

ABSTRACTS 2014



Undergraduate Symposium

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service-learning



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Abstracts and Art Statements

University of Wisconsin–Madison

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THE SHORT AND DIFFICULT LIFE OF WALES' DEVOLVED GOVERNMENT: WAS IT ALWAYS A LEGITIMATE INSTITUTION?

Lucille Abrams, Yoshiko Herrera (Mentor), Political Science

The construction of the regional, or devolved, government of Wales, as well as its corresponding governing body, the National Assembly for Wales, was a protracted process. Through library research, I sought to find the reasons for this difficulty and ask if Welsh citizens believed the Assembly to be a valid, or legitimate, political institution. The political history of the United Kingdom, Wales' individual history, and analysis of voter turnout at the first Assembly election, contribute to answering this question. The Assembly did not suffer from a lack of legitimacy but from an apathetic and alienated constituency. This apathy is widespread among the United Kingdom today, and changes must be made to British politics to keep Wales' difficulties from reoccurring in other policy initiatives.

POLITICAL HUMOR ON TWITTER

Kyle Acevedo, David Lassen (Mentor), Political Science

Twitter is an ever-growing social network that is popular in our cultural. It is being used for news, sports, or what my research is focused on, political humor. The objectives of this research project include trying to figure out how political content and humor on twitter are directly related. Also to see how these compare to humor that is not politically related. To help distinguish between these we code tweets on a University of Wisconsin–Madison survey platform. This survey contains specific questions to help us categorize tweets; into two main groups political and non-political. We are coding tweets from not only government officials, but also the public. With this research we are trying to understand how people are getting news, specifically, political news.

CHARACTERIZATION OF IRX4+ CARDIAC PROGENITORS

Luke Adesso, Daryl Nelson (Mentor), Cell and Regenerative Biology

Regenerative cell therapy has emerged as a possible remedy for the damage inflicted by myocardial infarction (MI). One form of cell therapy entails the use of cardiac progenitors, which demonstrate the cardiac-specific potency necessary to adequately replenish the infarcted myocardium. The purpose of the experiment is to identify a cardiac progenitor population that exhibits ventricular-specific potency, and to determine whether Irx4 serves a genetic marker for the elucidation of this specified cell type. Progenitors that expressed Irx4 were purified from a culture of differentiating mouse embryonic stem cells (mESCs). The purified Irx4+ cells displayed the proliferative capacity and potency necessary to be classified as cardiac progenitors. Progeny generated from the differentiated Irx4+ progenitors include the following: endothelial cells, smooth muscle cells, and ventricular myocytes.

ANALYSIS OF CO-CULTURE DERIVED NATURAL PRODUCT

Srikar Adibhatla, Navid Adnani (Mentor), Pharmaceutical Sciences

Our lab has identified a novel antibiotic produced by co-cultivation of a *Micromonospora* sp. with a *Rhodococcus* sp. interestingly, the compound is not produced when either is grown in monoculture. We aim to identify if cellular contact of the two bacteria is necessary for biosynthesis of the novel antibiotic. To test this, we will modify 24-well culture plates to include porous membrane that will allow movement of small molecules between the two cultures, but not bacterial cells. To detect whether the novel antibiotic is produced in wells with and without the cellular contact, we will perform a disc diffusion assay of the culture extract against *B. subtilis*. This study will help better understand the culture conditions necessary for the production of the antibiotic in co-culture.

DIVINE ATTRIBUTES: EXPLORING THE NATURE OF GOD

Hiwot Adilow, Jesse Steinberg (Mentor), Philosophy

What type of characteristics do we believe are essential in a Divine Being? Through researching various religions and their descriptions of the Divine, or God, we are able to come closer to answering this question and posing others. When defining and describing God, what do various religions have in common? What about the Divine's makeup informs a believer's dedication to their Faith? Finally, what philosophical and scientific evidence supports those beliefs about the Divine and the believer's faith in Them? The goal of this research is not to find the "right" religion, but to contribute to dialogue around the commonalities and differences between Divine attributes in various religions and presenting the arguments and questions associated with each belief in a Philosophy of Religion book.

PERCEIVING FRACTION MAGNITUDES

Harim Ahn, Percival Matthews (Mentor), Educational Psychology

The purpose of this research was to investigate whether humans have perceptual tools that can help support fraction concepts. Past research argued that although perception supports whole numbers, humans do not have perceptual access to fractions, making it difficult to comprehend them. In the present study, participants compared pairs of symbolic or nonsymbolic fractions and judged which was the larger of the two. Nonsymbolic fractions were composed either of pairs of dot arrays or pairs of circles. Participants demonstrated distance effects across formats. Participants got faster and more accurate as the distance between stimuli increased. This finding suggests participants can perceive fraction magnitudes regardless of format, and further suggests that it may be possible to use perceptual training to teach about symbolic fractions.

STORAGE AND CHEMISTRY OF SOIL CARBON IN POST-AGRICULTURAL FORESTS

Nawaf Alghamdi, Emily Atkinson (Mentor), Forest and Wildlife Ecology

The purpose of this study was to investigate how soil carbon (C) is stored in post-agricultural forests. The study had two components: 1) Fractionation of organic matter in soil samples, and 2) ¹³C-Nuclear Magnetic Resonance (NMR) spectroscopy. Soil samples from St. Croix, U.S. Virgin Islands were collected and separated into multiple soil organic matter fractions. We hypothesized that a greater proportion of soil C would be stored as particulate (free floating) organic matter instead of stored inside soil aggregates. The second phase of the project was to measure potential differences in chemical composition of the soil organic matter fractions. We hypothesized that different forest types would have different proportions of organic functional groups in C that is stored inside soil aggregates.

WHO KNOWS BEST?: AN ALTERNATIVE TO THE TOP-DOWN APPROACH OF EVALUATING MEDICAL TECHNOLOGY

Janerra Allen, Linda Hogle (Mentor), Medical History and Bioethics

Medical science and technology have become increasingly complex, challenging existing systems to evaluate their efficacy and safety. What kind of expertise should be used in such evaluations, and how should oversight regulations be determined? Typically the experts are bioethicists and scientists, but ‘non-experts’ can also contribute by sharing their experiences and knowledge, leading to better evaluation, as argued by Brian Wynne, among others. This poster will show different models of how lay expertise has contributed to scientific research and evaluation. After reviewing the models developed by advocacy groups, I propose a new model to incorporate various kinds of expertise in a more equitable way.

13C/12C DELTA VALUE OF NEONATAL BREATH AS EARLY BIOMARKER OF INFECTION RELATED TO CHORIOAMNIONITIS

Nackers Allison, De-Ann Pillers (Mentor), Pediatrics

The purpose of this study is to determine if changes in 13C/12C delta value in breath can be used as an early biomarker of bacterial infection, specifically looking at newborns with fetal inflammatory response syndrome related to chorioamnionitis. Subjects in this study need to meet specific requirements and give consent. A neonatal nasal cannula is used to collect samples of breath into a bag and is tested in a cavity ring-down spectroscopy to determine the breath carbon isotope delta values. In this study, researchers hope to observe a correlation between 13C/12C delta value in breath and changes in physiology related to fractionation during APR to infection. In response to future results, this study hopes to serve as an early diagnosis of infection for future neonates.

TROPICAL CYCLONE WIND STRUCTURE PROJECT

Mohamed Amin, Christopher Rozoff (Mentor), Atmospheric and Oceanic Sciences

The accurate diagnosis and prediction of a tropical cyclone’s wind structure is vital for assessing the wind hazard posed to marine interests and onshore populations. However, the National Hurricane Center currently possesses a limited set of tools to predict tropical cyclone wind structure. Thus, this project will explore the analysis of tropical cyclone size to develop an enhanced climatology of a tropical cyclone size and also build an empirical-modeling system to forecast the size evolution of tropical cyclones. The project will be carried out through an investigation of models depicting one dimensional and two dimensional structures of the wind. A discussion about the results is given and a final conclusion about empirical modeling system is stated.

CELLULAR REPROGRAMMING BY INTRODUCTION OF ER α , FOXA1 AND GATA3 TO CREATE ESTROGEN RESPONSIVENESS

Nina Anbouba, Elaine Alarid (Mentor), Oncology

Estrogen initiates growth in the majority of breast cancers, and is primarily mediated by estrogen receptor alpha (ER α). However, some breast cancer cells do not express ER α (ER- cells) and patients with ER- breast cancer tend to have poor prognoses due to their inability to respond to drugs acting as estrogen antagonists. Our hypothesis is that only three transcription factors; ER α , FOXA1, and GATA3, are necessary to reprogram an ER- cell to become estrogen responsive. A HEK 293 cell will be stably transfected with these three transcription factors, and the transcriptional activity of a luciferase reporter gene and endogenous ER α -mediated target genes will be analyzed after estradiol treatment. This study will benefit basic breast cancer research by introducing new cell models to study breast cancer.

WHAT DO NAMING ERRORS TELL US ABOUT LEXICAL ABILITIES OF BILINGUAL AND MONOLINGUAL CHILDREN?

Ellen Anderson, Margarita Kaushanskaya (Mentor), Communication Sciences and Disorders

Although bilingual language abilities have been studied extensively in prior research, it is often difficult to interpret the causes behind the different levels of performance in bilingual vs. monolingual children. The current study examined the error patterns on a picture-naming task of 38 English-speaking monolinguals and 68 Spanish-English bilingual children (44 naturalistic and 24 school-based bilinguals), ages 5–7. The total number of errors as well as the distribution of error types in English categorized as semantic, lexical, non-word responses, and no responses or late responses were examined. Naturalistic bilinguals made more errors than school-based bilinguals and monolinguals. Both naturalistic and school-based bilinguals made a greater proportion of no-response errors than monolinguals. In addition, naturalistic bilinguals made a smaller proportion of semantic errors than monolinguals. These results suggest that errors made by monolingual children during lexical retrieval may be rooted in mis-activations within the semantic system, while errors made by bilingual children may be rooted in lack of semantic/lexical knowledge; lack of confidence; and/or slowed retrieval when responding in English.

HIGH PRESSURE CARBON DIOXIDE IN SITU DIFFRACTION OF METAL ORGANIC FRAMEWORKS

Michael Arend, Paul Evans (Mentor), Materials Science & Engineering

Metal organic frameworks form molecular crystals that undergo large structural distortions upon exposure to carbon dioxide gas. Understanding these distortions is important for the potential use of these compounds in CO₂ sequestration and other chemical applications. X-ray diffraction allows us to study crystallographic changes induced by CO₂ exposure. A sample holder was constructed to measure the adsorption of high pressure CO₂ in non-organic polymer powders via in situ X-ray diffraction. Prior to the construction of this sample holder, only low pressure (<2 atm) in situ measurements were attainable, which fails to elucidate how efficiently the lattice accommodates molecules of CO₂. The sample holder was constructed from materials that complimented the X-ray diffractometer. Parameters such as weight, stability, burst pressure, maximum temperature and translucency to X-rays were all taken into account during materials selection. Using this new piece of equipment we found that the metal organic framework CPL-2 undergoes an expansion of 0.16 angstroms along its (0 2 0) axis over a range of 1–7 atm.

WATCHING NASCENT PROTEIN RELEASE FROM THE RIBOSOME IN REAL TIME

Brian Arnold, Silvia Cavagnero (Mentor), Chemistry

Fidelity and efficiency in protein folding are essential to sustain cell life. Overall however, very little is known about the way proteins are able to attain their native structure within the context of the cell. In addition to the ribosome's well-established role in peptide bond formation, recent studies suggest that ribosomes may have strong influence on the early stages of protein folding in the cell and may be crucial for the production of folded bioactive proteins. Importantly, little is known about the impact of protein release from the ribosome on protein folding in the cell. Here, we present a kinetic study on the release time-course of ribosome-bound nascent chains of the *E. coli* globin ApoHmpH upon addition of the antibiotic puromycin. By time-resolved gel electrophoresis, we are able to follow puromycin's hydrolysis of the ester bond linking nascent polypeptides to the 3' end of tRNA. Steady-state fluorescence anisotropy and total intensity data allow us to follow the escape of ApoHmpH from the ribosome. Finally, time decay fluorescence anisotropy analysis in the frequency domain complements the above results by providing insights into the local motions experienced by the nascent protein before and after release from the ribosome. For the resolvable kinetic phases, we show that protein release from the ribosome is rate-limited by ester bond cleavage and that escape and folding of ApoHmpH occur quickly following ester bond cleavage. This result suggests that the cellular environment promotes efficient completion of folding upon release from the ribosome, possibly to prevent undesirable diffusion-and concentration-dependent phenomena such as aggregation.

IMPLICIT MINDSETS' IMPACT ON PERSONAL BELIEFS AND ACADEMIC PERFORMANCE

Alexander Ash, Bonnie Doren (Mentor), Rehabilitation Psychology and Special Education

Students with an incremental mindset believe they can change their performance through effort, whereas those with an entity mindset believe their performance is fixed and cannot change. Prior research has found that students presented with information and activities that support an incremental mindset have shown improvements in both academic effort and achievement over time. The present study will use an implicit theory intervention of intelligence to examine undergraduate students who have been identified with learning difficulties, ADHD, and other disabilities that interfere with academic performance. This study expects to reveal that those students exposed to an incremental theory of intelligence will exhibit increased self-efficacy, goal orientation, effort beliefs, and subsequently improvement in academic achievement.

EVOLUTION OF THE DARK SUPERNATURAL

Ellen Atterbury, Tomislav Longinovic (Mentor), Slavic Languages and Literature

The task of this project is to analyze the relation between emergence of the vampire and witch persecution after examining the origins and beliefs surrounding each phenomenon. From these analyses, the goal of the project will be to show how the history and folklore of these regions have shaped modern day opinions of the dark supernatural and the regional identity of contemporary Istrians. Before the advent of modern science, vampires and witches were legitimately feared in Europe as sinful and abhorrent monsters. Great atrocities ensued from this fear when people were persecuted and convicted for suspected vampirism or witchcraft. However, these atrocities are not visible in modern day attitudes toward these creatures. For instance, the village of Kringa in modern day Croatia has an entertainment industry based off the carnivalesque aspects of vampires. Now that profit is seen from the idea of the vampire, the questions being asked in this project will include: what did pre-modern beliefs, local and widespread, of monstrous beings entail; how did the role of science affect persecutions; and what is the predominant feeling regarding the fact that this idea thrives as a major part of commerce and culture when it refers to such a dark time in history?

ANALYSIS OF 3D-BIOPLOTTING PROCESS PARAMETERS IN PRODUCING SCAFFOLDS FOR BONE FRACTURE HEALING

William Ault, Heidi-Lynn Ploeg (Mentor), Mechanical Engineering

3D-Bioplotting is a form of rapid prototyping for constructing scaffolds for tissue engineering applications. The goal of the research is to assess this method for producing bone scaffolds and investigate the process parameters which affect scaffold architecture and strength. Material selection is known to have the largest impact on a scaffold's properties and is the current focus of research; specifically, biodegradable polyester based copolymers such as PLLA, PCL, and PLGA. Scaffolds are scheduled to be constructed at the end of May using the 3D-Bioplotter in the Human Mobility Research Centre at Queen's University in Kingston, Ontario, Canada and will be evaluated using mechanical testing and Finite Element Analysis.

"ON WISCONSIN" ON WSUM MADISON STUDENT RADIO

Stephanie Awe, Sarah Hopefl, David Black (Mentor), Journalism and Mass Communication

"On Wisconsin" is an hour-long talk show that airs every Monday on WSUM 91.7 FM Madison Student Radio. Re-established last October by hosts Sarah Hopefl and Stephanie Awe, the show reaches out to the campus and the community regarding current issues and events related to campus. This program is the only show at WSUM that performs long-form and in-depth interviews with people important to the campus and surrounding community, including Women's Volleyball Coach Kelly Sheffield, Alderman Scott Resnick and Dean of Students Lori Berquam. To engage audience members, the hosts maintain a website and a social media presence. The purpose of the show is to bridge communication between local figures and its surrounding residents to display the spirit of the Wisconsin Idea and On Wisconsin.

WISCONSIN BRACHYTHERAPY ROBOT DEVELOPMENT PROJECT

Jennie Aylyng, Andrew Shepard, 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 currently performed by hand. This past year, our research has involved finding the most effective method and design for this robot. There are many design considerations, but through careful analysis of the situation, we were able to choose an effective strategy. The final design has been chosen and our group is ready to procure the materials we need to begin construction on this promising project.

USING DRAMA TO PROMOTE LANGUAGE DEVELOPMENT IN ELEMENTARY ELL'S

Amy Bahr, David Furumoto (Mentor), Theatre and Drama

The purpose of this project was to study the impact of using drama-in-education techniques with English Language Learners (ELL's). I led five drama workshops with a group of ELL's in a Madison area elementary school. I focused on the topic "Thinking Like A Historian" and taught through a variety of techniques such as warm-up exercises, improvisation, and imaginative play. In executing this research I discovered that process-based drama activities where students helped guide parts of the lesson were most successful. However, the project also highlighted the need for educators to directly teach academic language before using process drama. Because academic vocabulary is one of the most challenging aspects of language learning, ELL's benefit from the presence of experienced teachers who can balance the direct teaching of language with interactive learning.

EVALUATION OF FBXO10 AS A CANDIDATE GENE OF THE BREAST CANCER SUSCEPTIBILITY LOCUS MCS5A

Rachael Baird, Michael Gould (Mentor), Oncology

Breast cancer is the most commonly diagnosed malignancy in women of the Western world. Genome-wide association studies have identified a number of moderately penetrant breast cancer alleles that occur at a high population frequency. One such allele is the MCS5A/Mcs5a locus that has been hypothesized to act in a non-mammary cell-autonomous manner during early mammary carcinoma development in Mcs5a resistant congenic rat lines through $\gamma\delta$ TCR⁺ cells via down-regulation of Fbxo10 expression in T-cells. This study shows that both Fbxo10 knockout mice and Fbxo10 knockdown rats display the same increased $\gamma\delta$ TCR⁺ cell populations seen in Mcs5a resistant rats. Fbxo10 knockout mice also show a resistant phenotype in mammary tumorigenesis studies. These results provide further evidence for Fbxo10 as the candidate gene of the Mcs5a locus.

THE EFFECT OF CLIMATE WARMING ON TREE GROWTH AND FOLIAR NITROGEN

Patrick Bass, Mary Jamieson (Mentor), Entomology

The goal of my research is to investigate potential effects of climate warming on white spruce (*Picea glauca*) tree growth and nutritional content of needles. In particular, I am studying how elevated temperature affects aboveground biomass and nitrogen content of spruce needles. I hypothesized that warming would change biomass and nitrogen due to the influence of elevated temperature on tree growth and physiology. In order to test this hypothesis, I measured the total dry weight of needle and stem tissues and quantified the concentration of nitrogen in dried needle tissues for trees grown in a forest warming experiment in northern Minnesota. Specifically, trees were grown from seedlings for approximately 5 years under one of three different temperature treatments: control (ambient temperature), H1 (+1.4 C above ambient temperature), H2 (+3.7 C above ambient temperature). My results showed that elevated temperature reduced tree growth; trees in control plots were more than twice the size of trees in H2 plots. Additionally, as temperature increased, foliar nitrogen concentrations decreased. In conclusion, simulated warming negatively affected tree growth and foliar nitrogen.

PERCEPTION OF ACCENTED VS. NON-ACCENTED SPEECH BY MONOLINGUAL AND BILINGUAL CHILDREN

Michelle Batko, Margarita Kaushanskaya (Mentor), Communication Sciences and Disorders

Previous studies showed that adults find it difficult to process accented speech. However, little is known about how children perceive variability in their input. In the present study, I propose to examine how children process accented speech. Specifically, I will examine whether prior experience with the native language of the accent modulates the effects of accented speech in children. Monolingual English-speaking children and bilingual children speaking English and Spanish will listen to sentences that are either non-accented (recorded by a native speaker of English) or accented (recorded by a non-native speaker of English with a Spanish accent). In line with prior studies, I predict that monolingual children will find it more difficult to comprehend accented sentences than non-accented sentences. However, I also predict that prior experience will assist the bilingual children in the accented condition. Therefore, I expect the bilingual children to show less difficulty with the accented sentences compared to the monolingual children. These findings will contribute to our understanding on how children develop the ability to adapt to the variability in their auditory environments.

EVALUATION OF CHOLECYSTOKININ ACTIVATION BY CYCLIC AMP AS A FUNCTION OF GLUCOSE DEPENDENCY

Therese Battiola, Dawn Davis (Mentor), Medicine/Endocrinology

The increasing prevalence of type 2 diabetes mellitus coupled with a growth in obesity rates across the world have prompted a search for new therapeutic strategies aiming to prevent obesity, improve tissue-responsiveness to insulin, and promote pancreatic beta cell proliferation. The inability of beta cells to compensate for the reduction in insulin sensitivity of target tissues results in the characteristic high blood-glucose levels and deficit in functional beta cell mass seen in affected patients. It has recently been shown that the gastrointestinal hormone cholecystokinin (CCK) is expressed in beta cells, is up regulated in conditions of obesity, and protects beta cells from apoptosis. However, it is unknown how CCK is regulated and if it is glucose sensitive. We have found that cyclic adenosine monophosphate (cAMP) treatment of INS-1 beta cells in the presence of high glucose (11.1 mM) leads to a 7.25 fold activation of Cck gene expression. This also activates expression of the CCK A receptor by 4.11 fold. To determine if this activation is glucose sensitive, we treated INS-1 cells with cAMP in the presence of either moderate (5.6 mM) or low (2.3 mM) glucose. In 5.6 mM glucose, cAMP treatment yielded a 6.1 fold upregulation of Cck, but only a 1.5 fold upregulation of Cckar. Likewise, in 2.3 mM glucose, cAMP treatment causes a 3.6 fold activation of Cck and a ~2 fold activation of Cckar. Together, this demonstrates that while both Cck and Cckar activation levels are moderately reduced in low glucose conditions, their regulation by cAMP is not glucose dependent.

UNDERSTANDING BRAIN DEVELOPMENT THROUGH HUMAN EMBRYONIC STEM CELL GENE KNOCK OUT

Michael Battistoni, Jingyuan Cao (Mentor), Waisman Center

The Pax6 gene has been shown to be crucial in guiding a blank, human embryonic stem cell (hESC) into a more specialized neural cell. Researchers at the Zhang Laboratory aim to better understand the methods and conditions by which brain cells develop in humans by disabling Pax6 in hESC. The hESC were harvested in lab, outside the original organism, and treated to cut out Pax6 before being multiplied. The cells which tested positive for lack of Pax6 were stored. Further in the research, they'll be tested for gene expression and cell function. It's hypothesized that the Pax6 protein will be the main factor behind many different kinds of neural cell qualities.

A SOCIETY OF INEQUITY

Emma Becher, Emilie Klos, Taylor Robbins, Zack Stachowiak,
Audrey Trainor (Mentor), Rehabilitation Psychology and Special Education

A system is only as strong as its weakest parts. Across America, students receiving special education services experience some of the most unfavorable outcomes. American society has shaped an institutional inequity amongst people of different races and disability categories. This inequity is associated with life-altering consequences, such as incarceration. Data supports a hypothesized correlation between people of color being over-identified in disability categories. There is also research that supports the idea of a correlation between people of color who have disabilities, and having a higher probability of dropping out of high school. This information ties into a hypothesized correlation that people of color, who have disabilities and who drop out of high school, have a greater chance of being incarcerated at some point in their lives.

BEYOND THE SHADOWS OF AUSCHWITZ: ISRAEL IRAN AND THE NUCLEAR MIDDLE EAST

Jacob Beckert, Rachel Brenner (Mentor), Hebrew and Semitic Studies

Israel and Iran are engaged in a regional struggle over Iranian nuclear proliferation. Israeli leaders have often evoked the Holocaust as an influence in Israel's determination to prevent Iranian nuclear acquisition. However, my analysis of Israeli leaders' rhetoric and nuclear strategy shows that conventional nuclear theories dictate Israeli actions rather than any influence from the Holocaust. In addition, variation in past Israeli responses to nuclear proliferation further undercuts the argument that the Holocaust is a major strategic factor in Israeli nuclear thought. This analysis helps to separate strategic effects of the Holocaust from its tactical rhetorical use, examines the factors that govern Israeli strategic thought, and raises important questions about the use of the Holocaust in politics.

NET ZERO DAIRY BARN PROJECT AT UW ARLINGTON AGRICULTURAL RESEARCH STATION

Michael Beeler, V. Venkataramanan (Mentor), Electrical and Computer Engineering

A net zero building is any building that produces as much energy as it consumes. On an older building, getting to Net Zero is usually accomplished through a combination of energy efficiency retrofits and installation of renewable energy systems. Funded through the DOE's Energy Matters Grant, the Wisconsin State Energy Office sought to implement a Net Zero building at the UW Arlington Research Station. The proposed barn houses over 500 dairy cows, with an attached office and milking parlor. The designs for the project consisted of an energy efficiency retrofit, a solar PV system, and an anaerobic digester. The State Energy Office designed this pilot project to be replicable for the many Wisconsin dairy operations that are similar to the Arlington Research Station.

THE ROLE OF REGIONAL DIALECTAL VARIATION ON LEXICAL CATEGORIZATION

Rachel Beletti, Emma Fricke, Haley Vlach (Mentor), Education Psychology

Many theories of speech perception assume features of words are normalized to strip away dialect variation, leaving abstract lexical entities. However, recent studies support the usage of episodic representations, suggesting sensitivity to fine-grained talker-specific details in the acoustic signal. The current study investigated recognition memory for regional dialect variations during word and category learning. Participants were presented with three novel noun lexical categorization tasks and three auditory component memory tasks in Greater Northern, Midland, and Southern dialects. Participants were then presented with memory and language learning tests, either immediately or after a brief delay period. Results showed significant differences in performance between participants' native and foreign dialects, suggesting the usage of episodic representations to categorize lexical information. Future research on how dialectal variation affects memory and categorization processes will provide a greater understanding of how we learn language.

AFYA UKUMBI — HEALTH THEATRE IN RURAL KENYA: A HEALTH BY MOTORBIKE INITIATIVE

Tracy Bennett, Backes Brianna, Araceli Alonso (Mentor), Gender and Women's Studies

Health by Motorbike, a non-profit organization and a service-learning program at UW–Madison has brought students to rural Kenya for the past four summers to conduct health training and establish sustainable health programs in seven villages of southeastern Kenya. With the help of Wisconsin Idea Fellowships, funding was provided for the creation of a Health Street Theater to combat endemic diseases such as malaria. The Wisconsin Idea Fellowship 2013–14 provided the training of more female performers to travel between several villages and perform malaria-related scripts throughout the year. The skits proved to be so effective in teaching anti-malarial messages that a more permanent Street Theater was created, the Afya Ukumbi. This theater expanded the project further into other women's health issues and to more isolated Maasai villages. Afya Ukumbi seeks to encourage women's creativity and ingenuity in advancing health in their communities. The program has not only empowered the audiences that the actresses have reached, but also has given the actresses themselves greater self-confidence and personal responsibility for initiating social change in their own communities.

UNDERWOOD FONT SPECIMEN

Jacob Berchem, Dennis Miller (Mentor), Art

This project is inspired by the history of type foundry and marketing. The first part of this project began in early 2013 when I created the Underwood type family, with 5 different weights. In the fall of 2013, I began research to help realize a project that could merge the print and digital worlds of type. This project not only allows the client to peruse the full typeface in different contexts on the page, but also provides the benefit of interacting with a screen, using the book as a controller. The book contains strips of conductive ink that, when connected to a microprocessor embedded in the cover, act as capacitive sensors which control and influence on-screen animations aimed at showcasing the typeface.

THE EFFECT OF MSN DERIVATIVES ON THE MECHANICAL PROPERTIES OF ACRYLIC BONE CEMENT

Christopher Besaw, Juan Vivanco (Mentor), Mechanical Engineering

Polymethyl methacrylate, PMMA, is the most common form of acrylic bone cement used today in many orthopedic procedures, and has been shown to be the best method for implant fixation. PMMA has two main functions including the immediate fixation of the implant and to distribute the forces from the implant to the surrounding bone. The most prevalent cause of mechanical failure in joint replacements is directly related to the mechanical failure of the PMMA surrounding the implant. This study will focus on the addition of mesoporous silica nanoparticles, MSN, in order to increase the mechanical properties of PMMA. Different levels of MSN will be added to PMMA and evaluated by micro-indentation according to the ASTM standard.

PROTEOMICS, MASS SPECTROMETRY, AND THE SEARCH FOR ANCIENT TROY

Cora Betsinger, William Aylward (Mentor), Classics

The city of Troy went down in history as the setting of the legendary Trojan War. First occupied during the Early Bronze Age (late 4th millennium BCE), it has a rich history spanning nearly 4,500 years. The site was first discovered in 1793 and identified by scholars as Troy in 1820. Since then it has been the focus of several archaeological studies. In 2012, an interdisciplinary team of archaeologists and scientists collected samples of chemical residue from pottery found at the site of the ancient city of Troy. This residue was obtained from scrapings taken from large storage jars dating back to the Late Bronze Age (ca 1500 BCE), and from Roman pottery found in houses dating to the time of Emperor Trajan (100 CE). These samples are currently being analyzed at the Biotechnology Center on the University of Wisconsin–Madison campus. I am assisting with the work of developing techniques to aid in the reconstruction of proteins from the residue samples. Analysis of the reconstructed proteins will allow us to determine what the inhabitants of Troy were consuming thousands of years ago, which will shed light on both the daily lives of the people of Troy and the environment of the region.

GENERATING STABLE CELL LINES OF HPV-16 E7 MUTANTS IN HUMAN ORAL EPITHELIAL CELLS USING VECTORS

Divya Bhat, Randall Kimple (Mentor), Human Oncology

Human Papillomavirus 16 (HPV-16) encodes the viral oncogene E7 that facilitates HPV-associated carcinogenesis. We developed a panel of Human Oral Epithelial (HOE) cells and NOK cells harboring various HPV-16 E7 mutants to understand the role of HPV-16 E7 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 E7 mutation. Results and conclusion: Generation of a panel of HPV-16 E7 mutant HOE 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.

FUNCTION AND MECHANISM OF FMRP IN NEURAL STEM CELL MAINTENANCE

Ismat Bhuiyan, Xinyu Zhao (Mentor), Neuroscience

Fragile X syndrome (FXS), the most common single genetic cause of mental retardation and autistic spectrum disease, occurs when the fragile X mental retardation 1 (FMR1) gene is mutated. Our lab has shown that fragile X mental retardation protein (FMRP) deficiency in adult neural stem cells (aNSCs) leads to impaired neurogenesis and learning deficits. Despite extensive studies, how FMRP regulates neurogenesis is unclear. A loss of aNSC population and subsequent deficit in neurogenesis correlate with a loss of cognitive functions in neurological diseases. We hypothesize, that FMRP plays a crucial role in maintaining the quiescence of aNSCs and reducing stem cells depletion in the adult dentate gyrus (DG). The results of this study will unveil the function of FMRP in adult neuronal development.

DESIGN OF AN INFANT CARDIORESPIRATORY (CARE) MONITOR FOR USE IN DEVELOPING COUNTRIES

Drew Birrenkott, Catherine Finedore, Christine Morris, Amit Nimunkar (Mentor), Biomedical Engineering

The United Nation's fourth Millennium Development Goal, to reduce by two-thirds the number of under five child deaths from 1990 to 2015, will not be achieved by many countries because of high neonatal mortality rates due in large part to asphyxia and preterm birth. These causes of death can be reduced through monitoring of respiration and heartbeat. The CaRe Monitor, designed by our team, seeks to do this using impedance pneumography to monitor respiration and heartbeat. In addition, the device has a number of novel design aspects making it ideal for use in developing countries including: a cell phone battery power supply, a rugged, reproducible device housing, completely reusable parts, an easy to use electrode system incorporated into infant clothing, and a low cost (~70 USD).

IDENTIFICATION AND CHARACTERIZATION OF THG-1 AS A TR α COACTIVATOR IN EXPRESSION OF α MHC

Drew Birrenkott, Eugene Kaji (Mentor), Cardiology

Physiologic hypertrophy is one of two mechanisms by which the heart responds to increased workload. A key pathway in physiologic hypertrophy is thyroid hormone (TH) up-regulation of the hypertrophy protein α MHC by the binding of Thyroid Receptor α (TR α) to α MHC's upstream Thyroid Response Element (TRE). In the absence of TH, TR α represses α MHC, but when TH binds TR α , α MHC expression increases. The mechanism is further complicated by multiple TR α co-factors which have not been characterized. We identified TSC22D4 Homologous Gene 1 (THG-1), as a possible co-factor through a yeast two-hybrid screen. Our findings suggest it may have a novel up-regulatory effect on TR α . Our work further characterizes and quantifies the role of THG-1 through in vitro GST-Pulldown assays and gene expression using quantitative PCR.

DISPELLING THE GAYDAR MYTH: LESBIAN AND STRAIGHT WOMEN'S FACES ARE NOT VISIBLY DISTINCT

Alyssa Bischmann, Patricia Devine (Mentor), Psychology

Some researchers (Rule, Ambady and Hallett, 2009) argue that people can tell whether targets are gay/lesbian or straight from the face. Others (Cox, Devine and Hyde, 2014) have recently called this work into question, showing that these "gaydar" effects arise from a third variable confound so that gay and straight men's faces are not perceptibly distinct. The current study extends Cox and colleagues' work to lesbian and straight women. Matching predictions, when third variable confounds (i.e., makeup, picture quality) are removed, participants cannot determine whether women are lesbian or straight from the face. Whereas Rule and colleagues' work supports an intergroup differences view, the current work shows that the faces of lesbian and straight women are not distinct, supporting an intergroup similarities interpretation.

THE CONTRIBUTION OF NEIGHBORHOOD BUILT ENVIRONMENT POLLUTION TO HEALTH DISPARITIES AMONG CHILDREN

Candace Bishop, Alexandra Wells (Mentor), Landscape Architecture

Numerous ethnic, socioeconomic, gender, and other health disparities exist in the United States today. The aim of this study is to examine how neighborhood features of the built environment contribute to health disparities among children. The HAPPY 2 project is a community partnership with the United Community Center in Milwaukee promoting a healthy lifestyle for Latino middle-schoolers. We're developing a lesson plan that includes an exercise in measuring built environment pollution and how it relates to children's health. A number of built environment studies on health disparities related to traffic, particulates, and health outcomes such as asthma have implications for the HAPPY 2 project. This study will examine and summarize these analyses as a basis for this exercise.

ROOT COLONIZATION OF FORAGE LEGUMES AND PASTURE GRASSES BY ENVIRONMENTAL ISOLATES OF *E. COLI*

Brianna Jeanne Bixler, Taylor Wahlig (Mentor), Agronomy

The quality of the forage legumes and pasture grasses that are grown as feed for cattle is crucial for the health of the animals as well as the success of the farm. Forage legumes have the ability to form a symbiosis with rhizobia bacterium in structures called root nodules, while pasture grasses do not have this capability. Bacteria, such as rhizobia and *E. coli*, are found in the soil of these fields. Pathogenic *E. coli* poses as a threat to the health of the cattle if the forage is able to be colonized by the bacterium. It has been found that *E. coli* has the ability to colonize certain legumes, such as *Medicago truncatula*, internally and externally; however, it is unknown if there is a significant variation between the colonization of legumes and grasses. We hypothesize that *E. coli* can colonize legumes in higher rates than pasture grasses because of their characteristic symbiotic qualities. This project aims to quantify the variation in root colonization between species of forage legumes and pasture grasses by nonpathogenic, environmental isolates of *E. coli*. Select species of pasture grasses and forage legumes will be grown in vitro and inoculated with *E. coli* that has chromosomal resistance markers. Root colonization will be quantified by serially diluted suspensions plated on selective media. A statistically significant variation between the legumes and the pasture grasses would prompt further research related to understanding this interaction in order to find methods to improve the quality of the forage feed to cattle.

HYDRAULIC CONDUCTIVITY OF POLYMER-MODIFIED GEOSYNTHETIC CLAY LINERS USING PERMEANT SALT SOLUTIONS

Kori Black, Sabrina Bradshaw (Mentor), Geological Engineering

Geosynthetic clay liners (GCLs) used in waste containment facilities prevent leakage of contaminants due to their low hydraulic conductivity, but are susceptible to changes in hydraulic conductivity depending on the ionic strength (I) and ratio of monovalent and divalent cations (RMD) in the containment liquid. This study evaluated the hydraulic conductivity of polymer-modified GCLs (PM-GCLs) at various I and RMD to determine under what conditions hydraulic conductivity increases appreciably. Hydraulic conductivity tests were conducted with salt solutions of varying I and RMD until chemical equilibrium was established between the PM-GCL and permeant. Preliminary results yield a threshold of I and RMD in which hydraulic conductivity of PM-GCLs increases appreciably, providing information for recommendations for this products use in various containment scenarios.

THE USE OF OCULAR HYDROGELS IN DESCEMET MEMBRANE ENDOTHELIAL KERATOPLASTY (DMEK) SURGERY

Jacob Blitstein, Matthew Parlato (Mentor), Biomedical Engineering

I am researching the use of hydrogels as a platform to prevent cell loss in DMEK surgery. DMEK surgery is used to restore hydration of the cornea in order to restore efficient eyesight. Currently, the procedure for DMEK surgery is to physically transplant descemet's membrane (DM), the inner most layer of the cornea, into a patient's eye. The physical manipulation of the DM during donor extraction, surgery preparation and transplanting the membrane causes significant cell loss and often results in follow up surgeries. My research mentor Matthew Parlato and I propose using a specifically optimized polyethylene glycol (PEG) based hydrogel as a platform for the DM to prevent DM cell loss during the physical manipulation of the tissue. Instead of physically manipulating just the DM, the surgeon would be touching just the hydrogel with the DM on it and then implant the entire hydrogel-DM complex into the patient's eye. Hydrogels are materials made of polymers whose mass is made up of at least 90% water. Hydrogels are a prime candidate for this platform as hydrogels can be optimized in many different ways such as water retention amount and degradation time length. PEG-based Hydrogels been proven to be tolerated and compatible with the human body which makes them acceptable for implantation in the eye. In order to prove that hydrogels will improve DMEK surgery, I plan to collect data regarding the cytotoxicity of the hydrogel on DM tissue. I will then optimize the hydrogel further in order to allow efficient adhesion of the DM to the hydrogel. I will finally conduct experiments regarding the hydrogel's ability to prevent DM cell loss to show. The rest of the research will be geared into optimizing the hydrogel to the specific conditions of DMEK surgery.

CAMPUS ENERGY PROJECT: THE FUNDAMENTALS OF ENERGY USED BY THE UNIVERSITY OF WISCONSIN-MADISON

Eleanor Bloom, Angela Pakes Ahlman (Mentor), Geological Engineering

Do you wonder where UW-Madison gets its energy? UW-Madison's annual campus energy consumption is approximately 1.2 trillion kWh annually. The UW Office of Sustainability is researching the sources and application of energy on campus. Campus heating and cooling is provided through networked campus heating plants. Natural gas is purchased from Madison Gas & Electric and burned at the heating plants to produce steam and chilled water for heating and cooling campus buildings. Most of UW-Madison's electricity is purchased directly from MG&E and sourced from coal. Some of MG&E's electricity is sourced from renewables such as wind energy. UW-Madison also purchases wind energy as Renewable Energy Certificates. Other on-campus renewable energy sources include photovoltaics, solar thermal panels and geexchange systems.

COMPARISON OF PLASTIC DEFORMATION BETWEEN AGGREGATE AND RECYCLED ASPHALT PAVEMENT (RAP)

Mark Bodnar, Jongwan Eun (Mentor), Geological Engineering

Using recycled material from construction and demolition (C&D) offers a viable solution to reduce both the consumption of natural aggregate and the amount of waste disposed in landfills. According to the National Asphalt Pavement Association (NAPA) (2009), recycled asphalt pavement (RAP) is the most recycled material in the United States among C&D. Based on previous research, the RAP is a high-quality aggregate that provides good performance as a course granular base before the peak strength. However, the RAP can be highly compressible (i.e., softening) due to the hot asphalt mixed into the material. Currently, there is a lack of research focused on the plastic deformation of RAP after the peak, which results in damage to the pavement system in the long term. Therefore, in this study, the deformation of RAP is compared to that of fresh aggregate and analyzed quantitatively by using the resilient modulus test.

CARDIORESPIRATORY FITNESS, BRAIN STRUCTURE AND COGNITION IN ADULTS AT RISK FOR ALZHEIMER'S DISEASE

Elizabeth Boots, Ozioma Okonkwo (Mentor), Medicine

Cardiorespiratory fitness (CRF) measures physical activity (PA). The gold standard CRF measurement is graded exercise testing, which is not feasible in many settings. We examined whether a non-exercise CRF estimate was related to gray matter volumes, white matter hyperintensities (WMH), cognition, memory complaints, and mood in individuals at risk for Alzheimer's disease (AD). Three hundred and fifteen adults underwent MRI, cognitive testing, and a PA questionnaire. CRF was calculated using an equation incorporating sex, age, body-mass index, resting heart rate, and self-reported PA. Results showed CRF was associated with gray matter volumes in seven AD-relevant brain regions, lower WMH, better cognition, and fewer memory complaints and depressive symptoms. These findings indicate participation in physical activity provides protection for brain structure and cognitive function, decreasing future risk for AD.

CLOSING THE GENDER GAP IN MATH PERFORMANCE WITH A SOCIAL-PSYCHOLOGICAL INTERVENTION

Jilana Boston, Judith Harackiewicz (Mentor), Psychology

Research has shown that a simple writing intervention termed values affirmation (VA) can reduce gender gaps in STEM disciplines, but little is known about why this intervention boosts students' performance. We conducted a study to compare different ways of implementing VA in a math-testing situation. By encouraging participants to focus on either independence or interdependence in their writing, we can gain greater insight into how VA operates by comparing which version of the intervention is most effective. Does VA resolve a perceived mismatch between women's interdependent values and the independent nature of mathematics, or does VA buffer women against stereotype threat? This study highlights two psychological mechanisms that can impair women's performance in mathematics and explores how we can best resolve the persisting gender gap.

EFFECTS OF ESTROGEN ON PULMONARY VASCULAR STRUCTURE AND FUNCTION IN PULMONARY ARTERIAL HYPERTENSION

Madison Boston, Aiping Liu (Mentor), Biomedical Engineering

Pulmonary arterial hypertension (PAH) is a female dominant vascular disease characterized by vascular remodeling. However, female patients have better outcomes than males. Our study aimed to determine the impact of estrogen on PA function and structure in a mouse model of PAH created via SU5416+chronic hypoxia. Ovariectomized C57B6 female mice were treated with estrogen or placebo. PA hemodynamics was measured in vivo and PA remodeling was assessed histologically. Our preliminary results show that estrogen treatment mainly affected proximal PAs through attenuating collagen deposition and PA wall stiffening, compared to the placebo-treated SuHx group. The distal arteries of both groups show no significant differences in structure and function. This study will shed light on hemodynamic and biological processes of how estrogen modulates the progression of PAH.

STRATEGIES TO SUPPORT FAMILY MEALTIMES FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

Erin Bradley, Karla Ausderau (Mentor), Kinesiology

Children with Autism Spectrum Disorders (ASD) have eating challenges creating stress during family mealtimes, specifically on the mothers. Mothers work to create a shared mealtime experience with health promoting foods for their family, including their child with ASD. The primary goal of this study was to identify strategies families use to support family mealtimes that include their young child with ASD and eating challenges. Family mealtime videos were analyzed using a thematic approach to begin to name specific actions mothers were implementing at mealtime to decrease family stress and allow the family to engage in a mealtime all together. Mothers used strategies that were unique to their own family and child's needs.

DETERMINATION IF LOCATION OF ENDOMETRIOSIS RISK IS AT SAME LOCUS IN RHESUS MONKEYS AND HUMANS

Jack Brady, Joseph Kemnitz (Mentor), Cell and Regenerative Biology

Endometriosis is a common female health disorder that causes chronic pelvic pain, potential infertility, and discomfort during intercourse. It is estimated that 1 to 2 percent of females of reproductive age experience endometriosis. Several factors, such as C-section delivery, exposure to high levels of estrogen and certain environmental toxins, are known to increase risk for development of endometriosis. Recently a genetic risk has been noted a putative gene loci have been identified in women. Rhesus monkeys develop endometriosis with many of the same characteristics of the condition as women. Because of the experimental advantages of studying rhesus monkeys in this context, we extract DNA from tissues of affected monkeys and controls, sequence it and aim to identify loci that impart risk. This information will then be compared to results from studies of women.

