not cleared during the innate immune response and leads to persistent infection, while in BL6 mice the virus is effectively cleared by the T-cell response and demyelinating disease does not develop. Our lab has shown CD11b+Ly6C+ cells of TMEV-infected SJL mice suppress T-cell responses, allowing persistent infection. In this study, we compared the CD11b+Ly6C+ cell responses in SJL mice with those in BL6 mice. We analyzed cytokine expressions of CD11b+Ly6C+ cells and T-cell proliferation in TMEV-infected mice. Our results suggest that CD11b+Ly6C+ cells have suppressive functions in SJL mice while CD11b+Ly6C+ cells in BL6 have inflammatory functions.

## CREATING A HUMAN SCHWANN CELL CULTURE FROM INDUCED PLURIPOTENT STEM CELLS

Nikita Tongas, Anita Bhattacharyya (Mentor), Waisman Center

Charcot-Marie-Tooth Disease (CMT) is a progressive disorder affecting the peripheral nervous system. CMT is most commonly caused by the misexpression of PMP22. An abnormal level of expression results in the deterioration of the myelin sheath surrounding the axon, ultimately harming the axon. Schwann cells create this myelin sheath. Our proposal is to create a human Schwann cell culture from induced pluripotent stem cells (iPSCs). The first step in the derivation of Schwann cells is to take iPSCs turn them into Neural Crest cells (NC). From NC cells it is then possible to obtain Schwann cells. The proposed generation of a Schwann cell culture will lead to the opportunity for future therapies and tests to try and regulate PMP22 expression.

## THE EGUNGUN TRADITION IN THE YORUBA CULTURE

Jason Townes, Henry Drewal (Mentor), Art History

This research project entails acquiring research about the Egungun masquerade, particularly within the Yoruba culture. The research will be based on the spiritual significance of this tradition in Yorubaland; along with how modern circumstances in Nigeria have shaped and changed the tradition throughout the years. The student is compiling annotated, bibliographical research and providing physical copies of the research, along with any audio or visual recordings that may be acquired. The student will construct a poster for the Undergraduate Research Symposium that will include photos and text regarding the Egungun costume(s) and the meaning behind the garb and its accessories. There will also be an art exhibit that will include some of the research acquired during this project.

## LITERACY AND IDENTITY DEVELOPMENT OVER TIME AND SPACE: A STORY OF CARLOS

Sarah Tran, Catherine Lilly (Mentor), Curriculum and Instruction

This project follows 15 children from immigrant families from grade 1 to high school. The objective of this process is to examine how children and their families make sense of relocation to the USA across a long period of time and how these experiences particularly affect the children's experiences at school. Carlos's story, a bilingual student living in the United States, is mainly told through his artistic abilities of drawings and photographs. His visual representations of the world around him points to how he make senses of the spaces he lived in. Ultimately, through this approach, researchers and educators can help connect with those students whose first choice of communication may not be words.

## UNDERSTANDING THE ROLE OF HMGR1 IN SYMBIOSIS

Tien Tran, Oswaldo Valdes Lopez (Mentor), Agronomy

A key success of the legume family, which comprises approximately 700 genera with more than 18,000 species, was the evolution of mutualistic symbiosis with nitrogen-fixing bacteria of the family Rhizobiaceae to directly capture atmospheric dinitrogen to support plant growth. As product of this interaction is the formation of a new organ, the root nodule, inside which the rhizobia can fix atmospheric nitrogen efficiently and transfer it to the plants. Over the last decade several of the molecular mechanism that control the legume-rhizobia interaction has been described. However, the molecular events that occur during the first hours of this interaction (e.g 1 h) has been not studied in detail. Previous results in Dr. Jean-Michel Ane laboratory indicate that the enzyme 3-hydroxy-3-methylglutaryl-CoA reductase 1 (HMGR1), which control the early steps of the mevalonate (MVA) pathway, play an important role in the nodule formation in *Medicago truncatula* (*M. truncatula*). In order to have a better understanding about the role of HMGR1 in the nodulation formation process, the goal of this research is to identify HMGR1 knockout (plants that do not express HMGR1) *M. truncatula* plants. To achieve this goal we will genotype several *M. truncatula* mutant plants developed by Tnt1 insertion mutagenesis.

## TEACHING CPR IN THE PUBLIC HOSPITALS OF EL SALVADOR

Beau Trapp, Jordan Wackett, Nestor Rodriguez (Mentor),  
Division of Emergency Medicine

Due to its time proven effectiveness in saving lives, Cardiopulmonary Resuscitation (CPR) is taught to a vast range of people from teenage babysitters, to medical doctors. Despite its importance and effectiveness, there exists a knowledge gap in CPR training throughout El Salvador. This project focused on closing the knowledge gap by providing training in the skills necessary to perform effective CPR, as well as the use of Automated External Defibrillators to healthcare professionals in the public hospitals of El Salvador. Additionally, this project established a relationship between the El Salvadorian Ministry of Health and the University of Wisconsin-Madison in which knowledge and experience can be exchanged between one another.

## THE ECONOMICS OF AQUAPONICS

Miles Tryon-Petith, Sabrina Bradshaw (Mentor), Office of Sustainability

Aquaponics– an ages old method of utilizing the waste of fish to feed plants– reduces waste to produce food and conserve water. However, is aquaponics economically sustainable on a smaller scale? A cost benefit analysis was performed on current data for existing commercial aquaponics systems. A baseline was determined using optimal fish breeds and lettuce as the plant species. The optimal system, based on pounds of food produced and startup/upkeep cost, was a 2000 L model (1000 L for fish, 1000 L for plants). The 2000 L system feeds four mouths per day based on pounds/plate. A life cycle cost analysis of the system will conclude this portion of the research.