THE IMPACT OF CHILDREN WITH AUTISM SPECTRUM DISORDER ON THE QUALITY OF MARITAL INTERACTIONS

Jasmine Braithwaite, Vincent Sirocchi, Sigan Hartley (Mentor), Human Development & Family Studies

Today in the United States, approximately 1 in 88 children will receive a diagnosis of autism spectrum disorder (ASD). There is limited research on the quality of marital interactions of parents of children with ASD and whether these interactions are associated with level of parenting stress or family factors. Using preliminary data from an ongoing longitudinal study, we examined associations between the quality of couple interactions, parenting stress and family variables in 79 families of children with ASD. Findings indicate that the presence of an intellectual disability in the child with ASD and education level were associated with the quality of marital interactions. Parenting stress was not significantly related to the quality of marital interactions. Findings have important implications for designing interventions and supporting parents of children with ASD.

INHIBITORY SIGNALING PATHWAYS IN THE PANCREATIC BETA-CELL: RELEVANCE TO DIABETES?

Harpreet Brar, Michelle Kimple (Mentor), Medicine

In diabetes mellitus, there exists a deficiency in insulin secretion into the bloodstream. Key components in regulating insulin secretion are G protein coupled receptors (GPCRs), membrane proteins that transduce extracellular signals to intracellular G-proteins, which signal downstream to modulate cellular functions. Diabetes drugs that utilize GPCRs target a stimulatory GPCR, resulting in increased cyclic AMP (cAMP) production and improved insulin secretion. Few studies have probed the usefulness of blocking GPCRs that are inhibitory toward cAMP production. The focus of this research is the inhibitory GPCR, EP3. We have shown that mice deficient in the G-protein that couples to EP3, *Gaz*, exhibit improved insulin secretion and are protected from developing diabetes. These results suggest that the EP3 receptor might be a useful target for diabetes therapeutics.

SEX DIFFERENCES IN TODDLERS WITH AUSTISM SPECTRUM DISORDER

Anna Bridgeforth, Susan Ellis Weismer (Mentor), Communication Sciences and Disorders

Males with autism spectrum disorder (ASD) are more commonly diagnosed than females, which may reflect biased diagnostic measures based on the male profile of ASD. Sex difference findings are mixed on language and socialization, but these are important diagnostic characteristics of ASD. Comparisons between well-matched males and females with ASD at age 2.5 for receptive language, expressive language, and socialization were examined as well as the relationship of language and socialization. There were no sex differences in receptive language and socialization, but females had higher expressive language than males. Socialization and expressive language were unrelated for either sex. Socialization and receptive language were correlated in males but not females. Females with higher expressive language may be perceived differently than males with ASD who talk less.

DIFFERENTIATION OF HUMAN PLURIPOTENT STEM CELLS SHOWN TO GENERATE OTIC PROGENITOR CELLS

Rebecca Brodziski, Parul Trivedi (Mentor), Waisman Center

The main cause of hearing loss or deafness is loss of cochlear hair cells. Pluripotent stem cells could be used to derive hair cells to better understand developmental disorders and to find a therapy for hearing loss. The auditory system depends on the central nervous system for correct signaling during mammalian development. Given this close proximity, we hypothesized differentiation of pluripotent stem cells using a well-characterized neural paradigm will also produce otic progenitor-like cells. Using immunocytochemistry techniques, we identified translational factors to identify proteins expressed by differentiated cells into otic progenitors at specific points in development. Ongoing studies will focus on modifying the paradigm to generate otic progenitor-like cells to be further differentiated into mature inner-ear hair cell-like cells for transplantation into deaf mouse models.

RHO GDI AND THE SINGLE CELL WOUND HEALING PROCESS

Katie Brow, Kevin Sonnemann (Mentor), Molecular Biology

RhoA is a small GTPase involved in single cell wound healing. RhoA cycles between active and inactive states and is regulated by a variety of other proteins including RhoGDI. RhoGDI stabilizes inactive RhoA. The objective of this investigation is to express and purify recombinant RhoGDI to assess its effect on RhoA GTPase activity in vitro. A baculovirus encoding RhoGDI was generated and used to infect cultures of insect cells and recombinant RhoGDI was harvested and purified using affinity chromatography. Future experiments will involve the use of recombinant RhoGDI and other RhoA regulators to analyze their effect on the RhoA cycle and its involvement in cellular wound healing.

ISOLATION OF VENTRICULAR PROGENITOR CELLS USING ANTIBODY TARGETING CELLS

Audrey Brown, Mitch Biermann (Mentor), Medicine

Ventricular cardiomyocytes, or heart cells in the ventricles of the heart, are the main cells lost in heart disease. We are looking at stem cell transplantation to replace lost heart cells because the human heart has limited ability to repair itself. We hypothesize that ventricular progenitor cells (VPC) may be ideal for transplant, but no known VPC surface markers exist. Our project will use antibody targeting cells to identify VPC surface markers on cells that will differentiate into ventricular cardiomyocytes. We will identify VPC surface markers through fluorescence activated cell sorting, where the VPC surface markers are fluorescently marked to differentiate them from other cell surface markers. Our project will evolve antibodies to identify VPC surface markers on the cells that will differentiate into ventricular cardiomyocytes.

ELECTROPHILIC FLUORINATION OF YNAMIDES

Daniel Bruckbauer, Zhi-Xiong Ma (Mentor), Pharmacy

Fluorine has played a central and key role in modern pharmaceutical, agrochemical, and materials sciences. Methodology developments regarding the incorporation of fluorine are very important and active in organic chemistry. Herein we shall present an electrophilic fluorination reaction of ynamides to afford a series of α -fluorinated amides as useful synthetic building blocks. Both mono- and di-substituted fluoro-amides may be selectively obtained simply by controlling the amount of fluorine source.

TO OPEN THE GRAVE OR NOT? YOUTH ACTIVISM IN POST-DICTATORSHIP ARGENTINA AND SPAIN

Cole Bryant, Ksenija Bilbija (Mentor), Spanish and Portuguese

In the twentieth century, Spain (1939–75) and Argentina (1976–83) faced military dictatorships. Although the duration of each dictatorship differed, in both nations the victims were suspected to be leftist-enemies of the right wing, military state. Thousands of victims were “disappeared,” tortured, murdered, and dumped into mass graves. Democratic Spain and Argentina have reacted differently post-dictatorship. Argentina immediately held trials and opened up Truth Commissions, and the youth formed groups like H.I.J.O.S. to shed light on the victims of state terrorism. In Spain, however, there have been no trials, Truth Commissions, or groups resembling H.I.J.O.S. I have done research and conducted interviews in both countries to determine what role the time-span of the dictatorships has played and how Spanish and Argentine youths regard their country’s reaction.

NOVEL METHOD FOR ACCELERATED BIENNIAL VEGETABLE CROP SEED PRODUCTION

Lauren Brzozowski, Irwin Goldman (Mentor), Horticulture

Biennial crops are time and resource-intensive to breed and to harness for seed production. In this experiment, environmental conditions were manipulated to hasten seed production and shorten the breeding cycle for carrot, onion, and beet by a novel “in situ vernalization” (ISV) method. In this method, 7–8 week old seedlings were exposed to temperatures of 4C for 7–8 weeks in two different settings: a controlled temperature chamber and an outdoor cold frame. The control consisted of roots subjected to 12–16 weeks of vernalization at 4C according to standard methods. ISV was successful for beet but not for carrot or onion. ISV-treated beet seedlings flowered at rates similar to control plants. Use of the ISV method may increase the efficiency of beet seed production.

ARE THERE SEX DIFFERENCES IN MOTIVATORS FOR OR ENGAGEMENT IN CARDIAC REHABILITATION?

Elizabeth Brzycki, Yacob Tedla, Diane Lauver (Mentor), Nursing

Cardiac rehabilitation (CR) is effective in increasing patients’ functional status, but many do not engage in it as recommended. Although women and men experience cardiovascular disease differently, few researchers have studied sex differences regarding CR. Our purpose was to examine sex differences in motivation and engagement regarding CR. Using a cross-sectional design, our sample of fifty was two-thirds male. We conducted a secondary analysis of data collected with questionnaires from patients at a CR center. Using chi-square and t-tests, we found no sex differences between motivation and CR. Among those at CR, there may be few sex differences. Future researchers can examine sex differences among patients who are referred to CR so clinicians can address individual concerns and tailor their discussions to promote CR.

DISSENT AND DISCIPLINE: STRATEGIES FOR COALITION MAINTENANCE IN THE UNITED STATES CONGRESS

Andrew Bulovsky, Katherine Cramer (Mentor), Political Science

To make an informed decision at the ballot box, voters must understand the approximate policy agendas that coincide with each political party. Parties must be clear in what they stand for and this responsibility falls on the party's leadership. Using a combination of biographies, leading theories on resources available to leaders, and the Congressional Quarterly, my thesis hopes to provide insight on the utility of different strategies employed by party leaders. My intended results are that every leadership situation is unique, but he or she may rely on a combination of resources—committee assignments, agenda control, and raw persuasion—to varying degrees. Ultimately, I hope to show that the success of party leaders in ensuring party unity is inherently valuable for American democracy.

VISUALIZATION OF THE 3-DIMENSIONAL STRUCTURE OF CLOUDS AND WATER VAPOR IN THE HURRICANE ENVIRONMENT

Genevieve Burgess, Robert Knuteson (Mentor), Space Science & Engineering Center

Recent developments in satellite remote sensing include the Hyperspectral Atmospheric Infrared Sounder (AIRS) aboard the Aqua satellite, part of the A-Train Satellite system, that measures upwelling Earth-emitted infrared spectra using more than 2300 IR channels between 3.7 and 15.4 microns. UW CIMSS has developed a retrieval package for satellite derived water vapor products. The CSPP Dual Regression algorithm generates 3-Dimensional water vapor fields from the AIRS IR channels. Likewise, the UW CIMSS cloud amount vertical profile (CAVP) consists of a 3-D volume of cloud amount within the AIRS granule (135 x 90 x 54). SSEC/CIMSS McIDAS-V is software developed by SSEC/CIMSS to be able to visualize and analyze satellite data in 2-D and 3-D. With this new data and visualization we are able to see into the storm and see the inner workings of a hurricane while characterizing the environmental conditions which control the storm development.

COMMUNICATION OF CARE NEEDS FOR PATIENTS WITH DEMENTIA AND HIP FRACTURE UPON HOSPITAL DISCHARGE

Michelle Burns, Lydia Lemmenes, Andrea Gilmore Bykovskiyi (Mentor), Medicine

Detailed discharge communication from hospitals to Skilled Nursing Facilities (SNFs) is essential for patient safety. Research shows that inadequate communication from hospitals-to-SNFs results in patient harm and re-hospitalizations. This is especially true for older adults with hip fractures, as they often have cognitive impairment that limits their ability to communicate their care needs. This retrospective medical record abstraction study examined discharge summaries for N=69 hip fracture patients discharged to SNFs to determine the quality/extent of communication of cognitive status/diagnoses and behavioral care needs. Results will present the frequency/extent of discharge communication of these care elements. Findings suggest that vague communication regarding cognitive issues/ behavioral care needs is common, which may limit the SNF's capacity to implement a safe plan of care, potentially increasing re-hospitalization risk.

VARIATION OF BLOOD FLOW IN PATIENTS WITH PORTAL HYPERTENSION

Camilo Campo, Alejandro Roldan (Mentor), Radiology

Portal hypertension is the end-stage complication of cirrhosis. This complication is characterized by alterations in abdominal blood flow, especially in the flow of the mesenteric circulation that supplies blood to the gut and liver. 4D Flow MRI techniques have allowed comprehensive noninvasive assessment of abdominal circulation. In this study we used 4D Flow MRI to evaluate changes in mesenteric blood flow in healthy subjects and patients with portal hypertension. MRI scans were performed and images were subsequently processed using EnSight. Results revealed that blood flow in healthy subjects significantly increased in response to food intake in three of the four blood vessels analyzed. In comparison, patients with portal hypertension experienced much smaller increases in blood flow in two of the four blood vessels analyzed.

INDIVIDUALIZED QUALITY OF LIFE OF HISPANICS WITH HEART PROBLEMS

Nicole Cancel, Melissa Kadlec, Hector Salazar, Catherine Virnich, Beth Fahlberg (Mentor), Nursing

The purpose of this study is to test a Spanish language version of the Standardized Evaluation of Individualized Quality of Life (SEIQOL), a tool used to measure individualized quality of life, in a sample of older adults with heart problems. We also plan to use the data collected in this pilot study to provide preliminary information that will inform future research about quality of life and social support in Hispanic/Latino people with heart problems. We are recruiting a study sample of adults age 50 and over who report a history of heart problems who are ethnically Hispanic/Latino and who speak Spanish. Recruitment methods include internet recruitment through social networking and by contacts with organizations serving the Hispanic/Latino community. Data collection methods include surveys and a structured interview for administration of the SEIQOL. These interviews will be conducted in Spanish by two bilingual interviewers. They will be audio recorded, with written notes taken during the interview by a recorder. The resulting data will be analyzed via descriptive statistical analysis and content analysis of qualitative data to understand what participants considered the most important factors in determining their individualized quality of life.

THE ROLE OF CHONDROITIN SULFATE PROTEOGLYCANS IN RECOVERY AFTER FOCAL CEREBRAL INFARCTION

Claire-Marie Canda, Matthew Jensen (Mentor), Neurology

In a focal cerebral infarction, the loss of blood flow destroys brain tissues, causing some areas to lose function. The tissue's response to this injury is an upregulation of molecules that promote repair and regeneration of the lost neurons and structure. But, there is a prevalent amount of molecules, chondroitin sulfate proteoglycans (CSPGs), which inhibit this needed growth and, consequently, recovery. It is still unknown if the functions of these molecules apply to both the spinal cord and brain. A systematic review of scientific literature was done in order to examine the extent of CSPGs after stroke. The general conclusion is that these are inhibitory molecules expressed after central nervous system (CNS) damage. Furthermore, studies have shown that this type of molecule exists in relative forms, resulting in different localizations in the CNS. Future research is needed on these molecules' specific functions in the brain.

5-FLUOROURACIL EFFECT ON COLON CANCER CELLS IN RESPONSE TO ARYL HYDROCARBON RECEPTOR EXPRESSION

Patrick Carney, Gregory Kennedy (Mentor), Surgery

The aryl hydrocarbon receptor (AhR) is a ligand dependent transcription factor that acts as either an oncogenic pathway or tumor suppressive mechanism in human cancers. AhR activates a battery of cytochrome p450 surrogates, which play a major role in the metabolism of exogenous toxins and drugs. We hypothesize that decreased expression of AhR regulates the activity of anti-cancer agents such as 5-Fluorouracil (5-FU) in colon tissue in vitro through the activation or deactivation of downstream gene surrogates. We will use HCT 116 cells treated with 5-FU to determine the drug's efficacy in AhR knockdown cells vs normal cells. These studies will allow us to analyze the impact of the aryl hydrocarbon receptor in the metabolism of chemotherapeutic drugs and better understand its role in chemoresistance.

DECAYED, MISSING, AND FILLED TEETH COUNT IN OLANCHITO, HONDURAS

Emily Carroll, Carina Lasee, Graham Michaels, Amit Nimunkar (Mentor), Biomedical Engineering

The World Health Organization and most other research institutions use the decayed, missing, and filled teeth count (DMFT) to assess the oral health quality of different regions. In 1998, Honduras had a national DMFT of 4.0 among 12 year olds compared to neighboring countries Belize and Nicaragua with DMFTs of 0.63 and 2.8 respectively. The Ministry of Health recognizes the need for improved oral health with a goal to lower the DMFT among 12 year olds to 3.0. Olanchito, Honduras has not conducted a DMFT assessment. Many people in Olanchito do not have access to proper dental care, and an accurate measurement of oral health quality would assist municipal authorities in assessing public policies regarding oral health.

ALDEHYDE DEHYDROGENASE AS BIOMARKER FOR CANCER STEM CELLS IN HEAD AND NECK SQUAMOUS CELL CARCINOMA

Ebony Carson, Randall Kimple (Mentor), Human Oncology

Currently, research suggests that patients with human papillomavirus (HPV)-associated head and neck squamous cell carcinoma (HNSCC) have better treatment outcomes than those without HPV-associated HNSCCs. In addition, it is known that cancer stem cells (CSCs) found in the HNSCC tumors are resistant to radiation and chemotherapy treatment. Therefore, we hypothesize that levels of CSCs are low in HPV-positive HNSCC. To investigate the presence of CSCs, aldehyde dehydrogenase (ALDH) activity, a biomarker of CSCs, was measured to determine the amounts of CSCs in HPV-positive HNSCCs and HPV-negative HNSCCs. We performed three different experiments. First, an aldefluor assay was used to isolate the CSCs in HPV-positive and HPV-negative cell lines. Next, we measured the protein expression of ALDH using western blot. Lastly, we performed immunohistochemistry to stain tissues for ALDH expression. Upon analysis, we expect to see lower ALDH levels across all experiments indicating low levels of CSCs in HPV-positive HNSCC.

CULTIVATING ELDER INDEPENDENCE

Erin Cawley, Anne Ali, Susan Bright, Stephen Campbell, Jenna Ische, Kristin Ksobiech, Erika Marshall, Allison McDonald, Lilia Mendoza, Ellen Neal, Heather O'Donnell, Laura Priddy, Ashley Reno, Hannah Stellpflug, Scott Tortomasi, Carolyn Toth, Yvette Egan (Mentor), Nursing

The fastest growing segment of the American population is age 65+. As this population grows, so grow the misconceptions and stereotypes contributing to ageism. In truth, aging Americans want to reside in their homes and maintain independence for as long as possible. As part of the Elder Partner Project, every member of our UW-School of Nursing clinical class partnered with older Madison residents throughout the fall 2013 semester. These interactions allowed us to tackle some very common misconceptions regarding elder well-being and ability. Using specific assessment tools and tests, we evaluated home safety, nutrition, depression, and mobility. The results of the service-learning project were rewarding and a pre and post survey allowed us to see that our perceptions had changed significantly for the better, chiefly within the areas of elder learning, happiness, and memory.

CORN AND SOYBEAN SEED SALES: REVENUE ANALYSIS

Michael Cayemberg, Brent Hueth (Mentor), Agricultural & Applied Economics

Build a sales analytical workbook to deliver insight into performance analysis, product data, and potential historical trends.

INTERACTIONS BETWEEN AROMATASE EXPRESSING CELLS AND GNRH NEURONS IN THE MONKEY STALK-MEDIAN EMINENCE

Taylor Cesarz, Ei Terasawa-Grilley (Mentor), Pediatrics

Gonadotropin releasing hormone (GnRH) controls reproductive function. Studies from this lab show that neuroestradiol (neuroE2) synthesized and released in the hypothalamus is important for GnRH release in ovariectomized female monkeys. To investigate possible interactions between estrogen synthesizing cells and GnRH neurons, double immunocytochemical staining (ICC) experiments were conducted. For a marker of estradiol producing cells, antibodies for aromatase, the rate-limiting enzyme for E2 synthesis was used. Results indicate that although GnRH neurons did not express aromatase, contacts of GnRH fibers on aromatase expressing cells in stalk-median eminence were observed. We will confirm the results using a combined method of in situ hybridization (ISH) for aromatase mRNA and ICC for GnRH in the same hypothalamic tissue samples of monkeys.

FISH FOR DUMMIES: CREATING AN ILLUSTRATED TRAINING MANUAL FOR FLUORESCENCE IN SITU HYBRIDIZATION

Douglas Chalmers, Francisco Moya Flores (Mentor), Civil & Environmental Engineering

Fluorescence in situ hybridization (FISH) allows scientists to observe the makeup of bacterial populations. In FISH, fluorescent DNA oligonucleotides hybridize to rRNA molecules inside the cell and allow for visual differentiation of specific clades of bacteria when viewed under a microscope. FISH for Dummies aims to greatly enhance the speed and quality of training for new undergraduate students performing this long and sensitive procedure. The completed guide provides a concise outline of steps with language comprehensible to those without prior lab experience. New undergraduates can visualize all of the processes' intricacies with the help of annotated pictures of an actual FISH iteration. More intermediate strategies for FISH are included as well to promote eventual mastery of FISH beyond a basic novice understanding.

DISPLAYING HUMMINGBIRDS: IMITATING NATURE AND PERFORMATIVITY OF COLLECTING CULTURE IN 19TH CENTURY BRITAIN

Sur-Han Chang, Nancy Marshall (Mentor), Art History

The Victorian fascination for birds developed from the Romantic period's focus on the concepts of beauty, inspiration, and immortality. Part of the prevalent interest in natural history, exotic hummingbirds became one of the central objects in Victorian collections, embodied not only in scientific taxidermy but also in art objects and the fashion industry. This research project, with analysis of four hummingbird objects, examines the history of collecting taxidermic hummingbirds in Victorian Britain, and investigates how natural history and a culture of consumption popularized the act. By displaying hummingbirds, Victorians expressed their craving for understanding nature, yet at the same time fashioned themselves by muting and domesticating it.

IDENTIFYING AND UNDERSTANDING THE MECHANISMS OF PROTEINS THAT INTERACT WITH BICAUDAL-C PROTEIN

Nithin Charlly, Michael Sheets (Mentor), Biomolecular Chemistry

The Bicaudal-C (Bic-C) protein is a repressor that controls how specific mRNAs are used for protein synthesis. However, the molecular mechanisms by which Bic-C represses translation are unknown. Previous results demonstrated that Bic-C works in conjunction with the CNOT7 repressor protein. The goal of my proposal is to define the molecular determinants that guide these interactions between Bic-C and CNOT7 as a strategy to understand the mechanism of repression. Specifically, I am using the yeast two-hybrid assay to identify specific regions of CNOT7 and Bic-C that are essential for their interaction. Learning more about Bic-C may lead to a better understanding of the Bic-C-dependent events that control embryogenesis and the formation of adult organs such as the kidney and heart.

AROGENATE AND PREPHENATE DEHYDROGENASES INVOLVED IN TYROSINE BIOSYNTHESIS IN SOYBEAN

Siyu Chen, Hiroshi Maeda (Mentor), Botany

Two pathways of tyrosine (Tyr) biosynthesis have been proposed in plants and microorganisms: one utilizes arogenate dehydrogenase (ADH) to produce Tyr, the other utilizes prephenate dehydrogenase (PDH) to produce 4-hydroxyphenylpyruvate which is further converted to Tyr. Although only ADH activity has been detected in most plant species, legumes interestingly possess both ADH and PDH activities. The goals of this project are to identify genes encoding ADH or PDH enzymes in soybean and determine the biochemical properties of the identified enzymes, including substrate specificities, enzyme kinetics and potential feedback inhibition. Among twelve candidates identified by BLAST, five were expressed in soybean tissues and the encoded enzymes showed either ADH or PDH activity. This study will provide insights on the regulation and further engineering of Tyr biosynthesis pathways in legumes.

ENABLING IRON PYRITE SINGLE CRYSTALS FOR SOLAR ENERGY CONVERSION APPLICATION

Hong-En Chen, Song Jin (Mentor), Chemistry

Iron pyrite (FeS₂), is an earth-abundant semiconductor that has generated recent interest due to its promising properties for solar energy conversion (bandgap of 0.95 eV and high absorption coefficient $\sim 10^5 \text{ cm}^{-1}$). Despite intensive efforts, the solar conversion efficiency of pyrite remains below 3%. The Jin group has recently demonstrated that the poor performance of pyrite materials originates from intrinsic bulk and surface defects. In order to enable iron pyrite for solar energy applications, robust passivation strategies are needed. Herein, I will discuss my efforts in passivizing the intrinsic bulk defects of iron pyrite single crystals grown by chemical vapor transport. We will show the effectiveness of our passivation strategies by measuring their photoelectrochemical performance in liquid junction solar cells.

EXPERIMENTAL AND NUMERICAL INVESTIGATION OF SMALL SOLUTE CHEMICAL INTERACTIONS

Lixue Cheng, M Thomas Record (Mentor), Chemistry

The goals of this research are to quantify the interactions both experimentally and computationally between alcohols, polyols and related biochemical solutes with nucleic acid bases and base analogs. The data will be interpreted in terms of interactions of individual functional groups on the solutes (e.g. aliphatic C, hydroxyl O) and the nucleobases (carbonyl O, amino N, aliphatic C, and ring C, N). The analysis is based on additivity of these interactions, and involves the solution of an overdetermined set of equations dissecting each solute-base interaction free energy into additive contributions from all possible pairwise interactions of functional groups. This analysis can be performed in several ways, yielding interaction free energies per group or per unit of accessible surface area of each group. For this research project, we will determine additional polyol-nucleobase interactions and test the various methods of analysis and the underlying hypothesis of additivity, which our laboratory has demonstrated to be valid for other data sets. We will compare the results with those obtained from atomistic simulations of the radial distributions of solute in the vicinity of nucleobase, in order to test additivity and, if necessary, to refine the force field parameters used in the simulation.

MECHANISTIC INSIGHT INTO RTCB - ARCHEASE INCREASES RNA LIGATION AND EXPANDS NTP SPECIFICITY OF RTCB

Chin Leng Cheng, Ronald Raines (Mentor), Biochemistry

RNA ligases are vital enzymes responsible in biological processes such as RNA repair, genome duplication, and protein response. RNA ligase RtcB has been identified as an enzyme that catalyzes the noncanonical GTP-dependent ligation of 3'-P and 5'-OH RNA termini. Another component of the ligation reaction, Archease, has recently been discovered as an activator of RtcB. Interestingly, the gene that encodes Archease is localized into an operon with the *rtcB* gene, indicating possible functional association between RtcB and Archease. Through structural studies and enzymatic assays, we find that Archease increases RNA ligation catalyzed by *Pyrococcus horikoshii* RtcB and also remarkably expands the cofactor specificity of RtcB, allowing RtcB to also use ATP, dGTP, and ITP. Hence, our findings show that RtcB and Archease indeed function collectively.

EFFECT OF ESTRADIOL ON THE ORGANIZATION OF ARGININE VASOPRESSIN IN THE AMYGDALA

Jingyi Chi, Anthony Auger (Mentor), Psychology

Arginine vasopressin (AVP) is a neuropeptide that regulates social behavior and is implicated in several behavioral disorders in humans. Testosterone maintains AVP expression in adult male rats by altering the methylation profile of the *Avp* promoter. To further investigate how testosterone organizes the sex differences of AVP expression between male and female rats, we injected estradiol, a key metabolite of testosterone, to female rats on early postnatal days and examined the level of *Avp* mRNA and methylation of individual CpG sites within its promoter region in the amygdala. We observed an increase in AVP mRNA and a decrease in methylation at one CpG site. Our data suggest that estradiol may underlie the regulation of sex differences in AVP expression through a DNA methylation-dependent mechanism.

DELAYED AGING IN A PILL: METABOLIC ANALYSIS OF CALORIC RESTRICTION MIMETICS IN MICE

Monica Chou, Rozalyn Anderson (Mentor), Medicine

Caloric restriction (CR), a dietary intervention involving reduction in caloric intake without malnutrition, delays aging and the onset of age-associated diseases. Understanding of CR mechanisms will provide a unique perspective on the aging process. Pharmacological interventions can be designed to mimic CR's mechanisms. Three drugs have been identified as potential CR mimetics: lithium carbonate, bezafibrate, and resveratrol. For all three drugs the direct or indirect target is PGC-1 α , a master regulator of energy metabolism. The objective is to measure the drugs' impacts on energy metabolism in mice tissue using quantitative imaging techniques. Metabolic parameters will be determined on liver, skeletal muscle, and white adipose tissue from 1-year-old adult mice that have been untreated, treated with CR, or treated with one of the three CR mimetics.

THE TCDD INDUCED ACTIVATION OF ARYL HYDROCARBON RECEPTOR (AHR) CREATES NEUROVASCULAR MALFORMATIONS

Erica Christensen, Jessica Plavicki (Mentor), Pharmacy

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is a persistent environmental contaminant that exerts toxicity by activating aryl hydrocarbon receptor (AHR) signaling. AHR is a ligand-activated transcription factor that dimerizes with aryl hydrocarbon receptor nuclear translocator (ARNT) and binds to sequences known as aryl hydrocarbon receptor response elements (AHREs) upstream of target genes such as cytochrome P450, CYP1A. We wanted to see the impact TCDD and AHR had on neurovascular development. We have found malformations in the brain and its vasculature following activation of AHR by TCDD. Due to a genome duplication event, zebrafish have two AHRs, AhR1 and AhR2. To determine whether AHR 1+2 are important for normal zebrafish neurovascular development we used morpholino oligonucleotides (MOs) to block translation of AHR1+2 in zebrafish embryos. We have found vascular malformations in embryos injecting AhR1 and AhR2 indicating that AhR 1 and AhR 2 are needed for normal zebrafish development. Proper brain vascularization is necessary for brain health and functioning.

A GEOGRAPHY OF VIOLENCE; A STUDY INTO THE ROLE OF VIOLENCE IN THE U.S.-MEXICO BORDER THEATER

Serna Christopher, Paola Hernandez (Mentor), Spanish and Portuguese

The United States-Mexico border deters unwanted immigration while at the same time serves wealthy Mexican and American business owners, who have established factories (maquilas) on the Mexican side in hope of profiting from the free trade agreement laws. The geography of the border is a hostile environment teeming with murders, femicides, kidnappings and drug-related crimes among many other atrocities being reported over the last decades. Nonetheless, individuals from all over the continent still make their way there in search of a better life. This migrant diaspora that lives and thrives at "the border" creates a new hybrid culture with its own identity, rules, codes of ethics and problems. In my research I would like to study and analyze the impact of these outside elements on this cultural hybridization by looking at the theater that is written and performed at the border. How do the aforementioned atrocities affect the plays written and performed there? How does the theater, one of the oldest forms of literature, question and respond to the violence and does this violence become an integral part of the body of work?

FINDING A BETTER TOOL FOR NITROGEN DETERMINATION

Kim Chung, Troy Runge (Mentor), Biological Systems Engineering

Nitrogen, an essential component for plants growth, is applied to farm field through inorganic fertilizers and animal waste. Farmers must be able to control application to prevent negative environmental consequences such as run-off, leaching, and nitrous oxide emissions as well as lower their input costs for crop production. To help farmers manage their nitrogen in soil and animal waste, we are investigating a faster, non-destructive test X-ray fluorescence analysis (XRF) which can also provide information on other elements. By comparing the data given by XRF and comparing to the standard test method done with an automated discrete analyzer (AQ2) the research will demonstrate if XRF is suitable for this application.

NOT EVERYTHING IS AT IT SEEMS: PERSPECTIVES OF IMMIGRANT FAMILIES IN LIFE AND LITERATURE

Luis Cid-Ramirez, Catherine Lilly (Mentor), Curriculum and Instruction

Past research and literature does not show or explain the true stories of immigrant children and their families. There are only a few books and research that really convey the true struggles of immigrant children and their families. The focus of the study is on a migrant child and his family, over a period of five years. The information consisted of interviews, recordings and pictures in different places. Observations point out that although the United States gives immigrants many opportunities and safety, it is not easy to enter the American culture; additionally they face other problems such as finances and racism. It is hard for migrant children to have a good sense of identity if they cannot find themselves in the literature they read. We hope to continue doing the research till the child finishes high school to have a better understanding on the issue that millions of children and families face each day in America.

THE EMERGENCE OF THE PRECEDENCE EFFECT IN NORMAL HEARING TODDLERS

Alexandra Clark, Erin Shannon, Ruth Litovsky (Mentor), Communication Sciences and Disorders

The precedence effect results when a sound source and an echo occur in a room from different locations, but listeners hear one sound at the location of the source (leading sound). In a previous study, Litovsky et al. (2013) used the “Reaching for Sound” method (RFS) in order to measure sound localization for a source alone, in 2-year-old toddlers with normal hearing and children who use bilateral cochlear implants. This study investigates using the RFS method to gain insight in the emergence and development of the precedence effect in normal hearing toddlers. The children completed localization and left-right discrimination tasks using both single-source and lead-echo stimuli. Methodology of this novel approach to exploring the precedence effect along with preliminary data will be presented.

MULTI-METHODS APPROACH FOR DOMAIN-SPECIFIC GROUNDING: AN INTELLIGENT TUTORING SYSTEM FOR CONNECTION MAKING IN CHEMISTRY

Brady Cleveland, Martina Rau (Mentor), Biochemistry

Making connections between different graphical representations is at the core of learning in STEM fields. However, students often fail to make these connections on their own. Intelligent tutoring systems (ITS) are suitable tools to support connection making. However, current ITSs and other educational materials fail to address the different types of connection making, namely, sense-making and perceptual fluency. It is currently unknown how these two types of connection making interact and are gained. Our research aims to identify if these are indeed distinct skills and how these two interact. We must also answer the questions of how to teach both, as well as which order to teach them. Preliminary results show that sense-making and perceptual fluency are indeed distinct skills, and that teaching perceptual fluency before sense-making is detrimental to the students overall learning and connection-making skill.

2014 TRIBAL ENVIRONMENTAL SUMMIT

Brittany Cobb, Larry Nesper (Mentor), Anthropology

In October 1914 the Society of American Indians (SAI) gathered for their fourth national conference. The SAI was the first National Indian rights organization developed and run solely by American Indians. Our group is researching the lives and accomplishments of the American Indians that attended that first conference. We investigated their lives by compiling a literature review of newspapers, censuses and artifacts. At the Tribal Environment Summit in October 2014, we will pay tribute to those that attended the initial meeting. The partnership between the University of Wisconsin- Madison and the American Indians will be acknowledged, environmental problems tribal communities face will be discussed, and future goals will be planned for researchers and tribal leaders. We hope to work together to solve these problems and honor the attendees. Through our research we aim to see why the meeting in 1914 was so successful and attract Wisconsin’s current tribal leaders and interested tribal members to the Summit in 2014.

THE USE OF CICERONIAN RHETORIC IN THE AMERICAN PRESIDENCY

Nora Conneely, Daniel Kapust (Mentor), Political Science

An important puzzle in the study of American presidential rhetoric centers on a shift that occurred during the 20th century. This study seeks to explain the shift from exclusive, technical speech to popular rhetoric by comparing modern presidential rhetoric to Ciceronian oratory of the Roman Republic. By analyzing ancient and contemporary sources, I argue that what appears to be a modernization of presidential rhetoric is a return to ancient standards. I make this argument by identifying characteristics of Roman political rhetoric, focusing on Cicero. I then explore changes in American presidential rhetoric using campaigns and State of the Union addresses. Although some scholars see these changes as problematic, this study suggests this shift in rhetoric is beneficial for a more inclusive and transparent political environment.

THE EFFECT OF PGD2 ON INSULIN SECRETION IN BETA CELLS

Kelsey Connors, Michelle Kimple (Mentor), Medicine

The purpose of the project is to understand the effect of prostaglandin D2 (PGD2) on beta-cells. PGD2 is a derivative of arachidonic acid. The Kimple lab has previously shown that PGE2, a similar derivative of arachidonic acid, binds with the EP3 receptor to inhibit glucose-stimulated insulin secretion (GSIS). If expressed in the beta-cell, the corresponding receptor for PGD2, the DP receptor, should promote GSIS. Through the analysis of GSIS, viability assays, and genotyping, we will be able to tell 1) whether PGD2 has any effect on insulin secretion and the magnitude/directionality of this effect, and 2) whether this effect is caused by PGD2 binding to its own DP receptor or through competition with PGE2 for binding to EP3.

GRASSLAND BIRD-NESTING CHRONOLOGY IN WISCONSIN

Olivia Cottrell, Michael Guttery (Mentor), Forest and Wildlife Ecology

The objective of this study is to understand the effects of climatic variability and agricultural land-use practices on nest success of Eastern Meadowlark and Henslow's Sparrow. Nesting activity was monitored by frequent observation or video surveillance systems. The number, age, and status of eggs/nestlings at 1–4 day intervals were recorded until nests were empty. We back-dated nests, using random generation where necessary, to assign ages to nests to create survival histories. This information, coupled with historic climate and land use data, will be analyzed using a Bayesian statistical approach to model when the peak of nesting occurs in relation to climate and environment.

HOW CHILDREN LEARN PATTERNS: DIRECTED VS. EXPLORATORY LEARNING

Carol Coutinho, Charles Kalish (Mentor), Educational Psychology

Children are always learning patterns. Sometimes patterns are directly taught, other times they are learned from open-ended exploration. Our study explores the effects of directed and exploratory learning methods in children's experiences at the Madison Children's Museum by playing our "Monster" game with young children. Research questions concern the trade-off between learning one pattern well, but ignoring other patterns in experience, versus learning many patterns at the same but perhaps none very fluently. For example, if children are trained to predict a monster's mouth from its eyes, will they notice that its nose and hair also correlate? Our research impacts the community by informing parents and educators about children's pattern learning and providing museum staff with novel ways of designing more stimulating exhibits.

FEASIBILITY PILOT USING IPADS FOR SYMPTOM MANAGEMENT DATA COLLECTION

Neal Cragg, Karen Kehl (Mentor), Nursing

Symptom management is critical to provide effective and quality care in the last weeks of life. There are few prospective studies of the progression of symptoms in home hospice patients in the last days. There is even less data on the reactions of caregivers to observing the patient's symptoms. The purposes of this study are to determine the feasibility of using an iPad to collect symptom data and caregiver reactions every 24 hours in a home hospice setting, and to examine participant burden and acceptability of the technology to users, and describe the impact of consistent symptom documentation on caregivers.

WHAT'S IN A NAME?: ELITE FAMILIES AND NAMES IN AMERICAN POLITICS

Caroline Cromer, Jennifer Williams (Mentor), Political Science

At the intersection of legislative careerism, political psychology, and linguistics lies the question of elitism in American politics. What none of these fields address directly is whether and how a representative may pass on political advantages—a name, money, political connections—to other members of the family. This study isolates the influence of a familiar name in elections through a historical analysis of name type. This information is then examined within the context of political elections to illustrate the impact of a family name on the outcome of an election, regardless of the influence from other family political advantages.

TODDLERS' LEARNING FROM TOUCHSCREENS

Sarah Crook, Clare Demberger, Fatima Jallow, Emily Kitzerow, Mary Matoba,
Heather Kirkorian (Mentor), Human Development & Family Studies

We have found that toddlers learn better from an interactive touchscreen than from non-interactive video. The purpose of the current study is to extend this finding by determining 1) whether interactive screens increase learning between two- and three-dimensional displays and 2) if learning is greater for children with well-developed cognitive skills. Toddlers (27–33 months) will play a hide-and-seek game using only video or both video and real-life objects. We expect that toddlers will learn better when using interactive (vs. non-interactive) video and when using only video (vs. video and real-life objects). Further, we expect that children with stronger cognitive skills will perform better on the task. Research findings will provide a better understanding about how young children learn from interactive media.

MANAGING THE PERCEPTION OF FOREIGN INFLUENCE ON WOMEN'S RIGHTS IN MOROCCO

Kaylah Cruz-Herrera, Aili Tripp (Mentor), Political Science

Morocco is a top recipient of foreign aid globally, yet the Moroccan government is reluctant to advertise foreign sources of support for its gender-related initiatives. I will test my hypothesis that Moroccan authorities downplay the role of international donors in order to portray women's rights development as a reflection of a progressive Moroccan Islam, which is not beholden to Western influence. This research focuses on government reports on the National Initiative for Human Development, which I am able to read in Arabic. The program has a strong women's rights focus and receives massive support from the World Bank and European Union. I will compare the treatment of issues relating to women to other areas that receive external support to investigate any broader patterns.

NANOSTRUCTURED LAYERED DICHALCOGENIDES AS CATALYSTS FOR HYDROGEN EVOLUTION

Andrew Daniel, Song Jin (Mentor), Chemistry

Layered transition metal dichalcogenides (MX₂) materials show promise as cost-effective replacements for platinum as catalysts for hydrogen evolution. MX₂ compounds consist of covalently bound X-M-X layers where X is a chalcogen such as sulfur, and M is a transition metal, such as Mo or W, while discrete layers are held together via van der Waals forces. The performance of MX₂ materials is correlated with their morphology; edges exhibit catalytic activity for hydrogen evolution, whereas basal planes are chemically inert. My research has sought to increase the edge density of the products through chemical vapor deposition and chemical exfoliation to generate high edge density. The as-grown products are chemically and structurally characterized using a variety of techniques including electron microscopy, x-ray diffraction, and spectroscopy.

THE ROLE OF COLLAPSIN RESPONSE MEDIATOR PROTEIN 4 (CRMP4) IN AXONAL DEVELOPMENT

William Davis, Mary Halloran (Mentor), Zoology

Collapsin response mediator proteins (CRMPs) are implicated in cytoskeletal regulation, a crucial component of axonal development. CRMPs have been shown to localize to the growth cone, supporting a role in development. However, the role of CRMP4 has not been well defined. To investigate the contribution of CRMP4 to axonal development we designed a CRMP4 morpholino and tested its efficacy through RT-PCR. The zebrafish embryos were microinjected at the one-cell stage with morpholino, raised to one day and antibody stained to visualize sensory axonal morphology. We found no altered neuronal morphology. These results suggest that CRMP4 is not required for sensory axonal development or other CRMPs may be able to compensate for its loss.

EFFECTS OF CORTISOL ON MEMORY AND RELATED BRAIN ACTIVITY

Mark Dennison, Heather Abercrombie (Mentor), Psychiatry

Elevations of the stress-related hormone cortisol are a mechanism through which stressors alter memory formation. The goal of the current project is to determine how cortisol's effects on the brain mediate its effects on memory. We are testing the hypothesis based on previous research mainly in animals suggesting that cortisol's effects on memory depend on functional connectivity (or "coherence" in activation) between the amygdala and prefrontal brain regions. We are using fMRI to investigate the effects of pharmacologically manipulated cortisol (vs. placebo) on brain activity during viewing of emotionally salient and neutral photographs, for which memory recall is subsequently tested. Results from 11 women participating in this ongoing project will be presented.

DEVELOPMENT OF A XYLOSE FERMENTING GAMMA-VALEROLACTONE RESISTANT YEAST STRAIN

Quinn Dickinson, Jeffrey Piotrowski (Mentor), Wisconsin Energy Institute

A new process to break down cellulosic biomass into its monomers using gamma-valerolactone as a solvent has been developed. This process is promising for the development of cellulosic biofuels as it has the potential to lower the costs of the pretreatment of the biomass. We are working towards the development of a yeast strain capable of using the sugars present in this new media while withstanding the toxic effects of the gamma-valerolactone. To develop this strain, a combination of screening a collection of diverse *Saccharomyces cerevisiae* strains and genetic engineering are being utilized. As of now, gamma-valerolactone tolerant strains have been selected and engineered with xylose utilization genes. Further tests will be done to determine the best strain and if further genetic modification is necessary.

NATURAL AND HUMAN FACTORS NEGATIVELY AFFECTING THE BELUGA WHALE POPULATIONS IN NORTH AMERICA

Wynn Diels, Amit Nimunkar (Mentor), Biomedical Engineering

The Beluga whale species has been dwindling for decades and the precise causes for this are still unknown. The two main populations which have been studied in North America are the Cook Inlet population in Alaska and the Hudson Bay population in Canada. I have compiled research articles which focus on Beluga whales and these two locations, creating a universally usable document which compares and contrasts the two populations' environments and the human factors which could be hindering the populations. These comparisons can be used to hypothesize what experiments need yet to be conducted as well as to hypothesize a plan of action in order to save the population before it reaches extinction.