## DISCOVERING THE ROUGH EDGES OF SAND

Miles Tryon-Petith, James Tinjum (Mentor), Geological Engineering

Thermal resistivity of soils depends on the amount of water soil retains as an electric charge courses through the medium. This study will determine if angularity and roughness of different soils affects water retention of soil. Higher water content correlates to reduction in thermal resistivity in soil. Results would indicate better soils to bury utilities where energy waste and cost is reduced. Images were taken of 12 different soil samples using a high powered imaging microscope to qualitatively characterize the roundness and angularity using Powers' chart. A quantitative analysis will be performed on soils by explicitly measuring the short and long diameter of individual soil particles and empirical equations will be applied to determine exact angularity and roundness to compare with the qualitative analysis.

## WISCONSIN FOCUS GROUPS AND THEIR THOUGHTS ON NEW GRAY WOLF POLICIES

Catherine Turng, Adrian Treves (Mentor), Environmental Studies

Since the delisting of gray wolves from the federal Endangered Species List in 2012, Wisconsin has implemented new hunting policies to decrease depredations while keeping wolf populations stable. To assess the effectiveness of the new policies and people's attitudes, interviews with nine focus groups composed of farmers, deer hunters, and bear hunters, respectively, from three areas in Wisconsin were conducted. These discussions were recorded and transcriptions were analyzed for general trends in opinions and attitudes. Preliminary results indicate that the new policies generally did not change people's neutral or negative attitudes towards wolves, which were due to concerns over depredation, overpopulation, declining deer populations, and safety. Finalized results from this study can help policymakers create solutions that are beneficial to both regional animals and humans.

## THE HUSBAND-WIFE SHARED BUSINESS OWNERSHIP DYNAMIC

Liza Van Lanen, Debra Holschuh-Houden (Mentor), Entrepreneurship

My symposium research is concentrated on the Husband-Wife shared business ownership dynamic. This area of research is important and necessary to better understand how people in a marriage communicate and make decisions together in a business environment as well as the home. Issues explored will include boundaries between business and family, power relations, negotiating roles, and communication styles and strategies differing in each environment. Past research suggests that efficient communication, great trust, and balancing personality types foster a successful environment for the team. This multi-faceted relationship dynamic is intertwined with the home, thus creating a successful, stable, and fluid family business environment. Through academic research, interviews, and observation, I conducted a case study of this powerful dynamic and found that there are numerous advantages as well as some disadvantages, at work and at home, to being married to your business partner. This research proposes the notion that leadership in a business can be more effective and fluid when the leaders are engaged in a married relationship.

## EMOTIONAL COMMUNICATION WITHIN FAMILY BUSINESSES

Bethany Varley, Debra Holschuh-Houden (Mentor), UW Family Business Center

Communication is an enormous part of our everyday lives and can have a major affect on family businesses. Having to communicate ideas and thoughts is interesting enough, but how important is the communication of emotions within family businesses? Emotions are a daily occurrence that can change in minutes and can have major affects on current situations people face. Some families tend to be very open with each other emotionally while others are not. Communicating and discussing emotions, with others close to you, is something that everyone goes through at least once in awhile. Is it important for family businesses to have more open communication about emotions or not? How might this area of communication help or hurt family businesses? This project will look in to studies and research about the importance in communication of family emotions and will compare whether or not having open emotional communication within the family business is beneficial or not.



## CLASSIFYING AND QUANTIFYING CAROTENOID AND TOCOCHROMANOL COMPOUNDS IN COMMERCIALLY AVAILABLE CARROT

Rachael Vernon, Irwin Goldman (Mentor), Horticulture

Limited information exists concerning the perception that fresh carrots have more vitamin content than processed carrot products. I aim to help fill the gap to examine this question, focusing on methods of processing commercially available carrot products and their Vitamin A and E content. I propose to 1) assess if there is a correlation between carotenoid (Provitamin A) and tocochromanol (Provitamin E) content in processed carrot products and 2) make recommendations on vegetable products that have the most valuable nutritional profiles for these compounds. I will analyze 9 different commercial carrot samples using HPLC methods to determine if there is a correlation between the processes in which they are prepared and their vitamin A and E content.

## SOCIAL SUPPORT PREDICTS POSITIVE PSYCHOLOGICAL OUTCOMES AMONG STEM CELL TRANSPLANT RECIPIENTS

Savitri Viozat, Erin Costanzo (Mentor), Department of Psychiatry

This study examined relationships between social support and positive psychological outcomes among cancer patients undergoing stem cell transplantation. Participants (N=396) completed measures of social support pre-transplant and measures of psychological and spiritual well-being 1, 3, 6, and 12 months post-transplant. Multiple regression analyses indicated that HSCT patients who were integrated in social networks, experienced close attachment, and felt reassured reported greater psychological well-being 3, 6, and 12 months post-transplant ( $p < .05$ ). Patients who had reliable caregivers and received guidance reported greater spiritual well-being 1 month post-transplant ( $p < .05$ ). There were significant interactions between sex and support. Among women, attachment and guidance strongly predicted spiritual well-being, but there was no relationship between these dimensions and spiritual well-being for men. Findings suggest social support is crucial to transplant patients' quality-of-life.

## ROLE OF DMI3 SPLICE VARIANTS DURING SYMBIOSIS

Morgan Walcheck, Pierre-Marc Delaux (Mentor), Agronomy

The goal of the DMI3 project is to determine the role of three different splice variants of DMI3, a plant gene required for symbiotic association between legumes and the nitrogen fixing bacteria called rhizobia during symbiosis. A splice variant is different variations of one type of gene, which in this case is DMI3. The different splice variants were cloned in a vector that allows expression in plants.. Then a *Medicago truncatula* root transformation was performed. In the future, the transformed plants will be compared to the control plants to see how the symbiotic association was affected. Although it will take many years, when all of the components of signaling pathways in legume nodulation are found, it will be able to be applied to other families of plants, such as corn. This would help the plants fertilize themselves, lowering costs, sustainability and eliminating some pollution.

## SERUM COMPLEMENT ACTIVITY IN PCB-126 EXPOSED NORTHERN LEOPARD FROGS

Jacquelyn Walejko, William Karasov (Mentor), Forest and Wildlife Ecology

Polychlorinated biphenyls (PCBs) were once used as flame-retardants and coolant fluids in transformers and capacitors. Due to their prevalent nature, PCBs are still present in the environment today and are one toxicant affecting northern leopard frogs. PCBs may modulate the immune function of frogs, leaving them more susceptible to pathogens. One aspect of immune function that may be diminished by toxicant exposure is the serum complement system of innate immunity. To measure PCB effects on complement activity, we used a hemolysis assay with rabbit RBCs and the serum of exposed and control frogs. We expect to see an increased amount of hemolysis in control frogs compared to frogs exposed to PCB-126. This would show that the complement system is compromised in frogs exposed to PCB-126.

## DISTRIBUTION OF DENDRITIC CELLS IN THE INFLAMED MURINE BRAIN

Alec Walker, Zsuzsanna Fabry (Mentor), Pathology and Laboratory Medicine

Multiple sclerosis (MS) is hallmarked by T-cell mediated demyelination of the central nervous system (CNS). While largely absent from the healthy CNS, blood-emigrant dendritic cells (DCs) are necessary for the recruitment of encephalitogenic T-cells. Here, we measured the accumulation of fluorescently labeled DCs and T-cells in the brains of mice affected with experimental autoimmune encephalomyelitis (EAE)-a well-studied model of MS. We have employed complimentary techniques of flow cytometry and fluorescent microscopy to determine the cell number and localization of DCs, respectively. Preliminary data suggest that DCs and T-cells accumulate markedly in the olfactory bulb and cerebellum during early EAE. Further analyses will assess where and when CNS-infiltrating DCs and T-cells first interact. These studies could inform therapies targeting DC migration in MS patients.

## YMA FASHION SCHOLARSHIP FUND PROJECT

Daniel Walker, Jennifer Angus (Mentor), Textile and Apparel Design

The YMA Fashion Scholarship Fund asked its 2013 scholars to read a case study and present a resolution. This year's case study asked each participant to analyze a flash sale website and create a permanent "tween" line to be sold by the company during spring 2014. When developing the tween line, I was responsible for creating and illustrating eight tween girl garments, developing marketing strategies, making prints and color ways, predicting fashion trends and designing labels and logos. The project was ten pages of fashion illustrations, research papers and inspiration boards.

## STUDY OF THE DYNAMICS OF THE LUNAR ATMOSPHERE AND TAIL

Nick Walter, Edwin Mierkiewicz (Mentor), Physics

Although considered to be in a near perfect vacuum, the Moon does possess a thin and dynamically changing atmosphere. Due to the Moon's low gravity and the radiation pressure from the Sun, its atmosphere is constantly being shed, forming a lunar tail. The purpose of this project is to study the dynamics of the lunar atmosphere and tail by observing changes in the lunar sodium spectrum. We used a Dual Etalon Fabry-Perot Spectrometer connected to the McMath-Pierce Solar Telescope at Kitt Peak National Observatory to obtain highly precise measurements of the sodium emission line width and velocity shift for various positions about the Moon. My involvement was primarily focused on retrieving these parameters from the raw data by calibrating and fitting the sodium spectra.

## SWELLING INDEX TEST AND FLUID LOSS TEST

Liangquan Wang, Jiannan Chen (Mentor), Geological Engineering

The objective of this project is to show that the GCLs have similar compatibility with conventional and bioreactor leachates, and that the composite liners with GCLs are equally effective. To achieve the goal, we conducted the following experiments: 1. Setting up swelling index tests with the synthetic solutions to simulate the chemical environment in CCPs disposals; swelling indices are indicators of the GCLs' permeability, and these indices have negative correlation with the permeability, i.e. the greater the swelling indices, the lower the permeability, and vice versa. 2. Setting up fluid loss tests?the purpose of this test is to correlate it with swelling index tests and the hydraulic conductivity tests. Fluid loss tests readings have positive correlation with permeability, i.e. high fluid loss corresponds to high permeability and low swelling index, and vice versa. 3. Repeating all these tests with DI water to see the changes.

## IMPLICIT LANGUAGE LEARNING: THE MALLEABILITY OF ADULT GRAMMAR

Rachel Wang, Maryellen Macdonald (Mentor), Psychology

It is a mystery why children easily acquire language but adults struggle everyday in foreign language classes. This study investigates how adults can learn new uses of familiar English verbs, similar to what a learner of English must do to figure out in which situations he/she can use a verb appropriately. By giving adults experience with sentences that are normally ungrammatical in English, we test the effect of short exposure to new language uses. We found that participants were able to learn one type of ungrammatical construction but not the other. The learned construction was more salient, suggesting that in foreign language learning, salient features are more easily learned while features that are similar to their first language are subtler and harder to learn.

## CROSSROADS

Xin Wang, Karen McShane-Hellenbrand (Mentor), Dance

Performance Workshop Art Statement Student Choreographer: Xin Wang Performers: Xin Wang, Meng-Shin Liu Mentor: Karen McShane-Hellenbrand I am a university special student pursuing a Dance Certificate in the Dance Department. I have been studying Chinese dance for more than 10 years, and started taking Contemporary dance classes with UW dance department in Fall 2011 and I continue to do so. I am currently taking Contemporary technique with Chris Walker and Collette Steward. In my Contemporary dance technique classes, I am greatly inspired by the diversity of style, by the big range of movements, by the wide scope of space, as well as the freedom of the dance form. Many materials presented in classes remind me of certain elements imbedded in contemporary Chinese dance, such as spirals, contractions, body curves, and suspension/ release. I am very inspired to combine Contemporary technique materials learned, through my UW classes, with those like Chinese dance elements. My dance choreography will consist of 2-3 dancers. It's tentatively named "Crossroads". The idea is about uncertainty, exploration, examination into the past, outlook into the future, and above all - hope. The theme comes up as I reflect on our time: a time of information explosion, a time yearning for scientific breakthrough, a time of international integration as well as cultural diversity. It is easy for an individual to find oneself at crossroads. I hope to inspire the thought process - How do we define ourselves? How do we make a choice? Where do we draw strength? If we fall, how do we recover? I am excited to create a piece that embraces contemporary Chinese dance and Contemporary dance to express both their diversity and similarity using crossroads as a theme.