MANAGEMENT OF MOUTH SORES IN HEMATOLOGY PATIENTS RECEIVING CHEMOTHERAPY

Stephanie Dinse, Kristine Kwekkeboom (Mentor), Nursing

Mouth sores are a common chemotherapy side effect among patients with hematologic cancers, however, little research has explored self-care interventions for mouth sores in this population. The purpose of this study is to evaluate hematologic cancer patients' knowledge, use, and perceived effectiveness of interventions for mouth sores. The study uses a descriptive design. Participants will report their knowledge of 17 evidence-based interventions, describe if they used each intervention in the last three weeks, and if so, rate its effectiveness. Responses will be summarized with frequencies, percentages, means and standard deviations. Identifying self-care interventions to manage mouth sores will provide evidence for nurses to design better patient education targeting effective but underutilized strategies to lessen the onset or severity of mouth sores and improve patient outcomes.

USING DIFFERENT CELL TYPES TO HELP DELINEATE REPROGRAMMING TO AN INDUCED PLURIPOTENT STATE

Michael Diny, Khoa Tran (Mentor), Cell & Regenerative Biology

Induced pluripotent stem cells (iPSCs), which are somatic cells that have been reprogrammed to acquire the properties of embryonic stem cells (ESCs) by the overexpression of a small set of proteins, have revolutionized the prospect of therapeutic and regenerative medicine in recent years. However, in order for safe, controllable and efficient iPSC therapy to be achieved, the molecular activity of pluripotent states and transitions must be better understood. Several somatic cells have been successfully reprogrammed, but current science's knowledge of reprogramming all stems from studies using mouse embryonic fibroblasts (MEFs) as the starting material. The objective of my project is to help delineate the mechanism of reprogramming by analyzing the conversion rates of alternative cell types and comparing those rates with the rate of the widely studied MEF. Reprogramming efficiency will be calculated based upon the different cell types' ability to achieve pluripotency as determined by immunofluorescence. From my experiments we will be able to determine if somatic cells from different lineages have common or unique barriers in the acquisition of pluripotency.

EVOLUTION OF PHENYLALANINE BIOSYNTHESIS IN PLANTS

Camilla Dornfeld, Hiroshi Maeda (Mentor), Botany

This project focuses on the evolution of phenylalanine biosynthesis in plants. A possible evolutionary "border" has been determined for the gene that allows plants to produce phenylalanine from precursors. My previous research focused on testing genes that code for prephenate aminotransferase (PAT), which converts prephenate to arogenate. My findings in previous research have supported this border. I am now looking into another gene that encodes arogenate dehydratase (ADT), which converts arogenate to phenylalanine. Organisms that use PAT to produce arogenate can convert arogenate to phenylalanine using ADT. *C. tepidium*, my organism of interest, is known to have an active PAT gene. I therefore expect it to also have an active ADT gene. This result would strengthen the evidence that supports the hypothesized evolutionary border.

EFFECTS OF AEROSOLS ON RADIATION

Alyson Douglas, Tristan L'ecuyer (Mentor), Atmospheric and Oceanic Sciences

In the latest IPCC report, the largest amount of error resulted from the unknown radiative forcings of clouds. While it is known bright clouds increase the amount of shortwave radiation, and dark clouds increase the amount of longwave radiation, the global impact of clouds when influenced aerosols is still unknown. Using data from NASA's A-Train satellites, the radiative forcings of clouds in the Angola Basin off of the east African coast was analyzed. The research focused on comparing how high and low aerosol concentrations, in raining and non-raining clouds, influences the radiative forcings.

GENOMIC EDITING OF ALEXANDER DISEASE IPS CELL TO GENERATE ISOGENIC CONTROL LINE

Marina Dubovis, Su-chun Zhang (Mentor), Neuroscience

Alexander disease (AxD) is a rare neurodegenerative condition characterized by the aggregation of GFAP in astrocytes, a type of glial cell found throughout the central nervous system. Through the degeneration of white matter, AxD leads to cognitive deficits, seizures, macrocephaly, and ultimately death. Animal models have greatly advanced the understanding of this disease, however, no such models accurately recapitulate the disease, and thus induced pluripotent stem cells (iPSCs) have been developed from AxD patients to model the disease. The purpose of the following study is to employ the CRISPR/Cas9 system of genomic editing in order to generate an isogenic control line of AxD astrocytes in hopes of elucidating the pathogenesis of Alexander disease, along with other properties of GFAP and astrocytes.

ROLES OF E-PROSTANOID RECEPTOR ISOFORMS IN INSULIN SECRETION

Zach Dumar, Michelle Kimple (Mentor), Medicine

In pancreatic islets, the alpha subunit of the heterotrimeric G-protein, G-alpha-z, acts as part of a pathway to inhibit insulin secretion. The third isoform of the E-prostanoid receptor, EP3, binds to G-alpha-z and once activated inhibits adenylate cyclase. This pathway ultimately leads to lower insulin secretion by lowering levels of cAMP. Having looked at EP3, we are now focusing our attention on the other E-prostanoid isoforms, specifically EP1, EP2, and EP4. These receptors are thought to be stimulatory towards adenylate cyclase. We are treating isolated mouse islets with SC-51089 and AH-23848, which are EP1 and EP4 antagonists, respectively. Through modification of insulin secretion, we are attempting to develop novel therapeutics in the treatment of islet dysfunction.

ROLE OF CALCIUM BINDING IN THE ACTIVATION OF SYNAPTOTAGMIN I

Stefan Elde, Chantell Evans (Mentor), Molecular and Cellular Pharmacology

For 50 years it has been known that the rapid influx of calcium (Ca²⁺) into the presynaptic neuron triggers the fusion of synaptic vesicles (SVs) with the neuronal plasma membrane. This fusion releases neurotransmitters located within SVs from the presynaptic neuron that cause a cascade of signals that control nearly every physiological process. Soluble N-ethylmaleimide-sensitive factor attachment protein receptor proteins (SNARE) proteins are required for this fusion, and Synaptotagmin I (SytI), a SV protein, is proposed to be the Ca²⁺ sensor that regulates neurotransmitter release. However, the mechanism by which SytI triggers fusion is still unknown. Ca²⁺ binding within SytI is coordinated by aspartic acid residues found in the cytoplasmic domain. By mutating the negatively charged aspartic acid residues into asparagine, glutamic acid, and alanine, thereby varying the size and charge of the binding pocket, we measured their molecular interactions so that we can begin to characterize the mechanism of SytI triggered neurotransmitter release. SytI activation will be measured using two assays: a phospholipid binding assay, and a reconstituted in vitro fusion assay. Using these assays, I will systematically complete the first comprehensive in vitro study of the Ca²⁺ requirements of neurotransmitter release.

VIDEO GAME TUTORIALS & LEARNING: AN ANALYSIS OF TUTORIAL GAME DESIGN USING GEE'S LEARNING PRINCIPLES

Jacob Benford, Luca Brilli, Simon Casey, Kyle Ferris, Thai Thao, Mikaela Wallin, Annie Yang, Doris Yang, Jonathan Elmergreen (Mentor), Curriculum & Instruction

Tutorials in video games are often the first source of learning for a player. As a first point of contact, they occupy an important juncture during play. However, more research is needed to understand the work they do (or don't do). In his studies on learning and video games, James Paul Gee identified a number of learning principles that occur while players engage with games. In particular, some of these principles emphasize the importance of presenting information "just-in-time" or "on-demand." Just-in-time and on-demand are techniques for providing information only when it is relevant to the context (just-in-time) or requested by the player (on-demand). These ideas relate directly to the framework of video game tutorials and their effectiveness in delivering information to the player. By presenting information when it is relevant during a tutorial, it can be readily learned and immediately applied. If these principles are also present in game tutorials as they are in the rest of gameplay, understanding them will give us rich insight into the learning that occurs at first contact, as well as the implications it has for later gameplay. As such, the research here examines the types of learning that occur while playing video game tutorials. We use Gee's principles to analyze existing studies on video game tutorials and end with discussion and implications for tutorials in the field of educational game design.

CHARACTERISTICS OF RADIATION-INDUCED CHANGES IN CULTURED HUMAN VOCAL FOLD FIBROBLASTS

Gabrielle Enos, Elizabeth Levendoski (Mentor), Surgery

Radiation therapy for the treatment of head and neck cancer has been shown to have antagonistic effects on the vocal folds such as tissue damage and reduction in vocal fold function. Our understanding of the biological mechanisms underlying these changes is limited. The purpose of this study is to investigate the effects of radiation on gene expression, cell morphology, cell viability, and cell growth of vocal fold fibroblasts. I am specifically looking at the multiple inflammatory cytokine genes and ECM genes, analyzing cell stains, documenting microscopic images, and performing a clonogenic assay to assess these changes. Knowledge gained from this study will further our understanding of the biological mechanisms underlying radiation-induced vocal fold damage as well as lead to the development of future treatment options.

TRACE AND MAJOR ELEMENT VARIATIONS IN A HYDROTHERMAL ALTERATION HALO

Kyle Erdmann, Philip Brown (Mentor), Geoscience/Geophysics

The San Juan volcanic complex of southwest Colorado was mainly formed between ~33–23 Ma and hosts numerous hydrothermal ore deposits. In the late 19th century this region was a major producer of silver, gold, lead, and zinc. During hydrothermal transport of the ore components and deposition of the ore minerals, the hot, acidic fluids cause chemical and mineralogical alteration of the host rocks surrounding the vein complexes, seen here as the preferential leaching of certain elements, and the addition of others. This study looks at one particular vein and its alteration halo on the meter scale to see if there is a correlation between distance from the vein, mineralogical changes, as well as concentrations of major and trace elements within the host rock.

EFFECTS OF ACUTE GVHD ON PHYSICAL AND PSYCHOLOGICAL FUNCTIONING AFTER STEM CELL TRANSPLANTATION

Mackenzie Erdmann, Erin Costanzo (Mentor), Psychiatry

We compared physical and psychological functioning of hematopoietic stem cell transplantation (HSCT) survivors with or without acute graft-versus-host-disease (aGVHD). HSCT patients (N=108) completed physical and psychological functioning measures pre-HSCT and 3 and 6 months post-HSCT. By 3 and 6 months post-HSCT, there were no significant differences between those with and without aGVHD in physical functioning. There were significant differences in anxiety at 3 and 6 months post-HSCT ($F(2,103)=3.19$; $p=.049$; $F(2,98)=4.99$; $p=.011$). There was a trend toward a difference in personal strength at 6 months ($F(2,97)=2.86$; $p=.070$). Findings indicate those with aGVHD were doing as well as those without aGVHD in physical and most psychological functioning indices by 3 and 6 months post-HSCT. However, the experience of severe aGVHD appeared to affect aspects of psychological functioning.

INTERNAL MOTIVATION TO RESPOND WITHOUT SEXISM: AFFECT AND CONFRONTATION

Lynnsey Erickson, Patricia Devine (Mentor), Psychology

Individuals' personal standards for being non-sexist have been shown to differentially affect how they react to sexist behaviors in others. In the present study, participants were told that they would be evaluating a teaching assistant (TA) on his or her performance during two academic meetings. Participants read transcripts of these meetings in which the TA either made one or three sexist statements that were rated as either highly or moderately sexist. Participants also completed an affect measure both before and after being given the opportunity to leave written feedback for the TA on his performance (confrontation). Results highlight how individuals' personal standards for sexism affect their reactions to others' sexism and how they choose to confront that individual.

REMOVAL OF NITROGEN THROUGH A PHOTOBIOREACTOR

Lianne Estrella, Ben Oyserman (Mentor), Bacteriology

A photobioreactor was designed to experiment on how excess nutrients can be extracted from water to obtain clean water for future use. The goal is to design a total biological nutrient removal system by using natural processes: photosynthesis and nitrification to optimize water treatment. The efficiency of ammonium removal will be determined by controlling the amount of ammonium being added through media feeds and obtaining the rates of dissolved oxygen from a photosynthetic biofilm. Once photosynthesis coupled with nitrification is sufficiently established, a microbial denitrifying community will be introduced to determine how much nitrogen can be removed using this process. This research will introduce a sustainable removal system of excess nitrogen within water treatment plants.

INFLUENCE OF IMMIGRANT BACKGROUND ON LITERACY AND IDENTITY ON CHILDREN

Gbemi Famule, Catherine Lilly (Mentor), Curriculum and Instruction

The research seeks to understand how children from immigrant background are affected by this status e.g. their self-identification, and how their literacy progress is affected. Data is collected by observing and interviewing them at home and school, along with families and teachers and also charting their academic and behavioral progress. I transcribe the recorded conversations between the researcher and the subjects. So far, an observation is that, the children tend to do better in other subjects compared to language arts which might suggest some struggle with literacy. The findings are to be published with the goals that they help teachers and everyone involved with education to understand how such children learn and most importantly, inspire changes in education to accommodate children like the ones studied.

COMPARING SYSTEMIC CHEATING IN CHICAGO AND ATLANTA SCHOOL DISTRICT ORGANIZATIONS

Benjamin Fan, Erica Turner (Mentor), Educational Policy Studies

While cheating is often associated with isolated malpractice, recent outbreaks of mass cheating in Atlanta, Philadelphia and other large cities suggest cheating may stem beyond the individual. The purpose of this project is to identify possible explanations of cheating as a web of connections to socio-political origins between two school districts. Following the story of the Chicago and Atlanta public school cheating scandals through media reports in the Chicago Tribune and the Atlanta Journal, a series of qualitative analytical techniques have been applied to both identify and compare underlying themes. These artifact analysis include coding themes, keyword memoing and holistic apperception of the incidents to illuminate similarities found in both districts. As a part of a larger study to offer a sociological and political perspective on cheating, interviews of persons of interests will follow to gain more insight into systemic cheating.

PREDICTORS OF REFRACTORY ASTHMA IN OBESE PATIENTS

Jarjeh Fang, Lawrence Hanrahan (Mentor), Family Medicine

Over the last decade, the prevalence of both refractory asthma and obesity has increased in parallel. Obesity may influence asthma control and inflammation, and there is evidence of increased steroid resistance in obese asthma patients. Obesity related asthma might represent a distinct clinical phenotype. Different asthma phenotypes are likely associated with different treatment responses and prognoses. Using data from University of Wisconsin electronic Health record ? Public Health Information Exchange (UW eHealth PHINEX) program and by comparing asthma risk and control to demographics, clinical features, and community factors in patients categorized by their BMI, this study seeks to explore the relationship between obesity and asthma and uncover predictors of refractory asthma risk. This will provide further insight on asthma control and prevention.

SEDIMENTARY CARBONATE ROCKS WITH DOLOMITE / CALCITE MICRO-LAMINAE: INDICATOR FOR SEASONAL CHANGE

Yihang Fang, Huifang Xu (Mentor), Geoscience

Using in-situ X-ray diffraction (XRD) with support of optical imaging, scanning electron microscope (SEM) and transmission electron microscope (TEM), a micro-laminated carbonate rock formed during mid-Ordovician, is examined. Results show that darker layer is predominated by ordered-dolomite and calcite along with quartz and K-feldspars, while the brighter layer is dominated by calcite with fewer detrital materials and dolomite. Repetition between dolomite/calcite dominated layers suggests a possible annual cyclic, that seasonal change strongly influences the formation of dolomite. The dark layers, which rich in microbial mass, promote the dolomite crystallization at low temperature through reaction with seawater. Considering that summers provide more microbial mass, dolomitization occur in buried layers through sulfate-reduction and fermentation. Consequently, appearance of dolomite in micro-laminated carbonates could be used as a signal to interpreting ancient seasons.

MAKING RECEIPT REDUCTION AT UNIVERSITY OF WISCONSIN–MADISON A REALITY

Rachel Feil, Kyla Kaplan, Duncan Carlsmith (Mentor), Physics

With millions of register transactions taking place each year at the University of Wisconsin–Madison, the paper trail of receipts is noticeable on campus. The primary focus of this research addresses what forms of receipt reduction are possible for UW entities. By partnering with UW–Madison entities such as the University Housing Dining and Culinary Services, Wisconsin Union, Division of Information Technology, Babcock Hall Dairy Store, and UW Transportation Services, a baseline amount of receipts has been established. This baseline of receipt production of each entity is currently being examined with three aspects of improvements in mind. The three areas which are being explored reduce receipts include: utilizing paperfree receipts, reducing the number of receipts, and/or switching to Bisphenol A free paper.

WHITE MATTER HYPERINTENSITIES AND PHYSICAL ACTIVITY

Claire Fernandez, Elisa Torres (Mentor), Nursing

White matter hyperintensities (WMH) are areas on MRI scans indicating damaged white matter in the brain and are associated with many disabling disorders such as Alzheimer’s disease and depression. Risk factors for WMH are typically vascular. Vascular risk factors, such as high blood pressure, have been shown to improve by increasing one’s physical activity (PA). In theory, PA may also delay the progression of WMH and therefore slow the progression of WMH-based associated disorders. The purpose of this project was to determine the association between PA and WMH through conducting a systematic literature review using the PubMed database. Results were inconclusive. A large range of methods regarding how WMH were measured were identified, suggesting further research into a standardized measure of WMH is needed.

RESEARCH ON THE CORRELATION BETWEEN OBSTRUCTIVE SLEEP APNEA AND ASTHMA

Nicolas Fesser, Oleg Broytman (Mentor), Medicine

During the presentation I will talk about the research being conducted by Dr. Teodorescu, a pulmonologist at UW–Madison. Her research consists on finding a possible correlation between having asthma and developing obstructive sleep apnea in later years of life. I will talk about the roll lab rats play in the development of the research and will also speak about the medical conditions they are subjected to and how they are subjected to them. I will also speak about all the instruments used in the research and how they are essential to the collection of analyzable data. Finally I will talk about the results we have found and what they potentially could entail for the future of medicine.

INVESTIGATING THE RELATIONSHIP BETWEEN BICAUDAL-C AND CNOT7 IN TRANSLATIONAL REPRESSION

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 by repressing translation of specific mRNAs. However, the exact mechanism of translational repression by Bic-C is currently unknown. Preliminary data suggests that the Cnot7 protein interacts with the repression domain of Bic-C. A pull-down assay will be used to confirm interaction between Bic-C and Cnot7 and identify the minimal domains sufficient for the interaction. Identifying the minimal domains of the Cnot7 and Bic-C proteins sufficient for interaction should provide new insights into how these proteins mediate translational repression. Ultimately with this information, Bic-C could arise as a therapeutic target for diseases.

EFFECTS OF RESVERATROL ON GLIOBLASTOMA CELLS

Jonathan Fiala, Arthur Polans (Mentor), Ophthalmology and Visual Sciences

The purpose of this project was to determine whether resveratrol activates specific cellular pathways that contribute to its anti-cancer properties. Glioblastoma cells were treated with different concentrations of resveratrol for different periods of time or with DMSO as a control. SDS-PAGE and Western blotting were used to detect changes in the expression and/or activity of specific proteins which are indicators of proliferation, migration and the differentiation of cancer cells. Resveratrol activated p53 while simultaneously inhibiting Akt. No changes in nestin or GFAP were detected, however resveratrol did increase the expression of Beta-3-tubulin. We conclude that the activation of p53 by resveratrol correlates with its anti-proliferative property, while the inactivation of Akt correlates with its anti-migratory property. Resveratrol has some effect on the further differentiation of glioblastoma cells.

DEFINING EXPERTISE AMONG TEACHERS OF STUDENTS WITH SEVERE DISABILITIES AND FIRST-YEAR TEACHERS' COMFORT

Remington Finn, Risharda Bond, Andrea Ruppar (Mentor),
Rehabilitation Psychology & Special Education

The first study's purpose was to interview people that worked with students with severe disabilities about their opinions on what skills an expert who works with students with severe disabilities would have. Our role in this study was to transcribe the interviews; this made it possible for them to be analyzed. The purpose of the second study was to determine if there is a relationship between the type of teaching certificate received and how prepared teachers feel to use certain practices for students with severe disabilities among less experienced teachers. Our role in this study was to create a spreadsheet a contact list of special education directors in Wisconsin. Another role was to help create a survey for this study to measure preparedness.

MASSIVE STARBURST GALAXIES AT INTERMEDIATE REDSHIFT

Connor Firth, Christina Tremonti (Mentor), Astronomy

We have discovered a sample of very massive starburst galaxies at intermediate redshift. These galaxies are unique because they appear to be forming stars at the maximum rate allowed by current theories. The galaxies are also expelling large quantities of gas in the form of powerful galactic winds. We recently acquired images from Hubble Space Telescope that we will use to better understand their morphologies. Preliminarily, the Hubble data shows that the galaxies might be relics of recent galaxy mergers because they are surprisingly compact. This might help explain some of their unusual properties. We will be using a program called GALFIT to quantify the galaxies' compactness and compare our results to other samples in the literature.

DEVELOPMENT OF THE HYOID BONE: FUSION AND BONE DENSITY

Ellie Fisher, Hourii Vorperian (Mentor), Waisman Center

The hyoid bone, a small U-shaped bone, anchors the tongue and larynx while supporting the important functions of swallowing and speech. At birth, the hyoid consists of three parts that fuse after a protracted period. This study aims to quantify its growth/fusion. Three-dimensional hyoid models were segmented from 106 computed tomography studies (ages 1–94 years; 53 males, 53 females), and bone density as well as the extent of right-versus-left greater cornu to hyoid body fusion and were recorded. Findings indicate that bone density decrease as age increases, and that hyoid fusion, despite great variability, begins around age 22 years and is typically completed by age 50. Findings provide a baseline for understanding typical development with implications for atypical patients in Speech Pathology, Anatomy, and Forensics.

SOCIETY OF NATIVE AMERICANS 1914 UW–MADISON CONFERENCE

Alaa Fleifel, Dania Shoukfeh, Larry Nesper (Mentor), Anthropology

The Society of American Indians (SAI) was a national movement formed in Columbus, Ohio, in 1911 by fifty Native Americans who wanted a better life for the people on their reservations. They worked to improve issues relating to health, education, civil rights, and local government. The fourth annual SAI conference met October 6–11, 1914, at the University of Wisconsin–Madison. Not much is known about those who attended. Through our research we hope to shed some light on their background in order to better understand how to continue the legacy of the Native American rights movement. We also would like to fully understand how to address the current environmental concerns of the tribes. A group of five students divided up the list of attendees to research. Information regarding the background and genealogy of these attendees was compiled using resources from the Wisconsin Historical Society and archives, newspaper research guides, biographical sources, genealogical sources, primary sources written by the attendees and the Native American collections library. Our goal is to publish a booklet of short biographies and images of the roughly 44 conference attendees. We plan on having the booklet ready in time for the 2014 Tribal Environmental Summit, which falls on the 100th anniversary of UW hosting the 4th meeting of the Society of American Indians in 1914. By researching these individuals, we can better appreciate the role they played in the conference and boost our understanding of the diverse history behind the Native Americans of Wisconsin.

ASSESSING ASSIGNED PEER MENTOR BENEFITS BY TRACKING WEEKLY INTERACTIONS

Irene Ford, Ann Haase Kehl (Mentor), Undergraduate Programs & Services

The Women in Science and Engineering (WISE) learning community uses peer mentoring to promote student success. To reach all community members, we assigned each student a specific mentor. Each mentor completed certain mentoring tasks with assigned students. A reporting tool was created allowing quantification of weekly mentor and student interactions. This tool along with student satisfaction surveys allowed for mentor program assessment. Initial findings found many or most interactions came from an assigned mentor for students with few mentoring interactions. Less than half of overall interactions came from an assigned mentor for students with many mentoring interactions. The majority of students reported satisfaction with their assigned mentor. Based on these preliminary results, we concluded that assigned mentors assist with impact to students with fewer general mentor programming interactions.

CRANBERRY POLLINATION IN WISCONSIN: DOES HIVE LOCATION IMPACT HONEYBEE POLLINATION EFFICIENCY?

Tressa Franzmeier, Christelle Guedot (Mentor), Entomology

In cranberry, rented honeybees are commonly observed flying off-site, reducing pollination efficiency and wasting grower resources. This research project assesses whether the location of hives in cranberry marshes has an impact on the pollination efficiency and fidelity of honeybees in cranberry by investigating pollen composition and abundance of each pollen species carried by honeybee foragers back to the hive. We collected 10 honeybee foragers at four different marshes and three different locations per marsh. Sub-samples of 100 pollen grains from one of each foragers' legs will be identified to the plant family, genus or species level, when possible. Identifying the best location for hive placement to reduce the percentage of bees foraging off-site would have important implications on the foraging efficiency of honeybees in cranberry.

NICKEL CATALYZED ALPHA-SELECTIVE HYDROBORATION OF STYRENES UNDER MILD CONDITIONS

Michael Freidberg, Cale Weatherly (Mentor), Chemistry

Recent developments in the field of chemistry have pushed for reducing the cost and environmental impact of reactions. The purpose of this research project is to develop an improved route to benzylic boron reagents, which are easily functionalized and have a wide range of synthetic utilities, using a cheap and readily available nickel catalyst. This reaction has the advantage of using an inexpensive and environmentally friendly nickel catalyst compared to the commonly-used rhodium for catalyzed Markovnikov hydroboration of vinyl arenes. The chemoselectivity and yield of the reaction are in the process of being optimized and a variety of substrates are being tested to develop this chemistry.

CYTOPLASMIC INTERACTIONS OF THE ANTIVIRAL PROTEIN APOBEC3G WITH HIV-1: A VISUAL APPROACH

Stephanie Fricke, Nathan Sherer (Mentor), Oncology

To generate infectious virions, HIV-1 must traffic its genomic RNA (gRNA) to virion assembly sites at the plasma membrane. Cellular machineries regulating this process are poorly defined. APOBEC3G (A3G), a cellular antiviral protein, is trafficked with genomes to assembly sites in the absence of the viral Vif protein that stimulates A3G degradation. Using live cell imaging, we have studied changes to YFP-A3G subcellular distribution in response to HIV-1 gRNA and have demonstrated that Vif- HIV-1 expression triggers dramatic re-localization of YFP-A3G from cytoplasmic ribonucleoprotein (RNP) complexes known as processing bodies, to larger RNP complexes known as stress granules (SGs). We hypothesize that SG's represent sites of gRNA/A3G convergence and HIV-1 infection may be adapted to exploit the cell's stress response to promote infectious virion assembly.

THINK COLLEGE WISCONSIN

Jesse Galvan, Molly Cooney (Mentor), Waisman Center

Do the benefits of attending college extend to students with intellectual disabilities (ID)? We conducted a study to assess the benefits and challenges of attending college in Wisconsin for students with ID based on interviews with students, peer mentors, college faculty and administrators to gain their perspectives. Our findings indicate that individuals from multiple perspectives believe that the access to college for students with ID is important, but we also found that limited funding and a lack of infrastructure that supports these students are two key challenges. These findings will inform and support future outreach efforts to help others understand the benefits of including students with ID in college, which may lead to expansion of college opportunities for these students in Wisconsin.

THE ROLE OF LYMPHOID TYROSINE PHOSPHATASE IN NEUTROPHIL CHEMOTAXIS

Emily Gasteyer, Anna Huttenlocher (Mentor), Pediatrics

Neutrophils are essential regulators of the immune response and control infection through a number of mechanisms including phagocytosis, release of granule contents, and production of reactive oxygen species. In order to carry out these functions neutrophils must migrate or chemotax to sites of inflammation or infection. Impaired neutrophil chemotaxis has been proposed as a potential cause of autoimmune diseases such as rheumatoid arthritis (RA), systemic lupus erythematosus (SLE) and Type 1 Diabetes (T1D), but the mechanism through which this leads to disease remains unclear. Genome-wide association studies have found that a single nucleotide polymorphism in lymphoid tyrosine phosphatase (Lyp), which is highly expressed in neutrophils, is associated with a substantial increase in the risk of developing SLE and RA. However, the role of this polymorphism in the development of autoimmunity is unknown. We hypothesize that Lyp positively regulates neutrophil chemotaxis. To test this hypothesis we will use microfluidic channels to characterize chemotaxis in both primary neutrophils and Lyp-knockdown PLB-985 cells in response to the chemoattractant fMLP and the bacterium *Pseudomonas aeruginosa*. We expect that Lyp-knockdown PLB-985 cells will show decreased directionality or movement toward both fMLP and *P. aeruginosa* compared to non-Lyp-knockdown PLB-985 cells and primary neutrophils.

NURSES' EXPERIENCE CARING FOR PATIENTS WITH AN IMPLANTABLE CARDIOVERTER DEFIBRILLATOR

Therese Gedemer, Beth Fahlberg (Mentor), Nursing

Nurses describe experiences caring for patients with implantable cardioverter defibrillators (ICDs) where there is a lack of documentation about the device in the medical record and a lack of communication with patients and between providers. This lack of documentation and communication often results in stressful situations for the patient, family, and nurse. The purpose of the research is to learn about the experience of nurses and their recommendations about communication, documentation and policy in caring for individuals with ICDs, particularly as patients approach the end of life. The study is a descriptive, mixed method design using online surveys with multiple choice/Likert Scale, short answer and open-ended questions. The findings of this study will be used to improve the nursing care of patients with ICDs.

COGNITIVE AND NEURAL MECHANISMS OF MULTISENSORY AUDIO-VISUAL INTEGRATION OF NUMBER

Grace George, Edward Hubbard (Mentor), Educational Psychology

A fundamental question in understanding number is how the brain recognizes that four beeps and four flashes both represent four. Recent studies have shown that the intraparietal sulcus (IPS) contains neurons tuned for number that respond most strongly to specific quantities (e.g., 4) independent of modality (auditory, visual). We will conduct behavioral and fMRI studies to investigate whether presentation of the same number of beeps and flashes in the audio and visual modalities leads to integration of number. We predict that simultaneously presented auditory and visual numbers will lead to a stronger representation of quantity, as demonstrated by improved behavioral performance and increased fMRI responses in the IPS. This study will lead to improved understanding of the foundations of the human ability to understand numbers.

HUMAN IMPLICATIONS OF AGING TRENDS AND END OF LIFE CONDITIONS IN RHESUS MONKEYS

Sheila Ghanian, Joseph Kemnitz (Mentor), Cell and Regenerative Biology

Objective: To look at survival and end of life conditions of rhesus macaques to find trends that may give insight to human aging. Methods: This study used data from the NIA aging colonies of the Wisconsin Regional Primate Research Center. Results: The survival curves of both the male and female rhesus macaques show a trend of 50% survival at age 26 and 10% survival at age 33. Assistance from a pathologist is currently being used to gain a better understanding of the end of life conditions of the monkeys and the implications for human aging. Conclusion: The rhesus macaque's anatomical and physiological closeness to humans will help us understand many health-related topics in humans which is important in a nation where the aging population has been increasing.

OBSERVATION OF THE COSMIC RAY SHADOW OF THE SUN WITH ICECUBE

Geoffery Gilles, Juan Santander (Mentor), Physics

There has been an observed deficit in the number of cosmic rays coming from the direction of the Sun in the IceCube detector. The study of this shadow that is cast by the sun is used to characterize the angular resolution of the detector. Analysis of the "Sun Shadow" uses data taken between November of 2010 and February of 2011. The sun is highest in the South Pole sky during this period and the Sun Shadow has been observed to high significance. This measurement shows the directional reconstruction capabilities of the IceCube detector and opens up the potential for future studies of the magnetic field of the Sun.

AUDIO VISUAL INTEGRATION TRAINING

Alix Ginsburg, Michael Kiewe (Mentor), Waisman Center

Individuals who use cochlear implants (CI) tend to have difficulty locating sounds in space. This study focuses on sound localization in sub optimal listening conditions and whether or not it improves due to training. Typical hearing individuals are being tested with a stimulus that simulates the CI listening environment. The training method used focuses on reinforcing the correct sound to spatial location association. This is done by having the subject integrate auditory and visual cues from the surrounding speakers and a spatially corresponding LED array. Results of this study will show whether or not the training method used is appropriate for CI users rehabilitations.

“BARRIERS” OF PEACE? THE IMPACT OF ISRAEL’S ANTI-TERROR STRATEGIES ON THE PEACE CONFLICT

David Glickstein, Katherine Cramer (Mentor), Political Science

In response to various forms of terrorist attacks since the early 2000s, Israel has developed two nontraditional preventative anti-terror strategies to protect the Israeli citizenry: a 300-mile separation barrier and a short-range missile defense system called the Iron Dome. This thesis examines what impact, if any, these structures have on the capacity of Israelis and Palestinians to reach a peace agreement. Upon analyzing past negotiation failures, I find these strategies have caused a harsher environment for a successful peace deal because they have failed to stop terror attacks, solidified Israel’s settlement policy, eliminated incentives for Israel to negotiate on the basis of security, and sustained or exacerbated mistrust between the negotiating parties.

DIFFERENCES IN PARENTAL RATINGS OF CHILD BEHAVIOR PROBLEMS AND THE ASSOCIATION WITH MARITAL ADJUSTMENT

Greta Goetz, Sigan Hartley (Mentor), Human Development and Family Studies

The purpose of this study is to examine differences in behavior problems ratings of mothers and fathers and its association with marital adjustment within 79 married couples who have a child with an autism spectrum disorder (ASD). We examined factors associated with differences in ratings. Parents independently completed self-report measures of their marital adjustment and child’s behavior problems. A significant mother-father difference in ratings of behavior problems existed. This difference was associated with mothers’ affect and child’s intellectual disability status. Difference in parental ratings wasn’t related to marital adjustment. This study has implications for intervention services for families with a child with ASD. The awareness of predicting factors of parental disagreement on child behavior ratings might suggest precursors for spousal conflict and provide pre-emptive interventions.

LATIN AMERICAN MENTAL HEALTH PROVIDERS

Luis Gonzalez, Stephen Quintana (Mentor), Counseling Psychology

The purpose of this project is to analyze and understand cultural manners in the treatment of psychological health problems in Guatemala. The goal of this project is to show the traits and manners Latino communities take in order to treat many problems and issues faced upon. Throughout the year, audio files containing interviews done in Spanish or English with treatment specialists in a health clinic were translated and transcribed. Upon analyzing the information, signs of cultural traits show the importance of cultural values like collectivism and individualism, and cultural practices on the bases of family, faith, and shamanism compared to traditional medical practice in these communities. These findings may be useful in improving future treatments of psychological sicknesses in regions like Guatemala.

SOCIETY OF AMERICAN INDIANS MEMBERS ACCOMPLISHMENTS

Yackeline Gonzalez, Larry Nesper (Mentor), Anthropology

Professor Larry Nesper, who is in the Department of Anthropology and American Indian Studies, is conducting research in order to commemorate the members of the Society of American Indians who attended their national conference here at the University of Wisconsin–Madison a century ago. Using various databases and documents, researching some of the members of the society was doable. Most of the members who attended the conference were from Wisconsin, which allowed us to use the Wisconsin Historical Society as a reference in finding the members accomplishments. The date of birth and death of the individuals, family members, job occupations, graduate school and political involvement were a few of the findings amongst others. Using our findings of the members, we would give the current members insights on the accomplishments each individual had in contributions to the Native American society overall throughout the United States.

ANTISEMITISM AND THE INTEGRATION OF HOLOCAUST SURVIVORS INTO THE MADISON COMMUNITY

Eliana Goodman, Rachel Brenner (Mentor), Hebrew and Semitic Studies

Holocaust survivors are becoming scarce and we are losing the chance to record their histories. The purpose of this research is to connect how anti-Semitism in Europe forced people of all economic levels and abilities to leave their homes during and after the Holocaust and eventually settle in the Jewish community of Madison, Wisconsin. Through personal interviews with Holocaust survivors and research, the integration into a new country will be shown. Connections will be made between the similarities of the survivors' economic status, social status and involvement in Madison. The written information from the interviews will be given to Hillel and the Jewish Federation of Madison for their Holocaust programming.

EXPLORING THE MECHANISMS OF MSC-DERIVED BAFF REGULATION OF IDO EXPRESSION

Claudia Goodsett, Peiman Hematti (Mentor), Medicine

Mesenchymal stem cells (MSCs) express many suppression factors, including indoleamine 2,3-dioxygenase (IDO). They also express B-cell activation factor (BAFF), a pro-inflammatory cytokine. We had previously found that blocking the BAFF receptor BR3 in PBMC:MSC co-cultures, T-cell proliferation increased. To explore this finding, we began by down-modulating BAFF expression in MSCs using siRNA. We found an inverse correlation between BAFF levels and T-cell proliferation. We also determined that two BAFF receptors, BR3 and BCMA, were expressed on the cell surface of a host of MSC lines via flow cytometry. Interestingly, by blocking the two receptors, the gene and protein expression of IDO was down-modulated. These data suggest that the expression of IDO in MSCs is at least in part regulated by BAFF.

IMPORTANCE OF SLEEP QUALITY FOR THE POSITIVE AFFECT OF MOTHERS OF CHILDREN WITH AUTISM

Megan Gray, Samantha Hageman, Sigan Hartley (Mentor), Human Development and Family Sciences

Research suggests that mothers of children with Autism Spectrum Disorder (ASD) experience poorer psychological well-being than mothers of children in the general population. An important determinant of the psychological well-being of these mothers is the frequency and severity of their child's behavior problems. However, the extent to which mothers are stressed by their child's behavior may be influenced by their self-care behaviors such as their sleep quality. The purpose of our project is to examine whether mothers' sleep quality moderates the relationship between the frequency x severity of their child's behavior problems and their positive affect. We collected data from 75 mothers of children with ASD, in which mothers reported on the frequency and severity of their child's behavior problems and their own sleep quality.

AGE-RELATED BIOMARKERS IN CALORIE RESTRICTED AND UNRESTRICTED POPULATIONS OF RHESUS MACAQUES

Jenna Green, Joseph Kemnitz (Mentor), Cell and Regenerative Biology

With a growing senior population, interest has increased on the effects and determinants of aging and age-related conditions. This has led to studies of biological markers to predict the course of aging or even the remaining lifespan of an individual. We will examine biomarkers in two groups of Rhesus monkeys: those on calorie restriction (CR) and a group that continues to eat ad libitum. Biomarkers gathered from complete blood counts and serum chemistry tests will be compared. We hypothesize that some of these biomarkers will correlate with health status and be predictive of lifespan. Being able to relate biomarkers to aging could predict future health issues for preventative treatment to improve quality of life, cut health care costs, and create more effective and efficient treatment.

SYNERGY OF RADIATION AND IMMUNOTHERAPY IN SYNGENEIC MURINE TUMOR MODELS

Monica Gressett, Paul Sondel (Mentor), Pediatrics

Radiation and immunotherapy are powerful tools used in cancer treatment. Coupled together, radiation and immunotherapy may have the potential to synergize. This study combines radiation and immunotherapy in the form of anti-GD2 mAb hu14.18 and its conjugated hu14.18-IL2 immunocytokine in a syngeneic murine tumor model. Mice bearing B78 melanoma tumors were treated with a combination of single fraction external beam radiation (12 Gy), or sham radiation, plus hu14.18, hu14.18-IL2, or PBS. Modest tumor enhancement was observed with radiation and hu14.18 antibody treatment. Enhanced tumor response increased when hu14.18-IL2 immunocytokine was used with radiation treatment, completely resolving a majority of tumors. We conclude that anti-GD2 antibody and immunocytokine augment the response of murine melanoma to radiation. The mechanism of this potential synergy is currently being studied.

DANE COUNTY COMMUNITY ACTION COALITION AND ITS BENEFITS TO COMMUNITY GARDENERS

Caisey Griffith, Erin Skalitzky, Alfonso Morales (Mentor), Urban and Regional Planning

Community gardens have a wide variety of uses and benefits when utilized among communities. Literature supports that gardens provide a strong sense of community and safety. The purpose of our research is to determine if the community gardens are benefiting gardeners in Madison. The Community Action Coalition (CAC) developed surveys in 2008 to be distributed annually; these were implemented in our sample of 35 gardeners from 3 different community gardens in the Madison area. To remain consistent with previous years' data, we distributed the surveys as written, receiving positive results; however, this tool needs improvement due to misleading questions. In the future, we recommend working closely with CAC to develop better tools for data collection so we can provide accurate feedback.

THERMAL ANALYSES OF NADPH BINDING TO DHRS4 EXPLORES THE EFFECTS OF PHOSPHORYLATION AT S221

Drew Gunderson, David Pagliarini (Mentor), Biochemistry

Properly functioning mitochondrial proteins are key to metabolic homeostasis, yet mechanisms that regulate these proteins are not fully understood. Our recent proteomics analyses of mitochondria from lean and obese mice suggest that protein phosphorylation is a central mechanism for controlling mitochondrial function. To test this hypothesis, we evaluated the effect of phosphorylation on DhRs4, a protein linked to steroid and lipid metabolism. We discovered that a DhRs4 phosphomimetic mutant (S221E) had severely decreased activity. As S221 is within the NADPH binding site, we hypothesize that phosphorylation inhibits the binding of this cofactor. To test this, we are measuring NADPH binding affinity with differential scanning fluorimetry and isothermal titration calorimetry. Collectively, these experiments aim to establish the mechanism by which phosphorylation regulates a key mitochondrial protein.

THE RELATIONSHIP BETWEEN SELECTIVE ATTENTION AND CREATIVE ACHIEVEMENT

Ishaan Guptasarma, Igor Lupyan (Mentor), Psychology

People with many recognized achievements in creative domains perform well on laboratory tasks which require them to notice seemingly irrelevant background stimuli. Individuals with ADHD and schizophrenia also perform above average on these tests, suggesting a link between some mental illnesses and creativity. However, it is not known whether creative individuals possess any of the cognitive deficits characteristic of the mentally ill. I will administer the creative achievement questionnaire (CAQ) to undergraduates as a measure of externally recognized creative achievement. I will also challenge them with a task that places high demands on working memory and sustained attention. Midway through the task, I will introduce distracting sounds. I hypothesize that creative achievers will experience more distraction-related performance drops due to subclinical selective attention deficits.

A SYMBOLIC REVOLUTION

Morgan Haefner, Funda Derin (Mentor), Languages and Cultures of Asia

Authors do not write symbols solely for artistic purposes. Nor do authors exclusively develop symbolic analogies to help readers comprehend concepts. Rather, authors also utilize symbols to express personal opinions and sentiments about controversy in their work. In Mahmoud Dowlatabadi's *The Colonel*, Dowlatabadi portrays his opinion of the 1979 Iranian Revolution through the establishment of symbols. To come to this literary conclusion, I read the novel critically and traced symbols throughout the novel to see what they voiced in correlation to history and emotions. Thus, my findings and essay conclude it is necessary for readers to look into these subtle, symbolic expressions to truly understand the voice and motivation of the author.

WHAT IS THE BEST HISTOLOGICAL METHOD TO QUANTIFY CEREBRAL INFARCTION VOLUME?

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 and is not easily reproducible. We have performed a systematic review to find the best histological method to quantify the cerebral infarct volume. The results were a variety of different staining and semi-automatic technology to calculate the volume. 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.

CHARACTERIZATION OF THE EFFECTS OF TRAR, A REGULATOR OF RIBOSOME BIOSYNTHESIS, IN ESCHERICHIA COLI

Tianxiao Han, Saumya Gopalkrishnan (Mentor), Bacteriology

Bacteria survive various stresses, such as, entry into stationary phase, carbon starvation, and phosphate starvation, by modulating gene expression that alters metabolic output. During stress, the protein DksA and co-regulator guanosine tetraphosphate repress ribosomal RNA (rRNA) transcription, which consequently slows growth. Bioinformatic analysis identified the small protein, TraR, as a distant homolog of DksA. Blankschien et al., 2009 determined that, like DksA, TraR downregulates rRNA transcription. We aim to understand the mechanism of such downregulation. Our preliminary experiments suggest that TraR cloned into a plasmid construct is a valid experimental tool for analyzing the effect of wild-type TraR on rRNA transcription. Our future goal is to conduct site-directed mutagenesis on cloned TraR to identify critical amino acid residues that contribute to its structure and/or function.

PREDICTING PHYSICAL DISCOMFORT ASSOCIATED WITH VIEWING 3D FILMS

Taylor Hanley, Christopher Green (Mentor), Psychology

Although the popularity of 3D movies and television has grown, their overall success has fallen short of expectations. This may be due to feelings of discomfort reported by many individuals while viewing these displays. Previous research suggests that such discomfort is caused by sensory cues conflicting with one another. For example, many individuals become nauseous when reading in vehicles because the vestibular system is detecting movement and the visual system is not. The same phenomenon occurs with 3D images; disparity-based cues (different images presented in each eye) are in conflict with accommodation and vergence-based cues (how eyes change to focus at different depths). This study aims to discover whether differences in individual visual abilities predict discomfort felt during 3D viewing. To do this, we have subjects undergo a variety of visual tests and then watch 3D videos using the Oculus Rift, the cutting edge technology in virtual reality. The subject's balance is measured during the videos and also the physical discomfort they felt is reported. Subject's visual capabilities will then be compared to the level of discomfort experienced, in order to determine whether visual abilities can be predictors. This information will lead to a better model for comfortable 3D viewing.

VIEWING EMOTIONAL FACES INFLUENCES SENSORY JUDGMENTS

Crystal Hanson, Paula Niedenthal (Mentor), Psychology

Functional and evolutionary accounts of emotion suggest a link between emotions and sensory systems. To test this idea, we relied on the assumption that both emotions and conceptual knowledge are, at least in part, embodied. Participants viewed emotional facial expressions prior to verifying visual, auditory, olfactory, and gustatory judgments. We predicted that fear expressions would facilitate the verification of auditory and visual properties, and expressions of disgust would facilitate the verification of olfactory and gustatory properties. In line with our hypothesis, we found faster responses to visual judgments after viewing fear expressions. However, after viewing expressions of disgust, gustatory judgments were made slower. These results are interpreted under a functional account of emotion where fear enhances and disgust inhibits perception.

WHY DON'T PATIENTS ENGAGE IN CARDIAC REHABILITATION AS RECOMMENDED?

Kelly Hanson, Diane Lauver, Yacob Tedla, Diane Lauver (Mentor), Nursing

Cardiac rehabilitation (CR) programs improve function and reduce mortality in patients with cardiovascular disease. Despite these benefits, many patients do not engage in CR programs as recommended. Researchers do not understand fully patients' barriers to CR engagement. Our study purpose was to examine barriers to CR engagement among patients recommended for CR. We had a sample of 50 patients at CR in a cross-sectional study; 58% were ages 50–69, and 70% had > high school education. Based on descriptive statistics in a secondary analysis, the most common barriers were already exercising enough at home, distance from home/work, and work responsibilities. By identifying barriers to CR, clinicians can tailor their discussions about CR programs to facilitate patients' engagement in and benefits of CR.

ROLE OF BRAIN STEAROYL-COA DESATURASE-1 IN METABOLISM, OBESITY, AND GLUCOSE HOMEOSTASIS

Kristin Harrington, James Ntambi (Mentor), Nutritional Sciences

The high prevalence of obesity, coupled with its potential to develop into serious health issues reveals it is a significant health problem. To investigate how excess adipose tissue manifests into these health issues, we have observed the effects of a disruption in stearoyl-CoA desaturase 1 (SCD1), which is involved in the synthesis of endogenous monounsaturated fatty acids from saturated fatty acids. In the current study, we investigated the role of brain SCD1 in mediating the metabolic consequences of a high-fat diet. We observed that both male and female BKO mice weighed significantly less than Lox controls. In addition, male BKO mice had lower hepatic triglyceride levels than Lox mice. Overall, these results indicate brain SCD1 plays a role in HFD-induced adiposity and glucose homeostasis.

MECHANISTIC EXPLORATION OF MATERNAL TOUCH: LIAGND INDEPENDENT ACTIVATION OF ESTROGEN RECEPTOR ALPHA

Margaret Hayne, Tyler Grawien, Anthony Auger (Mentor), Psychology

Skin-to-skin contact has striking effects on developmental organization of behaviors regulated in the amygdala, including anxiety levels and social interaction. Estrogen receptor alpha (ER α) is a steroid receptor which, among other activities, is known to mediate important behaviors related to the amygdala in the developing brain. ER α has a canonical activation mechanism, in which estrogen enters the cell and binds to the receptor. However we propose a ligand-independent mechanism of activation in which ligands bind extracellularly at plasma membrane-bound receptors and induce a signaling cascade. This results in phosphorylation of the steroid receptor independent of estrogen. Simulated maternal grooming (SMG), a somatosensory stimulus that mimics a female rat's grooming of her young, has been shown to both decrease anxiety and increase ER α activation. We hypothesize that ER α undergoes ligand independent activation by a dopamine-mediated pathway during SMG treatment through direct observation of ligand independent activation effects on serine sites of the ER α molecule. We have been exploring this proposed mechanism using Western immunoblotting and immunocytochemistry methodologies.

PALMYRENE ONOMASTICS

Katelynn Healey, Jeremy Hutton (Mentor), Hebrew and Semitic Studies

When a person died in Palmyra, inscriptions were made on a funerary bust to show the name of the deceased, and to name their family relations. It is possible to make genealogical trees and verify personal names using these data. The goal of the current project is to trace names found in unpublished inscriptions. With many inscriptions collected in the book *Palmyrene Aramaic Texts* by Delbert R. Hillers and Eleonora Cussini, it is necessary to verify the details in each inscription. This project focuses on the preservation of Aramaic inscriptions from the Roman Period. Since devastation is currently occurring in Syria, these collections are at risk of being lost.

HISTOLOGICAL METHODS FOR EX VIVO AXON TRACING

Cassandra 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 has the ability to laterally diffuse through aldehyde-fixed plasma membranes, permitting the visualization of the neuronal pathway. Axon tracers have previously been used exclusively in vivo studies; however, tracing methods can currently be applied to ex vivo studies as well. An array of techniques for axon tracing has been established, these techniques can vary in application method, incubation conditions and the type of tracer. We sought to compare the available methods to determine the best histological method for ex vivo axon tracing.

NOVEL MHC CLASS II ALLELE DISCOVERY IN PIGTAIL MACAQUES

Katelyn Heimbruch, Julie Karl (Mentor), Primate Research Center

The major histocompatibility complex (MHC) is involved in immune response. MHC Class II is important because it associates with and presents antigens to helper T-cells. Six regions make up the Class II region: DPA/B, DRA/B, and DQA/B. In pigtail macaques, these regions have not been well studied, which has hindered their use in further immunological research. In this study we use next generation sequencing methods to interrogate amplified pigtail Class II sequences. We hypothesized that we would discover novel alleles in all MHC Class II regions. We identified 70 novel alleles and were able to identify some possible A/B pairings. With the knowledge generated from this experiment, we can begin to study the particular sites involved in the antigen presenting activity of MHC Class II alleles.

PERIODICITY OF MOLLUSCAN SHELL GROWTH BANDING

Steven Henning, Benjamin Linzmeier (Mentor), Geoscience

Molluscs grow by adding thin layers of material to their shell throughout their lives. Environmental and organismal factors control the thickness of these layers. We use a more accurate and precise analytical tool to identify changes in shell growth rate of modern and fossil shells, preserved as variable growth band thickness. We imaged shells using confocal laser and visible light microscopy and measured growth banding from the images. We applied evolutive harmonic analysis (EHA) to these data. Using results from EHA, environmental and organismal cycles can be identified at temporal scales ranging from sub-daily to annual. These methods allow for more robust analysis of growth band periodicity compared to previous studies. This study establishes methods for measuring changes in year length in deep time.

AFRICAN AMERICAN LIBRARIANS

Taiyani Hennings, Ethelene Whitmire (Mentor), School of Library and Information Studies

I am currently writing an essay about the commonalities and differences between the first generation of African American librarians dating from the late 18th century. I compiled this information and created a database for my mentor Dr. Ethelene Whitmire. My mentor is writing a book using the information I compiled for the introduction of her book. I have to make sure that all information I am collecting is accurate and I have to verify where the information is coming from. I find my research to be relevant because it's a great way to do an in-depth study about the diverse background, lifestyles, and occupations of African Americans over different time periods. My research will continue until all the background information of these librarians is complete for accurate information for her book.

A NOVEL APPROACH TO EVALUATING THE RADIAL DISTENSIBILITY OF THE LARGE PULMONARY ARTERY BRANCHES

Joseph Henningsen, Naomi Chesler (Mentor), Biomedical Engineering

Distensibility of the pulmonary arteries (PAs) is an important determinant of the pressure-flow relation in the pulmonary circulation. Radial distensibility, α , is defined as the ratio of the relative change in PA diameter to the change in mean PA pressure. We developed a novel approach to estimating α by combining pressure measurements from right heart catheterization (RHC) and PA geometry measurements from contrast enhanced magnetic resonance angiography (CE-MRA) or computed tomography digital subtraction angiography (CT-DSA). We validated our approach by embolizing six healthy female dogs to obtain data at two pressure levels. In our results, radial distensibility was 2% for any large branch. These results were confirmed with both angiographic techniques and were consistent with the overall α value calculated for the whole PA network.

QUANTITATIVE ANALYSIS OF ARTIFACTS IN VOLUMETRIC DIGITAL SUBTRACTION ANGIOGRAPHY

James Hermus, Charles Mistretta (Mentor), Medical Physics

When performing computed tomographic (CT) image reconstruction on digital subtraction angiography (DSA) projections, loss of vessel contrast has been observed behind highly attenuating anatomy, such as dental implants and large contrast filled aneurysms. In this work, we have developed a model for acquiring DSA projections that models both the polychromatic nature of the x-ray spectrum and the x-ray scattering interactions. In our simulation framework, scatter and beam hardening contributions to vessel dropout can be analyzed separately. We constructed digital phantoms with large clearly defined regions of material, when the phantoms were forward projected, the projections contained uniform regions of interest (ROI) and enabled accurate vessel dropout analysis. The analysis of this data showed that the contrast degradation is primarily due to scatter.

MANUFACTURING OF MICROPELLETS USING RAYLEIGH DISTURBANCES

Kevin Hernandez, William Aquite Aguilar (Mentor), Mechanical Engineering

As advances in technology continue to drive down the sizes of electronic devices, demand for smaller plastic parts continues to increase. In order to make these parts, manufacturers rely on 3-D printing methods that require high quality plastic micropellets. The quality of micropellets is determined by both the size and shape of the pellets in a batch. High quality pellets are small, less than one millimeter in diameter, and roughly spherical with smooth surfaces. Conventional methods of micropellet manufacturing are not capable of consistently forming small, high quality micropellets. We hypothesize that using Raleigh disturbances of fluids we can develop a new process of manufacturing micropellets that will consistently form high quality micropellets. To test this, we are making a 3-D simulation that can display how two fluids will interact with each other when they collide. With higher quality micropellets, manufacturers will be able to produce smaller higher quality parts for their devices.

INVESTIGATION OF THE TRIBOLOGICAL PROPERTIES OF BIO-BASED MATERIALS COMPARED TO SYNTHETIC LUBRICANTS

Cole Hess, Melih Eriten (Mentor), Mechanical Engineering

This research focused on biomimicking for tribological applications. Biomimicking involves the study of natural processes in order to find sustainable solutions to complex problems. Tribology is the study of friction, wear, and lubrication between two materials in contact. Testing was conducted on pitcher plants and synthetic motor oil. Coefficients of friction and adhesion measurements of the lubricants were taken using a nano-tribometer and atomic force microscopy (AFM). It was found that adhesive forces played a significant role in the results of both lubricant materials. The bio-material friction coefficients changed depending on the orientation of the plant, while the synthetic lubricant properties were independent of orientation. Therefore, the bio-material microstructure could be studied for use in more advanced applications where the direction of motion is important.

CHANGING THE WAY STUDENTS CONSERVE

Colin Higgins, Sabrina Bradshaw (Mentor), Geological Engineering

This talk will focus on measurable results from changes in student engagement in the form of an energy conservation competition (CCN). It will focus on the restructuring of the engagement opportunity and see how life in “conservation captains” boosts engagement and electricity conservation levels.

PRODUCTION OF RECOMBINANT TEV PROTEASE

Claire Hintz, Walter Goodman (Mentor), Entomology

The objective of this research was to produce protein from recombinant TEV protease. *E. coli* was transformed with TEV plasmid and one colony of transformed cells were selected. The cells were induced to make protein by inoculation in media with lactose and glucose. The cells were then lysed and protein was obtained through column purification. Gel electrophoresis was used to analyze how much protein was made. Much protein has been seen in the pellet fraction, meaning the cells are making protein in mostly insoluble amounts. To combat this, parameters were changed, such as amounts of lactose and glucose used, total volume of culture, and ways in which the protein was purified.

SEARCHING FOR NATIVE AMERICAN SITES IN WISCONSIN TOWNSHIPS.

Gideon Hoekstra, Sissel Schroeder (Mentor), Anthropology

This research finds and records Native American sites or trails across all of Wisconsin on plat maps from the 1800s. These maps were originally drawn by agents of the federal government who established a systematic grid that guided the sale of land parcels. During the survey process, surveyors described economically relevant vegetation and landscape features as well as places with evidence of Native American habitation. We searched the entire state of Wisconsin, one township (36 square mile grid) at a time. We focused on cornfields and other Native American sites. Our goal was to better understand Native American land use prior to sustained Anglo-American settlement of the state, particularly in the northern part of the state.

EFFECT OF BLOCKING ESTROGEN RELATED RECEPTOR ALPHA ON $[Ca^{2+}]_i$ OSCILLATIONS IN GnRH NEURONS

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

It is known that the ovarian steroid estradiol (E2) induces negative feedback on GnRH release through estrogen receptors (ER). Recent studies in this lab indicate that a short exposure of GnRH neuron to E2 (1 nM) rapidly induces stimulatory effects on $[Ca^{2+}]_i$ oscillations in GnRH neurons. Because this rapid stimulatory effect of E2 is not blocked by ER blockers, in the present study we examined the role of Estrogen Related Receptor alpha ($ERR\alpha$). The results indicate that suppression of $ERR\alpha$ did not block the E2-induced increase in $[Ca^{2+}]_i$ oscillations in GnRH neurons. Therefore, $ERR\alpha$ could potentially be ruled out as a mechanism of the E2 action.

BIOPSYCHOSOCIAL PREDICTORS OF PAIN AMONG WOMEN RECOVERING FROM SURGERY FOR GYNECOLOGIC CANCER

Kelsey Honerlaw, Erin Costanzo (Mentor), Psychiatry

We investigated the extent to which psychological distress and inflammation predicted post-surgical pain among women with gynecologic cancer. Participants (N=90) completed measures of pain (intensity, interference with activities) and distress (depression, anxiety) at 1, 4, and 16 weeks post-surgery. ELISA assessed inflammatory cytokines from peripheral blood. Results indicated that patients reporting greater distress experienced greater pain intensity and interference ($z=3.32-12.23$, all $ps<0.01$). Those with higher IL-6 and IL-10 also experienced greater pain intensity ($z=2.03-2.44$, all $ps<0.05$). Among individual participants, changes in distress and inflammation were associated with corresponding changes in pain, with patients reporting greater pain intensity when depression, anxiety, IL-6, and IL-10 were most elevated ($t=1.52-4.92$, all $ps<0.05$). Findings suggest risk factors that could be targeted to improve post-surgical recovery and quality of life.

OUR CANID NEIGHBORS: INVESTIGATING COYOTE AND FOX USAGE OF THE UW–MADISON CAMPUS

Holly Hovanec, David Drake (Mentor), Forest and Wildlife Ecology

Increasingly, coyote (*Canis latrans*) and red fox (*Vulpes vulpes*) have been spotted in areas of the University of Wisconsin–Madison campus, and in some instances were relatively close to people and pets. Although surprisingly discreet, urban wildlife are well adapted to living in the presence of humans. The purpose of my project is to better understand the home range, activity patterns, and general health of these two canid species on campus. I am also examining interactions between the wild animals, humans, and pets. I captured two coyotes and one red fox using cable restraints set at the Biocore Prairie and near Van Hise. To investigate their movements and activity, radio collars were fitted to the animals. Physical exams and blood and fecal tests were performed on the animals to evaluate health and screen for disease—all have been generally healthy. When tracking and locating the radio-collared canids I note their proximity to humans as well as weather and timing information to map potential activity cycles. Recent tracking of the animals indicates that coyotes use a smaller, more concentrated area than the fox, and both species have greatly varying habits. My research has the potential to yield information benefitting the safety and health of the preserve users, their pets, and the wild canids.

SELECTIVE ISOLATION OF PHYLOGENETICALLY CLOSE STREPTOMYCES WITH VARYING FILAMENT MORPHOLOGY

Xiaoyang Serene Hu, Kalin Vetsigian (Mentor), Bacteriology

Streptomyces are soil dwelling bacteria that are of great interest because their remarkable ability to produce a wide range of useful secondary metabolites. Interestingly, phylogenetically closely related strains of Streptomyces can produce very different secondary metabolites. Whole genome sequencing revealed exceptional abundance of genes clusters related to antibiotic production, and some view Streptomyces as a hunting ground for novel genomic organization. The Vetsigian lab aims to study why genetically similar Streptomyces often exhibit variations in morphology and secondary metabolite production. As part of the preliminary studies, my project goal is to develop a fast way of isolating morphologically different Streptomyces with similar 16s rRNA, based on the ability of their hyphae to penetrate small pores below 100 nm.

TREATMENT-RELATED FACTORS AND INFECTIONS FOLLOWING HEMATOPOIETIC STEM CELL TRANSPLANTATION

Emily Hussinger, Erin Costanzo (Mentor), Psychiatry

This study examined the occurrence of infections following hematopoietic stem cell transplantation (HSCT). Data were collected from the medical records of 432 adults who received HSCT at the Carbone Cancer Center. 56% of autologous transplant recipients and 44% of allogeneic transplant recipients developed at least one infection post-HSCT; the majority were bacterial infections. Autologous transplant patients developed bacterial infections earlier than allogeneic transplant patients ($t=3.958$, $p<.001$). Bacterial infections occurred more often among allogeneic transplant patients who received ablative treatment (62%) as compared to those receiving non-ablative regimens (27.5%; $\chi^2=16.581$, $p=.001$). Contrary to predictions, infection rates did not differ based on age or presence of post-transplant complications. Findings highlight the frequency of bacterial infections after HSCT and suggest individuals receiving ablative treatment are particularly at risk.

POTENTIAL DRIVERS OF EXTINCTION OF MAMMOTHUS PRIMIGENIUS, ST. PAUL ISLAND, PRIBILOF ISLANDS, ALASKA

Angela Ingrassia, John Williams (Mentor), Geography

A megafauna extinction occurred (50% of mammal species heavier than 32kg went extinct) from 40,000 to 10,000 years BP in North America. However, a piece of tooth bone from woolly mammoth dating back to 6,000 years BP was found in St. Paul Island, Alaska, which had been a part of the Bering Land Bridge but became isolated as sea levels rose with the last deglaciation. This indicates that megafauna population in St. Paul survived about 4,000 longer than in the rest of North America. This project aims to uncover the reason for extinction of the mammoths by analyzing cores from Lake Hill on St. Paul. My research focuses on processing and analyzing microscopic charcoal variability on this island, which will be used to infer a fire history and analyze whether changes in fire regime are associated with the St Paul extinction of woolly mammoth.

DECISION-MAKING: MOTIVATIONS BEHIND CHARITABLE GIVING

Carrie Ip, Anya Samak (Mentor), Consumer Science

Many people choose to donate out of social pressure and intrinsic motivation. If given the option, people would rather avoid being questioned to donate. We suggest that framing charitable giving into market transaction can reduce social pressure and bring in smaller donors. We conducted a door-to-door experiment, that had two treatments: gift and link. In the gift treatment, households would get a popcorn bag for every \$1.50 they donate. In the link treatment, popcorn can be purchased at \$1.50 and \$0.75 will go towards charity. Our results concluded that there was a higher percentage of people in the link treatment who opened the door and made a purchase but, the average payment was higher in the gift treatment.

SEQUENCE VARIATION AND ITS EFFECT ON OXIDATIVE STRESS PROTECTION IN THE RETINA

Xu James, Akihiro Ikeda (Mentor), Genetics

Akap13 is a scaffold protein that can function to both activate and deactivate RhoA and two non synonymous variations of Akap13 have been localized to an R2 alpha binding that plays an important role in the deactivation of RhoA. Akap13 an ideal candidate gene potentially regulates macular degeneration in mice. Fibroblast lysates will be immunoprecipitated for active RhoA and an immunoblot will be used to quantify the amount of active protein. If a quantifiable difference in active-RhoA is found between degenerative mice and non degenerative mice, then a potential molecular mechanism involved in neural aging processes will be elucidated opening the door for further study into mechanisms and potential viable treatment options.

THE EFFECTS OF SLEEP DEPRIVATION ON SYNAPTIC PLASTICITY AND NEURONAL EXCITABILITY

Kalene Jasso, Jeremy Williams, Rama Maganti (Mentor), Neurology

Our research focuses on the effects of different sleep deprivation forms on the susceptibility, frequency, and severity of seizures. We are testing three sleep deprivation methodologies, which consist of a rotating lever every 30–60 seconds for 10 seconds for various time periods during the sleep-wake cycle. The mice are in circular cages where a lever, attached to a motor at the center, rotates physically disturbing the mice and disrupting sleep while electroencephalographs record their sleep-wake cycle. By analyzing electroencephalographs and formatting spreadsheets for both acutely and chronically sleep deprived mice, we have found the lever rotation mechanism has fragmented normal sleep patterns. Using this data, we will determine the relationship between sleep and epilepsy through neuronal excitability testing within the brain.

TYROSINE BIOSYNTHESIS IN PLANTS: CHARACTERIZATION OF AROGENATE DEHYDROGENASE FUNCTION IN ARABIDOPSIS

Xing Jin, Hiroshi Maeda (Mentor), Botany

Tyrosine is an important aromatic amino acid in human and plants. Arogenate dehydrogenase (ADH) enzyme catalyzes the final reaction of Tyr biosynthesis: L-arogenate + NAD(P)⁺ + L-tyrosine + NAD(P)H + CO₂. The purpose of this study is to determine in vivo function of ADH2 enzyme in Arabidopsis plants. T-DNA inserted ADH2 mutants were screened by genomic PCR (mutants 765, 158, 324) to observe how they differ from wild type. RT-PCR and qPCR showed the 756 mutant lacks a full length ADH2 mRNA and exhibits small and pale phenotype. In future experiments, I will analyze levels of aromatic amino acids and tyrosine-derived secondary metabolites (e.g., tocopherols) in order to determine the metabolic function of the ADH2 enzyme.

HYDRAULIC CONDUCTIVITY OF GEOSYNTHETIC CLAY LINERS TO SYNTHETIC COAL COMBUSTION PRODUCT LEACHATES

Nicholas Jordan, Jiannan Chen (Mentor), Geological Engineering

A study is being conducted to evaluate whether coal combustion product (CCP) leachates affect the hydraulic conductivity of geosynthetic clay liners (GCLs) adversely. A database was compiled of the chemical properties of CCP leachates based on a nationwide survey of CCP disposal facilities. Four synthetic leachates were selected from this database to represent a range of conditions encountered in CCP disposal facilities: typical CCP leachate, strongly divalent cation fly ash leachate, flue gas desulfurization (FGD) residual leachate, and trona ash leachate. Five GCLs were used in the study: two conventional Na-bentonite GCLs, two polymer-modified bentonite GCLs, and one GCL with a bentonite polymer nanocomposite (BPN). Hydraulic conductivity tests were conducted on prehydrated (30-d on subgrade soil) and non-prehydrated GCLs using flexible-wall permeameters. For all specimens, a range of stresses was applied to simulate conditions at various stages of filling of a CCP disposal facility. GCLs with Na-bentonite or polymer-modified bentonite had high hydraulic conductivity ($>10^{-8}$ m/s) to trona leachate. For the FGD and strongly divalent cation leachates, GCLs with Na-bentonite had moderate to high hydraulic conductivity (10^{-9} to 10^{-8} m/s), whereas GCLs with polymer-modified bentonite had lower hydraulic conductivity (10^{-11} to 10^{-9} m/s). All of the GCLs had low hydraulic conductivity ($<10^{-10}$ m/s) to typical CCP leachate. GCLs with BPN had very low hydraulic conductivity ($\sim 10^{-12}$ m/s) to all leachates.

EXPLORING THAI CULTURE THROUGH COSTUME: RESEARCHING RAMA'S JOURNEY THROUGH MATERIAL CULTURE ANALYSIS

Alexandra Jordee, Emma Noffsinger, Danielle Benden (Mentor), Anthropology

The ethnographic collection curated in the Department of Anthropology at the University of Wisconsin–Madison is geographically widespread and includes objects made of a variety of materials. Although most of these objects were collected during the early-mid 20th century by faculty and graduate students as part of field expeditions, little is known about the history and meaning behind them. The goal of this research project is to re-discover the significance and history of a collection of costumes and headdresses from Thailand. The costumes and headdresses are related to the Hindu epic Ramayana and tell the stories of Rama's journey. Through research and collaboration with various staff members, we present our discoveries made about these objects.

WORD LIKENESS JUDGMENTS WITH MULTIPLE SPEAKERS

Kelly Jorgensen, Jan Edwards (Mentor), Communication Sciences and Disorders

Virtually all research on adult language processing has studied college students, who have high levels of education and speak Mainstream American English (MAE). However, there is evidence that both dialect and education influence language processing. This study examines the effects of education and dialect on wordlikeness ratings and the influence of phonotactic probability on these ratings. This study uses two sets of stimuli differing in dialect (MAE and African American English [AAE]) and three participant groups who differ in native dialect and education level. It is hypothesized that wordlikeness ratings will be the highest when listening to native dialect stimuli as well as when education level is high.

FINDING WHAT STICKS: ENHANCING CLINICAL DATA TO IMPROVE HEALTH CARE

Brian Jun, Lawrence Hanrahan (Mentor), Family Medicine

Current health care quality indicators fail to acknowledge the many causes of disease and provide limited insight on how to improve health. The University of Wisconsin Electronic Health Record, Public Health Information Exchange (PHINEX) program, was developed to address these shortcomings by linking clinical electronic health records and community level risk factors. It is not known how effective this approach is because information overload creates considerable noise and confusion. We need to design, use and display data so they pop into the foreground, actively engage the health care system and motivate them to act. To accomplish this, we will develop a PHINEX analysis plan focusing on diabetes and childhood obesity, incorporating the social determinants of health model.

PARENTS' PERCEPTION ON THE RELATIONSHIP BETWEEN NUTRITION AND HEALTH IN YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDER

Esha Kamath, Karla Ausderau (Mentor), Occupational Therapy/Kinesiology

Autism Spectrum Disorder (ASD) is a growing disorder affecting 1 in 88 American children. Many of these children experience feeding challenges such as selective eating, food refusal, and severe mealtime behaviors impacting their overall nutritional intake. The primary goal of this study was to identify parents' perceptions of their child's nutrition and the relationship to their child's health. Family interview data was analyzed using a thematic approach and compared with children's three-day diet records. Families had personal beliefs about their child's nutrition which matched their approach to providing their child health promoting foods.

DISCLOSING INFORMATION ABOUT PEERS TO PARENTS

Aaryn Kealty, B. Brown (Mentor), Educational Psychology

In determining what to tell parents about their peer relations, teens often must weigh their loyalty to friends and need to maintain friends' confidences against the need to be honest with parents and maintain parental trust. Based on Afifi and Steuber's (2009) revelation-risk model of disclosing information, we analyze qualitative and quantitative data from 63 university undergraduates to identify factors underlying their decisions about disclosing information about peers to parents while in high school. Preliminary analyses indicate differing reasons for high vs. low rates of disclosure; level of disclosure in high school also predicts adolescents' degree of disclosure to parents about college life. Further analyses will assess how perceived peer norms related to participants' disclosure patterns.

FUNCTIONAL NEURAL CORRELATES OF EMOTION REGULATION IN PEDIATRIC POST-TRAUMATIC STRESS DISORDER

Taylor Keding, Ryan Herringa (Mentor), Psychiatry

Studies on adult post-traumatic stress disorder (PTSD) suggest abnormalities in emotional brain circuitry. However, few studies have investigated pediatric PTSD. Twenty-eight healthy youth and 25 youth with PTSD completed fMRI during an emotion regulation task. Subjects viewed morphing emotional faces (angry, happy) across three blocks. There were significant group x age interactions in the prefrontal cortex (PFC); the PTSD group showed decreasing activation with age compared to increasing activation in controls. There was a significant emotion x group x block interaction in the anterior cingulate cortex (ACC); the PTSD group showed greater activation during the happy condition blocks 1 and 3 than controls. These results indicate that decreased activation in frontal brain areas may represent altered developmental trajectories of healthy emotion regulation in pediatric PTSD.

DISCRIMINATION LAWSUITS AND THEIR OUTCOMES: A STUDY OF LAWSUITS IN THE UNITED STATES FROM 1991 TO 2013

Diane Kee, Mary Triana (Mentor), Management and Human Resources

Through the evaluation of every employment discrimination lawsuit filed in the United States since the passage of the Civil Rights Act of 1991, our research analyzes the factors that contribute to the outcomes of these cases. We hypothesize that plaintiffs with lower social status (including women, minorities, and blue collar workers) are less successful in winning discrimination suits, perhaps because they lack access to quality representation. Moreover, coding the cases for the region in which they took place (whether they occurred in a formerly Confederate state or not) accounts for America's history of discrimination. We propose that lower social status applicants will be less likely to win discrimination suits in the ex-Confederate states which have a longer history of discrimination. The results of this study will yield insight into the barriers complainants face in discrimination lawsuits and pave the way for further research into disparities of legal outcomes.

POST-CONFLICT INFLUENCES ON GENDER-BASED VIOLENCE LEGISLATION IN SUB-SAHARAN AFRICA

Miriam Kelberg, Aili Tripp (Mentor), Political Science

As the number of conflicts in Africa has declined since the 1990s, the trend of post-conflict countries making constitutional and legislative reforms regarding women's rights has become more apparent. This research project assesses the extent to which post-conflict states in Sub-Saharan Africa are more likely to pass laws prohibiting gender-based violence and which factors have contributed to this trend. Information was collected from several inter-governmental sources to document if, and when, particular gender-based violence legislation was passed. Initial results reveal a significant correlation between post-conflict Sub-Saharan countries and improved legislation for women. This has been because international, regional, and national organizations' presence in post-conflict countries have changed opportunity structures and allowed women and other activists to have a greater role in shaping gender-based violence legislation.

TO CHARACTERIZE A NOVEL RETROVIRAL VECTOR FOR STUDYING MBD1 FUNCTION IN NEURONAL MATURATION

Laurel Kelnhofer, Xinyu Zhao (Mentor), Neuroscience

Methyl-CpG binding domain protein 1 (MBD1) has been shown to regulate the process of adult neurogenesis, particularly during the initial differentiation step of neural stem cells; however, the role of MBD1 in later stage differentiation is unclear. The purpose of this project is to determine whether MBD1 and its target genes regulate the maturation of immature neurons to mature neurons. To achieve this goal, we have created Retro-DCX-CreGFP, a retroviral vector. DCX is not present in neural stem cells; therefore, Cre and GFP should be only expressed in immature neurons. This retrovirus will be used to express Cre in MBD1 conditional mutant mice, therefore delete MBD1 expression in immature and mature neurons, without affecting the differentiation of neural stem cells into immature neurons. As the next step of this study, we will determine whether MBD1 has a significant role in maturation by comparing the maturation state and morphology of neurons with MBD1 deletion and the wild type neurons.

THE EFFECTS OF DYNAMINE STRAIN ON TYPE 2 DIABETES

Choua Kha, Juliana Maedke, Fan Fan (Mentor), Neuroscience

Pancreatic beta cell failure is at fault for the development of type 2 diabetes. Therefore, it is invaluable to understand the effects that different strains of DNA, including Dynamine, have on the function of the beta cell. Beta cells are responsible for the secretion of insulin which exits the cell through a process called exocytosis. In order for this process to succeed in reaching glucose homeostasis, the insulin must be recycled and the process of endocytosis must occur at the same rate of exocytosis. After testing how the uptake of insulin is effected in the beta cells of mice with and without Dynamine, it has been proposed that a low count of Dynamine will result in the inability of beta cells to undergo endocytosis which is essential to the function of beta cells. This means that a proper Dynamine level in beta cells could be essential in understanding type 2 diabetes.

PREVENTION HEALTHCARE EXPERIENCES FOR HMONG PATIENTS WITH LIMITED ENGLISH PROFICIENCY

Tounhia Khang, Elizabeth Jacobs (Mentor), Medicine

Patients with limited English proficiency (LEP) receive poorer quality of care compared to English proficient patients. Little is known about LEP Hmong patients' experiences in receiving care in the American healthcare system. Wisconsin has the third largest Hmong population in the United States. This study examines how LEP Hmong patients' experiences influenced their future care options, particularly for cancer screening. We used semi-structured interviews with a total of 11 Hmong participants (n= 5 males, n= 6 females) from Madison, Wisconsin. We systematically coded all transcripts and used content analysis. We discovered that Hmong participants who reported having negative experiences with their physicians did not seek preventative care. Identified barriers from the study can aide in reducing cancer screening disparities for Hmong patients with LEP.

COMPASSIONATE PARENTING: A MINDFUL AND CARING APPROACH TO RAISING CHILDREN

Chelsea Kiecker, Colleen Gleason, Chelsea Kiecker, Karen Krueger,
Lindsay Weymouth (Mentor), Human Development and Family Studies

This study examines the effects of cognitive-based compassion training (CBCT) in parents of young children randomly assigned to either CBCT or a control group. We investigate the effects on parent-child interaction, emerging empathic responding, and stress response. Pre- and post-intervention assessments include videotaped parent-child tasks, parental self-report measures of stress, depression, and self-compassion, and a measurement of cortisol levels in both parent and child. Observational data will be collected during the compassionate parenting sessions including open-ended interviews with parents and facilitators. In comparison to the control group, we hypothesize that children of the parents in the intervention group will display a greater degree of compassion and lower cortisol levels. Parents will report lower levels of cortisol, depression, and self-reported parenting stress and more positive parenting.

CONVERTING WISCONSIN GEOSPATIAL DATA TO RESOURCE DESCRIPTION FORMAT

Andrew King, Nancy Wiegand (Mentor), Space Science & Engineering

One of the visions of the semantic web is to create linked data in the resource description framework (RDF) format. RDF is the format standardized by the World Wide Web Consortium (W3C). It is a triple format with a subject, predicate, and object. An example is the Wisconsin River flows into the Mississippi River or the Wisconsin River has maximum depth nnn. The triple can be represented as a graph with the subject and maybe the object being nodes and the predicate being an arc connecting the nodes. However, if the object is a literal, e.g., a number or string, instead of another referenceable entity, then it is not a node. Nodes can participate as subjects or objects in other triples, forming a potentially large interconnected graph. This project is to take Wisconsin geospatial data and turn it into the RDF format to create a graph of geospatial-related data. The idea is to combine data from different data sets and link it to create a larger and enhanced knowledge base.

A METHODS COMPARISON FOR MEASURING SUN EXPOSURE RELEVANT TO CIRCULATING VITAMIN D

Taylor Kirby, Corinne Engelman (Mentor), Population Health Sciences

Vitamin D is correlated with many health outcomes. This demands more effective prediction of risk for vitamin D deficiency. Vitamin D is produced in the skin when exposed to ultraviolet radiation, resulting in a strong correlation between sun exposure and vitamin D levels. Data from the Survey of the Health of Wisconsin were used to compare two variables of sun exposure to serum vitamin D: one created using UV index values and questionnaire data, and another using skin pigmentation measured by spectrophotometry. Determining the more accurate predictor of vitamin D, and therefore sun exposure, will aid further investigations with vitamin D. The UV index and questionnaire data variable was more correlated ($r=0.174$) with vitamin D levels than the spectrophotometer data ($r=0.097$).

SUMMERTIME RESPONSE OF AIR EMISSIONS TO AMBIENT TEMPERATURE IN THE EASTERN UNITED STATES

Ryan Kladar, Teresa Holloway (Mentor), Civil and Environmental Engineering

When temperature rises in summer, people use more electricity, which requires more power from power plants. This results in a subsequent increase in harmful emissions such as CO₂, SO₂, and NO_x as power plants burn more coal to keep up with demand. How individual states react to rising summer temperatures is unclear. Using Clean Air Markets emissions data from the EPA and North American Regional Reanalysis meteorology data from NOAA, this relationship between temperature and emissions was explored. While Ohio reacts linearly to rising temperatures, other states, such as New York, react with an increasing rate of emissions with rising temperatures. This is due to various differences in infrastructure, but also response on the individual level, essentially choosing when to turn on the air conditioning.

BUMBLEBEE PREFERENCE OF NOVEL COLORS

Joshua Kluever, Johanne Brunet (Mentor), Entomology

Pollinators can select for certain floral traits in plant populations. Bumblebees have been shown to prefer the color blue. However, recent findings have suggested that preference for flower color can be modulated by previous experience. We hypothesized that previous experience may influence foraging decisions when bumblebees are placed in novel environments. To test whether bumblebees prefer novel colors, we first exposed them to either blue only, white only, or blue and white flowers and then tested their preference on an array with different flower color ratios (50/50 blue and white, 80/20 and 20/80). The results of these experiments will determine whether bumblebees prefer a novel color.

CANINE LIGAMENT DEGENERATION

Lisa Kohli, Walter Block (Mentor), Biomedical Engineering

While humans experience problems in the cruciate ligament of the knee primarily through traumatic rupture, dogs are far more likely to experience a degenerative process in a cruciate ligament leading to hind limb lameness. Better tools are needed to non-invasively detect, assess, and monitor the degeneration of these ligaments in dogs. Here we investigate the use of new markers based on new magnetic resonance imaging (MRI) techniques. Dogs diagnosed with degenerating ligaments were imaged with a faster type of volumetric scan that was sensitive both to ligament signal and local swelling. Volumetric studies of the ligaments were used to generate a quantitative assessment of the ligaments. An increased fluid signal in and surrounding the ligaments may provide a non-invasive method for monitoring degeneration.

PRODUCTION OF WORKABLE AMMOUNTS OF JUVENILE HORMONE BINDING PROTEIN

Alexander Koo, Walter Goodman (Mentor), Entomology

Juvenile hormone binding protein (JHBP) is a hemolymph protein that binds and transports the insect Juvenile Hormone (JH). While the binding characteristics are well known, much remains unknown about JHBP's biological functions. Because sizeable amounts of JHBP are needed to conduct biological studies, we have employed molecular biological tools. A plasmid containing the JHBP codon sequence from *Manduca sexta* was used as the template. The PCR product was used to transform *E. coli*. *E. coli* cells were then induced to produce JHBP. We have been unsuccessful in producing JHBP in sufficient quantities and are trying various methods to achieve better expression. Once the appropriate methods have been established we will move on to testing JHBP with site-directed mutagenesis to discover its specifics.

INDIVIDUAL DIFFERENCES IN SPACING: PROMOTING CHILDREN'S MEMORY BY DISTRIBUTING LEARNING ACROSS TIME

Carla Kraft, Katherine Dunne, Natalie Mickola, Haley Vlach (Mentor), Educational Psychology

The spacing effect describes the phenomenon that distributing learning events in time promotes memory to a greater degree than massing learning together in time. In this study, we were interested in whether individual differences in children's working and long-term memory would be related to how much children benefitted from spaced learning. Children completed three different tasks: a massed/spaced learning task, working memory task, and long-term memory task. The results showed participants who scored lower on the working and long-term memory tasks scored higher on the spaced learning task. This suggests participants who forgot faster benefitted more from spaced learning. These findings have implications for future research on the benefits of spaced learning and how to enhance memory in educational settings.

COMPARISON OF SOIL PROCESSING TECHNIQUES ON POTENTIALLY MINERALIZABLE NITROGEN

Jake Kruse, Matthew Ruark (Mentor), Soil Science

Long-term management of soil can affect the ability of soil to supply nitrogen (N) to plants. The objective of this research is to determine the difference in potentially mineralizable nitrogen (PMN) among soils within five different agronomic systems. A secondary objective is to compare soil handling procedures for anaerobic PMN incubations. There is no consistent, recommended soil handling procedure for PMN analysis, and current soil handling and storage techniques employed by the Ruark Lab are not established. Three soil handling procedures will be compared using the variability between PMN levels in the agronomic systems as a means of comparison. A seven-day soil incubation, followed by KCl extraction, will be used to measure the change in ammonium concentration.

DIRECTING AXONAL GROWTH AND DIRECTIONALITY USING INJECTABLE NEUROTROPHIC GRADIENT SCAFFOLDS

Susanna Kwok, Matthew Jensen (Mentor), Neurology

Neural regeneration and reestablishment of neural circuitry post-stroke is limited in the adult CNS due to chemical and physical inhibition by mature neurons and glial cells. Stem-cell therapy has been regarded as an attractive method to promote neural regeneration and involves injection of neural stem cells (NSCs) into sites of infarction. These methods, however, present minimal ability to direct the axon growth and NSCs orientation needed to restore neural circuitry in vivo. Concentration gradients of neurotrophic factors are found during neural development in embryogenesis to guide the neuronal positioning and axon growth needed for CNS formation. To direct injected NSCs, we propose using injectable neurotrophic gradient scaffolds in conjunction with NSCs in vivo to mimic the guiding conditions found in the development of the CNS.

METHODOLOGY OF REACTIVE ASTROCYTE MODEL IN VITRO

Jin 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 however acts as a physical and biochemical barrier, inhibiting the growth of axons following injury leading to impaired recovery. We are testing and modeling models of astrocytosis in vitro, to discover the best testing environment for the formation of glial scars. The best astrocytosis model will be key in testing different methods that may promote axon regeneration by overcoming the barrier provided by the glial scar as well as its mechanisms. We performed a systematic review of available evidence for methods to model astrocytosis in vitro, and found the advantages of individual methods based on particular astrocytosis study.

LOCALIZATION OF GSK-3 β IN RESPONSE TO RAPAMYCIN TREATMENT

Niraali Lad, Rozalyn Anderson (Mentor), Medicine

Glycogen synthase kinase-3 β (GSK-3 β) is an enzyme involved in numerous metabolic processes and has been linked to the development of diseases such as Alzheimer's, diabetes and cancer. Treatment of cells with the drug rapamycin leads to inhibitory phosphorylation of GSK-3 β . Preliminary results suggest that there is a change in localization between the phosphorylated and unphosphorylated forms of GSK-3 β . We hypothesize that rapamycin treatment leads to an accumulation of phosphorylated GSK-3 β in the nucleus. To test this hypothesis, we treated cells with rapamycin and observed a change in localization of GSK-3 β between cytosolic and nuclear compartments by immunofluorescence imaging. Given that GSK-3 β is downstream of insulin and mTOR signaling, understanding the mechanism of GSK-3 β localization will provide further insight into its role in metabolism and disease.

PREFRONTAL CORTICAL MU-OPIOID BLOCKADE REVERSES MOTIVATION AND IMPULSIVITY UNDER HIGH-HUNGER STATES

Curtis Lake, Ryan Selleck, Brian Baldo (Mentor), Psychiatry

Mu-opioids are small, protein-like molecules that act like “the brain’s heroin.” Mu-opioid receptors (muORs) are implicated in food-reward and impulsivity, but the brain sites in which muORs regulate these effects are not fully understood. In prior work, intra-prefrontal cortex (PFC) muOR stimulation augmented impulsivity and enhanced motivation in differential-reinforcement-of-low-rates (DRL, testing inhibitory control) and progressive-ratio (PR, testing food-motivation) paradigms in rats. Here, we pharmacologically blocked PFC-muORs under an elevated hunger state (18hr food-deprivation). Intra-PFC-muOR blockade dose-dependently reversed hunger-induced behavioral changes in the DRL and PR paradigms. Thus, hunger-associated changes in motivation and inhibitory control depend upon naturally occurring PFC mu-opioid transmission, which is significant for understanding the neural circuitry of motivation/executive control shown to be disrupted in binge eating disorder and bulimia nervosa.

MINERALIZATION AND ALTERATION OF THE LYNNE VMS DEPOSIT FROM ONEIDA COUNTY, WISCONSIN

Lauren Lande, Philip Brown (Mentor), Geoscience

The early Proterozoic Lynne massive sulfide deposit is located in northern Wisconsin within the Rhinelander-Ladysmith greenstone belt of Proterozoic volcanic and associated chemical sedimentary rocks. After formation on the seafloor >1.8 Ga, the deposit was then metamorphosed and deformed during the Penokean Orogeny that created most of Wisconsin. Mineable reserves in the deposit have been estimated at 5.61 million tons, averaging 9.27 percent Zn, 0.47 percent Cu, 1.71 percent Pb, 2.38 opt Ag, and 0.021 opt Au. Samples obtained from a core drilled through the deposit have been examined microscopically and analyzed using a SEM and hand-held XRF to constrain the mineralogy and composition of the ore minerals. Characterizing the Lynne deposit is a crucial step in providing better clarity for future mining prospects.