## DICHOTOMY

Kathleen Warner, Chiao-Ping Li (Mentor), Dance

As an undergraduate dance major I have performed choreography created by two different methods: music visualization, and movement created independently of music. I plan to choreograph a dance for four dancers that is made using both methods to see how the different outcomes compare within one choreographic piece. I will begin with the "movement" section, and then create the "musical" section, potentially incorporating some of the movement themes that I created without music. Both sections will be danced to music, and will be framed by a beginning and ending for cohesion. I don't intend for it to be overtly obvious to the viewer which section was created by which method. I hope that the final choreography is enjoyable to watch.

## CHEMTEACHER

Samantha Warnes, John Moore (Mentor), Chemistry

In a world where time is precious and professionals have a heavy pack of responsibilities, there is a need for educational resources to be provided with simple accessibility. This is why ChemTeacher was created. ChemTeacher is an educational website geared toward helping secondary teachers (including substitutes) utilize our multi-media world in a way to educate students. Content is presenting in a clear format and can be adjusted for varying levels of study; general science to advanced placement. Demonstrations were sought, tested, and adjusted to be more effective. The content was combined in a custom web site, using the Joomla! content management system as a framework. This project facilitates the access of teachers to quality resources in order to improve the students' learning experience.

## A NOVEL APPROACH TO MITIGATING BALLAST FOULING AND ENHANCING RAIL FREIGHT CAPACITY

Benjamin Warren, James Tinjum (Mentor), Civil And Environmental Engineering

Traffic on Class 1 railroads has increased 93% from 1980 to 2008. Under increased freight loads and speeds, the need for rapidly escalating maintenance has been pronounced. Railroad ballast degrades under cyclic loading cycles and fines (fouling) are generated, which weakens the rail substructure. Fouled ballast shows significant amounts of accumulated plastic strain during cyclic loading when compared to untreated ballast. An approach was developed at UW-Madison of injecting rigid polyurethane foam (RPF) into the ballast layer for reinforcement. Limited results from fouled ballast in combination with RPF have shown that there was a large reduction of accumulated plastic strain in comparison to untreated fouled ballast. Further benefits of using RPF in fouled ballast include stabilization of fines and forming an impervious geocomposite where water cannot infiltrate and degrade track performance.

## LOCALIZATION OF INTERNALIN MUTANTS IN LISTERIA MONOCYTOGENES INFECTED PLACENTAL AND DECIDUAL TISSUE

Elizabeth Weber, Thaddeus Golos (Mentor), Comparative Biosciences

Infection during pregnancy with the facultative gram positive bacterium *Listeria monocytogenes* has been linked to severe consequences affecting the fetus, including miscarriage and preterm birth. A previous study has investigated the temporal dimension of infection at the mother-fetus interface in the nonhuman primate to better understand these adverse pregnancy outcomes. Placental and decidual tissues from rhesus monkeys were surgically collected and infected with *Listeria*. Placenta, extravillous trophoblasts and decidua were targets of infection. The current study aims to extend these preliminary results to include the presence and location of *Listeria*, internalin A and B mutant strains, in the tissue fragments collected at 24 hours. The tissues will be histologically analyzed after being sectioned and gram stained. Results will indicate the bacterial proteins that mediate infection.

## CHILDREN OF INCARCERATED PARENTS: ADJUSTMENT TO SEPARATION

Serena Wegner, Julie Poehlmann (Mentor), Human Development and Family Studies

This research examines a child's adjustment to parental separation due to the parent's incarceration. The research involves examination of qualitative interviews performed during Dr. Julie Poehlmann's ongoing research on children of incarcerated parents. This research seeks to understand the consistencies and inconsistencies between the jailed parent and the caregiver's view of the child's adjustment to separation. Qualitative interviews were administered to the incarcerated parent and to the caregiver. Data were collected from 26 jailed parent interviews and 26 caregiver interviews. This research focuses on their response to the question, "How has the child adjusted to the separation? At First? Now?" This research contributes to the knowledge on children of incarcerated parents and provides a better understanding of the differing perspectives between jailed parent and caregiver.

## FACING EMPATHY AT THE EXTREMES: READING LÉVINAS WITH BELOVED, THE READER AND DISGRACE

Hannah Weinberg-Kinsey, Theresa Kelley (Mentor), English

Meet Sethe: She killed her daughter. Meet Hanna Schmitz: She chose who lived and died in concentration camps. Meet David Lurie: He raped a student in his literature course. In a digital clip, I will remediate my argument from my Senior Honors Thesis that unpacks how Toni Morrison's *Beloved*, Bernhard Schlink's *The Reader*, and J.M. Coetzee's *Disgrace*, create empathy for those to whom it seems impossible. Meet each character and then enter the mental space of the imagination which realizes the contingency of truth and expects no reciprocity.

## THE ROLE OF TCF19 IN THE PANCREATIC BETA-CELL AND DIABETES

Amy Whillock, Dawn Davis (Mentor), Medicine

Insulin is necessary for transporting glucose from the blood into the cells and is produced by the beta-cells in the pancreas. In diabetics, reduced numbers of functional beta-cells lead to insufficient insulin production, resulting in high blood glucose. Tcf19 is a new factor and may play a role regulating the growth of the beta-cell. We have demonstrated that knockdown of Tcf19 expression in beta-cells leads to reduced cell growth. We will examine the protein interactions of Tcf19 and its specific role in beta-cell growth. We will pull down Tcf19 using an antibody to identify its binding partners. The results of this experiment will clarify the role of Tcf19 in beta-cell growth, and could help identify a new therapeutic target to help treat or cure diabetes.