TESTING THE POWER OF A HAPLOTYPE SHARING STATISTIC FOR USE IN POPULATION GENOMICS

Jeremy Lange, John Pool (Mentor), Genetics

The detection of local adaptation between populations is a rapidly evolving area of study in population genomics. The purpose of this study was to test the power of a haplotype sharing statistic that detects local adaptation. A computer simulation program, MSMS, was used to simulate both human-like and Drosophila-like genomic data under neutral and selective models. A multitude of population scenarios and parameters were simulated, including different models of natural selection and population history. The statistic was then applied to the simulated genomic data to observe how frequently it detected selection, and results were compared to published statistics. Results showed that the power of the statistic varied based on population background. Findings suggest that this statistic may be appropriate for use in several population scenarios.

COMPARISON OF BEHAVIORS IN ADOLESCENT MALES AND FEMALES WITH AUTISM SPECTRUM DISORDER

Sarah Laudon, Leann Smith (Mentor), Waisman Center

Autism Spectrum Disorder (ASD), a disorder found in approximately 1 out of every 88 children, is characterized by lack of social reciprocity, communicative difficulties, and repetitive behaviors. While much research has examined the genetics of ASD, types of behaviors, and educational and behavioral techniques, little research has been conducted comparing the differences in behaviors between males and females, particularly during adolescence. This study will examine these differences in a sample of 40 high-functioning adolescents with ASD that present with no intellectual disability. Past research has found that females tend to show less repetitive behavior than males but no difference in social behaviors.

EVERYDAY TRACES: SOIL CHEMISTRY OF ACTIVITY IN DOMESTIC AND NON-DOMESTIC SPACES IN BRONZE AGE SCOTLAND

Joanna Lawrence, Sarah Clayton (Mentor), Anthropology

In this study I investigate the activities that occurred in four houses and community spaces at the Bronze Age archeological site of Balbithan Wood (Kintore, Scotland; c. 1550-1100 B.C.E.). Over time, activities such as cooking, eating, and sleeping leave chemical residues in the floor surfaces of living spaces. These chemistry signatures can reveal patterns of behavior. Three of these roundhouse structures were identified as houses upon excavation, while the fourth may have been a ritual area. I evaluate this hypothesis by analyzing the levels of 11 elements in earthen-floor samples using Inductively Coupled Plasma Optical Emission Spectroscopy. Finding that the spatial patterns appear similar in all four structures, I consider the characterization of domestic and ritual activity areas, and discuss a nuanced approach for classifying them.

ASPEN PHYTOCHEMISTRY CAN STRUCTURE INSECT COMMUNITIES

Sophia Lawrence, Hilary Bultman (Mentor), Entomology

Plants use chemical compounds to defend themselves against herbivores. I hypothesize that these plant defense compounds can then structure insect communities. To test this hypothesis, I used a common garden with nine different aspen (*Populus tremuloides*) genotypes ($n = 10$). From each tree, I collected 20–30 leaves for chemical analyses (phenolic glycosides and condensed tannins) at the beginning of the summer 2013. The insect communities were surveyed on all of the experimental trees in both July and August. I will use MANTEL tests to discern whether insect communities on aspen vary with foliar defense compounds. The goal of this research is to understand how aspen phytochemistry can shape associated insect communities.

IMPORTANCE OF ANTI-NUCLEAR POWER PLANT MOTIVATION

Jennifer Le, Toshihiro Higuchi (Mentor), History of Science

My research first semester prepared me for actual research conducted alongside Professor Higuchi second semester. There were various methods that enhanced or introduced skills needed for historical research. The first method was through online blogs or conversation threads finding citizens, not workers, who experienced the Three Mile Island. Other people were found in a book called *Three Mile Island: Thirty Minutes to Meltdown* by Daniel F. Ford. The second method I had found was interviewing someone who lived through the timeframe of TMI on campus. My research now entails doing research at the Wisconsin Historical Society. The purpose is to find the importance of anti-nuclear motivation of activists and how the role of radiation plays in peoples on Wisconsin nuclear power plants.

EXPERIMENTAL INVESTIGATION OF THE COPPER CATALYZED 1,3-HALOGEN MIGRATION MECHANISM

Gabriel Le Gros, Nicholas Dolan (Mentor), Chemistry

Copper-catalyzed 1,3-halogen migration is a novel reaction that is not well understood. To expand the utility of copper-catalyzed halogen migration, it is necessary to develop an understanding of its mechanism. Several different methods will be used to investigate the factors that influence selectivity of migration versus hydroboration. Furthermore, we will investigate whether migration occurs with inversion or retention of stereochemistry. Broadening the general understanding of copper catalysis could lead to cheaper alternatives for many reactions that involve expensive transition metals.

NOTCH1 EXPRESSION DURING WOUND HEALING IS VALIDATED THROUGH DUPLICATE EXPERIMENTS

Taylor Lecy, Madhuchhanda Roy (Mentor), Pathology

Wound-related complications and chronic wounds affect millions of people and the impact on the United States economy is over \$25 billion annually. Re-epithelialization of wounds occurs by a series of events where keratinocytes migrate, proliferate, and differentiate to restore barrier function. Notch1 is a transmembrane receptor that controls cell fate decisions and has been found in my laboratory to be important for wound healing. This experiment is validating the methods used (Western blot and indirect immunofluorescence staining) to ensure that the results are reproducible. The experimental protocols have been used repetitively and extensively, so I hypothesize that my experiments will have similar results. Understanding the specific role of Notch1 in wound healing will enable us to design novel therapeutics for improving wound healing in patients.

LONG-TERM POPULATION DYNAMICS OF TWO

Yujin Lee, Ben Oyserman (Mentor), Civil and Environmental Engineering

Enhanced biological phosphorus removal (EBPR) is an economical and sustainable wastewater treatment method to remove phosphorus using polyphosphate accumulating organisms (PAO). One of the main types of bacteria that are responsible for the EBPR process is "Candidatus Accumulibacter". Clades IA and IIA in particular have been studied extensively than others, but most studies have been carried out over a short time span. In this study, clade IA and IIA DNA samples that have been collected for three years were analyzed. Populations of these clades were quantified by quantitative polymerase chain reaction (qPCR) targeting the *ppk1* region. A correlation between the environmental conditions of the reactors and population dynamics of the two clades over time are expected through further analysis.

BIOPHYSICAL APPROACH TO THE LEADING CAUSE OF THE BREAST CANCER: SND1 AND MTDH INTERACTION

Woojong Lee, Yongna Xing (Mentor), Oncology

Staphylococcal nuclease homology domain containing 1 (SND1) is known to be overly expressed in many different types of cancers, including lung, liver, and breast cancers by forming a complex with Metadherin (MTDH). However, the biophysical aspect of the duplex is poorly understood. With the knowledge of the structure of full-length SND1, it is possible to test how SN 1/2 domains affect the degradation of RNAs versus full SND1 structure using the proteins prepared by the standard molecular cloning. Particularly, knowing that SND1 interacts with MTDH, it is also possible to test whether MTDH peptides can affect the activity of SND1 to recognize and cleave double-stranded RNA. Based on previous observations, the 20-bp double-stranded RNAs containing four Watson/Crick base-paired AAUA/UAUU or four wobble-paired IIUI/UIUU can be possible candidates as substrates for RNA degradation by SND1.

THE COST OF TRANSFERRING A HUKOU IN CHINA

Ling Lei, Samantha Vortherms (Mentor), Political science

The hukou, China's household registration system, connected to education, social welfare and health care in China, greatly restricts the mobility of individuals. Individuals who move outside of the original registration, might not guaranteed access to social welfare. In order to better understand mobility in China through quantitative measurement, our study focus on the cost to transfer a hukou, either from rural to urban or from non-local to local. We assume that the more developed the target city is, the more costly it will be to transfer one's hukou. In order to compare the cost of the process, surveys will be conducted in different cities in China and an evaluation criteria will be used to calculate the cost of the whole transferring process.

MANUFACTURE AND APPLICATIONS OF ULTRAFILTERED, DIRECT SALTED BLOCK GOUDA CHEESE

Nicholas Lepak, Selvarani Govindasamy-lucey (Mentor), Center for Dairy Research

This research was done to understand the impact lactose:casein ratios in fluid milk had on the final cheese pH, and also to produce a block, directly salted cheese which has a similar texture to traditional Gouda cheese. Currently, pH levels in Gouda cheese are controlled by draining whey (lactose) and adding back warm water. For this study, three fluid samples with different lactose:casein ratios were used to control cheese pH. Data show that high lactose:casein ratios in milk yield a cheese with a lower pH. Additionally, Gouda curds were salted directly, instead of being placed in a salt brine. The resulting cheese was shown to have comparable texture and taste to the traditional, wheel cheese.

ESTABLISHING SYSTEMS TO EXAMINE ANTI-TUMOR EFFICACY AND IMMUNE INHIBITION OF TK INHIBITORS

Lauren Lever, Paul Sondel (Mentor), Human Oncology

The use of multi-targeted tyrosine kinase (TK) inhibitors imatinib and dasatinib has proved beneficial in the treatment of several cancers. However, these drugs also inhibit TKs involved in immune activation. This study aims to create systems to examine the anti-tumor effects and immune inhibition of TK inhibitors. Anti-tumor efficacy was measured through binding of the TK c-Kit in vitro and in vivo using proliferation assays and two-tumor mouse models, respectively. In both settings, c-Kit expressing Ba/F3 cells transfected to be either sensitive or resistant to TK inhibitors were used. Immune inhibition was explored through in vivo vaccination studies also using these cells. Both in vitro and in vivo systems to quantify anti-tumor efficacy were established, while the system exploring immune inhibition must be further modified.

THE WATERWAYS PROJECT: PROVIDING ARTS INTEGRATION IN PUBLIC EDUCATION

Allison Levin, Karen Mcshane-Hellenbrand (Mentor), Dance Department

The Waterways Project provides opportunities for arts integration at Kennedy Elementary School, in Janesville, Wisconsin. Through dance pedagogy, my partners and I have focused on student achievement and targeting diverse learners. Drawing upon the framework created by my faculty mentor, my partners and I have developed and implemented an original, water-themed curriculum that can be shared in conjunction with the National Waterways Dance Project in April 2014. The Waterways Project is a two-year model. Following development and implementation of the initial water curriculum in Year One, students have participated in a dance residency, provided by my faculty mentor. Our curriculum will be expanded in the project's second phase to include environmental conservation, situated learning, and community action.

SOCIAL DISCRIMINATION IN THE WORKPLACE

Silun Li, Mary Triana (Mentor), Management & Human Resources

The purpose of this research is to identify whether the outcomes of discrimination lawsuits vary according to the plaintiffs' demographics and the defendants' organizational characteristics. Under the hypothesis that low socioeconomic status plaintiffs tend to experience hardships on winning lawsuits, we review those lawsuits which took place in 1991 or later, after the 1991 Civil Right Act. Using the Westlaw legal database, we code the data based on different categories, such as worker's occupation, lawsuit location (confederate or union states), occupation using Standard Occupational Classification (SOC) Code, and business type including publicly traded or privately held. We code the business type of defendant firms to determine the company size, which will be used as a control variable in some of the analyses. We expect the research findings to demonstrate the tendency of less favorable and positive results for lawsuits involving plaintiffs with low social status (blue collar workers, women, and minorities), particularly in confederate states. This research will provide insight about the vulnerability of some groups in legal practices, and may also indicate the impact of discrimination lawsuits on companies' financial performance.

VARIATIONS IN PAY WHAT YOU WANT AND ITS EFFECTS ON CHARITABLE GIVING

Daniel Li, Xiang Li (Mentor), Consumer Sciences

Gneezy (2010) showed that selling a product through pay what you want (PWYW) and contributing a portion of the chosen purchase price to charity boosts profits. We investigated PWYW through the sale of a book and varied the portion going to charity to determine its effect on chosen purchase price. We used PWYW door-to-door book sales and several different charity percentage treatments with the residents of Sun Prairie, WI. In our preliminary results, we found that higher charity treatments encouraged more book purchases at a lower price per book, while the exact opposite was also true. This could be a result of price anchoring, where higher charity treatments are anchored at zero dollars going to charity and lower charity treatments are anchored at the retail value of the book.

STRUCTURAL INVESTIGATION OF THE U6/PRP24 COMPLEX

honghong liao, Samuel Butcher (Mentor), Biochemistry

Pre- mRNA splicing is an essential part of eukaryotic gene expression, in which introns are removed from pre-mRNA and exons are ligated together to form a mature mRNA. This splicing process is catalyzed by the spliceosome, which contains five protein-RNA complexes called snRNPs. Assembly of the spliceosome requires binding of the Prp24 protein to the U6 snRNA, where the Prp24 protein subsequently acts as a structural chaperone to facilitate annealing of U6 with another snRNA, U4, during the early stages of spliceosome assembly. Though previous research has determined small structural fragments of U6 snRNA and Prp24; the architecture of the intact U6/Prp24 was unknown. This summer research project helped to crystallize an U6/Prp24 complex that would improve our understanding of spliceosome assembly.

INVESTIGATING MENTAL HEALTH SYMPTOMS AND TREATMENT UTILIZATION IN AN ADOLESCENT TWIN SAMPLE

Spencer Liebl, Mollie Moore (Mentor), Psychology

Although mental illness affects a sizable minority of adolescents, less than a quarter of affected teens utilize mental health services (Ringel & Sturm, 2001). We used a large adolescent community sample (N=930) to characterize adolescents' symptoms, treatment use, and identify factors that affect use. Teens who had seen a mental health professional in the last year had the highest number of self-reported mental health symptoms. Although females reported more anxiety and mood-related symptoms than males, there was no gender difference in treatment use in the last year. Adolescents who had seen a MHP did not report greater negative life events in the last year. We will investigate additional potential predictors of use, including SES, parenting, and race/ethnicity. These findings may help target outreach to promote adolescent help-seeking.

USE OF COGNITIVE INTERVIEW IN THE DEVELOPMENT OF THE NURSE SELF-EFFICACY WITH AMBULATING OLDER PATIENTS

Daniel Liebzeit, Barbara King (Mentor), Nursing Professor

Cognitive interviewing is commonly used by survey methodologist to enhance instrument reliability and validity by gaining insights into problems with wording, ordering of items and how respondents formulate responses to questions. The purpose of the cognitive interviews in this study was to assess nurses' understandings and interpretations of the nurse Self-Efficacy with Ambulating Older Patients items. Two cognitive methods were used during the interview, 1) think aloud to elicit data on participants' thoughts about items and how they made decisions to respond to items and 2) verbal probing for further clarification of participants' interpretation of items and to identify ambiguous wording or poorly worded questions. Data were analyzed item by item with regard to participants understanding and ability to answer the questions, revisions were made.

INDIRECT PHOTODEGRADATION OF LAMPRICIDES

Laura Linde, Christina Remucal (Mentor), Civil and Environmental Engineering

The lampricides 3-trifluoromethyl-4-nitrophenol and 5-chloro-N-(2-chloro-4-nitrophenyl)-2-hydroxybenzamide, commonly referred to as TFM and niclosamide, respectively, are employed in the Great Lakes to selectively kill invasive sea lampreys. Their photodegradation fate, however, is not well understood. Natural water samples collected from Wisconsin rivers with varied alkalinity and pH, as well as varied concentrations of dissolved organic matter (DOM), were used in this assessment. Additionally, standard DOM isolates, Pony Lake fulvic acid and Suwannee River fulvic acid were also used to determine the importance of DOM in the photodegradation of lampricides. Of the multiple degradation pathways, indirect photodegradation was determined to be an important pathway for niclosamide. TFM, in contrast, is less susceptible to indirect photodegradation. Additionally, the possible interactions of reactive oxygen species on the indirect photodegradation pathway were studied. Furfuryl alcohol (FFA) was used as a probe for the radical, singlet oxygen, while perinaphthone was used as a sensitizer. In the future, these studies will allow us to establish the reaction mechanism for both TFM and niclosamide.

PHONOLOGICAL SIMILARITY IN THE ONSET OF COMPOUND WORDS AND HUMAN LANGUAGE PRODUCTION CHOICES

Emily Lindeman, Maryellen MacDonald (Mentor), Psychology

People change words all the time to make them easier to say, as when “facsimile machine” became “fax.” However, alliteration, the repetition of syllable onset sounds is extremely common in advertising and business, even though alliteration has been shown to increase speaking difficulty. This raises a puzzle: Why would alliterative compound phrases be so common if they are, in fact, so difficult to say? This study recorded multiple measures of production difficulty including rate of errors, latency of speech onset time, and duration of the participants’ utterances when producing phonologically similar and dissimilar noun phrases. Participants also rated their preferences for these same compounds. The results shed light on the relationship between language usage preferences and speaking difficulty, with implications for language production theories.

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. The final steps are thought to occur in three stages: docking and tethering of the vesicle, priming of the vesicle for fusion, and Ca²⁺-triggered membrane fusion. In neuroendocrine cells, the priming protein Munc13-1 is essential for Ca²⁺ regulated dense core vesicle fusion. The activity of Munc13 has been reported to be regulated through C2A dimerization. However, it is unclear if this regulation occurs in vivo. In this study, we monitored the function of the C2A domain in mediating stimulus-dependent translocation of Munc13 to the plasma membrane. Taken together, the experiments presented suggest that homodimerization prevents Munc13 translocation to the plasma membrane under resting conditions.

SEDIMENT DELIVERY FROM SMALL AGRICULTURAL WATERSHEDS DURING FROZEN AND NON-FROZEN GROUND PERIODS

Daniel Linton, Anita Thompson (Mentor), Biological Systems Engineering

This research is focused on comparing transport of sediment and solids during rainfall and snowmelt events during frozen and non-frozen ground conditions. To date, more emphasis has been placed on sediment transport during non-frozen conditions; however, significant transport can occur from rain on frozen ground or snowmelt. The data set includes a continuous record (2004–08) of flow and sediment load at the outlets of several small agricultural watersheds at UW–Platteville Pioneer Farm in southwest Wisconsin. Sediment loads will be linked to precipitation and landscape characteristics to determine conditions conducive to transport of sediment. This study applies concepts of watershed dynamics to the frozen ground and snowmelt spheres to help provide a more complete understanding of sediment transport.

DEVELOPMENT AND APPLICATION OF A UNIFIED WIDE-ANGLE OBLIQUE AUTOMATED STREAMFLOW IMAGING SYSTEM

Yuli Liu, Chin-Hsien Wu (Mentor), Civil and Environmental Engineering

A unified wide-angle oblique automated streamflow imaging system (UW–OASIS) is developed to remotely monitor stream discharge near human-made hydraulic structures. The system contains an adaptive bi-camera system, in which wide-angle lens are deployed to ensure that any single camera is able to capture the entire cross section of stream at optimum image resolution. Large scale particle image velocimetry is deployed for discharge calculation and the velocity index value is estimated taking into account the impacts of hydraulic structures on flow vertical profiles. Full automation is also incorporated into UW–OASIS algorithm. Performance of UW–OASIS is evaluated under various flow conditions at the Lafollette Dam, the Yahara River outlet of Lake Kegonsa, and results are compared with those from conventional moving-boat acoustic Doppler current profiler measurements.

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

Zihao Liu, Zexi Liu, Hao Meng, Yao Mu, Yu Hen Hu (Mentor), Electrical and Computer Engineering

To conceal the identity of protesters in uploaded video during Arabic Spring demonstrations, YouTube launched a new tool that allows user to blur human faces in a video before publishing. In this paper, we propose a quantitative model to assess the effectiveness of YouTube’s face blurring tool and use this model to guide the development of an alternative algorithm that yields better performance. First, a baseline algorithm is developed using the Harr Cascade Classifier included as part of the OpenCV’s object detection module. Leveraging the temporal correlation between successive frames in video sequences, we developed a novel face detection and tracking algorithm. We manually annotated frame by frame four short video sequences and compute the sensitivity and positive predictability of face detection using these three methods. Preliminary results indicate that the proposed new approach significantly reduces the probability of miss detection by OpenCV’s baseline algorithm and achieves better false detection rate than YouTube.

POLITICAL HUMOR AND NETWORKS ON TWITTER

Alisa Lollino, David Lassen (Mentor), Political Science

Users of Twitter are exposed to an abundant amount of political information and are using the network to obtain that information. This project examines how much and what kind of political humor exists in an average Twitter feed by coding tweets. Coding entails reading tweets from all different users and using their Tweet ID for an online survey answering a set of questions pertaining to just the political content. Not all tweets are particularly political, but every single one is coded according to the presence or lack thereof political content. The mentor then looks at the tweets coded and examines the humor content, if any. After all the information is assessed, it will give insight on how people are exposed to and get political information.

CLAUDIA LLOSA’S FILMS: CAUGHT BETWEEN THE LOCAL AND THE GLOBAL MARKET FORCES

Nina Longinovic, Guido Podesta (Mentor), Spanish and Portuguese

This research proposes to understand a disparity between the local and global reception of the two films, *Madeinusa* (2006) and *The Milk of Sorrow* (2009) by the young Peruvian director Claudia Llosa. Why do her two critically acclaimed films, starring traumatized ingenious female protagonists, appeal so much to international audiences but do not share the same popularity with local Peruvian viewers? In addition to looking at the reception through historical cinematographic trends in Peru and Latin America as well as economic aspects that determine the local and the global markets, I will consider the gender perspective and the feminism that exist at this time in Peru.

IMPACT OF NATURAL ORGANIC MATTER ON THE ZETA POTENTIAL AND HYDRODYNAMIC DIAMETER OF NANOPARTICLES

Vong Lor, Arielle Mensch (Mentor), Chemistry/ Hamer's Group

With the increasing use of nanoparticles in consumer products, a need exists to understand the possible implications of nanoparticles on environmental systems. First, we must understand the impact on nanoparticles when exposed to natural organic matter (NOM). Specifically, we want to see how the size and charge of gold nanoparticles and diamond nanoparticles with different surface ligands are impacted by NOM. The zeta potential of the particles prior to and after exposure to NOM allows us to study its impact on the surface charge. Dynamic light scattering allows us to study impacts of NOM on the hydrodynamic diameter of the nanoparticles. These studies will guide further investigations on the effect of NOM exposed nanoparticles to model environmental systems (supported lipid bilayers, and single- or multi-celled organisms) to help to understand the impact nanoparticles may have on the environment.

HIGH-PERFORMANCE COMPUTING AND LARGE-SCALE DATA CHALLENGES IN GALACTIC ASTRONOMY

Daniel Losinieccki, Elena Donghia (Mentor), Astronomy

This is the decade of the discoveries in our Galaxy, the Milky Way. Ongoing experiments have just started mapping the spatial and velocity distributions of the stars in our Galaxy over a larger volume than has previously been possible, revolutionizing the makeup of our stellar disk in our Galaxy and moving us towards an era where the acquisition of data is imaged to an unprecedented depth. From the ability to manage this huge amount of data and information, we utilize the Center of High Throughput Computing (CHTC) to run N-body simulations of stars moving under the effect of gravity to assemble a picture of the environment in which the stars in the stellar disk and our Sun originated and how they were incorporated into the Galaxy. The observational experiments suggest that our Sun has migrated from its initial birthplace and is an immigrant in this part of the Galaxy. In general, all of these phenomena cannot be created in a typical laboratory; instead, we have to create "virtual laboratories" on Earth in order to simulate the relevant physics in large-scale computational experiments.

SLEEP QUALITY PREDICTS PSYCHOLOGICAL FUNCTIONING FOLLOWING HEMATOPOIETIC STEM CELL TRANSPLANTATION

Alicia Luedtke, Erin Costanzo (Mentor), Psychiatry

We examined the extent to which sleep quality (SQ) predicted psychological functioning following hematopoietic stem cell transplantation (HSCT). Participants (N=482) completed measures of SQ and psychological functioning (well-being, depression, anxiety) pre-transplant and 1, 3, 6, and 12 months post-transplant. Poorer SQ was associated with poorer psychological well-being pre-transplant ($\beta=-0.247$, $p<.001$), 1 ($\beta=-0.305$, $p<.001$), 3 ($\beta=-0.314$, $p<.001$), 6 ($\beta=-0.367$, $p<.001$), and 12 months post-transplant ($\beta=-0.393$, $p<.001$). Poorer SQ measured at the preceding time point also predicted subsequently poorer psychological well-being at 1 ($\beta=-0.091$, $p=.07$), 3 ($\beta=-0.173$, $p=.001$), 6 ($\beta=-0.164$, $p=.002$), and 12 months ($\beta=-0.145$, $p=.011$). A similar pattern of findings was observed for depression and anxiety. Results suggest poor sleep may adversely affect psychological functioning, identifying a target for interventions that could improve quality of life after HSCT.

VANISHING MOUNTAINS: A HISTORY OF THE CERAMIC INDUSTRY IN JIAJIANG, CHINA

Ran Luo, Judd Kinzley (Mentor), History

Despite the copious amounts of research and speculations published on China's economic growth and environmental doom, many have neglected the integrality of rural enterprises in China's narrative. For my project, I studied China's shift from state-owned businesses to township and village enterprises from 1978 to present, and the environmental consequences that resulted from government oversight and increased citizen engagement in entrepreneurship and industry. In addition, I sought to shed light on stories often untold: the ambition of citizens to participate in a modernizing economy, the concerns towards their health, and their activism. To achieve this goal, I conducted a case study of the ceramic industry in Jiajiang County using historical evidence, gazetteers, and extensive interviews with company officials, government officials, doctors, factory workers and farmers.

EFFECTS OF GIVING VERSUS RECEIVING SOCIAL SUPPORT AMONG STEM CELL TRANSPLANT RECIPIENTS

Zhan Luo, Erin Costanzo (Mentor), Psychiatry

This study examined the extent to which giving versus receiving social support predicted psychological well-being among adults undergoing hematopoietic stem cell transplantation (HSCT). Participants (N=401) completed measures of social support pre-transplant and psychological symptoms pre-transplant and 6 and 12 months post-transplant. Patients who received more support reported less depression ($\beta=-.176, -.209, p=.001$), less anxiety ($\beta=-.128, -.1.73, p<.05$), and greater well-being ($\beta=.209, .219, p<.001$) pre-transplant but not post-transplant. Providing assistance to others was not related to psychological symptoms pre-transplant but predicted less depression 6 months post-transplant ($\beta=-.121, p=.025$). However, those who had concerns about caring for others had more psychological symptoms and poorer well-being pre- and post-transplant ($\beta=.116-.530, p<.05$). Giving and receiving social support appear to have distinctive effects on the psychological well-being of HSCT patients.

INVESTIGATING THE ROLE OF DROSOPHILA GENE MOODY IN NEUROPROTECTION

Shu Hui Lye, Stanislava Chtarbanova-rudloff (Mentor), Genetics

Disruption of the blood-brain barrier (BBB) has been observed in patients with neurodegenerative diseases. We have previously found that *Drosophila melanogaster* mutants defective for the gene moody exhibited phenotypes characteristic of neurodegeneration including shortened lifespan, locomotive defects and brain vacuolization that worsens with age. These results indicate that moody, which encodes a G-protein coupled receptor (GPCR) responsible for BBB formation and maintenance, may play an important neuroprotective role. To confirm that these phenotypes result from the moody-mediated pathway, a functional moody gene will be re-introduced into the mutant. According to our hypothesis, the rescued mutants will have lifespans, locomotive behavior and brain morphology comparable to those of wild-type flies. In addition, we will perform similar analyses on mutants defective for septate junction (SJ) proteins, which are involved in fly BBB maintenance. They are hypothesized to display phenotypes similar to those of moody mutants.

SLOW FOOD UW COMMUNITY PARTNERSHIPS: STRENGTHENING COMMUNITY THROUGH HEALTHY EATING IN SOUTH MADISON

Oona Mackesey-Green, Rebecca Wasserman-Olin, Margaret Nellis (Mentor), Interdisciplinary Studies

The purpose of Slow Food UW Community Partnerships (SFCP) is to foster relationships between UW students and the South Madison community while advancing the ideals of the SF organization's motto: "good, clean, fair food for all". In response to growing geographical, socioeconomic and cultural barriers between low-income residents and healthy food, SFCP addresses issues that are important to the South Madison community while furthering SFPC's goal to increase community awareness of and access to local, sustainable, culturally relevant, and nutritious foods by involving youth. By cooking and gardening at community centers with kids, SFCP aims to influence their food habits at home and for their future. We create a dialogue and bridge cultural differences between local diverse communities using food as a universal experience.

THE SMART DUMMY: A PACIFIER DESIGN PROPOSAL

Jasmine MacLaughlin, Heidi-Lynn Ploeg (Mentor), Mechanical Engineering

Pacification devices have been used for centuries to quiet, calm, and soothe restless infants. The current handle-shield-nipple design was first patented in 1900 and has developed very little since. The current pacifier deters parents from soothing their infants in this way because of its affinity to collect dirt and germs. I propose a new design, guided by testing and analysis, for a pacifier that addresses these negative issues. It consists of a one-piece design that tends to fall base-down, thus preventing the nipple from coming into contact with dirty surfaces. The shape soothes baby's gums, mimics breastfeeding, and may prevent orthodontic malocclusion. Increased safety without adverse effect on cost is a priority. This preliminary design may make the pacifier more appealing to parents and infants.

MBD1 REGULATES NEURONAL MATURATION THROUGH MICRORNA MIR-182

Daniel Magyar, Xinyu Zhao (Mentor), Neuroscience

Neurogenesis, a process of new neuron production, continues in the dentate gyrus (DG) of the hippocampus in the adult brain. Studies have shown neurogenesis to play a significant role in learning and memory, with deficiencies leading to neurodevelopmental disorders such as autism. One protein found to be regulating neurogenesis is MBD1. Unpublished data from our lab suggest microRNA-182 (miR-182) as a possible downstream regulator for MBD1 and Brain-derived neurotrophic factor (BDNF) a predicted target of miR-182. Based on these data, I hypothesize that MBD1 regulates neuronal maturation through a downstream pathway involving miR-182 and BDNF. To test this hypothesis, I propose to make use of a new flagged MBD1-cKO mouse line developed by our lab. This project aims to take a first step towards understanding how MBD1 regulates neuronal maturation through regulating miR-182.

PHOSPHOLIPID ETHER ANALOGS FOR THE DETECTION OF COLORECTAL TUMORS

Molly Maher, Dustin Deming (Mentor), Hematology and Oncology

Treatment of localized colorectal cancer (CRC) depends on primary tumor resections with sufficient margins and lymph node sampling. A novel imaging agent that accumulates in CRCs is needed. Novelos Therapeutics, Inc. has developed a diagnostic and therapeutic phospholipid ether analog platform. CLR1502 is a near-infrared fluorescent molecule, whereas 124/131I-CLR1404 is under clinical investigation as a PET tracer/therapeutic agent. CLR1502 was investigated for the detection of intestinal cancers in a murine model that developed tumors ranging from benign adenomas to locally advanced adenocarcinomas and 131I-CLR1404 in human metastatic CRC. After 96 hours post CLR1502 injection, intestinal tumors were analyzed via IVIS Imagers. Each tumor's fluorescent signal intensity was correlated with its histological characteristics. A clinical trial used SPECT imaging with 131I-CLR1404 in patients with advanced tumors.

REGULATION OF GENE EXPRESSION USING HYPOXIA DRIVEN VIRAL VECTORS

Bridget Mais, Corinna Burger (Mentor), Neurology

Parkinson's disease is a degenerative disorder of the central nervous system characterized by death of dopaminergic neurons and reduced levels of dopamine. Current drugs do not restore dopamine levels and cannot regenerate neurons giving a need for alternative treatments such as gene therapy. Glial-derived neurotrophic factor (GDNF) is a gene that promotes the survival of dopaminergic neuron but cannot cross the blood brain barrier without a gene transfer vector such as adeno-associated virus (AAV). A proper regulator, such as a hypoxia regulator, is required to control the basal expression. The goal of this experiment is to develop a hypoxia regulated AAV transfer vector that exploits hypoxic conditions as a trigger for dosing GDNF in the brain to combat the effects of Parkinson's disease.

COMPUTER ENGINEERING X JEWELRY DESIGN: LED LIGHT PENDANT

Keith Maki, Joseph Krachey (Mentor), Electrical and Computer Engineering

The goal of this senior design project was to capture the beauty of a logical computing system in a wearable piece of jewelry. The student designed, fabricated, and assembled a battery-powered printed circuit board device that could fit inside a 47mm pocketwatch case. The device was then programmed to control twelve LED lights in an adjustable pattern of light cycles. Eight buttons inside the case allow the wearer to change the color and intensity of each cycle in the pattern to fit their preferences. The embedded computing system chosen for this project was a Texas Instruments MSP430F133 low-power microcontroller. The pendant is powered by a standard 3V CR2032 watch battery, which supports continuous operation for two to three weeks.

VICTORIAN VISUAL SERIALITY

Bronte Mansfield, Nancy Marshall (Mentor), Art History

For my project, I assisted Professor Susan Bernstein of the English Department with her research on Victorian serial novels. The objective of the project was to catalogue the visual material (advertisements and illustrations) in the original serial printings of Charles Dickens's 1865 novel, *Our Mutual Friend*. This information is generally lost in modern re-printings, resulting in a decontextualization of nineteenth-century publications. While the purpose of this project was not to draw specific conclusions—only to collect and preserve information about the monetization of Victorian serial novels—it appears as though many of the products heavily advertised today, like medicine and cosmetics, were prevalent amongst the advertisements in the serial printing, and there were at times correlations between the advertisements and the content of the novel itself.

THE ROLES OF ARYL HYDROCARBON RECEPTORS ON PLACENTAL VESSEL FORMATION AND FETAL DEVELOPMENT

Sohum Mansukhani, Jing Zheng (Mentor), Obstetrics and Gynecology

Fetal growth is affected significantly by increased blood flow to the placenta. Thus, any factors affecting placental and fetal vascular growth and functions will impact fetal development. Aryl hydrocarbon receptor (AhR) is a receptor for mediating dioxin (TCDD)-increased fetal and neonatal mortality and decreased litter sizes. In our lab, we propose to explore physiological roles of AhR in fetal vascular function using ITE, a non-toxic AhR endogenous ligand, to determine if ITE and TCDD affect the activation of eNOS and production of nitric oxide, a vasodilator, in human umbilical vein and artery endothelial cells. These studies will reveal important information on physiological roles of AhR in fetal and fetal vascular functions, potentially providing a target for regulating placental, fetal, and vascular development in pregnancies.

MEMBRANE BIOREACTOR METHOD OF EBPR RESEARCH

Vogt Mark, Ben Oyserman (Mentor), Civil and Environmental Engineering

Enhanced Biological Phosphorus Removal (EBPR) is a crucial part of wastewater treatment and is traditionally studied in batch reactors. This method is limited by the maintenance effort, as only a few reactors may be operated by a reasonable staff of researchers. In hopes of establishing a more efficient research technique, a Membrane BioReactor (MBR) method will be presented. The objectives of the MBR design are to minimize maintenance effort and achieve high-throughput results. PAO's are grown on a membrane filter under favorable conditions while syringe pumps slowly provide the nutrient feeds. Each membrane filter houses about 1,000 times less PAO's than a traditional batch reactor, and eight reactors can be maintained with two syringe pumps.

PROGRAM EVALUATION OF THE ESCHOOLCARE PROJECT

Blood Marley, Michaela Cline, Emily Richards, Danielle Sendelbach, Lori Anderson (Mentor), Nursing

eSchoolCare is an innovative iPad-based program that provides on-the-go support for school nurses, who are the primary health professional in educational settings and provide care for children with chronic health conditions (CCC). The project's goal is to improve health/educational outcomes of children with chronic conditions. Interviews and surveys provided both qualitative and quantitative data. Interview data were analyzed using content analytic techniques and provided insight into how/what circumstances the app and iPad were used, barriers. Survey data were examined using descriptive statistics and associations. Results 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.

SERVICE LEARNING IMPACT ON STUDENTS: AFTER EXPERIENCE IN THE DOMINICAN REPUBLIC

Bailey Marquardt, Kim Ebner, Chi Hunyh, Nichole Springer, Jasmine Clay (Mentor), Residence Life

In this research project we ask the question: Can one week of service learning have a lasting impact, on volunteers? Students from Chadbourne Residential College had an opportunity to participate in a one-week academic volunteer trip to the Dominican Republic to teach English, sustainability, and health to Dominican children. During the trip, students reflected about the impact on service learning and immersion. Immersed in a different environment, the impact of service learning is strong when the students are in the location where the service learning is taking place. However, once returning to America, many students forget about the trip's impact. Can a one-week service-learning trip cause a long-term impact on the life of an individual? This project reviews results from three years of service trips.

THE SEXUAL CONCERNS OF KIDNEY AND SIMULTANEOUS PANCREAS AND KIDNEY TRANSPLANT RECIPIENTS

Jessica Martell, Tasha Crooks, Dami Ko, Rebecca Muehrer (Mentor), Nursing Education/Research

Transplantation significantly improves quality of life (QOL) for recipients. An area of QOL that does not improve after transplant is sexuality, yet few studies have addressed it after transplant. The purpose of this study is to describe the sexual concerns of kidney (KTxR) and kidney/pancreas (SPKTxR) recipients. Eligible participants were sent a packet of questionnaires containing sexuality and QOL measures. Data for this study were collected by adding open-ended questions to capture sexual concerns that are not addressed by the closed-ended questionnaires. Conventional content analysis was used to analyze responses from 142 KTxR and 70 SPKTxR. Five themes were identified: sexual functioning, desire for more information, relationship with partner, appearance changes, and other concerns. Correlations will be explored with QOL measures.

ROLE OF PIP2 IN VESICLE TRAFFICKING

Cesar Martinez, Xuelin Lou (Mentor), Neuroscience

One of the objectives of the lab is to investigate the function of PIP2 in vesicle trafficking. PIP2 is a phospholipid embedded on the inner leaflet of the plasma membrane responsible in regulating the SNARE complex which is a key component in mediating exocytosis. The lab aims to determine whether PIP2 and vesicles colocalized in nanometer resolution. Fluorescent microscopy is used to localize PIP2 and vesicles. By monitoring mEOS3.1-PHPLC δ 1 and NPY-mEOS3.2, the localization of PIP2 and vesicles within the cell can be assessed, respectively. I used molecular cloning techniques to develop these plasmids. So far, the plasmids have located PIP2 and vesicles successfully. However, the relative localization of PIP2 and vesicles still needs to be determined and the lab will continue to investigate how PIP2 regulates exocytosis.

CAREGIVERS' STORIES: SUCCESSES AND MISSES IN INTERACTIONS WITH PROFESSIONALS

Andalusia Masad, Elizabeth Larson (Mentor), Kinesiology

This performance ethnography will use narratives from caregivers of children with disabilities to describe their experiences and interactions when seeking services for their children. Research shows parents of caregivers spend significant time negotiating within school and health systems to have their child's needs met. In this performance piece, both negative and positive direct accounts from caregivers' experiences with professionals will be synthesized into a reading that emphasizes the traits of successful professionals.

CHALLENGES FACED BY YOUNG CHILDREN WHEN VISITING AN INCARCERATED PARENT

Rachel Massart, Stephanie Metz, Julie Poehlmann (Mentor), Human Development and Family Studies

The purpose of this project is to explore the experience young children have when visiting a parent in jail. We hypothesize that the visiting experience can be challenging for young children especially when it is a non-contact visit. Data were collected during the child's visit to the jail, where trained observers documented the child's behavior and affect while visiting the incarcerated parent through a Plexiglas window or video monitor. Additionally, the child drew a family picture to assess the level of emotional regulation that the child experienced during the visit. The results of this study may lead to recommendations on how to improve the quality of a child's experience during a jail visit.

ASSESSING CLOUD AND SEA ICE EFFECTS ON THE ARCTIC RADIATION BUDGET IN THE CMIP5 MODELS

Marian Mateling, Tristan L'ecuyer (Mentor), Atmospheric and Oceanic Sciences

Due to the sensitivity of the Arctic to changes in climate, known as “Arctic amplification,” quantifying the radiation budget of the polar region is important. Today’s climate predictions rely on Global Climate Models (GCM) to simulate the response of the Arctic to changes in greenhouse gas concentrations. This study uses all-sky and clear-sky radiation data from NASA’s A-Train satellites to evaluate the international set of GCMs that participated in the 5th iteration Climate Model Intercomparison Project (CMIP5). The cloud and sea ice effects on the Arctic radiation budget will be quantified and used to identify biases in the CMIP5 ensemble that forms the basis for the latest Intergovernmental Panel on Climate Change (IPCC) report.

EFFECTIVENESS OF ALTERNATIVE SCHOOLING

Courtright Maxwell, Kimber Wilkerson (Mentor), Rehabilitation Psychology and Special Education

Alternative schools, like their “traditional” counterparts, aim to optimize student outcomes. Past researchers have established three categories for alternative schools: “schools of choice” that offer innovative instruction; “last-chance” schools, that focus on behavior and are often offered as an alternative to expulsion; and “remedial” schools, that emphasize basic skills and credit recovery. Currently these schools are relatively understudied with regards to student outcomes. Our research examines outcomes across different types of alternative and traditional high schools. Outcome data, including attendance rates, credit accrual, suspensions and office referrals will be compared across school types. The initial research involves one Midwestern urban school district. The aim is to improve educational outcomes for students at risk of failure by illuminating what can be gained from these educational options.

EVALUATION OF THE USE OF ANTI-GD2 BNF NANOPARTICLES TO SELECTIVELY TARGET NEUROBLASTOMA

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

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 minimally expressed 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 evaluate the in vitro and in vivo performance of anti-GD2 BNF nanoparticles, which previous experiments have indicated are a promising candidate for neuroblastoma targeting.

BLACK FARMERS CONTRIBUTION TO THE BLACK FREEDOM MOVEMENT

Tasi-Jo McFarlane, Monica White (Mentor), Community and Environmental Sociology

Historically, agriculture has served as a force of oppression against African Americans and farmers of color. This research seeks to contextualize how Black farmers were able to utilize agriculture as a mechanism of resistance and freedom. This research first examined historical data of Black farmer cooperatives and collectives from the 1800s to the present. After examining these organizations, findings show Black farmers used political mobilizations and direct action campaigns such as boycotts, protests, marches and strikes; they engaged in community building and shared resources which sought to improve their social and economic hindrances. These results highlight positive aspects of agriculture to African American history and allow scholars to deviate from the negative aspects of agriculture in African American history which is usual discussed.

APPLICATION OF THE PATIENT ACTIVATION MEASURE: A LITERATURE REVIEW

Kelly McGinn, Andrea Gilmore Bykovskyi (Mentor), Nursing

Patient Activation (PA) has been shown to increase health outcomes and reduce health care utilization and costs. PA is a process that promotes an individual to gain knowledge, skills, and confidence for managing their health and healthcare. The Patient Activation Measure (PAM) is a widely used, valid/reliable instrument to measure PA. However, the PAM has limited application for patients whose care is managed partly or completely by caregivers or care partners. A literature review was conducted to examine the use of PAM and its application to patient populations requiring caregivers. The PAM has been used primarily in adult, cognitively intact populations. Suggestions for expanding the utilization of PAM will be discussed.

AMERICAN BLACK BEAR AGING AND DIET

Cecilia Mecozzi, Rebecca Kirby (Mentor), Forest and Wildlife Ecology

In order to investigate American black bear biological aging and diet, stable isotope analysis and molecular techniques (such as PCR) are required. These processes involve the use of samples of hair, blood, vegetation, and coyote scat. DNA can be extracted from blood and bear hair. From these samples, repeating sequences of DNA at the ends of the chromosomes—called Telomeres— can be examined to determine length. The length of a telomere will ultimately determine the biological age of the black bear to be compared with individual characteristics. In addition, we are studying bear diet, which can be done through isotopic analyses. Through isotope analysis, the ratio of carbon isotopes in samples will indicate how heavily the animal relies on human-food as a part of its diet.

AN APPLICATION OF METAL-MEDIATED SYNTHETIC SYMMETRIZATION IN THE STUDY OF THE SIGMA 1 RECEPTOR

Hannah Meddaugh, Brian Fox (Mentor), Biochemistry

Sigma 1 receptor (S1R), a transmembrane protein critical in many nervous system functions, remains a challenging target for structural studies. It was proposed that rational mutagenesis of surface residues of a fusion partner, maltose-binding protein (MBP), would improve S1R crystallization. The present study focused on a series of engineered mutations known to produce crystallization-prone MBP, referred to as metal-mediated synthetic symmetrization mutations. To investigate the applicability of this method, a series of mutated MBP-S1R fusion constructs were designed, expressed in *E. coli*, purified, and then crystal screened in the presence of metal ions. It is hoped that continued crystallography trials may reveal the structure of this target. Structure determination of S1R would be invaluable to those who study this protein and its diverse functions.

CHARACTERIZATION OF INDUCED PLURIPOTENT STEM CELLS FROM A DOWN SYNDROME INDIVIDUAL

Margaret Medo, Anita Bhattacharyya (Mentor), Waisman Center

Trisomy 21, commonly known as Down Syndrome (DS), is a common genetic disorder that causes cognitive disability. However, little is known about what goes wrong in the brain to cause this disability. Because of their ability to become any cell in the body, induced pluripotent stem cells (iPSCs) from DS individuals can be differentiated into neurons to study mistakes that are made during brain development. iPSCs must express certain pluripotency genes to be defined as iPSCs. We characterized newly generated Trisomy 21 iPSC for their expression of Sox2, Oct4, and KLF4 and Nanog and confirmed that the parent fibroblasts did not express these markers. In future studies, these Trisomy 21 iPSC will be differentiated into neurons to study brain development in DS.

YOUNG SCIENCE SCHOLARS: PUTTING THE “SCIENCE” BACK IN SCIENCE EDUCATION

Kelsey Melah, Leigh Danner, Dorothea Ledin (Mentor), Institute for Biology Education

Currently in the Madison Metropolitan School District there is a growing emphasis on math and literacy instruction due to underperforming scores on statewide exams. This emphasis has pushed instruction of other subjects such as science to the periphery. In addition, many teachers are intimidated by the prospect of teaching science without a strong background in the topic. Young Science Scholars is a grant-based program designed by Dolly Ledin (UW Institute for Biology Education) and Kathy Huncosky (Madison School District) to foster collaboration to address this problem. Young Science Scholars pairs university students and scientists, teachers and afterschool leaders from three Madison schools, creating a collaborative environment for developing innovative and engaging science lessons for the classroom. In addition to these lessons, this group works to support science outreach throughout the district. This presentation is not only a discussion of Young Science Scholars work in the last year but also a call to action for local support and greater involvement from the university, the community, and other supporters of science education.

STEPPER MOTOR DRIVEN HEAT SWITCH FOR CRYOGENIC APPLICATIONS

Brandon Melcher, Peter Timbie (Mentor), Physics

A mechanical heat switch was constructed for use in a cryogenic detector system utilizing an adiabatic demagnetization refrigerator. The heat switch is driven by a commercially-available stepper motor and control electronics. With slight modifications of the stepper motor, the switch functions reliably at 4 K and achieves an on state heat conductance of 1.04 mW/K. With limited computer control and the low heat conductance value, improvement will be necessary before the system is considered better than the current options. In cosmology, cold detectors can be used for precision measurements of the Cosmic Microwave Background. In relation to more general astrophysics, the NASA and ESA collaboration Herschel used cold detectors for observations of Black Holes, Dwarf Planets, and the Interstellar Medium. They can also be used for Dark Matter Detection, X-Ray Detectors, and recently, BLAST used cold detectors for measurements of dense Interstellar Medium in relation to star formation. Continued development of the heat switch will hopefully provide greater efficiency to all of these applications.

TWITTER AND POLITICS

Tierra Merritt, David Lassen (Mentor), Political Science

Twitter is a social network with a growing population of users. It is a social network for news entertainment as well as political humor and political learning. Twitter can be used to provide insight on what the relationship is between political content and political humor. To explore this relationship, tweets will be coded using an excel file, provided by a UW–Madison survey platform. In this survey, I code things such as political content, partisan references, any media sources, and links in the tweet. The tweets can stem from just one user, or several users. The goals of this study include: understanding how people acquire political information, and seeing what kind information is being distributed on Twitter in humorous ways, hoping that humor can help make people more interested in politics.

SHADES

Tiffany Merritt-Brown, Katherine Corby (Mentor), Dance

“Shades” explores identity within the context of contemporary choreography using movement, music, and discussion. My overall approach was to create an aesthetically pleasing work that brought awareness about racial identity to both the performers and audience. The final product was a work that became universal through abstraction.

DISSECTING PLANT VIRAL TRANSLATION OF TRITICUM MOSAIC VIRUS 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 and use of living plant cells called protoplasts to dissect the mechanism of translation in vivo 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.

STUDENT EMPLOYMENT WORK MODEL (SEWM)

Briana Miller, Zoe Dixon, Anna Golackson, Winston Vakunta, Angela Rosas (Mentor), Office of Human Resources

SEWM addresses underutilization of students workers, which provides less opportunity for students to gain skills/professional development, and less ability for non-student staff to rely on students. SEWM addressed this by incorporating theoretical frameworks/ideologies to identify how to integrate students into the work place with greater levels of responsibility (e.g. growth mindset allowed us to give students work beyond what they feel they are 'good' at to broaden skills; person-environment fit theory helped foster an environment which molds to the person, not the other way around to ensure success.) Students are more engaged and gain a more holistic experience; staff rely on student employees in a meaningful way, and we learned that work in this context is beneficial for both student employees and non-student staff equally.

EXPRESSION OF FABP7, HPGD, OR GALNT12 MIGHT DISTINGUISH MURINE COLONIC ADENOMAS FROM CARCINOMAS

Devon Miller, Richard Halberg (Mentor), Medicine

Although colonic polyps can grow and progress to cancer, adenomas are much more likely to remain static in size. We studied tumor progression using a long-lived murine model of colorectal cancer. Microarray analysis revealed that the pattern of gene expression observed during early tumorigenesis distinguished adenomas which do not progress and those that progress to carcinomas. Three genes have previously been identified during microarray analysis to be upregulated in adenomas but downregulated in carcinomas: FABP7, HPGD, and GALNT12. This study sought to determine whether expression of these genes is significantly different in adenomas in a benign state versus adenomas that progressed to a more advance state. To investigate gene expression, I performed quantitative polymerase chain reaction on tissues collected from murine colonic adenomas and carcinomas.

CHARACTERIZATION OF SOX9B EXPRESSION AND FUNCTION IN ZEBRAFISH NEURAL DEVELOPMENT

Kevin Miller, Jessica Plavicki (Mentor), Pharmaceutical Sciences

The transcription factor Sox9 is involved in many developmental regulatory processes, but little is known about its spatial and temporal role in brain development in zebrafish. Sox9 has been shown to induce and maintain mammalian neural stem cells, and is implicated in the switch from neurogenesis to gliogenesis during development. Using a transgenic reporter line, I have characterized the expression pattern of the zebrafish homolog sox9b during neural development. In addition, antisense morpholino oligonucleotide knockdown of sox9b perturbs the morphology of specific neural structures, demonstrating its vital function during early development. By using these two approaches, the role of sox9b in zebrafish brain development can be better understood.

UTILIZING 3D PRINTING FOR RECYCLING

William Milner, Duncan Carlsmith (Mentor), Physics

In our current academic climate, the issue of sustainability is becoming an increasingly palpable area of debate. A large portion of plastics can be characterized as thermoplastics and can be broken down seamlessly into simpler materials. Working under Professor Carlsmith of the physics department, the goal of the project is to develop and study methods of breaking down plastics into filament to be used for printing. Using a machine called the Filabot, along with experimental techniques, the true attributes of recycled filament can be tested. If recycled filament has the same qualities that consumers have come to expect from commercial filament, then recycled filament could prove to be sustainable in everyday life.

AVIAN CISGENIC MODIFICATION OF MX GENE TO CONFER RESISTANCE TO AVIAN INFLUENZA

Alissa Milonczyk, Mark Berres (Mentor), Animal Sciences

Highly pathogenic avian influenza (HPAI) has severe public health, economic, and production-related impacts. Managing this disease is most practical at the level of domestic chicken flocks. Due to complexities associated with vaccinations and selective breeding programs to enhance disease resistance, genetic modification by gene insertion is a viable alternative. This research focuses on avian Mx, a gene thought to confer resistance to AI. Using lentivirus, an Mx allele from a duck known to be resistant to AI will be transduced into AI-susceptible chickens and evaluated for antiviral efficacy. Previous studies have all suffered from multiple sources of variation within and between experimental designs. This in vivo approach will be the most accurate in determining Mx effectiveness and lead toward enhanced AI resistance in domestic chickens.

THE PROLIFERATIVE EFFECTS OF ELECTROCONVULSIVE THERAPY ON MBD1 DEFICIENT MICE

Janessa Mladucky, Xinyu Zhao (Mentor), Neuroscience

The mechanisms regulating stem cell proliferation and differentiation are not fully clear. These mechanisms are the key to understanding brain function and could lead to improved treatments of brain diseases. One such unknown mechanism is that of Methyl-CpG binding protein 1 (MBD1) which has important implications in neuronal development because it can recognize and silence the transcription of methylated DNA. The mechanisms of how MBD1 works are still being characterized, but an absence of the protein has been linked to neurodevelopmental disorders as well as depression. Neuronal activity increases have been shown to induce de novo methylation of some genes, but how such activation would be interpreted in the absence of MBD1 is currently unknown. Determining the proliferative effects of neuronal stem cells in activity induced (Electroconvulsive therapy treated) MBD1 deficient mice would open up new areas for research and possible treatments in cases where MBD1 is inactivated.

THE EFFECTS OF INDUCED CONSTITUTIVE OVER-EXPRESSION AND KNOCKDOWN OF ATF2 IN AEADES AEGYPTI ADULTS

Peter Monteagudo, Susan Paskewitz (Mentor), Entomology

Development of new mosquito control methods is essential to decrease the incidences of vector-borne diseases including Malaria, Dengue, and West Nile. Recent studies have shown that ATF2 plays a role in the transcriptional activities of SCP2, a protein involved in a female's ability to produce healthy eggs. ATF2 is a promising target for molecular methods of *Aedes aegypti* population control. The objective of this investigation is to examine how the over expression and knockdown of ATF2 influences the biological fitness of *Aedes aegypti*. This study will focus on changes in mortality rate, fertility, and rate of development in adult samples due to over-expression of ATF2 and the knockdown of ATF2. This study may lead to the development of future vector control methods for *Aedes aegypti*.

THE SOCIAL DIMENSION OF HUMAN ATTACHMENT

Pablo Montes, Alice Goffman (Mentor), Sociology

Research into human attachment focuses on biological imperatives and psychological processes. Our human need to bond, and the particularities of our childhoods shape our attachments as adults. While we certainly become attached for biological and psychological reasons, our attachments emerge and develop through our social interactions, arrangements, and context. With Professor Goffman, I investigated some of the social dimensions of attachment, in particular the role of holidays, separations, and jealousy in bringing people together or pushing them apart. Holidays like Christmas and Valentine's Day can be quite pivotal for our romantic bonds, pushing them in one direction or another. Distance tends to decrease our bonds, while proximity helps strengthen them.

COMPARISON OF DRIED PLASMA SPOTS AND DRIED BLOOD SPOTS FOR USE IN PHENYLKETONURIA DIET MONITORING

Jackson Moran, Mei Baker (Mentor), State Laboratory of Hygiene

Phenylketonuria (PKU) is a genetic disorder caused by a mutated gene that codes for phenylalanine hydroxylase, an enzyme that breaks down the essential amino acid from phenylalanine to tyrosine. The treatment of PKU requires the dietary restriction of phenylalanine and supplement of tyrosine, and the effectiveness of treatment is monitored by frequently checking the blood concentrations of phenylalanine and tyrosine. Typically, blood tests have used dried blood spot. We proposed that dried plasma spot (DPS) may make the blood testing results more accurate in comparison with dried blood spot. The comparison was made on the basis of the amount of phenylalanine and tyrosine recovered from samples with known values. We believe that the removal of red cells will provide better recovery in the DPS.

FULL-LENGTH MHC CLASS I NOVEL ALLELE DISCOVERY IN CHINESE RHESUS MACAQUES

Rebecca Morgan, David Oconnor (Mentor), Pathology & Laboratory Medicine

Major histocompatibility complex (MHC) class I genes play a major role in the immune response against pathogens and are important for transplantation studies. Deep sequencing techniques have revolutionized MHC class I allele discovery. In this experiment, data from Roche/454 and Illumina Miseq sequencing platforms were combined to discover novel full-length MHC class I alleles from Chinese rhesus macaques. These macaques have been used as models to study HIV, influenza, malaria and stem cell therapies. This approach can be applied to a variety of nonhuman primates used in scientific research and will lead to the completion of MHC class I sequence libraries for these primates within a few years.

WILD YEAST PROGRAM AND BIOFUELS

Ryan Moriarty, Christopher Hittinger (Mentor), Genetics

Although yeast is commonly associated with beer and bread, it has many other uses and habitats. With the Wild YEAST Program in the Hittinger Lab in Madison, samples from various regions around the United States are sent in and analyzed. From these samples of dirt, leaves, bark, and fruits, yeast is extracted using a series of steps. It is enriched in a high sugar media (usually glucose) with antibiotics. Then, cultures are diluted onto agar plates with glucose and other nutrients. Once the plate has yeast colonies growing, the different strains are streaked to isolate the descendants from a single cell. These pure strains are inoculated and cryopreserved. In parallel, DNA is extracted using NaOH, and a "barcode" gene is amplified using PCR. After PCR, the sample is sequenced so that the DNA trace can be read by a computer program. By comparing this data against a global database, we can genetically identify exactly which species of yeast has been isolated. Yeasts have the potential to make new fuels, because they convert sugars, such as glucose and xylose, and are potential sources of genes that could be used to engineer industrial strains. At this point in my research, I have begun to identify strains from my samples. With further studies, I will be able to learn to what makes some yeasts more efficient at converting certain sugars to fuels, and why they are found in particular places.

ASSOCIATIONS BETWEEN BODY TEMPERATURE AND WILLINGNESS TO APPROACH AN OBJECT OR HUMAN IN CALVES

Amy Moy, Amy Stanton (Mentor), Dairy Science

Our objective was to determine associations between fever and willingness of calves to approach a novel object (OBJ) or a human (HU). Calves ($n = 75$) were housed in groups with 9 ? 1. For six weeks, calves were tested weekly for willingness to approach (<60s) an OBJ or SH. Approach was considered one step towards the OBJ/SH. After the approach tests, rectal temperatures were categorized (TS) as 0 (37.8–38.2°C), 1 (38.3–38.8°C), 2 (38.9–39.3°C), and 3 ($\geq 39.4^\circ\text{C}$). Calves with a TS 0 were 5.2 (1.8–15.6) and 4.6 (1.7–12.6) times more likely to approach OBJ ($P < 0.005$) and SH ($P < 0.005$) than calves with a TS of 3. This suggests that approach tests could be used to identify calves with fevers.

MEDIA COVERAGE OF CHEATING IN ATLANTA PUBLIC SCHOOLS

Angela Moynan, Erica Turner (Mentor), Educational Policy Studies

Since the first standardized test was administered in 1845, there has been evidence of cheating. However, little research investigates why cheating occurs and how it affects students, schools and communities. In 2009, a large systematic cheating operation was uncovered in the Atlanta Public School District (APS). This study aims to identify what (if any) social and political factors influenced APS, and how the cheating affected the district's students, schools, and surrounding community. The systematic cheating that occurred in APS is well documented and has been thoroughly reviewed and cataloged as part of this study. Through this process, we have identified themes in the media's explanation for cheating. Soon, a series of interviews will be conducted to identify the impacts of cheating on the community.

BECKHOFF SAFETY DESIGNS: THEATER

Nick Munger, Daniel Lisowski (Mentor), Theater & Drama

Live entertainment occurs around the world every day, and in many situations, involves potentially dangerous props. A consumer-ready safety system would be beneficial to all types of theatrical networks. Using Beckhoff's TwinCat 3 professional engineering software implemented inside of Microsoft Visual Studio 2012, we can control a network of electronics and emergency stop (E-Stop) buttons and can implement virtual Visualization. The Visualizations will involve creating virtual buttons and connections the users would interact with to monitor and control their stage production. The current status of the project includes ordering parts, familiarization with the coding style, and writing our own codes. The outlook of our research includes implementing our system into numerous theatrical designs to create a safe, reliable environment for all theater.

SAFETY CONCERNS IN CANCER PATIENTS REPORTING CHEMOTHERAPY-INDUCED PERIPHERAL NEUROPATHY

Megann Mussatti, Kristine Kwekkeboom (Mentor), Nursing

Chemotherapy-induced peripheral neuropathy (CIPN) presents a risk factor for falls or injury due to decreased peripheral sensation. Falls and injury are especially dangerous in the cancer population because chemotherapy causes a reduction in platelets and an increased risk for bleeding. The purpose of this study is to describe: 1) self-reported incidence of falls and injury related to CIPN, 2) patients' perceived risk for falls and injury related to CIPN, 3) the percentage of patients who reported receiving education on specific recommendations for fall risk reduction related to CIPN, 4) the extent to which patients report following risk reduction recommendations. This descriptive quality improvement study will utilize simple statistics to analyze data from a survey distributed to patients from the University of Wisconsin Carbone Cancer Center.

BEYOND INTRATHECAL PAIN MANAGEMENT: TARGETED DELIVERY OF BIOLOGICS WITHIN THE SPINAL CORD

Carrie Nacht, Jillian Joslin, Lisa Liu, Kush Patel, Steven Siegel,
Vishavdeep Singh, Gurwattan Miranpuri (Mentor), Neurological Surgery

Chronic pain costs the United States an estimated 635 billion dollars annually. Management of pain through modulation of targets within the spinal cord (SC) is currently accomplished through cell receptor drug-based therapies administered through systemic or intrathecal (IT) routes. These therapies are inadequate for many patients and do not address the core cause of pain. New approaches for pain management, including gene therapies, are being studied in small animals where the large surface to volume ratio of the SC allows IT therapies that simply bathe the SC to be effective. Development of new delivery platforms that penetrate and target regional locations within the human SC is necessary for large animal SC models and translation to humans. The University of Wisconsin has extensive experience with convection-enhanced delivery (CED) of gene therapies targeting local regions of the brain. This proposal aims to adapt this technology for delivery of biologics into the SC using a pig model.

VITAMIN A LEVELS IN PIGLET TISSUES AS A FUNCTION OF DOSE TIME

Nivedita Nair, Michael Grahn (Mentor), Nutritional Sciences

Vitamin A deficiency is a serious problem in many developing nations, where diet is nutritionally insufficient, especially for small children. Vitamin A deficiency can cause blindness and poor immune response—a major factor in infant mortality. Consequently, mass dose Vitamin A supplementation has been used globally to replenish Vitamin A reserves. However, dose timing, amount, and frequency have been debated. This study aims to determine the effect of timing of dose on tissue Vitamin A levels. A single 50,000IU dose of Vitamin A was administered to piglets at 12–24 hours, 2 days, or 7 days after birth. Piglets are a viable model as their metabolism of Vitamin A mirrors that of humans. Total Vitamin A was calculated in different tissues to determine Vitamin A levels.

MICROPATTERNED HESC-DERIVED CARDIOMYOCYTES DISPLAY AN ORGANIZED SARCOMERE STRUCTURE

Brett Napiwocki, Wendy Crone (Mentor), Engineering Physics

When cultured in vitro, cardiomyocytes derived from human embryonic stem cells (hESCs) are pleomorphic in shape and exhibit a disorganized sarcomere structure. On the other hand, cardiomyocytes found in vivo have a length-to-width aspect ratio of 7:1 and an anisotropic sarcomere organization. In the present study, a pure population of hESC-derived cardiomyocytes was seeded onto controlled two-dimensional micropatterned features of various sizes. Interestingly, analysis of sarcomere alignment in the seeded cells via α -actinin expression showed clear alignment with the width rather than the overall aspect ratio of the features, with the greatest alignment occurring between 30 and 80 micrometers. These results provide a deeper understanding of sarcomerogenesis and cardiomyocyte development.

DEVELOPMENT OF A PIG MODEL TO STUDY HUMAN PANCREATIC SECRETORY FUNCTION AND ACUTE PANCREATITIS

Calvin Nauer, Guy Groblewski (Mentor), Nutritional Sciences

This study evaluated the use of pig pancreas as a model to study pancreatic disease. Pancreatic lobules were prepared by mincing and cultured in DMEM containing trypsin Inhibitor. Treatment of rat lobules with CCK–8 or Carbachol (Cch) +/- Atropine showed two- and four-fold increases in secretion with 100pM and 100nM CCK–8, respectively. Similar increases were seen with Cch. Unexpectedly, Atropine increased secretion by CCK–8. In pig lobules, secretion was enhanced by 10nM CCK–8, whereas physiological concentrations (100pM) had no effect. Experiments suggested intracellular trypsin activation was enhanced by both CCK–8 and Cch. Further studies will determine if CCK–8 acts directly on acinar cells or secondary to nerve activation. Results suggest that pigs may provide a useful model to study secretory function and acute pancreatitis.

EFFICACY OF A NOVEL DRUG AGAINST HUMAN PROSTATE CANCER XENOGRAPTS

MaryAnne Naundorf, George Wilding (Mentor), Medicine

There is no approved drug that can prevent the transition from androgen-dependent prostate cancer (PCa) to the deadly castrate-resistant PCa (CRPCa). Here we test if F1174-3266 is effective in inhibiting growth of androgen-dependent LNCaP or castrate-resistant LNCaP C4-2 human prostate cancer cell xenografts in immuno-compromised mice. Mice were treated with 50 mg/kg F1174-3266 or vehicle control. Tumor growth and body weights were monitored over time. LNCaP C4-2 tumors treated with F1174-3266 grew at a decreased rate as compared to tumors treated with vehicle control in both castrated and intact mice. No difference was seen for LNCaP tumors. F1174-3266 shows promise for prevention of progression of CRPCa by inhibiting growth of castrate-resistant LNCaP C4-2 cell xenografts under both castrate and intact conditions.

IDENTIFICATION OF PUTATIVE BIOMARKERS EXPRESSED IN LOWER URINARY TRACT SYMPTOMS USING A MOUSE MODEL

Anatoliy Nechyporenko, Lingjun Li (Mentor), Pharmacy

Lower urinary tract symptoms (LUTS) is a prevalent problem that negatively impacts the elderly. Although treatments are available, a barrier to their execution is the lack of techniques necessary to identify biomarkers corresponding to the variegated pathologies of LUTS. This study develops such a method. Urine samples were collected from bacterial-induced prostate inflamed and hormone-induced urinary obstructed mice. Proteins were extracted, digested, and desalted. Resulting peptides were separated over a reversed-phase liquid chromatography gradient and spectra were acquired using tandem mass spectrometry. Eleven protein candidates were found in urine of the prostatic inflammation group, five of which are implicated in fibrotic syndromes. Six candidates were found in the urinary obstruction group. The technique was successful and could be used for similar studies in humans.

PHOTOCATALYTIC SYNTHESIS OF DIHYDROBENZOFURANS BY OXIDATIVE [3+2] CYCLOADDITION OF PHENOLS

Sarah Nordeen, Tehshik Yoon (Mentor), Chemistry

A new method for the oxidative [3+2] cycloaddition of phenols with styrenes is described for the synthesis of 2,3-dihydrobenzofurans. This reaction employs visible-light photocatalysis to perform the necessary redox transformations, and uses an environmentally-benign oxidant, ammonium persulfate. The reaction is shown to possess a wide substrate scope that encompasses a variety of electron-rich phenols, and electron-neutral and electron-rich styrenes.

PROJECT HEALTHDESIGN

Mulki Nur, Patricia Brennan (Mentor), Gail Casper (Mentor), Nursing

Project HealthDesign was created to stimulate innovation for personal health records (PHRs). Five grantee teams were tasked with the creation of patient-centered interactive applications, which enabled individuals to capture and interpret observations of daily living (ODLs) and share them with their healthcare providers. These applications permitted clinicians to have a better understanding of the person's health concerns, health behaviors, and health state. Each of the five teams amassed large amounts of observations over a 6-month period. One team provided separate data files for each of its 32 participants; these files had to be merged into a single file. The merged file contained 3,690 observations that had to be evaluated for accuracy and reliability. This presentation will report on the strategies used for merging and evaluating the resultant file.

INVESTIGATING THE ROLE OF F-BOX AND SRO GENES IN THE PLANT INNATE IMMUNE RESPONSE

Jackson Nyman, Brian Keppler (Mentor), Plant Pathology

Recent work in the Bent lab identified a set of genes associated with plant defense responses. We investigated how some of these genes affect immune responses in the model plant *Arabidopsis thaliana*. A gene encoding an F-box protein, one of hundreds in the plant genome that targets specific proteins for ubiquitination and degradation, was investigated through pathogen growth assays. We hypothesized that a knockout mutant of this gene would increase susceptibility to pathogen infection while overexpression would enhance resistance. The other genes investigated, the six members of the SRO family, were approached from a different perspective: we focused on utilizing RNAi to generate knockdown lines which will be used in the future to investigate their role in the plant innate immune response.

LETTER CATEGORIZATION: A NEGLECTED HURDLE IN LEARNING TO READ

Megan O'Callaghan, Mark Seidenberg (Mentor), Psychology

Learning to read is challenging for many children. Previous research has established a correlation between knowledge of letter names (B = "bee") and early reading success. This is puzzling because letter names play no direct role in reading. My study tests the hypothesis that letter names help the child solve an important problem: treating different exemplars of a letter as instances of the same category of letter. Visual similarity is not sufficient to solve this (e.g. C and O are visually similar but different letters). I hypothesize that letter names are crucial to categorizing letters. This hypothesis will be tested in preschoolers, using tasks that look at letter knowledge and other reading-readiness skills. The results will be relevant to developing letter processing skills in pre-readers.

BEST GREEN PRACTICES MANUAL

Brenna O'Halloran, Laura Linde, Sabrina Bradshaw (Mentor), Geological Engineering Program

A sustainable work environment provides benefits to the workers as well as the community by enhancing environmental and financial resource management. This project seeks to provide a resource that would help inform and engage people by creating a green office and green laboratory manual that will be made available electronically. The manual will be developed by compiling information on best practices for offices and laboratories and revised to incorporate campus specific information and resources. Campus green teams will be utilized as a resource for practical implementation of the recommendations given in the manual. Ideally this manual will provide businesses, communities, and individuals with the resources needed to efficiently implement programs that will contribute to a more sustainable workplace.

CHARACTERISTICS OF THE FIRST 10 WORDS PRODUCED IN TODDLERS WITH AUTISM SPECTRUM DISORDER

Kylie O'Keefe, Susan Ellis Weismer (Mentor), Communicative Sciences & Disorders

Toddlers on the autism spectrum (ASD) exhibit language delays and pragmatic impairments. Due to the language delays associated with ASD, there is reason to believe that early words produced by toddlers with ASD will not only be delayed, but also differ categorically from those of typically developing children. This study is a comparison of the normative first words on the MacArthur Bates Communicative Development Inventory I) for typically developing 30-month-olds and the first 10 words produced by 30-month-olds with ASD. One-sample t-tests were conducted to test whether toddlers with ASD produced different proportions of words relative to those reported for typically developing children. Further research should focus on how to integrate the first words produced by children into the clinical diagnosis of ASD.

ALTERNATIVE APPROACHES TO SURGICAL RECONSTRUCTION OF KEY PINCH FOLLOWING SPINAL CORD INJURY

Stephanie O'Leary, Joseph Towles (Mentor), Biomedical Engineering

Tetraplegia, a condition caused by cervical spinal cord injury, is characterized by partial or complete loss of muscle function in all four limbs. Individuals with tetraplegia experience major independence-limiting, functional impairment including the inability to perform grasping tasks. Tendon transfer surgery, involving transfer of a still-functioning donor muscle in the forearm to a paralyzed thumb muscle, is commonly performed to restore lateral pinch between the thumb and lateral index finger. Surgical outcomes, however, vary greatly, leading to maximum pinch forces in patients that differ 10-fold and are as low as 1.8 N. The goal of this project is to demonstrate that a novel tendon transfer method, where the donor muscle is attached to multiple paralyzed thumb muscles rather than just one, enable stronger pinch forces.

PEER NETWORK AND PEER SUPPORT INTERVENTIONS TO ENHANCE RELATIONSHIPS AND INVOLVEMENT IN HIGH SCHOOL

Manjari Ojha, Estefanie Becerra, Colleen Moss (Mentor), Waisman Center

Social isolation and low engagement in school activities is often the experience of many high school students with significant disabilities. The Peer Partner Project has focused on coaching school staff to implement peer mediated supports in and outside the classroom to create social relationships, increase school participation, and stimulate friendships between students with and without disabilities. Data was collected to evaluate the impact and feasibility of peer supports in the classroom, and peer networks outside the classroom, as compared to the school's business as usual. After implementing peer interventions in more than 22 high schools in 2 states we have found that peer mediated interventions are an effective and practical approach for building social connections and friendships between students with and without disabilities during high school.

DECOMPOSING ORGANIC WASTE IN A CONTINUOUS FLOW STIRRED TANK REACTOR

James Olson, Daniel Noguera (Mentor), Civil & Environmental Engineering

After collecting the fruits and vegetables from farms across the United States, there is still a lot of energy left in the leaves, stalk, and root systems. Currently, we harness this energy by burning the organic waste to power steam engines. Researchers in the Wisconsin Energy Institute are engineering a much more efficient, and environmentally friendly, process where the waste is decomposed into fatty acids and hydrogen gas. One proposed technique to accomplish this decomposition is using a Continuous Flow Stirred Tank Reactor (CFSTR) with a photosynthetic bacterium. This technique maintains practicality on a large scale. Ideally, the bacterium will be able to survive and continue decomposing at a concentration greater than 14.38 g dry cell weight per liter. If successful, this technique could radically change post-harvest farming methods, as well as have significant ramifications on adjacent fields of waste management and water purification. As a small part of this research, I designed the reactor, and collected data from various genetically modified bacterium.

IS PRENATAL YOGA SAFE?

Olushola Olukoga, Gudrun Buhnemann (Mentor), Languages and Cultures of Asia

It was once believed that it was unsafe for women to exercise during pregnancy. However, that assumption has since been proven wrong. Among the different exercise options, prenatal yoga has been a popular choice amongst women. It is claimed to be efficient in optimizing women's health during all the stages of pregnancy, and even help with the delivery of the baby. In this paper I will access how beneficial prenatal yoga is to women in the three trimesters of their pregnancy. On the basis of my research I will conclude that it is not always a beneficial exercise.

ADPADS

Christian Opacich, Kyle Hinke, Katie Shinkle, Brent Hueth (Mentor), Agricultural and Applied Economics

AdPads makes everyday waiting rooms an interactive experience by giving businesses with waiting rooms free tablets for their customers to use instead of reading old magazines. We simply charge local businesses a monthly fee for adspace on each tablet's wallpaper, lock-screen, and/or webbrowser homepage. As time goes on, the adspace money will be used to pay off the existing tablets purchased as well as for investing in new tablets in waiting rooms of local automobile repair shops, hair salons, dentist offices, hospitals, etc. Our motive is to make waiting rooms more appealing to customers and to encourage business growth in the local community.

ASSESSMENT OF THE DIFFERENCE IN BEE (BOMBUS) USE OF FORAGING AREAS, BY TIME AND HABITAT TYPE

Jay Osvatic, Johanne Brunet (Mentor), Entomology

Bee populations are declining. It is important for us to understand more about their diversity and foraging habits to better manage the surviving populations. Bee diversity in an area can be quantified using microsatellites. Moreover, kinship coefficients among worker bees can help identify colonies. Two meadows were sampled for this project, one mesic (moist) area and one xeric (dry) area, twice in the summer of 2013, once in early and late summer. These samples were used to estimate bee genetic diversity and to determine the number of colonies foraging across meadows and time periods. We expect a greater dependence on mesic meadows later in the season, and therefore a greater proportion of the colonies to forage on mesic meadows in late relative to early summer.

FORTALEZAS FAMILIARES: MAKING FAMILIES STRONGER

Karina Ovalle, Carmen Valdez (Mentor), Counseling Psychology

The purpose of the Fortalezas Familiares (FF) program is to aid Latino families affected by maternal depression. The program consists of three different groups—parents, teenagers, and younger children—intended to enhance family relations and parent, child, and other caregiver functioning. At the end of the program families tend to have better communication with each other and express themselves in a healthier manner. The study I have been a part of consists of piloting the group for young children (ages 4–8) with respect to developmental and cultural fit. An outcome of the study is to revise the group, develop a procedural manual, and incorporate the group component into the larger FF program.

IT'S NOT CRICKET: A CROSS-NATION COMPARISON OF ONLINE POLITICAL DISCOURSE IN SPORTS FORUM

Meghan Padron, Gayathri Sivakumar (Mentor), Communication Science

A cross-nation comparison of online political discourse in sports forum is key to determine the extent online groups facilitate exposure to political disagreement. In today's media crazed society people more often resort to the internet to express their world views than via any other medium of exchange. For this research project two forums are studied in particular, PakPassion and IndiaCricket, both are geared to attract a specific type of audience on a sports themed site; this is an important component of the research being conducted. The objective of this investigation is to examine whether people become more involved in political debate on a site where the main purpose is to discuss about cricket. A behavioral study of sorts, this project is aimed at gaining further understanding of human behavior and web-based communication.

MODULATION OF LARYNGEAL MECHANOSENSORY DETECTION THRESHOLDS WITH VOICE AND INTERRUPTED VOICE

Stephanie Palm, Michael Hammer (Mentor), Surgery

Laryngeal mechanoreceptors provide perceptual and proprioceptive afference for a variety of essential human functions including airway protection, breathing, deglutition, speech, and voice. It is interesting that mechanosensory information that yields a defensive response when an individual breathes may go largely unnoticed when the individual voices. Modulation of mechanosensory detection may be critical to maintain an uninterrupted voice pattern in the presence of potentially distracting input. We tested whether there is voice-related modulation of laryngeal mechanosensory detection, and whether a similar modulation of mechanosensory detection would be present during the intent to phonate. We measured laryngeal mechanosensory detection thresholds during a baseline condition of tidal breathing, an experimental voice condition, and an experimental voice condition when phonation was temporarily interrupted. We found that thresholds were significantly higher during the voice conditions, and that women maintained a greater sensitivity during the voice task than men. We would suggest that voice related modulation may be important to maintain fluent voice production, is present during the intent to phonate, and that such modulation has important implications for laryngeal control.

NEGOTIATING COSTA RICAN CULTURE FROM AN AMERICAN PERSPECTIVE TOWARD GLOBAL PROFICIENCY

Nicole Pandl, Emily Fahl, Eleanor Gehin, Lucero Serna, Caroline Stevens, Ksenija Bilbija (Mentor), Spanish and Portuguese

This project involves the observation and interpretation of Costa Rican culture from the perspective of students from the United States. It draws mainly from primary sources such as the students' experiences and photographs from their participation in the UW First Year Spanish Program in San Jose, Costa Rica in January of 2014. The goal is to compare and contrast the diverse cultures of Costa Rica and the United States to engender global proficiency among the students involved as well as the UW Madison community.

THE EFFECT OF TGF-BETA ON THE GROWTH OF THE FTC 133 CELL LINE

Michelle Pardo, Ricardo Lloyd (Mentor), Pathology & Laboratory Medicine

TGF-beta promotes epithelial to mesenchymal transition (EMT) in tumor cells. EMT is associated with an increase in cancer stem cells (CSCs) in some cancers. We hypothesized that TGF-beta leads to EMT and may increase the CSCs in the FTC 133 follicular thyroid carcinoma cell line. The effects of TGF-beta on the FTC 133 cell line was analyzed using control and TGF-beta-treated cells, and counting the cells weekly for three weeks. Compared to controls, TGF-beta inhibited cell growth in the first two weeks, then stimulated growth. We are examining EMT biomarkers in the treated and control cells. TGF-beta appears to have a time dependent inhibitory and then stimulatory effect of FTC 133 cell proliferation which should provide further insights into thyroid cancer regulation.

CHINA'S AUTHORITARIAN REGIME AGAINST UYGHUR ETHNIC-MINORITY PROVOKES TERRORISM

Andrew Park, Katherine Robiadek (Mentor), Political Science

Including the most recent attack in March 2nd, 2014, there have been numerous terrorist attacks in China, conducted by Uyghur separatists. While not many people are aware of any terrorisms in China, people wonder who the Uyghurs are and why they are perpetrating such violent deeds. The notion defining terrorists as irrational maniacs shaking old Soviet's AK-47 and RPGs above their heads, justifying violent behaviors under their god's name is an anachronism after the 9/11-attack. With the advance of internet technology, people are connected to vast amount of intelligences from around the world, but only limited amount of people are alerted to gravity of the terrorism in China. Through my paper, I would like to provide details regarding the issue and accuse China's authoritative policies.

EPIGENETIC REGULATION OF MMPS BY FOLIC ACID TO ALLEVIATE SPINAL CORD INJURY-INDUCED NEUROPATHIC PAIN

Kush Patel, Jillian Joslin, Lisa Liu, Carrie Nacht, Steven Siegel,
Alice Wnuk, Gurwattan Miranpuri (Mentor), Neurological Surgery

Neuropathic pain (NP) following spinal cord injury (SCI) is a significant clinical problem which affects the quality of a patient's life. We hypothesize that folic acid can alleviate spinal cord injury-induced neuropathic pain (NP) by DNA methylation-mediated suppression of the expression of matrix metalloproteinases (MMP). Inhibiting MMP2 and MMP9 expression significantly decreases neuropathic pain in animals that have undergone contusion spinal cord injury. The goal of this study is to determine if folic acid can regulate the expression of MMP genes. In this study, Sprague-Dawley rats will receive contusions to their spinal cord that mimic a SCI. Rats will then receive no treatment, distilled water, or folic acid. The spinal cord will be harvested and analyzed for MMP levels by western blot and zymography. This study will address the use of folic acid supplements as a way to manage pain from SCI.

EXPLORING MOBILE TECHNOLOGIES TO SUPPORT COASTAL HERITAGE TOURISM

Ivan Pereda-Zorrilla, David Hart (Mentor), UW Sea Grant Institute

As the 21st century diverges into further mobile technology integration, the global community relies heavily on these revolutionary technologies for quick access to resources and immediate feedback times. The demand for accessible information and communication is extraordinary especially in a fast-paced environment. With such technology, it is very viable to assimilate traditions such as coastal tourism with a mobile user interface that will augment and promote coastal tourism experiences. However, this can contribute to possible distractions and dependence; rendering tourism artificial and meaningless. The objective of this study is to explore current mobile technologies and apply the best fitting interface that will attract a large user population with its usefulness and contribution to a natural sense of exploration.

IMPROVEMENTS IN THE DELIVERY OF RADIONUCLIDE THERAPY

Sarvesh Periyasamy, Bruce Thomadsen (Mentor), Medical Physics

A radionuclide is an atom that emits energy via radioactive decay. In recent decades, the use of radionuclides has become popular in radiation oncology to treat a variety of oncological diseases. Through numerous methods, radionuclides can be delivered to the site of a tumor or cancerous tissue and provide cytotoxic dose. Current problems with radionuclide therapy include minimizing radiation exposure to surrounding tissues, as well as minimizing global risk to tissues throughout the body. Our research investigated numerous targeting methods for delivery of radionuclides and how they can be improved.

PROBING THE RELATIONSHIP BETWEEN PROMOTER SEQUENCE AND OPEN COMPLEX LIFETIME AND STRUCTURE

Trenton Persing, M. Thomas Record (Mentor), Chemistry

Transcription of genes by RNA polymerase (RNAP) is the first step of gene expression. Initiation of transcription requires opening the start site region of the promoter and stabilizing the open complex in part by interactions of RNAP with the discriminator region of the nontemplate strand. DNA transcription into RNA is important to many different functions in a cell, and even though this process has been studied extensively, specifics about its mechanism remain unclear. This study aims to understand this process by using *E. coli* RNAP and the promoter T7A1 comparing it to the promoter λ PR. Preliminary data show that the two have different open complex dissociation kinetics, and this may be due to difference in sequence and the length of the promoter. The goals of this study are to determine whether the proposed initiation mechanism for λ PR is the same as for T7A1.

SPEECH ACOUSTICS AND ANATOMY IN TYPICALLY DEVELOPING CHILDREN AND CHILDREN WITH DOWN SYNDROME

Allison Petska, Hourii Vorperian (Mentor), Waisman Center

As children grow, their vocal tracts (VT) lengthen, with a consequent change in the acoustic patterns of speech. This study examines anatomic and acoustic changes in a longitudinal study of children with Down syndrome (DS)—who often have reduced speech intelligibility—and typically developing (TD) controls. Method: Five DS speakers participated three or more times and provided acoustic pharyngometry data (for anatomic VT measurements), and speech recordings (for acoustic measurements) over a period of 3 to 6 years. Results: Overall developmental trends were similar between the two groups of children, but the children with DS showed smaller changes in anatomy and acoustics. Conclusions: A combined anatomic-acoustic study is useful to understand developmental patterns of speech and intelligibility in individuals with DS.

CAREGIVER DISCLOSURE OF PARENTAL INCARCERATION AND CHILDREN'S ATTACHMENT SECURITY

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

One in 28 children in the United States has an incarcerated parent. The information that caregivers disclose to children of incarcerated parents is widely variable. Some caregivers say nothing about the parent's incarceration, whereas others tell the simple truth, and others make up something (e.g., a distortion) to tell the child. A previous study found that not disclosing a parent's incarceration status was associated with insecure attachment in young children. This project focuses on what caregivers disclose to their children about the parent's incarceration in jail and how that relates to the child's attachment to their caregiver. Child age is also examined as a covariate.

MAXIMIZATION OF NATURAL KILLER CELL KILLING IN TUMOR-PERIPHERAL BLOOD MONONUCLEAR CELL CO-CULTURE

Emily Phillips, Paul Sondel (Mentor), Human Oncology

Natural killer (NK) cells can kill malignant cells and are utilized in cancer immunotherapy for their potent cytotoxic capabilities. Yet, they are often unable to completely kill all tumor cells in an in vitro culture despite a high effector peripheral blood mononuclear cell (PBMC) to tumor ratio (E:T). We isolated PBMCs from healthy donors and co-cultured them with the K562 and K562-41BBL-IL15 leukemia cell lines. Cells were co-cultured for four hours in a ⁵¹Cr release assay or for several days. Results indicate that the NK cells we tested have relatively low cytotoxic activity against both K562 cell lines. An E:T ratio of 100:1 is needed to suppress almost all tumor proliferation. This borderline NK activity might reflect a lack of sufficient NK stimulation.

IT'S NOT CRICKET: A CROSS-NATION COMPARISON OF ONLINE POLITICAL DISCOURSE IN A SPORTS FORUM

Olivia Pitzo, Gayathri Sivakumar (Mentor), Communication Science

Through Internet coding and analysis, we aim to identify factors that could potentially affect the quality of discussion of political events in online sports forums. The forums analyzed in this study are designed for cricket fans, and we are primarily focused on discovering which factors lead to more deliberate discussion when citizens of rival nations such as India and Pakistan are involved. The study is currently in phase one of coding and analyzing poster participation in the forums and will move on to phase two of conducting surveys once that coding data has been summarized. Ultimately, we aim to examine the effects of participating in the forum in terms of knowledge, opinion, and willingness to listen to other people's opinions.

PARENTAL PSYCHOSOCIAL EFFECTS OF NEWBORN-SCREENING AND THE INTERMEDIATE CLASS OF CYSTIC FIBROSIS

Amy Plaza-Baji, Audrey Tluczek (Mentor), Nursing

This study uses a mixed methods approach to examine factors affecting parenting following an abnormal screen for Cystic Fibrosis. The sample includes three groups of parents classified by their children's NBS and/or sweat test results: (a) abnormal CF NBS + abnormal sweat test consistent with CF diagnosis (CF group), (b) abnormal CF NBS + intermediate sweat test results (IST group), and (c) normal NBS results (H group). Results will measure group differences for anxiety, depression, over-protectiveness, and parent perception of child vulnerability. Conclusions will show whether families of children with intermediate results are more like parents of children with CF or parents of healthy children. Results will point to parenting risk-factors and inform future clinical interventions.