## MECHANOSENSORY STIMULUS CALIBRATION DEVICE

Nikala Wickstrom, Elliot Eklund, Michael Hammer (Mentor), Surgery

We use an endoscopic stimulus delivery method in ongoing mechanosensory detection experiments. The air pressure output of this endoscopic method is well documented. However, the precise spatial extent of the air pressure stimulus remains unknown. Therefore, we designed a specific calibration device for this purpose. Our goal is to measure the spatial extent and rate at which pressure dissipates from the midpoint of the stimulus. The device includes a pressure sensor mounted to a stage capable of moving in three spatial dimensions to precisely control the sensor's location relative to the endoscope. This device and the resulting data will enable us to better understand the precise temporal and spatial distribution of the air pressure stimulus used in mechanosensory detection experiments.



## PHOTOCATALYTIC ALPHA-AMINO RADICAL ADDITION TO MICHAEL ACCEPTORS

Eric Wiensch, Tehshik Yoon (Mentor), Chemistry

The functionalization of N-aryl tetrahydroisoquinolines via a Michael Addition reaction was efficiently conducted through formation of an alpha-amino radical by utilizing a photocatalyst and further enhanced in the presence of a Bronsted acid co-catalyst.

## CORRELATION BETWEEN CANCER AND THE EXTRA-CELLULAR MATRIX (ECM)

Brandon Wiley, Paul Campagnola (Mentor), Engineering

Understanding the interactions between the cancer cells and extracellular matrix (ECM) will help gain the insight into the dynamics of cancer metastasis. In our approach, multi-component proteins such as laminin (LN) and collagen are photo-cross-linked to simulate the natural ECM by two-photon excited (TPE) photochemistry. The cell migration speeds of four ovarian cancer cells: HEY, OVCAR, SKOV and IOSE on gradient concentrations of LN lines fabricated by TPE are measured. It is found that OVCAR, SKOV and IOSE have the tendency migrate from low to high concentration of LN while Hey does not show such tendencies. Further, the cell migration speeds of gradient regions are faster than the regions of uniform concentration. Our results suggest the TPE fabricated microstructure can serve as a new platform to study the fundamental interaction between cell and matrix.

## POST-BRONZE AGE CERAMICS AT TROY

Tasia Williams, William Aylward (Mentor), Classics

From 700 BCE to 500 CE, the ancient city of Troy was under the influence of the Hellenistic, Roman, and Byzantine cultures. Archaeologists have focused on imported ceramic ware from this time period but have largely ignored the locally made pottery. Dr. Penelope Mountjoy showed that local Trojan pottery made during the Mycenaean era contained gold and silver mica inclusions. These types of mica could have only originated in western Turkey, proving that the ceramics were made locally. This summer, the author will examine the pottery found at Troy. It is expected that the local pottery from the Post-Bronze Age era should also contain gold and silver mica. By examining these ceramics, conclusions about the technology, trade, and culture of the Trojans can be examined.

## ANALYZING AND LOWERING THE PREVALENCE OF VENTILATOR ASSOCIATED PNEUMONIA IN THE TLC

Vaughn Williams, Nasia Safdar (Mentor), Infectious Disease

The purpose of this experiment is to analyze the correlation of characteristics of patient's rooms in the Trauma and Life Support Center (TLC) at the UW Hospital and the prevalence of Ventilator Associated Pneumonia (VAP) in the TLC. Between July 2011 and July 2012, VAP treatment cost the TLC \$1.6 million in avoidable costs. As the data collector, I take quantitative and qualitative data on the room such as the head of bed, oral care and inline maintenance. This project is currently still going but we expect to find the cases of patients with VAP also statistically have evidence of improper care. From the findings of this research project, we should find effective solutions to continue to lower the prevalence of VAP in the TLC.

## ENTRAPMENT — OIL PAINTING SERIES

Ella Williquette, Ellen Siebers (Mentor), Art

This tryptic displays different forms of physical entrapments, which represent the human tendency to emotionally and spiritually trap ourselves. These symbolic entrapments (routine, negative feelings, jealousy, etc.) keep us from connecting with a divine presence and being a part of a purpose bigger than our own self. In the paintings I use a strong illusionistic perspective, high contrast, and a buildup of paint to create tension between three-dimensional illusionistic images and flattened ambiguous spaces which relates to the concept of the work. The intent of these paintings is to create an awareness of the spiritual world, our life in the absence of it and to inspire a desire to investigate the truth in the Bible, in order to find freedom from entrapment.

## COMMON PATHWAY OF ENHANCED LONGEVITY IN MICE

Lauren Willoughby, Rozalyn Anderson (Mentor), Medicine

Caloric restriction (CR) is a dietary intervention shown to delay aging and extend lifespan. CR dramatically impacts adipose tissue metabolism and gene expression, including factors that regulate systemic metabolism and inflammation. Rapamycin, an inhibitor of the nutrient sensitive growth regulator mTOR (mechanistic target of rapamycin), has been shown to positively impact longevity. We hypothesize that rapamycin and CR share a common pathway. Western blot detection in protein extracts confirms that key factors regulated by CR in adipose tissue are also regulated by long-term treatment with rapamycin. These factors are linked to the regulation of metabolism and include AKT, GSK3b, and the transcriptional coactivator PGC-1a. These data suggest that metabolic adaptation of adipose tissue is common to both methods of enhanced longevity.

## ANNA KOMNENE'S SELF-CREATED IDENTITY

Chelsey Wilson, Leonora Neville (Mentor), History

Anne Komnene, a 12th century Byzantine princess, wrote the *Alexiad* chronicling the reign of her father, Alexius I. Throughout her work, Anna created parallels between herself, her mother Irene Komnene, and her grandmother, Anna Dalassene in a way to depict them as the ideal Byzantine women. Anna genuinely believed that all three women were examples of the ideal Byzantine woman, but Anna recognized that each woman engaged in activities that could be seen negatively by contemporaries. To conceal these negative actions, Anna over-emphasized the piety and familial devotion associated with all three women. This eclipses the women's negative actions and solidifies them as ideal Byzantine women. Anna's self-created identity as the ideal Byzantine woman calls into question her role as a feminist.