LABORATORY APPARATUS FOR EVALUATING CRITICAL TEMPERATURE

Hannah Podzorski, Brett Kravitz, William Likos (Mentor), Civil and Environmental Engineering

A major cost in wind energy production is the required underground cables that move electricity from turbines to the grid. These cables are expensive to install compared to above ground cables, and are susceptible to overheating leading to expensive repairs. To avoid damage cables are highly insulated at an added cost. This study sought to reduce the cost associated with underground cables by better understanding thermal dissipation in soil, reducing insulation and avoiding overheating. An experimental apparatus is being developed to measure heat transfer through soil. These tests will evaluate the relationship between moisture and air migration through the soil, validating the current model. This study will clarify properties that influence thermal dissipation in soil, and identify the best backfill soil for underground transmission cables.

RNA BINDING PROTEIN HUD REGULATES PROLIFERATION AND DIFFERENTIATION OF ADULT NEURAL STEM CELLS

Eric Polich, Xinyu Zhao (Mentor), Neuroscience

Neurogenesis in the adult brain has been shown to exist primarily in the dentate gyrus (DG) of the hippocampus and the subventricular zone (SVZ) of the lateral ventricles. The mechanisms that differentially control neurogenesis in these two brain regions are still unclear. The RNA binding protein HuD is a regulator of neuronal differentiation and involved in paraneoplastic encephalomyelitis disorders with learning deficits. Here, we found HuD has distinct expression patterns in these two neurogenic regions. HuD is expressed throughout the process of SVZ neurogenesis from neural stem cells (NSCs) to mature neurons, whereas HuD is only expressed in NSCs and doublecortin-positive immature neurons in the DG. We also found that HuD exhibits a differential regulatory roles in NSCs derived from these two neurogenic regions.

FACTORS AFFECTING GROWTH IN A HIGH TUNNEL RASPBERRY SYSTEM

Michael Polkoff, Beth Workmaster (Mentor), Horticulture

High tunnels are temporary, unheated, plastic covered structures that provide season extension and increased yield of woody perennial crops, like raspberries, in a temperate climate. This project compares the effects of high tunnel environmental conditions (temperature and light quality and intensity) with five weeks (June 21–July 17, 2014) of growth data (primocane fall-bearing cultivars 'Heritage' and 'Caroline') in a controlled study at the UW West Madison Agriculture Research Station. While plants inside the tunnel had slightly higher growth rates than those in outside plots, the largest contributor to plant height differences between the environments is likely the increased tunnel temperatures early in the season. Light quality differences do not appear to contribute to growth rate and plant architecture differences.

UTILIZING 19F NMR TO STUDY UBIQUITIN CHAIN TOPOLOGY

Prashanth Prabakaran, Hongngoc Pham (Mentor), Chemistry

Fluorine NMR technology has advanced to enable many novel applications. In our work, we have studied fluorine-labeled ubiquitin polymers to measure their chemical shift values, which can report on linkage types. We found that the different ubiquitin linkages (e.g. K6, K48, and K63) give rise to distinct chemical shifts allowing us to detect them in vitro. An amazing application of this assay has been to study the formation of hydrolysis of ubiquitin polymers in real time by ubiquitin ligases and deubiquitinases. The ability to monitor these reactions as they occur has many advantages and can allow us to detect new linkage types created by various ubiquitin enzymes.

PTSD AND THE NEUROPLASTICITY OF WHITE MATTER FIBER TRACTS: THE EFFECTS OF MINDFULNESS TRAINING

Frank Prado, Jack Nitschke (Mentor), Psychiatry

Mindfulness training is on the frontier as an endorsed treatment option for individuals with post-traumatic stress disorder (PTSD). Previous studies have demonstrated that meditation can induce neural plastic effects in regards to both functional connectivity and white matter microstructure. Diffusion tensor imaging (DTI) scans will be performed before and after a mindfulness intervention to test the hypothesis that mindfulness training will increase structural integrity of specific white matter structures, while simultaneously reducing PTSD symptoms. This study has the potential to be of high impact if it shows that an intensive, seven-day mindfulness intervention leads to changes in the structural connections between key brain areas implicated in prior research on PTSD.

DIFFERENTIATING INDUCED PLURIPOTENT STEM CELLS OF DOWN SYNDROME PATIENTS INTO GABA INTERNEURONS

Aisha Prasad, Anita Bhattacharyya (Mentor), Waisman Center

Many neurological diseases, such as Down Syndrome (DS), result from a loss or dysfunction of γ -aminobutyric acid (GABA) interneurons in the forebrain. Being able to study cells from individuals affected with DS is difficult as live human interneurons are difficult to obtain. There is another way to study live GABA interneurons. GABA interneurons can be differentiated in vitro from human induced pluripotent stem cells (iPSCs) as a way to study interneuron function and dysfunction. The purpose of this study is to grow GABA interneurons from iPSCs from DS individuals and compare them to unaffected controls. We will assess the ability of DS iPSCs to generate interneuron progenitors and GABA interneurons by immunofluorescence for specific markers. These markers include GABA and BetaIII-Tubulin.

CREATION OF NOVEL HUMAN PLURIPOTENT STEM CELL LINES USING RNA-GUIDED GENE EDITING

Ryan Prestil, Krishanu Saha (Mentor), Biomedical Engineering

In order for stem cells to fulfill their promise of revolutionizing modern medicine and biology, it is essential that the genome be controlled precisely, easily, and effectively. The Cas9 nuclease utilizes a segment of guide RNA complementary to a target genomic locus to induce highly specific double-stranded DNA cuts resulting in custom mutations or inserting reporters or gene circuits. After optimizing the protocol necessary to deliver the Cas9 nuclease and donor vector into the cell, we have created several cell lines with a fluorescent marker on nuclear histone 2B, known as H2B-mCherry. These lines will be used to elucidate the effects of nuclear shape on fibroblast reprogramming efficiency and the subcellular mechanisms underpinning differentiation to various mature cell types.

STRUCTURE/FUNCTION ANALYSIS OF CIP4 USING CHIMERIC PROTEINS CONSTRUCTED BY GENE SOEING

Amanda Price, Erik Dent (Mentor), Neuroscience

CIP4, a member of the F-BAR protein superfamily, is expressed highly in cerebral cortical neurons during neuronal migration. In most cell types CIP4 functions in membrane invagination and tubulation (endocytosis), but has a novel role in neuronal membrane protrusion. Specifically, CIP4 expression produces actin ribs and membrane veils that surround neurons and inhibit neurite outgrowth. FBP17, a CIP4 family member, forms tubules instead of veils and does not inhibit neurite outgrowth. To determine how each of the three domains in CIP4 is functioning in neuronal development, chimeric EGFP fusion proteins were constructed by interchanging specific domains of CIP4 and FBP17 using gene splicing by overlap extension (gene SOEing). These chimeras were transfected into CIP4 knock-out neurons and their localization was determined with high resolution imaging.

APPROACHES TO VITAMIN A DEFICIENCY IN SUB-SAHARAN AFRICA

Melissa Ptak, Heidi Busse (Mentor), Surgery

Vitamin A deficiency has a high prevalence in Sub-Saharan Africa, where food security is low and malnutrition is rampant. VAD causes ailments such as blindness and compromises the immune system, making those who suffer more susceptible to infection. The two most studied effective approaches to combat VAD in developing regions are through either a natural, food-based approach, including the consumption of yellow/orange and dark-green leafy fruits and vegetables, or synthetic, direct supplementation, either through pill or liquid form. Through a literature review of numerous studies of VAD interventions and an analysis of current research conducted in Ethiopia through UWSMPH, this project compares the effectiveness and sustainability of the two approaches. Preliminary results suggest, resource permitting, that an integrated approach of these two methods is superior.

SAP THE COVE: DIGGING DEEP

Jenny Quilty, Frederick Stonehouse (Mentor), Art

Presently, I am a senior and will graduate in the spring of 2015. My intention with this new body of work is to establish a personally significant and particular language that can simultaneously address universal archetypes. This universality deals mainly with the respective symptoms of greater social and interpersonal dysfunctions. Told through an ongoing and developing narrative, these archetypal creatures exist somewhere between traditional and modern mythologies. Each image or character emerges through repeated iterations of specific forms weighed against personal experience. Ideas of history, humanism, culture, philosophy, psychology, sociology, and trauma, both personal and universal are referenced as well. Themes of self-destruction and selfish consumption are an undercurrent of the larger narrative. I would hope that this work could reveal an experience or symptom that maybe we can all share in or identify with. Mentors: Fred Stonehouse, Jack Damer and T.L. Solien

THE ESCHERICHIA COLI TOL-PAL COMPLEX IS ESSENTIAL FOR THE POSITIONING OF PROTEINS AT THE CELL POLES

Madhusudan Rajendran, Douglas Weibel (Mentor), Biochemistry

Organisms regulate essential biological processes, including growth, division, motility, and virulence, by controlling the subcellular localization of proteins and other biomolecules. Even though bacterial cells lack a complex internal system of endomembrane, they use numerous mechanisms to establish, maintain and replicate their subcellular organization. Particularly, the bacterial poles are home to numerous cytoplasmic and membrane proteins. However, the molecular mechanisms regulating the non-uniform localization of polar proteins are largely unknown. Here we show that the Tol-Pal complex, a conserved component that maintains cell wall integrity in Gram-negative bacteria, plays a key role in the polar localization of chemoreceptors in *Escherichia coli*. Mutants lacking the Tol-Pal complex and expressing fluorescently labeled chemoreceptors showed characteristically mis-localized (i.e., non-polar) chemoreceptors dispersed along the length of the cells. Cell motility and chemotaxis assays showed that the mutants presented motility and chemosensory defects that were not observed in the wild-type strain. My long term goal is to investigate the role of the Tol-Pal complex in a diverse group of bacteria, with a focus on bio-medically relevant organisms.

ALTERED FUNCTIONAL ACTIVATION MAPS IN STROKE PATIENTS DUE TO NEUROVASCULAR UNCOUPLING

Ryan Raut, Vivek Prabhakaran (Mentor), Radiology

The validity of functional MRI can be compromised in the presence of a diminished relationship between neural activity and cerebral blood flow with aging and disease. We hypothesized that stroke patients would show decreased vascular reactivity due to this phenomenon, known as neurovascular uncoupling. We compared the activation maps of acute stroke patients (N = 30, mean age = 60 years) with those of younger (<30 years) (N = 21, mean age = 22 years) and older (>50 years) (N = 22, mean age = 59 years) healthy subjects from a breathhold task performed in the scanner. Results indicated that stroke patients showed significantly less vascular reactivity in the right thalamus and right superior frontal gyrus (cluster $p < .05$) compared to older healthy subjects.

THE EFFECT OF PH ON STABLE FE ISOTOPE EXCHANGE AND FRACTIONATION BETWEEN AQUEOUS FE(II) AND GOETHITE

Thiruchelvi Reddy, Clark Johnson (Mentor), Geoscience

To date, the majority of experimental studies of aqueous Fe(II) and iron oxide interactions have been done at circum-neutral pH, and the effect of pH variations on the rate and extent of isotope exchange between aqueous Fe(II) and iron oxide minerals, as well as the natural mass-dependent fractionation between these species, has not been adequately explored. Here, the three-isotope method (^{57}Fe – ^{56}Fe – ^{54}Fe) was used to investigate the effect of pH (between 2.5 and 7.5) on the rate and extent of isotope exchange, using an enriched ^{57}Fe tracer, as well as the natural, mass-dependant stable isotope fractionation, using $^{56}\text{Fe}/^{54}\text{Fe}$ ratios, between aqueous Fe(II) and goethite. Three Fe(II) solutions (differing in $^{56}\text{Fe}/^{54}\text{Fe}$ ratios) were utilized to approach isotope equilibrium from multiple directions. Aqueous Fe(II) decreased in $\delta^{57}\text{Fe}/^{56}\text{Fe}$ value, whereas the $\delta^{57}\text{Fe}/^{56}\text{Fe}$ value of goethite increased over time, indicating isotope exchange between these reactants; the extent of such exchange showed a positive correlation with pH. The $\delta^{56}\text{Fe}$ value of goethite remains mostly constant although the $\delta^{56}\text{Fe}$ value of aqueous Fe(II) increases or decreases depending on the rate and extent of exchange. Reactions conducted at low pH produced small isotope fractionations for $^{56}\text{Fe}/^{54}\text{Fe}$ ratios. The decreased rate and extent of exchange at low pH likely reflects the decrease in sorbed Fe(II) under these conditions. Our work illustrates that iron isotope exchange between aqueous Fe(II) and goethite is substantially inhibited at low pH and that the slow rates at these conditions minimize kinetic isotope fractionations. Although kinetic isotope fractionation may occur at high pH during rapid isotope exchange, continued reaction “erases” these effects, approaching equilibrium isotope fractionations.

STUDYING THE ROLE OF OXIDATIVE STRESS IN TRISOMY 21 NEURONS USING INDUCED PLURIPOTENT STEM CELLS

Rebecca Reese, Anita Bhattacharyya (Mentor), Waisman Center

Oxidative stress (OS) can affect many cellular functions in cells. OS has been associated with Down syndrome (DS), a neurodevelopmental disorder caused by an extra copy of chromosome 21. Increased levels of OS have been found in DS neurons, but it is unclear if this stress is intrinsic to DS or if it is due to the environment in which the cells are cultured. This study used induced pluripotent stem cells (iPSCs) from DS individuals to determine if OS is an intrinsic property of DS cells or if it is simply caused by culturing them in atmospheric oxygen. Data from iPSCs maintained in different O₂ levels will be presented with the intention of future work on neural progenitors and neurons

EVALUATING DOPAMINE IN THE SUBSTANTIA NIGRA OF A PINK1 KNOCKOUT RAT MODEL OF PARKINSON DISEASE

Brooke Resch, Michelle Ciucci (Mentor), Communication Sciences & Disorders

Parkinson disease (PD) is a progressive neurodegenerative disorder characterized by a loss of dopamine cells in the substantia nigra and sensorimotor deficits. Voice and swallowing dysfunction occurs early in the disease process and is not responsive to dopamine replacement, thus nigral dopamine loss is not likely contributing to these deficits. To address this, we studied voice and swallowing deficits and integrity of dopaminergic cells in the substantia nigra in a rat model of early stage PD (PINK Knockout-KO) compared with wild-type controls. After vocalization and swallow behavioral testing, we quantified the number of cells positive for tyrosine hydroxylase (TH), a marker for dopamine in the substantia nigra and counter-stained with haematoxylin to ensure cell viability. We expected to see little to no loss in TH despite the presence of voice and swallowing deficits. Results showed that PINK1 KO rats had significant vocalization and swallowing deficits at 4- and 8-Months of age, but no significant differences in of the density of TH or cell viability between the groups. We conclude that the behavioral deficits were not due to nigral dopamine depletion and are likely due to other neurodegenerative mechanisms.

CHARACTERIZATION OF THE ENZYME 3-DEHYDROQUINATE SYNTHASE IN THE SHIKIMATE PATHWAY IN PLANTS

Zoe Retzlaff, Hiroshi Maeda (Mentor), Botany

3-dehydroquinate synthase (DHQS) is the enzyme that catalyzes the second enzymatic step in the shikimate pathway leading to aromatic amino acid biosynthesis. The objective of this study is to characterize DHQS using in vitro and in vivo methods. To test DHQS function in vitro, the corresponding *Arabidopsis thaliana* gene has been cloned and transformed into *E. coli* cells. The generated recombinant enzyme is being tested for DHQS activity using a spectrometric thiobarbituric acid assay. The in vivo assessment of the DHQS enzyme involves an RNAi knockout for the DHQS gene to analyze different phenotypes and production of aromatic amino acids in plants using high performance liquid chromatography. The study will help guide future research on improving aromatic amino acid production in plants.

THE IMPACT OF TGF α AND IGF1 ON SEROUS OVARIAN CANCER CELL INVASION

Olivia Rice, Pamela Kreeger (Mentor), Biomedical Engineering

The growth factors IGF1 and TGF α are known to be involved in multiple Ovarian Cancer (OvCa) cell responses. When a receptor on a cell binds its ligand, downstream signaling is initiated and the cell may respond in multiple ways. We have shown that TGF α and IGF1 and their corresponding receptors are present in serous OvCa cell lines OVCA429, OVCAR5 and OVCA432. My goal is to determine how TGF α and IGF1 signaling affect OvCa cell invasion through Collagen Type 1 and eventually mesothelial cells (LP9s). Mesothelial cells line many body cavities and organs and OvCa has been shown to metastasize via invasion of this lining. Experiments were first performed with only Collagen Type 1 to establish a robust and functional protocol. A layer of collagen plus a layer of mesothelial cells will be used to more accurately replicate an in vivo environment. The OvCa cells were plated in serum-free media and allowed 6 hours to attach to the collagen. They were subsequently treated with TGF α , IGF1 and TGF α + IGF1 alongside a control. The OvCa cells were allowed 24 hours to invade. The wells were then fixed, stained and imaged; the percent area of OvCa cells invaded was evaluated using imageJ. Completion of this study will provide more insight into how TGF α and IGF1 signaling affects OvCa progression. Ultimately, this can improve knowledge of key control nodes in ovarian cancer treatment.

COMPARISON OF BEHAVIORAL TASKS FOR QUANTIFYING WHISKER FUNCTION IN RODENTS: A SYSTEMATIC REVIEW

Jacob Richie, Matthew Jensen (Mentor), Neurology

Many scientists use animal research, especially with rodents, to explore procedures that could potentially be applied to humans. However, quantitatively assessing the behavior of animals can be quite difficult, and there is no standard method of analyzing the behavior of rodents. This review will focus on finding the most effective method for analyzing the behavior of rodents, specifically in the whiskers of rats. A systematic review will be performed and articles will be selected for review if they have a quantifiable behavioral task that targets the whiskers.

THE ROLE OF NKB AND THE KNDY NEURONAL NETWORK IN THE ONSET OF PUBERTY IN THE FEMALE RHESUS MONKEY

Dustin Richter, Ei Terasawa-Grilley (Mentor), Pediatrics

Recent work has led to the hypothesis that kisspeptin (KP)/neurokinin B (NKB)/dynorphin neurons (KNDy neurons) in the arcuate nucleus (ARC) play a pivotal role in gonadotropin releasing hormone (GnRH) pulse generation. A recently developed model proposes KP as the agent driving GnRH secretion, with NKB and dynorphin acting as start and stop signals for pulsatile release, respectively. Considering the well-established role of increased GnRH secretion accompanying the onset of puberty, KNDy neurons hold a great deal of promise in gleaning significant information on the regulatory mechanisms governing the initiation of puberty. These regulatory mechanisms in primates parallel those in humans but differ greatly from other species, which is of paramount significance to this study. Previous studies in this lab found that KP release increases along with the pubertal increase in GnRH secretion. However, the role of NKB in puberty remains unclear. This study utilized in vivo microdialysis to examine the role of NKB in the pubertal increase in GnRH release in a non-human primate model. Collectively, I investigated whether NKB in the KNDy neuronal network in the ARC modulates pubertal increase in GnRH pulsatile release and plays a vital role in pubertal onset in primates.

RURAL AND URBAN CULTURAL PERCEPTIONS OF TRAUMATIC BRAIN INJURY

Sarah Riedeman, Lyn Turkstra (Mentor), Communication Sciences and Disorders

Traumatic brain injury (TBI) affects people from a broad spectrum of cultural groups, and differences in cultural beliefs are likely to influence expectations for recovery and other outcomes for individuals with TBI. One major cultural difference that is relevant to TBI rehabilitation is the difference between rural and urban cultures. The cultural perceptions of TBI in rural and urban communities are unknown and could be adversely affecting the health care received by individuals in both areas. The current study aims to address the gap in knowledge about rural and urban attitudes. Participants completed a 60-item questionnaire, the Questions about Traumatic Brain Injury Survey (QATBIS). Survey items focus on social issues, post-injury expectations, public health perceptions about TBI, and expectations for recovery, communication skills, and cognitive problems.

THE RELATIONSHIP OF MINDFUL EATING WITH HEALTHY LIFESTYLE FACTORS AND EMOTION

Ellen Ringle, Lisa Flook (Mentor), Waisman Center

There is growing interest in dispositional mindfulness and its impact on health and well-being. Mindful eating may be an important component of a healthy lifestyle. 142 college students participated in online questionnaires that measured mindful eating, dietary quality using a 3-day food log, daily physical activity, and daily positive and negative emotion. Participants who reported a body mass index in the healthy range had a significantly higher score on the mindful eating questionnaire. Mindful eating emotion subscore was significantly correlated with positive emotion ($r=0.169$, $p<0.05$) and inversely related to negative emotion ($r=0.279$, $p<0.001$). Positive emotion, but not negative emotion, was significantly correlated with dietary quality ($r=0.228$, $p<0.01$). These findings may indicate that mindfulness and our emotions have a close link to making choices beneficial for health. Further study is necessary to determine if positive mood precedes or follows healthy lifestyle choices.

TEEN DRIVING SAFETY

Bryant Robles, John Lee (Mentor), Industrial and Systems Engineering

The leading cause of death for teenagers in the United States is traffic related accidents. An approach to reduce the number of fatalities is to give teenagers feedback on their driving performance. Although past research has been done in this area, it has focused on the individual driver and they have not examined the influence of social networks. Therefore, the main goal of this study is to examine the driving behavior of teenagers within a social network and to enhance their driving behavior by using feedback through a website and mobile application.

LIVE IMAGING OF MEMBRANE REPAIR IN THE RETINAL PIGMENT EPITHELIUM

Charles Rodenkirch, Aparna Lakkaraju (Mentor), Ophthalmology & Visual Sciences

In age-related macular degeneration, accumulation of lysosomal lipofuscin in the retinal pigment epithelium causes excessive activation of the complement pathway, resulting in chronic inflammation of the macula. Data from our laboratory shows a lipofuscin component, A2E, perturbs lysosome function. Fusion of lysosomes with the plasma membrane is critical for membrane repair after complement-mediated attack to prevent inflammation and cell death. Epithelial cells expressing a pH-sensitive fluorescent tag on the interior of their lysosome membranes allows for quantification of these fusion events. The pH-sensitive tag will not fluoresce while encased in the lysosome interior, but will fluoresce if the lysosome fuses with the cell membrane as this presents the tag to a neutral pH. Spinning disk confocal microscopy was used to visualize these lysosomal fusion events.

CHILDREN'S THINKING LAB: PATTERN RECOGNITION

Jessica Rodriguez, Charles Kalish (Mentor), Educational Psychology

Through the Study of Children's Thinking lab, we created stimuli to explore children's pattern recognition. We are hoping to better understand how different forms of practice affect children's learning. The lab has been collecting data with children at the Madison Children's Museum, as well as bringing kids into our lab. Some children receive specific task instruction, while others receive more open ended practice. Results thus far indicate that children within the age range are able to notice the patterns in each phase.

MUTATIONS OF GREEN FLUORESCENT PROTEIN TO PRODUCE BINDING VARIANTS WITH CYAN AND YELLOW FLUORESCENCE

Claudia Roen, Eric Shusta (Mentor), Chemical and Biological Engineering

Green fluorescent protein (GFP) is an inherently fluorescent molecule whose versatility gives rise to a broad spectrum of applications. Previous work in our lab has demonstrated the ability of GFP to accommodate the insertion of antibody loops to create novel GFAb molecules that can be used to selectively bind antigens. Additionally, GFP has a chromophore that is responsible for the protein's fluorescence and to which mutations make possible color variants such as cyan GFP (CFP) and yellow GFP (YFP). The engineering of a cyan GFAb (CFAb) and a yellow GFAb (YFAb) holds the potential to surpass the utility of binding and color GFP mutants alone. The combination of binding and color mutations to GFP will allow for the real time, intracellular labeling of multiple antigens.

SCREENING DROSOPHILA EMBRYONIC-VIABLE DEFICIENCIES FOR DEFECTS IN SYNAPTIC GROWTH

Elizabeth Roeske, Kathaleen O'Connor-Giles (Mentor), Genetics

We are conducting a genetic screen to identify regulators of synapse formation. A subset of *Drosophila* deficiencies, chromosomal deletions of ten to a hundred or more genes, that survive to the end of embryogenesis with grossly intact nervous systems has been identified. This collection was previously screened for defects in motor axon pathfinding, the developmental step in which motoneuronal axons migrate to their intended muscle targets (Wright et al., 2010). We are now screening those lines found to have normal axon pathfinding for defects in synapse formation. This screen will allow us to very quickly target genes that may be involved in this late step of neuronal development. We have developed embryo dissection, immunohistochemistry, and imaging procedures that will allow for the detailed investigation of synapse morphology and molecular makeup in late stage *Drosophila* embryos. Using these methods to screen select deficiencies, we hope to identify genes important for the initial formation of synapses.

EARLY LIFE STRESS EXPOSURE AND BRAIN REGIONS RELATED TO REWARD PROCESSING AND INHIBITORY CONTROL

Alex Rokni, Joanna Swinarska, Seth Pollak (Mentor), Psychology

While early life stress (ELS) is correlated with various degrees of substance abuse and addiction, few prior studies have addressed the neural mechanisms behind this trend. Previous research on those exposed to high ELS suggests decreased activation of the ventral striatum, as well as altered connectivity in the ventromedial prefrontal cortex, amygdala, and ventral striatum during reward processing. Furthermore, ELS has also been shown to induce decreased activity of the dorsal anterior cingulate, as well as altered connectivity in the dorsal prefrontal cortex and ventral striatum in inhibitory tasks. The present longitudinal study aims to determine the changes in activation and connectivity of regions related to reward processing and inhibitory control, due to ELS exposure. We obtained functional magnetic resonance imaging (fMRI) and neurocognitive assessments via the Cambridge Neurophysiological Test Automated Battery from 12, 18–25yo participants, and determined current stress and ELS via the Life Stress Interview (LSI).

UNDERGRADUATES INVESTED IN IMPROVING BIOCORE CELL BIOLOGY LAB CURRICULUM: A NEW APPROACH TO TEACHING

Chayanne Rosado, Nico Angenent-Mari, Alexandra Cohn, Sheela Gogula, Michael Lampe, Honghong Liao, Chester Zara, Michelle Harris (Mentor), Biocore

Undergraduate students rarely have the opportunity to develop undergraduate curriculum. At the beginning of the Fall 2013 semester, a team of former Biocore Cellular Biology 384 laboratory students was recruited to improve a Western blot protocol of a cellular signal transduction unit curriculum for this course. These veteran students all met weekly in a seminar setting and earned Directed Study 699 credits for their efforts. Seminar students were separated into two teams: Documenters and Benchworkers. The Benchwork team worked to determine a new, easily detectable and cost efficient target protein for a Western blot while the Documenter team was tasked with revising the existing laboratory manual as well as adding to the curriculum to more efficiently teach Western blot technique. All seminar students will serve as peer mentors to current Biocore 384 students during their final 5-week capstone independent research project in spring 2014.

PREDICTION OF VASCULAR ACCESS DYSFUNCTION: CAN IT BE TAUGHT?

Joel Rosenberg, Alexander Yevzlin (Mentor), Medicine

Physical examinations can be a very useful and inexpensive tool in evaluating arteriovenous fistulae (AVF), despite rarely being used due to reliance on more advanced technology and perception that physical exam of the access is difficult to learn. We hypothesized that the physical exam can be taught to a non-medical professional, and, with time, would be comparable to the physical exam performed by a full-time interventional specialist. An undergraduate student, catheter lab nurse, and an interventional specialist (MD) will examine AVF for dysfunction on patients suspected of having dialysis access dysfunction and referred for intervention. Physical exam findings will be blindly recorded by each examiner and compared to gold standard of angiographic results. Percentage of correction will be recorded over a six month time period.

ANALYZING FLU TRENDS ON UW–MADISON CAMPUS USING SMARTPHONE APP, OUTSMART FLU

Konstantin Rosich, Christine Muganda, Ajay Sethi (Mentor), Population Health Sciences

In September 2013, a team of researchers at UW–Madison launched a smartphone app called Outsmart Flu (OSF) to crowd-source flu surveillance among undergraduate students on campus. The app allows users to voluntarily report symptoms consistent with influenza-like illness (ILI). These data are aggregated to track the incidence of ILI on campus and returned to the user. The purpose of my analysis is to study the recruitment of undergraduate students from September 2013 to May 2014. To goal is to understand how representative OSF users are of all UW–Madison students. Out of 803 participants, 367 (46%) and 190 (31%) of the participants were females and males, respectively. Students in CALS and L&S made up 259 (69%) of the total population. Participation by location was split at 260 (53%) on campus and 230 (47%) off campus.

COMPETITION AS A LEARNING MOTIVATOR IN MULTIPLAYER GAMES

Emanuel Rosu, Constance Squire (Mentor), Curriculum & Instruction

Competition as a strategy to motivate learning is not a new idea, but its effectiveness is uncertain. Utilizing public player statistics for Halo 3 alongside a system devised to obtain and make use of that information on a large scale, relevant data from an unbiased sample of thousands of players with complete data points for the tens to thousands of games each played was gathered for analysis. Results focus on player trends across different levels of competition, particularly player motivation and affinity towards competitive play across skill levels. The findings from this work aim to paint a picture of the effectiveness of competition in this particular learning environment, and offer insight into whether the design decisions behind this type of competitive system merit further study.

HISTOLOGICAL QUANTIFICATION OF NEUROINFLAMMATION POST FOCAL CEREBRAL INFARCTION: A SYSTEMATIC REVIEW

Natanya Russek, Matthew Jensen (Mentor), Neurology

Ischemic stroke is a leading cause of death and disability, and current treatments to limit tissue injury and improve recovery are limited. Cerebral infarction is accompanied by intense brain tissue inflammation involving many inflammatory cell types that may cause both negative and positive effects on outcomes. Many potential neuroprotective and neurorestorative treatments may affect, and be affected by, this inflammatory cell infiltration, so that accurate quantification of this tissue response is needed. We performed a systematic review of histological methods to quantify brain tissue inflammatory cell infiltration after cerebral infarction. We found reports of multiple techniques to quantify different inflammatory cell types. We found no direct comparison studies and conclude that more research is needed to optimize the assessment of this important stroke outcome.

EVIDENCE-BASED PROTOCOL TO PREVENT POUR

Inna Rybakova, Robin Appel, Karie Zimmerman, Susan Heidrich (Mentor), Nursing

Postoperative urinary retention is a complication that many patients experience after surgical procedures under general anesthesia. Urinary retention may result in urinary tract infection, bladder and kidney damage. To avoid these complications, ambulatory surgical patients are required to void prior to discharge. As a result, discharge of ambulatory surgical patients is often delayed, which leads to staff overtime and patient's admission to the hospital. We developed an evidence-based protocol to allow discharge of low risk patients without voiding. In brief, we collected protocol-related data on 41 ambulatory surgical patients at the Madison VA Hospital. Seven patients had a delayed discharge because of voiding problems. Using the new protocol, three patients could have been discharged early. None of the patients had any urinary problems after discharge.

SOCIAL EFFECTS ON PARASITIC INFECTION IN NIGERIAN RED-CAPPED MANGABEYS

Mason Saari, Sagan Friant (Mentor), Pathobiological Sciences

We are investigating how host characteristics and behavior influence parasitic infection in social animals. The research focuses on patterns of gastrointestinal parasitism in a population of semi-free ranging red-capped mangabeys (*Cercocebus torquatus*) in Nigeria. Fecal samples and behavioral observations were collected between May–June 2012. Fecal samples were concentrated and analyzed using microscopy to measure parasite richness (number of parasite species within an individual), prevalence (percentage of individuals infected), and intensity of infection (parasite eggs per gram of feces). We will analyze these data by measuring relationships between parasitism and host characteristics including sex, age, stress, and social behavior. We hypothesize that host characteristics and social behavior affect parasitism in these social animals, which may serve as a useful model for understanding drivers of animal health.

IN VIVO TRACKING OF HUMAN NATURAL KILLER CELLS USING MAGNETIC RESONANCE IMAGING

Erbay Salievski, Christian Capitini (Mentor), Pediatrics

Natural killer (NK) cells have the ability to kill tumor cells with the aid of several different NK cell receptors and cytotoxic granules. However, it is not understood how NK cells mediate their anti-tumor effects after infusion. We have optimized the non-toxic tracer agent Fluorine 19 using magnetic resonance imaging (MRI) to track human NK cells in vivo. In vitro, we show that hNK cells highly uptake ^{19}F within 24h while preserving their cytotoxic functions. In vivo, ^{19}F -labeled hNK cells injected subcutaneously or intratumor into immunodeficient mice were nontoxic and detectable by MRI for at least 48h. Overall, ^{19}F labeling of hNK cells represents a successful method to track and quantify the number of cells in a region of interest without altering their function.

ROLE OF TFG OLIGOMERIZATION IN CELL TRANSFORMATION

Alexander Salmon, Anjon Audhya (Mentor), Biomolecular Chemistry

Recombination during DNA replication may result in the fusion of TFG, a protein hypothesized to regulate the secretory pathway, to NTRK-1. TFG-NTRK-1 has been implicated as a central factor in papillary thyroid cancer, and our lab has proposed that this is due to a localization of TFG-NTRK-1 to endoplasmic reticulum (ER) exit sites. We hypothesize that the oligomerization of TFG-NTRK-1 plays a critical role in the transforming activity of cells, and if altered, transforming activity will be reduced. To test this hypothesis, we have biochemically characterized several putative binding domains of TFG in its chimeric state using point-mutation cloning methods and hydrodynamic protein analysis. We will test the transforming activity of human cells infected with TFG-NTRK1 using three-dimensional soft agar assays in vitro.

SLEEP QUALITY PREDICTS PHYSICAL FUNCTIONING FOLLOWING HEMATOPOIETIC STEM CELL TRANSPLANTATION

Ashley Santilli, Erin Costanzo (Mentor), Psychiatry

We examined the extent to which sleep quality (SQ) predicted physical functioning following hematopoietic stem cell transplantation (HSCT). Participants ($N=482$) completed measures of SQ and physical functioning pre-transplant and 1, 3, 6, and 12 months post-transplant. Poorer SQ was associated with poorer functional well-being and greater pain and fatigue interference with daily activities at all assessment points (all $p < .001$). Poorer SQ measured at the preceding time point predicted subsequently poorer functional well-being at 6 ($\beta = -0.21$; $p = .001$) and 12 months post-transplant ($\beta = -0.225$; $p < .001$); greater pain at 1 ($\beta = 0.139$; $p = .013$) and 6 months post-transplant ($\beta = 0.129$; $p = .026$); and greater fatigue at 6 months post-transplant ($\beta = 0.15$; $p = .008$). Results suggest that poor sleep may adversely affect physical functioning, identifying a target for interventions that could improve well-being after HSCT.

PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF STRESS: BENCH TO BEDSIDE IMPLICATIONS

Elizabeth Sargent, Andrew Endsley, Benjamin Kopitzke, Natasha Mason,
Elizabeth Sargent, Claire Skille, Marcia Slattery (Mentor), Psychiatry

Stress contributes to multiple deleterious health problems, such as depression and cardiovascular disease; studying stress response mechanisms is therefore critical to developing preventive and treatment interventions. The stress response consists of psychological and physiological components, including alterations in the hypothalamic-pituitary-adrenal (HPA) axis, the primary physiological stress response system. Laboratory paradigms used to study stress, including HPA activation, require standardized elements of social evaluation and control. This presentation will describe the two paradigms (Cold Pressor Task; Trier Social Stress Test) used in our laboratory to study stress in children and adults. We will further present our current work that employs these approaches to study stress mechanisms in mental and physical health disorders. Translational implications for the development of clinical interventions will be emphasized.

CONSTRUCTING RESCUE VECTORS FOR NOD GENE MUTANTS IN RHIZOBIUM SP. STRAIN IRBG74

Charles-Etienne Sauve, Matthew Crook (Mentor), Agronomy

My lab has recently demonstrated that rice can recognize the Nod factors produced by Rhizobium sp. strain IRBG74. To identify the Nod factor structure(s) recognized by rice, in-frame deletions of several nod genes have been generated. These mutations may result in an altered phenotype in which strain IRBG74 should be no longer able to nodulate Sesbania cannabina (its original host) and/or colonize rice as an endophyte. Rescue experiments must be performed to confirm that the deletions are responsible for any observed change in phenotype. Rescue plasmids were constructed by cloning specific nod genes into the expression vector, pRF771, using Gateway technology. The rescue plasmids were subsequently introduced into the corresponding deletion strain of IRBG74 by tri-parental mating.

PREDICTING GROWTH IN LEXICAL DENSITY AND GRAMMATICAL COMPLEXITY IN YOUNG CHILDREN WITH ASD.

Jessica Schanker, Susan Ellis Weismer (Mentor), Communication Sciences and Disorders

The purpose of this study was to examine whether three child and two environmental variables predicted growth rate of lexical density and grammatical complexity. Due to the wide range of spoken language skills in children with autism spectrum disorder (ASD), it is important to determine the factors that support positive growth in this population. Sixty-five children with ASD participated in the study. Multiple linear regression analysis was used to examine the relationship between the five variables and growth rate in lexical density and grammatical complexity. Results indicated that expressive language at age 3.5 significantly predicted growth rate in lexical density from age 3.5 to 5.5. None of the predictor variables significantly predicted growth in grammatical complexity when controlling for each other.

HARD AND SOFT POWER IN ROMAN IMPERIALISM

Hanna Schieve, Daniel Kapust (Mentor), Political Science

In this study, I apply modern international relations theory to Roman Imperialism. I used Joseph Nye's definition of soft power and hard power to describe the foreign policies implemented by imperial Rome. I researched Roman influence on culture, values, life conditions, social order, and political structures in various provinces throughout the Empire and then attributed the success of these influences to either hard or soft power. I found that Rome, much like the United States, garnered a significant amount of its power through its cultural attractiveness in addition to its hard policies. This study proves that modern theory can be used to explain Roman power and give us a better understanding of the factors at play.

ESTROGEN ATTENUATES PULMONARY ARTERY REMODELING IN A MOUSE MODEL OF PAH

Tony Schmitz, Aiping Liu (Mentor), Biomedical Engineering

Pulmonary artery hypertension (PAH) is a fatal disease, caused by distal narrowing and proximal PA stiffening. Compared to males, females have less severe PAH, suggesting estrogen protects PA remodeling. We measured the effect of estrogen via measuring PA resistance (Z_0) and characteristic impedance (Z_c), which indicates distal and proximal PA remodeling, respectively. Z_0 and Z_c were calculated from pressure and flow waveforms measured in ovariectomized mice treated with/without estrogen and with/without PAH via SU5416+hypoxia (SuHx). Preliminary results demonstrate SuHx increased Z_0 and Z_c in placebo-treated mice, suggesting distal PA narrowing and proximal PA stiffening. Estrogen treatment reduced the increase in Z_c but not Z_0 in mice with PAH, suggesting that estrogen attenuates PA stiffening but not resistance. Our findings demonstrated estrogen protects PA remodeling, suggesting a novel treatment to PAH.

JYOTIRAO PHULE’S INFLUENCE ON THE UNTOUCHABLES IN INDIA

Benjamin Schneider, James Klausen (Mentor), Political Science

This project focuses on compiling information regarding the political thought of Jyotirao Phule, a nineteenth-century philosopher in India, and the influence he has had on the struggles of the oppressed “Untouchables” in his country. Ever since the oppression that resulted from India’s well-known caste system, several thinkers have started and influenced various social movements that have tried to help improve conditions for India’s lowest class. This research mostly draws upon scholarly articles, journals, and selected books, including books with primary sources. Through examining the case of Phule and his impact on the underprivileged class of Indians, this project is able to shed some light on how social uprisings can start and how they can be successful or unsuccessful.

RELIGION AND LAWN CARE PRACTICES

Mackenzie Schnell, Michael Hernke (Mentor), Operations and Information Management

This research explores the association between religious and political views and residential lawn care behaviors relevant to ecological health and marketing. Lawns are observable publications of homeowner land stewardship methods, which reflect civic duty mindedness and environmental knowledge or the willingness to act on environmental knowledge. Lawn care practices can affect property values, water and air quality, wildlife, and human health. Religious and political affiliation associates with choice of home lawn care approach. The differential understanding of civic duty mindedness expressed in lawn care suggests that Judeo-Christian beliefs are not inherently antithetical to ecological health. Conservative Christians tend to adopt more chemically intensive approaches that maintain a conventional aesthetic. Liberal Christians tend to adopt less chemically intensive approaches and show greater alignment with Christian stewardship principles and environmental science. Success in eco-Marketing will require eco-cognition—a way of understanding ecological benefits that resonate with the different ways that Christians understand themselves to be taking care of the Creation.

PRODUCTION OF FATTY ALCOHOLS USING AN INDUSTRIALLY RELEVANT BACTERIAL STRAIN

Haley Schoenberger, Mark Politz (Mentor), Chemical and Biological Engineering

In order for bacteria to produce valuable chemicals from renewable sources, it is necessary to create stable bacterial strains that can be cultured on a large scale. This can be accomplished by modifying the microbial genome using a set of techniques known as recombineering. Although useful, many of these methods leave a 50–100 base pair scar region on the chromosome, which can prevent consecutive use of the technique to construct a complex strain. To overcome this limitation, a scarless chromosomal mutagenesis strategy was implemented using *Escherichia coli*’s thymidylate synthetase as a selectable and counter-selectable marker. The utility of this technique is demonstrated by successfully integrating a large cassette into the genome of *E. coli* to produce fatty alcohols, which are commonly used in cosmetic products.

MADISON GHOST WALKS: A CASE STUDY OF SUPERNATURAL TOURISM IN WISCONSIN’S CAPITOL

Kylie Schroeder, James Leary (Mentor), Comparative Literature and Folklore Studies

Supernatural tourism is a growing form of entertainment which functions to highlight cultural heritage and facilitate the possibility of paranormal belief. In my work, I analyze the case study of Madison Ghost Walks, a local tour company that offers interactive walking tours around Wisconsin’s state capitol, during which a guide stops at specific locations to provide legends and ghost stories for the participants. Recent studies show the diverse importance of these tours in locations with recognized supernatural heritages; however, my research examines the ways in which Madison Ghost Walks functions to utilize the urban built environment in order to create and promote a valued supernatural heritage in Madison, a place without a prominent paranormal history. Research methods include personal interviews, participant-observation, and an online survey.

SPANISH-SPEAKING PATIENTS' BARRIERS TO PREVENTIVE CANCER SCREENING

Michelle Schroeder, Rebecca Schwei, Elizabeth Jacobs (Mentor), Medicine

Objective: We conducted a qualitative study to better understand what factors contribute to disparities in cancer screening rates among limited English-speaking patients seen in primary care in the UW Health System. Methods: We conducted semi-structured interviews with 10 Spanish-speaking patients. Each interview was audio-recorded, transcribed, translated and coded for interpretation. Themes were identified using content analysis. Results: Physician recommendation, doctors who care about and respect their patients, gender concordant doctors, and familial experience with cancer facilitated cancer screening. Patient- identified barriers included lack of money and/or insurance, appointment time constraints, machismo among male patients, previous negative healthcare experience, and lack of knowledge regarding preventative care. Conclusion: The results suggest that culturally-tailored education is necessary to reduce barriers in receiving cancer screenings among limited-English speaking patients in primary care. This research will provide valuable information regarding how to increase knowledge and acceptability of preventative care in Spanish-speaking patients in our community.

SUBJECTIVE MEMORY COMPLAINTS, CORTICAL THINNING, AND COGNITIVE DYSFUNCTION IN MIDDLE-AGED ADULTS.

Stephanie Schultz, Ozioma Okonkwo (Mentor), Medicine

It is not fully known whether persons with Subjective Memory Complaints (SMC) harbor AD-related brain alterations. Therefore, we examined whether SMC is associated with (1) thinning of cortical regions involved in AD and (2) worse performance on objective cognitive tests. Participants (N=261) answered a subjective memory question, received a neuropsychological exam and subsequent MRI. ANCOVAs were conducted to investigate group differences (SMC+ vs. SMC-) on 10 ROIs and on neuropsychological measures. Compared with the SMC- group, the SMC+ group had significant cortical thinning in the entorhinal, fusiform, posterior cingulate, and inferior parietal cortices, and had significantly lower scores on measures of memory. These findings suggest that some persons who endorse SMC in midlife might be at increased risk of progression to AD in the future.