## THE EVOLUTION OF A LITERARY TYPE: FROM BYRONIC HERO TO VAMPIRE

Katherine Winiecki, Tomislav Longinovic (Mentor),  
Department of Slavic Languages and Literature

The figure of the vampire has become a fixture in literature and film, usurping the role of the Byronic hero as an embodiment of Romantic ideals. My research has focused on the reason behind the shift and its reflection upon societal values and mores. In the process of becoming a romantic archetype, the demon of folklore underwent a domestication through which it was mollified, eroticized, and humanized. This new vampire not only more articulately encapsulates Byronic principles, but serves as a testament to our collectively repressed desires in the Victorian Era as well as the present day.

## THE PROS AND CONS OF NEPOTISM

Allison Wodicka, Josh Flax, Debra Holschuh-Houden (Mentor),  
UW Family Business Center

Nepotism has many negative connotations, and it is rarely discussed in a positive light. When it comes to a family owned business nepotism often keeps a business running and with the same values and business goals as previous management. This paper will explore the pros and cons of nepotism in managing a family business, and whether it is helpful to the success of a business in the long run. Specifically, this paper will delve into what effects the family dynamic has on the business and to the other employees. Through interviews, case studies, and outside research this study will uncover what is more effective, keeping management inside the family, contracting out to new management or a combination of the two.

## HMONG EDUCATED PARENTS AND THEIR SUPPORT FOR THEIR CHILDREN IN HIGHER EDUCATION

Maimoua Xiong, Alberta Gloria (Mentor), Counseling Psychology

Since the 1970s, the Hmong have made drastic changes in the United States, however, generally speaking, they continue to be the least educated as more than thirty percent hold a high school degree and about three percent have obtained as far as a graduate or professional degree (Census, 2010). In addition, many of the Hmong in the U.S. have had opportunities to a better education compared to many in other countries. Though the opportunity to go on to college has been rewarding, it has also become a struggle as Hmong students face barriers with little academic support provided from parents (Thao, 2009). Despite these barriers, experiences may differ among each Hmong individual, varying on the family background and history. The researcher believes that an understanding of Hmong parents who are educated can contribute to the successes and self-efficacy of their child in college. Research has found that Hmong parents are unaware of the resources and opportunities offered on their child's campus, influencing their role in supporting their child in college differently (Her et al, 2010). More importantly, Hmong parents support also differed based on their educational background. This is a qualitative and preliminary study examining two sets of Hmong parents and one Hmong mother. The research focuses extensively on Hmong educated parents and how they provide support to their child(ren) in college. The researcher developed interview questions based on the psychosocialcultural (PSC) model. Interviews were conducted and analyzed to identify emergent themes.

## IDENTIFYING GENETIC FACTORS THAT CONTRIBUTE TO AGING IN THE EYE

James Xu, Akihiro Ikeda (Mentor), Medical Genetics

While scientific knowledge of aging processes in the brain and related organs has progressed throughout the years, research has yet to provide complete understanding of the aging mechanisms of the neural systems. Here, using the retina, one of the most structurally organized neural structures as a model, we look for the genetic differences between two strains of mice that cause differences in the aging process. Two chromosomal areas where genetic differences may be causing more significant aging have been identified. Our research goal is to understand what kind of genes are involved in this aging process and how they are involved. This novel information will enhance general understanding of aging processes and may lead to potential clinical applications.

## IDENTIFYING NON-HOST CHARACTERISTICS THROUGH ARABIDOPSIS-NEMATODE INTERACTION

Amy Yan, Andrew Bent (Mentor), Plant Pathology

Cyst nematodes are parasitic pathogens that exploit their host for nutrients through the creation of a nematode feeding site (NFS). Soybean cyst nematode (SCN), or *Heterodera glycines*, is the most damaging pathogen of U.S. soybean crops. Scientists seek to develop new cultivars that improve soybean resistance to SCN. One of the most commonly used models for plant research, *Arabidopsis thaliana*, is a host for *Heterodera schachtii* (BCN) but is a non-host for SCN. The exact cause of this difference in host range is still under investigation; previous studies have suggested a possible lack of communication between SCN and *Arabidopsis*, or a rigorous host defense response. Published data also suggest that auxin manipulation by the nematode is crucial to the creation of its NFS. We propose to test *Arabidopsis* mutants with defects in known antimicrobial or anti-insect defense pathways, to see if these impact BCN or SCN infections. Additionally, GUS staining will be used to reveal possible distinctions in SCN and BCN's ability to manipulate auxin levels in the host. Our goal is to identify plant mechanisms that control SCN host range so that it may become possible to apply these non-host characteristics to soybean.

## YOUNG HMONG AMERICAN WOMEN'S BELIEFS ABOUT MENTAL ILLNESS

Palee Yang, Earlise Ward (Mentor), Nursing

Hmong refugees are among approximately two million Southeast Asians who have resettled in the United States in the past 37 years. Although it has been decades since the Hmong have resettled, there is a lack in research regarding mental illness among this ethnic group. Post-migration, many Hmong families experienced difficulties associated with acculturation, poor English literacy skills, inadequate work skills, and heavy reliance on public assistance. Furthermore, many refugee parents held strong traditional beliefs regarding family orientation, marriage, gender role, child-bearing, healthcare decisions, as well as beliefs regarding physical illness and mental health. Hmong children growing up in both traditional Hmong and American cultures often face conflicting challenges in cultural identity which affect their mental health. It is important to assess how Hmong young adults perceive mental illness as it relates to bi-cultural health beliefs and practices. This research will address the following: 1) What are the thoughts, beliefs, and opinions regarding emotional problems or mental illness among Hmong young adults, and 2) What are Hmong young adults' coping behaviors in response to emotional problems or mental illness? This study will use a focus group design and will be conducted with 8-10 Hmong young adults between the ages of 18 to 25. Recruitment will involve using social media and printed flyers. The data analysis plan will involve transcribing the focus group discussion results. The transcripts will then be analyzed to identify themes related to perceptions of mental illness and coping behaviors. The knowledge gained from this research has potential to inform future research pertaining to health beliefs and mental health interventions for Hmong young adults.

## CELLULAR DECISION MAKING PROJECT

Yang Yang, Amir Assadi (Mentor), Mathematics

Cellular decision-making is the process that cells assume different, functionally important and heritable fates while an associated genetic or environmental condition keeps the same. It is considered as one of three key developments at various scales of biological organization. The deep understanding of cellular decision-making will improve the personalized medicine and other healthcare advances, such as the treatment of cancer. In order to explore more about the cellular decision-making, we collected more than 50,000 gene data points. Based on to our microarray data, our main goal is to find a significant relationship between genes and the process of differentiation. The second interest is to find the interactions among these genes. However, not all genes in the dataset are significant. Thus, we first use Gene Selection process to reduce the dimension. The main strategy for that is to use chaos theory to find genes that demonstrate the same expression rate in different trials of an experiment at the same time points. By that method, we selected ten genes that exhibit steady expression across all the time points. The second step is to use Bayesian inference so that we can derive the structure and likelihood of the genes regulatory network. Since we successfully detected different decision-making genes, the next step is to find and classify different varieties of decision-making processes and verify them.

## VALUE AND ART: NIETZSCHE'S ANSWER TO NIHILISM

Jingcai Ying, Richard Avramenko (Mentor), Political Science

To Nietzsche, humanity as a whole still lacks meaning and thus remains nihilistic. Although he himself and others tend to see him as a pioneering philosopher who smashes old, decadent values, my research suggests that Nietzsche is more than an iconoclast. By contending how art could play a crucial role in formulating new values, Nietzsche shows us what constitutes meaningful values (and what does not) for a race of higher and nobler human beings.

## THE MOLECULE PDE4B AND INTESTINAL FIELD CANCERIZATION: CAUSE VS. EFFECT

Lindsay Young, William Dove (Mentor), Oncology

Colorectal cancer is one of the most common and deadly cancers in the U.S. It has been a model for classic theories of tumorigenesis, but recent evidence suggests that intestinal and other epithelial cancers are preceded by a 'field cancerization effect' long before neoplasias form. A field effect is characterized by contiguous areas of tissue that are morphologically normal but possess pre-neoplastic molecular changes. The physiological role of molecules that characterize a field effect have not yet been clearly identified. This lab has identified a phosphodiesterase, PDE4B, to be upregulated 2.5 fold in epithelial tissue surrounding intestinal tumors in C57BL/6J Min mice, a murine model of intestinal cancer. A C57BL/6 mouse, heterozygous for a knockout allele of *Pde4b* will be obtained from UC-Davis and bred to C57BL/6J Min mice to produce an F2 generation. The Min cancer phenotype will be observed in this F2 generation and tumor counts and size measurements will be statistically compared between genetic classes to test whether PDE4B affects the development or maintenance of tumors. Characterizing the biology of the field effect and identifying biomarkers of this phenomenon have strong implications for cancer research and diagnosis and treatment of epithelial cancers.

## NONSENSE-MEDIATED MRNA DECAY TARGETING IN THE *S. CEREVISIAE* MSH4 GENE

Bethany Zeitler, Michael Culbertson (Mentor), Genetics

Nonsense-mediated mRNA decay (NMD) is a mechanism of post-transcriptional gene regulation that targets select mRNAs for degradation by termination of translated upstream open reading frames or out-of-frame translation initiation followed by termination. NMD is also triggered by the 3'-untranslated regions (3'-UTRs) of some mRNAs. The molecular basis of 3'UTR-targeting is currently unknown. We have shown that the 3'-UTR of the *MSH4* gene in *Saccharomyces cerevisiae* targets a transcript produced by a CUP1-GFP-*MSH4*-3'UTR fusion for degradation by NMD. Between two transcripts of unequal length that are produced from the fusion gene, the longer transcript that is extended at the 3'-end is degraded by NMD. We will test the hypothesis that NMD targets the longer transcript for degradation by recognizing the normal stop codon as premature.

## TONE PERCEPTION IN NATURAL MANDARIN SPEECH BY 6- TO 8-MONTH-OLD ENGLISH INFANTS

Yayun Zhang, Jenny Saffran (Mentor), Psychology

Seventy percent of the world's languages are tonal languages: pitch height and pitch contour are integral features of word meaning. However, infant speech perception research has typically focused on the phonetic properties (e.g. consonants and vowels) of speech sounds in non-tonal languages, such as English. Tone perception studies have shown that young English-learning infants can discriminate Thai tone types as well as nonlinguistic tone sequences by rapidly capturing statistical properties of the input language. However, no previous studies have focused on how English-learning infants learn words from natural tonal speech. Therefore, the present experiment is designed to investigate whether short-term exposure to natural Mandarin (tonal language) speech can modulate infants' sensitivity to the lexical tone features embedded in the language. It is hypothesized that 7- to 8.5-month-old English learning infants are able to segment Mandarin words embedded in natural speech and they can treat words with different tones as different from one another.

## INVESTIGATING THE HOFMEISTER INTERACTIONS BETWEEN SALTS AND DNA DOUBLE HELIX

Yurun Zhang, M. Thomas Record (Mentor), Chemistry

Salts interact differently with and affect the solubility of the charged biopolymers at different concentrations. At high salt concentrations, the Hofmeister interaction of salts and DNA double helix has a dominant influence. Although it has been found that salts can destabilize DNA at high concentrations, the Hofmeister interactions between salt and different DNA surfaces are still unclear. I performed a two-phase partitioning assay and a 12bp DNA hairpin melting experiment to investigate the specific interactions between Hofmeister salts and DNA double helix. Results show that Na<sub>2</sub>SO<sub>4</sub> interacts unfavorably with DNA bases, and other salts could interact either favorably or unfavorably. In melting experiment, all salts have destabilizing effects on 12bp DNA hairpin helix formation. The results from both studies provide important information for future research.



## MULTIPLE INSTANCE LEARNING TO DETECT REGULATORY ELEMENTS ACTIVE IN STEM CELL DIFFERENTIATION

Matthew Ziegler, Mark Craven (Mentor), Biostatistics and Medical Informatics

The identification of regulatory relationships among genes is an important and challenging part of genetics and developmental biology research, and can help us understand the mechanisms behind cell type differentiation. We are working to develop a supervised learning algorithm to identify regulatory elements at work during differentiation of embryonic stem cells into mesendoderm, mesenchymal stem cells, neural progenitor cells, trophoblasts, and fetal lung fibroblasts. Using computational predictions of enhancer regions and transcription factor binding sites, we hope to find combinations of transcription factor binding sites that are overrepresented in genes that have differential expression between the cell types in question, using a multiple instance learning framework.

## PRAGMATIC COMMUNICATION SKILLS AND EMPLOYMENT AFTER BRAIN INJURY

Alyssa Zillner, Lyn Turkstra (Mentor), Communication Sciences and Disorders

Individuals with a traumatic brain injury (TBI) have difficulties communicating with other people, particularly in social situations, and also have a very low rate of return to employment after injury. It is likely that these two aspects of outcome are related, but the connection of poor communication skills to successful return to work has not been directly studied. The aim of the present study is to identify specific pragmatic communication skills that differentiate employed vs. unemployed adults with TBI. Results of this study will help both in development of appropriate therapies and also in matching individuals with TBI with the best type of employment.

## CHILDREN'S SOCIAL CATEGORY-BASED FOOD SELECTIONS

Kat Zimmerman, Ashley Jordan (Mentor), Psychology

The presence of obesity in children and adolescents has increased significantly in recent decades (Styne, 2001). Understanding how kids make food choices may help slow or reverse this trend. Previous research suggests that children align their food preferences with same-gender, peer models, while the gender of an adult model may have no effect (Frazier, Gelman, Kaciroti, Russell and Lumeng, 2012). The present study explores the salience of an adult informant's gender, and their reaction (positive, negative) to a particular snack. Children, ages 3-6, are shown videos of two adults, one male and one female, expressing differing opinions of foods. Kids are then asked which snack they want to try. This study's findings are applicable to successfully introducing new, healthy foods to children.

## COMPARISON OF TRANSGENIC VERSUS NON-TRANSGENIC POLLEN VIABILITY IN ALFALFA UNDER DIFFERING TEMPERATURES

Ross Ziobro, Johanne Brunet (Mentor), Entomology

The effects of transgenic out crossing (the spread of genes from a genetically engineered organism) to non-transgenic plant populations are a current topic of debate among agriculturalists. Hybrids of transgenic and non-transgenic parents may out-compete individuals of the same population who do not possess the transgenic gene. Pollen viability is one factor that affects the potential for outcrossing of the transgenic “Roundup Ready” alfalfa. In this study, we compared the pollen viability of transgenic and non-transgenic alfalfa under different temperature regimes meant to simulate conditions where alfalfa is commonly planted. The results of this experiment will determine whether pollen from “Roundup Ready” alfalfa is more viable than non-transgenic alfalfa under some conditions and therefore may be more likely to out cross over longer distances.

## TELL EL-HESI DATABASE

Danielle Zwang, Jeffrey Blakely (Mentor), Hebrew and Semitic Studies

The archaeological site of Tell el-Hesi, located in the modern-day Israeli city Qiryat Gat, was the focus of a research project sponsored by the American Schools of Oriental Research during the 1970s. This project emphasized the excavation in two areas of the site: the acropolis and its surrounding area, and the Early Bronze III wall system of the lower city. In order to gain a better understanding of the artifacts recovered, the goal of this project is creating a database system that will record all information pertaining to this site. Specifically, I will be recording information pertaining to beads that were recovered from the site during this eight year timespan. To accomplish this goal, information from old databases will be complied with material from field notes and my own additional research into an Access database file. Afterwards, I will be doing a stylistic analysis of all non-mineral beads.

## OSCILLATORY HYDRAULIC TOMOGRAPHY

William Zweifel, Michael Cardiff (Mentor), Geoscience

Our research focuses on the use of Oscillatory Hydraulic Tomography as a method of characterizing groundwater aquifers. The study aims to refine and research the use of the technique at a laboratory scale via multiple testing methods. A laboratory aquifer will be constructed for the purpose of validating oscillatory hydraulic tomography and associated mathematical theories and models at both the laboratory scale and field level scale. Three important questions will be answered: How do the mathematical concepts and models hold up to an upscaled field test? What can we determine through our observation of the oscillatory signals? What is the affect of anomalies such as air bubbles or energy loss due to changes in friction as the grains of porous media rearrange themselves?

## ASSOCIATIONS BETWEEN MATERNAL MENTAL HEALTH, PARENTING STRESS, AND CHILD EXECUTIVE FUNCTION

Annisia Zynda, Janean Dilworth-bart (Mentor), School of Human Ecology

Executive Function ((EF) comprised of inhibitory control, attentional control, and working memory) is necessary for school-readiness. Studies have shown a correlation between mother mental health and its affect on her child. This study examined relationships between maternal mental health and the executive function skills of preschoolers aged 4.5 to 5.5 years old ( $N = 49$ ). Mothers completed the State-Trait Anxiety Inventory, the Centers for Epidemiology Study-Depression Scale, and the Parenting Stress Index. Children's executive function skills were directly assessed using measures of inhibitory control, attention shifting, and working memory. Analyses revealed that maternal depressive symptoms and children's inhibitory control were marginally negatively correlated and girls displayed lower impulsivity than boys.

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