SEXUAL CONCERNS IN GYNECOLOGICAL CANCER SURVIVORS: IDENTIFYING NEEDS AND SELF-CARE STRATEGIES

Tara Schuster, Kristine Kwekkeboom (Mentor), Nursing

Gynecological (GYN) cancer survivors report sexual concerns after cancer diagnosis and treatment that are inadequately addressed. The study purpose was to identify 1) what survivors believe their healthcare professional (HCP) could do to effectively address their sexual concerns and 2) what self-care strategies survivors have used to help with their sexual concerns. This descriptive study included a sample of 109 women diagnosed with any GYN cancer. Two open-ended items asking about desired help from the HCP and self-care steps taken were included in the survey of a parent study. Raters independently coded responses into categories and consensus was reached. Survivors reported a broad range of needs and self-care strategies which could be useful in future research interventions to improve GYN cancer survivors' quality of life.

JEWISH ACTIVISM AT ITS FINEST: MARCH ON WASHINGTON 1987

Rebecca Schwab, Rachel Brenner (Mentor), Hebrew & Semitic Studies

On December 6, 1987, 250,000 people convened to protest the restrictive policies preventing Soviet Jewry from leaving the USSR. The March occurred before the Summit between Soviet Premier Mikhail Gorbachev and U.S. President Ronald Reagan and heavily influenced policy change. The objective of this research is to examine this event as an important display of Jewish National Unity and assess the unique factors that led to the movement. By assessing historical texts and biographical accounts, I will provide a timeline, primary accounts, and my own analysis of the major components that led to the success of the movement. Because there is very little information readily accessible online, I am creating a website to virtually archive the significance of the movement from 1960–87.

LITERACY LEARNING AND IDENTITY CONSTRUCTION OVER SPACE AND TIME

Briana Schwabenbauer, Catherine Lilly (Mentor), Curriculum and Instruction

The objective of this longitudinal study is to understand identity and literacy emergence with immigrant children over space and time. The study follows ten immigrant children and their families documenting their experiences in the U.S., while focusing on how relationships at home and school effect the focal student's identity as a reader and writer. Time and space are used as the theoretical framework for the project and guide data analysis. Discourse analysis is used to monitor the student's identity emergence from multiple perspectives. Although the project is in its fifth year and we will not have concluding results for several more years, current analysis of the data shows that the way children identify as readers is affected by familial and school environments.

MEASURING SOIL CARBON TURNOVER RATES AND POOL SIZES AS A RESULT OF BIOFUEL CROP TREATMENT

Megan Seeley, Laura Szymanski (Mentor), Geography

Many queries of sustainability surround biofuels and their influence on the carbon cycle. Carbon response to biofuel crop cover can either negate or enhance the net carbon comparison of biofuels versus fossil fuels. The objective of this project is to test laboratory methods of measuring the soil microbial community responses to different biofuel crops. By combining these measurements with acid hydrolysis, the distribution of soil carbon in three biologically meaningful pools will be analyzed. Soil carbon resides in either the fast-cycling or active pool, which is readily degraded by microbes; the slow, less accessible, pool, and the inaccessible, or passive pool, with slow turnovers. Ultimately, these tests will reveal changes in the carbon pool size and turnover rates of these biofuel soils.

COMPARING JAILED PARENT OFFENSE TO AMOUNT AND TYPE OF CONTACT WITH CHILD

Abbey Seidel, Katherine Schroeder, 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 the relationships between the reason for incarceration and the type and amount of contact the parent has with his or her child. We will be using self-reports from an interview with the jailed parent. Questions from the interview include "What is the reason for your incarceration? Do you have contact with your child? If no, please explain why. If yes, do you contact your child through phone, mail, or in-person visits?" We will be using correlational data analysis to compare these relationships. Differences in jailed parents' reports will be examined in relation to race, parent gender, and other characteristics.

HIGH SPEED RADIO FREQUENCY DETECTION OF BILIPID MEMBRANE FORMATION AND ION CHANNEL ACTUATION

Arjun Seshadri, Robert Blick (Mentor), Electrical and Computer Engineering

Ion channels play a key role in electrophysiology and cell homeostasis. Careful screenings of these protein structures have led to major discoveries in a wide variety of pharmaceutical and research applications. The major obstacles to large scale ion channel measurements lie within the cumbersome and lengthy procedures associated with present techniques. Recently, it has been shown that the dwell time of ions within a channel during actuation allows for accurate probing by means of Radio Frequency devices. Here, I propose the novel use of an RF Coplanar Waveguide device combined with microfluidic devices to study the activation of ion channels. By effectively shaping the parameters of this device to create a sharp resonance, it will become possible to screen ion channels at high speeds with great ease. Furthermore, due to the on-chip laser fabrication of nanopores, the device could be potentially used for a host of other groundbreaking applications, from high speed coulter counting to the rapid sequencing of DNA nucleotides.

EFFECT OF GAZE DIRECTION AND CULTURE ON FACE PERCEPTION

NianJun Shi, Paula Niedenthal (Mentor), Psychology

Research has demonstrated that, more than Westerners, East-Asians are influenced by peripheral (“context”) faces when judging the emotion expressed by central, target faces (Masuda, Wang, Ishii, & Ito, 2012). However, the effect may be moderated by eye gaze of context faces. East-Asian and Western participants will view groups of faces and judge the expression of the target face. Context faces will express the same or different emotion as the target, and will conform to three gaze conditions (toward/ away from target, and direct gaze). Westerners’ ratings of target faces should not be influenced by contextual faces with direct gaze, but should be influenced by contextual faces with gaze toward the target. This study has the potential to question the contextual-focal difference between East-Asians and Westerners.

EXPLORING THE COGNITIVE AND NEURAL FOUNDATIONS OF DEVELOPMENTAL DYSCALCULIA

Taylor Shiff, Edward Hubbard (Mentor), Educational Psychology

To better understand the way that the brain functions in people with developmental dyscalculia, who experience difficulty trying to learn mathematical functions that are appropriate for their age, we will administer standardized tests to compare dyscalculic children with age- and ability-matched peers. We then will use functional magnetic resonance imaging (fMRI) to study the activation in the intraparietal sulcus (IPS)—part of the parietal lobe involved in processing symbolic numerical information and visuospatial working memory, and which has previously been implicated in dyscalculia—during mathematical processing. Following previous work with adults, we expect to see an atypical activation of the IPS in children with dyscalculia while their brains process basic numerical and arithmetic information.

THE ACCORD OR THE ALLIANCE: WHICH AGREEMENT TACKLES UNSAFE FACTORIES?

Pavel Shmelov, Stephen Young (Mentor), Geography

As Multinational Corporations seek lower wages to remain competitive in the global marketplace, developing countries are top contenders for the apparel and garment industry. However, this can come at the price of hazardous working conditions. This raises a question about accountability: Who is responsible for workers’ safety? In response to the April 2013 Bangladesh disaster, major U.S. retailers have been pressured to sign either The Bangladesh Accord on Fire and Building Safety or The Alliance for Bangladesh Worker Safety to reduce the likelihood of these tragedies occurring. However, the language used in both is similar and difficult to distinguish. In this research, I conduct an analysis of the two documents in order to separate their major differences. I then argue that the University of Wisconsin–Madison should require clothing suppliers to sign the Accord in order to give workers the right to a dignified and safe job.

MICROPARTICLES IN PRION DISEASE PATHOGENESIS

Dania Shoukfeh, Alexandra Chesney, Hannah Kornely, Joel Pedersen (Mentor), Soil Science

Prions are misfolded proteins that stimulate abnormal folding of the benign, host-expressed form of the protein to pathogenic conformations that cause neurodegeneration and death. Our group has shown that a phyllosilicate clay mineral potentiates oral disease transmission. We present results of experiments designed to elucidate the path of prion propagation from the gastrointestinal system to peripheral and neural tissues when white-tailed deer are orally dosed with prions in the absence and presence of the clay mineral. Prions were detected in tissues by the highly sensitive protein misfolding cyclic amplification technique. We expect accumulation rates and tissue tropisms to differ between the treatments with and without microparticles. Results consistent with this expectation would imply that prion adsorption to microparticles alters early disease pathogenesis.

MILLIMETER-WAVE ROTATIONAL SPECTROSCOPY AND DC GLOW DISCHARGE CHEMISTRY OF PYRIDAZINE

Joshua Shutter, Robert McMahon (Mentor), Chemistry

The rotational constants of pyridazine in its ground and first five vibrationally-excited states have been determined using thousands of rotational transitions between 238 and 360 GHz. This is more than sufficient for the purpose of future radio astronomical searches for pyridazine in the interstellar medium. In addition, a complete structure determination was performed by analyzing the rotational spectra of pyridazine and its isotopologs, both naturally-occurring and deuterium-enhanced, in their ground vibrational states. Using the millimeter-wave rotational spectrum of pyridazine as a spectroscopic “fingerprint,” we are now proceeding with probing pyridazine’s chemistry by studying its reactive intermediates, decomposition products, and its deuterium incorporation in DC glow discharges.

ENHANCING FLUORESCENCE OF WISCONSIN INFRARED PHYTOFLUOR FOR POTENTIAL USE IN INFRARED IMAGING

Jerad Simmons, Katrina Forest (Mentor), Bacteriology

Infrared fluorescent imaging is ideal as a whole body reporter for noninvasively visualizing deep tissue. Wisconsin Infrared Phytofluor is a promising candidate as an infrared fluorescent protein. Wi-Phy has been engineered from a bacteriophytochrome isolated from *Deinococcus radiodurans*. However, the phytofluor sometimes nonspecifically binds an incorrect chromophore, reducing its fluorescence. Rather than binding the native biliverdin molecule, Wi-Phy has gained affinity for protoporphyrin. In an effort to prevent nonspecific chromophore binding, Wi-Phy bound to protoporphyrin was assessed and characterized. Although unable to obtain a crystal structure of protoporphyrin bound Wi-Phy, we were able to speculate structural differences and determine what will better enhance future attempts at crystallization.

THE EFFECT OF CLR1404 ON CELL VIABILITY IN HUMAN NEUROBLASTOMA TUMOR CELL LINES

Sorabh Singhal, Mario Otto, Dana Baiu (Mentor), Pediatrics

Current cancer therapies treat many patients by targeting the fast-dividing cells in the body, but they have many side effects. These side effects make chemotherapy a risky treatment, and new treatment options are constantly being researched. Literature describes evidence that some alkylphospholipids can successfully inhibit cancer cell viability. Our own research indicates that CLR1404, a synthetic alkylphospholipid, selectively induces apoptosis in neuroblastoma cell lines when compared to its effect on normal cells. Using an MTT assay, this study will evaluate if CLR1404 can selectively induce cell death in various neuroblastoma cancer cell lines while leaving normal cells unaffected.

FUNCTIONAL SIGNIFICANCE OF NERVOUS WRECK AND SORTING NEXIN INTERACTION AT DROSOPHILA NMJ

Samantha Sison, Fiona Ukken (Mentor), Molecular Biology

The human nervous system is made up of trillions of circuited neurons which are regulated by many factors. Synapse regulation is essential for the formation and function of these neuronal circuits which underlie memory and learning. Previously, Nervous wreck (nwk) a synaptic protein has been shown to physically interact with Sorting nexins (SNXs), which are regulators of endosomal sorting, in mammals. However, the functional significance of this interaction is unknown. In this study, we used genetic interaction assays and imaging of fluorescently tagged proteins at the *Drosophila* neuromuscular junction (NMJ) to investigate and analyze this interaction. Understanding Nwk-SH3PX1 (*Drosophila* Sorting nexin) interaction may help better understand the molecular basis of cognitive impairment seen in neurological conditions such as Down syndrome or schizophrenia.

MEMORY FORMATION: MOMENTS MATTER

Chelsea Siwik, Heather Abercrombie (Mentor), Psychiatry

Experiences in the moments before or after an event can interfere with formation of the memory trace for that event. We investigated whether small differences in the amount of time between events affect memory formation. Participants completed two study visits: a memory formation session and a memory retrieval session 48 hours later. In the memory formation session, participants were exposed to stimuli in either short or long inter-stimulus-interval conditions (2–3 vs. 8–9 seconds). Results showed that stimuli separated by 2–3 seconds were not remembered as well as stimuli separated by 8–9 seconds. Results suggested that having slightly more time between events allows for more robust memory formation. These data have implications for the design of neuroimaging studies, which tend to present stimuli in rapid succession.

EXAMINING THE SEVERITY OF SURGICAL COMPLICATIONS FROM THE PERSPECTIVE OF THE PATIENT

Alexander Siy, Emily Winslow (Mentor), Surgery

The postoperative morbidity index (PMI) is currently used by surgeons to grade the severity of postoperative complications; however, the categories in this index are derived by consensus from medical professionals, but importantly do not account for patient perspective. This research aims to understand patient perspectives on postoperative complications. Surveys were sent to patients discharged from the UWMC general surgery service from November 2013 through February 2014. Surveys presented three outcomes per question. Patients rated the severity of each outcome on a scale of 1–100. The response rate was 20% (90/460). Preliminary analyses suggest that PMI is not in line with patient perceptions of complication severity. A better understanding of patients' perceptions regarding surgical outcomes will help foster efforts at shared decision making regarding surgical procedures.

ACCEPTABILITY OF LONG-ACTING REVERSIBLE CONTRACEPTION AMONG YOUNG WOMEN IN DANE COUNTY

Grace Skarda, Jennifer Higgins (Mentor), Gender and Women's Studies

Increased use of long-acting reversible contraception (LARC) could help to significantly reduce unintended pregnancies in the US. However, few women in the United States currently use LARC methods. This study addresses the gap in research regarding clients' acceptance of LARC revolving around relationship status, sexuality, and predisposed fertility concerns collected directly from the population. We are in the process of conducting focus groups with women ages 20–29 in the community to discuss their attitudes toward LARC. Interviews with women who have used LARC will hopefully help us better understand their decision making process in choosing LARC methods. The information we receive in the study could help to develop clinical and educational messages to increase LARC uptake and to further research on LARC acceptability.

THE ROLE OF DNA SEQUENCE IN CELLULAR LOCALIZATION OF THE RIBOSOMAL RNA OPERONS IN *E. COLI*

Alex Sliwicki, Richard Gourse (Mentor), Bacteriology

Six of the 7 ribosomal RNA operons of *E. coli* are in close proximity in three-dimensional space within live bacterial cells, even though some are genetically separated by as much as about 2,000,000 bp on the circular chromosome. Thus, when a fluorescent-CFP fusion protein is bound next to the *rrnD* operon, it colocalizes with a YFP-fusion bound next to any of 5 other rRNA operons, including *rrnG*. This close proximity is reminiscent of the eukaryotic nucleolus. We found that deletion of *rrnD*, leaving the adjacent fluorescent protein binding site intact, eliminated colocalization with *rrnG*, indicating that a site within the operon is responsible. More specific deletions are currently under investigation to help determine sequences responsible for rRNA operon colocalization.

EFFECT OF GLOBAL CLIMATE CHANGE AND INSECT HERBIVORY ON VOC EMISSION IN POPULUS TREMULOIDES

Heather Smaby, Kenneth Keefover-Ring (Mentor), Entomology

All plants produce volatile organic compounds (VOCs), chemicals emitted to facilitate defense, communication, and recovery from stress. VOCs are emitted in greater abundance when a plant is exposed to biotic or abiotic stressors, although very little research has analyzed the effect of multiple stressors. While insect herbivory and increased temperature have both been shown individually to increase VOC emissions in plants, the interaction of these two stressors is currently unknown. I predicted that the simultaneous presence of both insect herbivory and increased temperature would result in an enhanced, but non-additive increase in VOC production relative to plants exposed to either one of these factors individually. To test this hypothesis, I grew different genotypes of aspen (*Populus tremuloides*) in controlled environments at two temperatures, both with and without gypsy moth larvae (*Lymantria dispar*), a natural herbivore of this species. I then collected volatiles from each plant using dynamic headspace methods and analyzed them using gas chromatography. This study not only helps establish the interaction between insect herbivory and temperature stress factors, it also demonstrates the effect of higher temperatures on plant VOC production. In the context of current and future global climate change, this study is essential to learn how warming will affect not only plant volatiles, but also key ecological interactions with importance for forest ecosystem function.

SOUND HEALTH: BRINGING MUSIC TO MEDICINE

Meredith Smalley, Alex Dwyer, Mary Perkinson (Mentor), Arts Institute

The effects of listening to classical music have been shown to bring comfort to hospital patients by easing pain, lowering blood pressure, reducing anxiety and depression and improving coping abilities. Studies show that, following exposure to music therapy, many patients experience faster recovery times. Sound Health, a music outreach program through the UW–Madison School of Music, aims to enrich the UW Hospital environment by bringing live classical music performances to public spaces in the hospital. These performances aim to enhance the healing environment for patients as well as hospital guests and staff. Survey feedback has shown strong, widespread support for the program’s influence on the hospital environment.

INCREASING BASIC SANITATION AT LWEZA PRIMARY SCHOOL, UGANDA

Nikki Smith, Natalie Atchison, Stefan Elde, James Ntambi (Mentor), Biochemistry

Our WIF funded a program at Lweza Primary School to increase sanitation. Our project with Waste2Energy formed a system that included: a biodigester; latrines; a kitchen that utilizes methane from the biodigester; gutters that funnel rainwater into tanks which are used to mix the biodigester feedstock and for handwashing. Toilets will be built for the kindergarten, and we are supplementing the curriculum with educational materials on sanitation. The implications for the field of service learning are two-fold. First, local community leadership is crucial in implementing projects that are sustainable. Second, leaders who value flexibility are more successful. The methods of this project changed since conception, but with the available resources we were able to reach our goal.

CAMPUS CLIMATE CHANGE RESOURCE

Kyle Smith, Sabrina Bradshaw (Mentor), Geological Engineering Program

This project was initiated to create a UW - Madison web resource that could serve to provide both basic knowledge and also clear up common misconceptions behind the science of climate change. Content was targeted using a study that surveyed teens and the general public to identify common knowledge gaps. A list of climate change events, student groups working on climate issues, and further resources for climate change were also integrated to maximize user access to resources.

SOCIETY OF AMERICAN INDIANS RESEARCH

Rachel Smitz, Larry Nesper (Mentor), Anthropology

The Society of American Indians is a Native American rights organization that held a conference in Madison in October of 1914. For the hundred year anniversary next fall, we are compiling biographies of the original attendees. I used campus libraries and online resources to research the following people. Marie Baldwin was a Chippewa lawyer who worked in the Bureau of Indian Affairs. William Kershaw was the first Vice President of the Society of American Indians and Assistant Attorney General of Wisconsin. Frank S. Gauthier was a tribal interpreter, Chairman of the Tribal Advisory Board for Menominees, and a delegate to Washington. Chief Wyeshkesit was the leader of the Zoar community. Dennison Wheelock was an attorney and a music instructor.

TRANSLATING CLINICAL GUIDELINES ABOUT CALCIUM INTAKE INTO PRACTICE

Veronica Sommers, Diane Lauver (Mentor), Nursing

Multiple evidence-based guidelines have been published regarding ideal calcium intake for peri- and post-menopausal women. The variance in guidelines has caused confusion among clinicians trying to recommend calcium for patients. To support clinicians and facilitate the translation of evidence into practice, an informational brochure was constructed summarizing current clinical guidelines on calcium. The brochure will be evaluated by a sample of 8–10 clinicians via questionnaire. Using descriptive statistics, we will summarize responses including accuracy, helpfulness, and likelihood of use. If evaluations are positive, we will have a means to support clinicians in practice. They can use this tool to make recommendations to peri- and post-menopausal women

EFFECT OF TBI ON DISEASE PROGRESSION IN A DROSOPHILA MODEL OF TAUOPATHY

Pamela Xiyao Song, Carin Loewen (Mentor), Genetics

Tauopathies are a diverse group of neurodegenerative diseases that are characterized by decline in cognitive and motor function, progressive loss of neurons, and intraneuronal inclusions formed by deposition of the microtubule binding protein tau. One environmental risk factor for tauopathies may be traumatic brain injury (TBI). Drosophila that have experienced TBI, especially repeated concussive injuries, often develop disease progression in a drosophila model of tauopathy. TBI affects drosophila's life spans and neurodegeneration in the brain. To characterize the effect of TBI on disease progression in a Drosophila model of tauopathy, we will measure the life spans of drosophila that experience TBI, and analyze their neurodegeneration in the brain through brain sectioning.

EFFECT OF GLOBE ENLARGEMENT ON THE RETINAL NERVE FIBER LAYER OF THE EYE USING OCT IMAGING IN FELINES

Rachel Sossaman, Gillian McLellan (Mentor), Surgical Sciences

Glaucoma results in peripheral vision loss due to damage to the optic nerve and associated decreased thickness of the retinal nerve fiber layer (RNFL). Data obtained by Optical Coherence Tomography (OCT) imaging quantify the RNFL thickness, and OCT has become an important tool in the diagnosis and monitoring of glaucoma in human patients. Primary congenital glaucoma in humans and felines is associated with globe enlargement and increasing axial length. This globe enlargement is hypothesized to result in decreased accuracy of OCT-derived RNFL measurements. Histomorphometry was used to evaluate the influence of axial length on OCT-derived RNFL thickness values in cats with glaucoma. This project enhances our understanding of the effects of globe enlargement on OCT images in glaucoma.

TRANSITIONING TOGETHER: AN EDUCATION AND SUPPORT PROGRAM FOR FAMILIES WITH ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

Rebecca Stadler, Catherine Beguin, Dakota Zarak, Leann Smith (Mentor), Waisman Center

Due to challenging behaviors, raising an adolescent with Autism Spectrum Disorder (ASD) is a stressful experience. Transitioning Together, an eight-week psychoeducation program for families with adolescents with ASD between the ages of 14 and 17, was created to reduce negative emotional intensity and challenging behaviors by improving problem solving strategies for parents and their adolescents with ASD. The program sought to reduce caregiver stress and negativity by increasing parents' knowledge, promoting advocacy, and providing support and resources in the transition process from adolescence to early adulthood. Post-intervention, parents reported improvements in their ability to anticipate their adolescent's behavior problems and significantly higher levels of feeling proud of their adolescents. Despite high levels of stress, participants benefited from education and support through participating in an eight-week family-based intervention.

DOES SOY INFANT FORMULA EXACERBATE SEIZURES IN FRAGILE X MICE?

Lauren Steinberg, Cara Westmark (Mentor), Neurology

Fragile X Syndrome (FXS) is considered the primary genetic cause of autism. FXS patients lack a protein called fragile X mental retardation protein, or FMRP. The absence of this protein increases seizure incidence. To study the disorder in a model organism, we used Fmr1 knock out (Fmr1KO) mice, which lack FMRP, and exhibit audiogenic-induced seizures (AGS). We found that mice fed a soy-based feed were more susceptible to AGS while mice fed a non-soy diet were more resistant to AGS. We further identified a seizure-promoting ingredient in the soy as the phytoestrogen (i.e. plant estrogen) daidzein. Our goal is to continue investigating the effects of soy on seizures in FXS in the mice fed diets based on soy-based or milk-based infant formulas.

THE FOUCAULT PENDULUM: A DEMONSTRATION OF THE EARTH'S ROTATION

Joseph Sterle, Duncan Carlsmith (Mentor), Physics

As a consequence of the Coriolis force, the planar swing of the Foucault pendulum rotates through time. To deduce that the Earth does in fact rotate, the pendulum's precession frequency must be examined. Excitation and damping mechanisms are utilized in order to maintain the pendulum's amplitude long enough for the effects of the Earth's rotation to be observed. Many experimental procedures can be constructed from a completed Foucault pendulum. We will integrate the use of interactive labs to create controllable barriers for the excitation mechanism, and we will utilize a program that will create light and sound from the movement of the pendulum. These methods and devices will enable the observer to detect how the pendulum is processing in multiple ways.

QUANTIFYING FUNCTIONAL GROUP EFFECTS OF GLYCEROL AND OLIGOETHYLENE GLYCOLS ON CRO REPRESSOR FOLDING

Matthew Sternke, M. Thomas Record (Mentor), Chemistry

Small solutes affect noncovalent protein processes through preferential interactions with the functional groups on the protein that are buried or exposed during the process. Solute effects on protein processes are exploited by in vitro biochemists to drive folding or binding, but many of these effects are not understood. Here we determine the effects of glycerol and oligoethylene glycols (PEGs) on folding of a variant Cro repressor monomer and dissect the effects of these solutes into effects from the terminal ($-CH_2OH$) and interior ($-CH_2OCH_2-$) groups. We find that glycerol and diEG are protein-stabilizing solutes, triEG has a neutral effect on protein stability, and tetraEG is a protein-destabilizing solute. From this we conclude that the end groups of PEG are stabilizing and the interior groups are destabilizing.

SEXPECTATIONS PART II: YOUNG ADULT FEMALES' RESPONSES TO MALE "SEXPECTATIONS" ONLINE

Mara Stewart, Heather Royer (Mentor), Nursing

Adolescents are among the highest users of social media; the implications of this media exposure on sexual decision-making remain understudied. The aims of this study were to explore young adult females' perceptions regarding: 1) the use of Facebook to investigate potential romantic partners; 2) the motivations underlying females' sexual reference displays on Facebook; 3) their male counterparts' "Sexpectations." Findings from eight focus groups, conducted with 35 females across two communities, were analyzed. Three themes emerged: 1) There are gender differences in information-seeking behavior on Facebook; 2) Young adult females have various motives for displaying sexual content on Facebook; 3) Displayed sexual content may influence sexual expectations, but barriers exist to applying this knowledge. Findings suggest that displayed sexual content on Facebook is a powerful communicator.

MEASURING EMERGENCY SAVINGS

Isaiah Stock, Leah Gjertson (Mentor), Center for Financial Security

The importance of saving for financial emergencies among low-income households is an area of growing interest for researchers and policy advocates, however, the term 'emergency savings' has no standard definition. It is usually defined as some amount of liquid assets that can be quickly accessed to address unexpected income or expenditure shocks. Previous research asserts many households do not have sufficient emergency savings, yet without a consistent definition, comparing results across studies is difficult. This project aims to identify a series of validated items to reliably measure emergency savings. A comprehensive literature review identified existing measures that were built into an electronic survey. The survey measures will be tested in a nationally representative sample of low-income households to identify reliable measures of emergency savings.

ACTIVE STUDENT EMERGENCY RESPONSE TEAM YOUTH CONFERENCE

Zoe Storck, Rachel Brodhead, Jason Dietz, Sean Fleming, Sam Grow,
Katja Kane Foempe, Abby Schenian, Joshua Ross (Mentor), Emergency Medicine

In order to instill a sustainably safe environment in our community, it is imperative to be prepared for violent attacks, medical emergencies, natural disasters, and the like. The Active Student Emergency Response Teams Youth Conference united Wisconsin middle and high school students with emergency management professionals to enhance their level of preparedness for natural and manmade disasters. Students had the opportunity to network with peers, including teaching and learning from one another, and later applying those skills in a mock natural disaster. A panel of professionals in emergency response, medicine, and disaster relief shared personal experiences and discussed their own career paths, inspiring some students to pursue careers in the field themselves. As a result of the conference, students developed a stronger understanding of how to prepare for, respond to, and recover from disasters. The knowledge exchanged will be brought back to the students' communities in order to improve disaster preparedness and enhance public safety.

A SYSTEMATIC REVIEW OF PHYSICAL ACTIVITY AND WHITE MATTER HYPERINTENSITIES

Emily Strack, Elisa Torres (Mentor), Nursing

White matter hyperintensities (WMH) are markers of decreased blood flow within the brain resulting from aging, visible through magnetic resonance imaging (MRI). Research has shown that some disorders such as depression and dementia have been attributed to the presence of WMH within the brain. Since physical activity improves blood flow, my research interest focuses on whether physical activity may delay the progression of WMH and prevent or postpone subsequent disorders. The purpose of this systematic literature review, performed within the database Web of Science, was to determine if evidence supports the association between physical activity and decline of detectable WMH in the brain.

GENDER, GENDER EXPRESSION AND SUPPORTIVE CARE IN COUPLES FACING A CANCER DEATH

Kelly Strawman, Sabeena Cheema, Eunjin Lee, Linda Roberts (Mentor), Human Development and Family Studies

Little is known about the dynamics of supportive care for couples facing an impending death, particularly when men take on a caregiver role in the partnership. The present study examines the impact of caregiver and patient roles on gender expression, caregiving behavior and relationship functioning in the context of a terminal cancer diagnosis. Qualitative data collected from 14 opposite-sex couples and 1 same-sex couple include a video-recorded caregiving conversation between the partners and in-depth interviews with each partner. Interpretive Phenomenological Analysis (IPA) is used to identify patterns in caregiving behavior and the partners' lived experiences in the context of their changing relationship. Understanding these patterns and their relation to gender and dyadic coping has the potential to inform end-of-life care efforts.

THE ROLE OF DNMT ON GROWTH OF CULTURED DRG AXONS AFTER SPINAL CORD INJURY

Joslyn Strebe, Wil Gibb, Bermans Iskandar (Mentor), Neurological Surgery

We have shown that folic acid significantly enhances axon regeneration in vivo and in vitro following CNS injury, partly via DNA methylation. To determine whether DNA methylation is necessary for axon regrowth, we silenced the DNA methyltransferase genes Dnmt3A and Dnmt3B in cultured dorsal root ganglion cells obtained from rats with spinal cord injury. Neurons exposed to Dnmt siRNA had significantly reduced axonal growth compared to controls. These data have important implications for the understanding of the epigenetic mechanisms responsible for repair and recovery after CNS injury.

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

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

A clinical need exists for a reliable, low cost, and safe breast imaging modality. 3-D microwave imaging is being investigated as a solution. Pre-clinical validation of this technology can be achieved by evaluating imaging performance using anthropomorphic models ("phantoms") derived from breast MRIs. MRIs provide 3-D high resolution image data ideal for phantom construction - the topic of this presentation. The phantoms simulate the morphology of adipose and fibro-glandular tissue in the breast. An oil-in-gelatin dispersion is used to mimic the tissues' dielectric properties by varying oil concentrations. A 3-D printed shell defines the outer boundary of the breast. An additional printed shell defines the interior boundary between the two tissue types, with fibro-glandular tissue contained within the inner shell and adipose tissue outside.

HOW CORTICAL THICKNESS CORRELATES TO EXECUTIVE FUNCTION THROUGH HVLT, BVMT, AND TRAILS MAKING TEST

Maggie Sundstrom, Vivek Prabhakaran (Mentor), Radiology

We hypothesized that acute stroke patients (less than 7 days from stroke) would show impairments in performance on the Hopkins Verbal Learning Test (HVLT) and Brief Visuospatial Memory Test (BVMT), compared to patients with Transient Ischemic Attack (TIA) and healthy normal controls. On the HVLT, stroke patients < 7 days from stroke onset (N=50, mean age=58.1) scored significantly ($p<0.05$) lower than TIAs (N=22, mean age=63.9) and healthy controls (N=44, mean age=37.8) in total recall and delayed recall categories. There was no significant difference between TIA and healthy controls. On the BVMT, stroke patients (N=40, mean age=54.8) scored significantly lower ($p<0.05$) than healthy controls (N=42, mean age=36.9) in total recall. Results are discussed in terms of change in cognitive profile following stroke and correlates with brain plasticity changes.

THE EFFECT OF IRON DEFICIENCY ON AUDITORY EVOKED POTENTIALS IN INFANT RHESUS MONKEYS, MACACA MULATTA

Emma Svenson, Christopher Coe (Mentor), Psychology

Iron deficiency (ID) is the world's leading micronutrient deficiency. ID can be associated with increases in maternal and perinatal mortality, cognitive defects, and effects on social well-being and adult productivity. Auditory brainstem responses (ABRs) have been used to evaluate the impact of ID during infancy on the maturing central nervous system. Prior human and rodent studies have shown that ID produces abnormal ABRs. Our current study assessed the functionality of the neural-auditory pathways of both iron-deficient and iron sufficient infant rhesus monkeys via an analysis of ABR potentials elicited by a series of clicks produced at 60 dB and 85 dB. Contrary to previous findings, we found no significant difference in inter-wave latency or onset of potentials based on iron status. This species difference may reflect the very early maturation of the auditory pathways in monkeys or the fact that the anemia emerged during later infancy as the young monkeys' growth-related iron needs exceeded the iron present in breast milk.

MEASUREMENT OF THE TRANSMEMBRANE HELIX ASSOCIATION IN E. COLI VIA TOXCAT ASSAY

Chin Huat Tan, Alessandro Senes (Mentor), Biochemistry

The interaction of α -helices in the transmembrane region of certain proteins is important for the functional association of these proteins. The goal of our project is to study the self-association of the transmembrane region of AarF Domain Containing Kinase 3 (ADCK3) and map its interaction interface. ADCK3 is a putative human mitochondrial kinase predicted to form a functional dimer. We measured the strength of transmembrane helix-helix dimerization of ADCK3 via the TOXCAT assay. Our results show that ADCK3 transmembrane forms a strong homodimer. Site-directed mutagenesis is then carried out to map the interaction interface of ADCK3 to determine the amino acids that are important for homodimer formation.

CAN AHL ACYLASES OF P. SYRINGAE DEGRADE AHLs OF NEIGHBORING MICROBES?

Rehan Tariq, Ryan Shepherd (Mentor), Plant Pathology

Two *Pseudomonas syringae* strains, called Str1 and Str2, constitutively express AHL acylases and have the capacity to degrade AHLs, or acyl homoserine lactones. These signaling molecules are involved with quorum sensing, or the ability of bacterial cells to communicate in a cell density-dependent manner. The purpose of my research is to determine if these AHL acylases can degrade AHLs of neighboring microbes. Bioreporters *Escherichia coli* JB524 and *P. syringae* BHSL-BQ9 will be used to detect AHL degradation in overspray assays with wild type strains of *E. coli*, *Agrobacterium tumefaciens*, and *P. syringae*. We expect that the constitutive production of AHL acylases by strains Str1 and Str2 will allow the strains to degrade AHLs of neighboring bacteria.

OPTIMIZING CHARACTERISTICS OF FORAGING DEVICES FOR THE ENRICHMENT OF RHESUS MACAQUES (MACACA MULATTA)

Parker Tenpas, Peter Pierre (Mentor), Primate Research Center

Nonhuman primate research facilities provide a broad range of environmental enrichment opportunities to promote the psychological well-being of the animals. Laboratory environments are often less complex than natural environments, therefore, to increase the expression of species-typical behaviors animals are given manipulative opportunities (e.g. toys, extractive foraging) and cage enhancements (e.g. climbing structures, hiding areas). While an extensive literature supports that foraging devices (toys) increase species-typical behavior, few studies have examined how characteristics of a foraging device can be optimized to increase foraging behavior. The purpose of this study is to manipulate the device characteristic, "cup volume", and measure time spent foraging. Two age groups were included to assess maturational effects. Our goal is to optimize cup volume to engender increased manipulative foraging.

DOUBLE DOSE OF MSCS VIA IV AND TRANSENDocardIAL INJECTION ON AN ACUTE MYOCARDIAL INFARCTION IN A SWINE

Nicole Terry, Eric Schmuck (Mentor), Medicine

Heart disease is the leading cause of death in United States and worldwide. We investigated if a double dose via intravenous and transendocardial injection of porcine bone marrow-derived mesenchymal stem cells are a safe and effective treatment for acute myocardial infarction in a swine model. Results indicated that our treatments were able to significantly reduce the arrhythmia burden and deleterious ventricular remodeling post MI. The treatments were also able to significantly decrease the size of the infarct. We can conclude that this double dose strategy is both safe and effective for the treatment of MI in a swine model.

IMMUNOTHERAPEUTIC STRATEGIES TO IMPROVE ALLOGENEIC BONE MARROW TRANSPLANT FOR NEUROBLASTOMA

Kyle Terry, Paul Bates (Mentor), Pediatrics

For children with high risk neuroblastoma, overall survival is still poor. We wanted to determine if the immunocytokine hu14.18-IL2 can improve the graft-versus-tumor effect of allogeneic bone marrow transplant (alloBMT) against neuroblastoma. On day +0, CD45.2+ Balb/c mice were lethally irradiated and transplanted with CD45.1+ B6 bone marrow and increasing doses of T cells. On day+10, mice were challenged with NXS2 tumor. On days+14–16, mice were injected with hu14.18-IL2 and monitored for GVHD and tumor growth. Hu14.18-IL2 can be safely after alloBMT given with T-cells doses up to 103 without developing lethal GVHD. In addition this T cell dose can control NXS2 growth as well as improve survival. These data demonstrate for the first time that hu14.18-IL2 can be used after alloBMT for neuroblastoma.

THE ROLE OF G α Z IN B-CELL SURVIVAL AND PROLIFERATION DURING THE DEVELOPMENT OF DIABETES

Mary Thompson, Michelle Kimple (Mentor), Medicine

Gaz is a unique heterotrimeric G protein alpha-subunit involved in various transmembrane signaling systems throughout the body. We know Gaz decreases beta cell proliferation and insulin secretion in various mouse models diabetes. Gaz acts through the EP3 receptor, which signals downstream to Gaz to inhibit the production of cAMP. In contrast, the GLP-1 receptor signals to Gas to increase cAMP. We hypothesized that blocking the Gaz signaling pathway, alone, or in combination with stimulation of the Gas pathway, would preserve or restore beta-cell mass in a mouse model of type 1 diabetes. Our studies show that Gaz-null mice treated with Exendin-4, a GLP-1 receptor agonist, are resistant to the development of glucose intolerance through the beta-cells' ability to increase replication and decrease apoptosis.

CHILDREN'S UNDERSTANDING OF DISABILITY

Ana Thormann, Stephen Quintana (Mentor), Counseling Psychology

A developmental model of children's understanding of disability was proposed and evaluated in this study by Dr. Quintana. The model provides a definition of each level and the progression that a child can go through. Children from Guatemala were interviewed about their perspective on disabilities. From the responses the children were then placed into levels with in the model, with accordance to their level of understanding of disability.

OBESITY AND VOLUMETRIC/STRUCTURAL BRAIN DIFFERENCES

Michelle Tong, Stacey Schaefer (Mentor), Waisman Center

Obesity is the nation's most pressing health epidemic, yet its cause and effects on the brain remain uncertain. We examined volumetric and structural differences of the brain related to body mass index (BMI). 65 adult participants (age = 27–65, BMI = 20.1–50.1) provided structural magnetic resonance images (MRI) as part of the MIDUS study (midus.wisc.edu). The brain imaging software Freesurfer (surfer.nmr.mgh.harvard.edu) was used to reconstruct gray/white matter and pial surfaces; measure cortical thickness, surface area, and folding; and compute inter-subject registration based on the pattern of cortical folds for use in both volume-based and surfaced-based analyses. The CDC's standard BMI classifications were used to group subjects. Our findings will add to our understanding of the structural brain differences associated with obesity.

CROSSLINKING POLYMER MODIFIED MAGNETIC NANOPARTICLES USING CLICK CHEMISTRY

David Trebatoski, Donald Stone (Mentor), Materials Science Engineering

Magnetic nanoparticles have recently been of interest due to their superparamagnetic properties, biocompatibility, and size, which allows them to be a major candidate for biomedical applications like magnetic resonance imaging (MRI), drug delivery, and cancer treatment. Factors that directly affect the nanoparticles' ability to perform these applications are the particles magnetic properties and biological stability. For example, recent work has shown improved magnetic properties from creating clusters of nanoparticles. It was the goal of this project to create crosslinked clusters of particles, using iron oxide magnetic nanoparticles modified with heterobifunctional polyethylene oxide ligands to give a background material that offers stability in biological environments. Detailed in the poster is the production of a stable crosslink cluster network, which will theoretically have enhanced magnetic and stability properties due to increased size and enhanced anisotropy of the polymer-particle complexes. The poster outlines the methodology, procedure, experiments and results of the conducted studies.

PUTTING WASTE IN ITS PLACE

Miles Tryon-Petith, Jacob Kositzke, Sabrina Bradshaw (Mentor), Geological Engineering

The Office of Sustainability engages in a variety of strategies to foster sustainable waste management on campus. This project provides an overview on the implementation and effectiveness of waste reduction campaigns executed in partnership with campus housing, dining, unions, and the physical plant waste division. Aspects of the project include composting initiatives to expand and monitor compost operations at several Wisconsin Union dining locations. Campus-wide composting is enhanced through de-contaminating efforts to maximize use of the waste when received at the composting facility. Information from various pilot projects has led to the expansion of outdoor recycling on campus by leveraging relationships with physical plant and WE Conserve. Strategies such as the trash audit help drive the project to evaluate, educate and expand sustainable waste management.

SYSTEMATIC REVIEW OF PHYSICAL ACTIVITY AND WHITE MATTER HYPERINTENSITIES IN DEPRESSION

Tyler Tumey, Elisa Torres (Mentor), Nursing

White matter hyperintensities (WMH) are markers of decreased blood flow within the brain resulting from aging, visible through magnetic resonance imaging (MRI). It's important to study WMH because evidence suggests the presence of these markers contribute to diseases such as depression. This research project focuses on examining the question; can physical activity stop or delay the progression of WMH, which may postpone if not decrease the risk of depression? A systematic review of the literature was undertaken in the database PsychInfo to determine if more physical activity is associated with less WMH in depressed adults.

SERVICES TO ADDRESS FEEDING CHALLENGES IN YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDER

Sara Twadell, Karla Ausderau (Mentor), Kinesiology

Up to 89% of children with Autism Spectrum Disorder (ASD) are reported to have feeding challenges disrupting health, family mealtime, peer interactions, and consumption of necessary nutrients. Interventions to address feeding challenges in children with ASD are variable with limited evidence-based practices. The goal of this study was to identify the types of services young children with ASD were receiving to address their feeding challenges as well as the impact of age of diagnosis, household income, and maternal education on receipt of those services. Parents reported therapies their child was receiving as well as the amount of time directly spent addressing feeding concerns. Although feeding challenges were primary concerns for families, limited amount of their services were spent actually addressing these concerns.

THE EFFECTS OF CCKA-RECEPTOR KNOCKDOWN ON ER-STRESS INDUCED APOPTOSIS OF BETA CELLS

Heidi Umhoefer, Dawn Davis (Mentor), Medicine

Previous studies have demonstrated that cholecystokinin (CCK) is produced by pancreatic islets and is necessary to protect beta-cells from obesity-induced apoptosis. Because obesity is associated with increased ER stress we investigated the effect of disrupted CCK signaling on ER stress-induced apoptosis by knocking down the CCKA-receptor (CCKAR) in a beta-cell line. We then treated the cells with thapsigargin, an ER stressor, and measured levels of the ER stress-induced gene Chop. We found that in cells with normal CCKAR expression, thapsigargin increased Chop expression 14-fold. Knockdown of CCKAR in the absence of thapsigargin had no effect on Chop expression, however knockdown of CCKAR in combination with thapsigargin treatment increased Chop expression 24-fold. These results suggest that a loss of CCK signaling increases thapsigargin-induced apoptosis in beta-cells.

WRITE TO LEARN: COMBINING NUTRITION LESSONS AND CREATIVE WRITING FOR YOUTH IN ETHIOPIA

Hanna Vadeboncoeur, Jessica Lyga, Heidi Busse (Mentor), Surgery

Write to Learn is a two-week course that uses storytelling and creative writing to increase the nutritional understanding and literacy rates of the youth in Shashemene, Ethiopia. From the tradition of oral storytelling, we will create community-based educational materials that will serve as a community profile for further research. We are partnering with the International Potato Center who is currently working to combat vitamin A deficiency in Ethiopia. Our program uses the engaging methods of storytelling and creative writing to educate the youth about locally available vitamin A rich foods. The youth will be able to 'publish' their stories in a book-making workshop using local and recycled materials. The youth will reflect on their nutritional status while enhancing their literacy and creative writing skills.

USING ARCHAEOLOGICAL SITES AND PAST CLIMATOLOGY DATA TO PREDICT MASTODON ECOLOGY

Gabriel Valdes, Warren Porter (Mentor), Zoology

The effects of climate change during the Pleistocene epoch were studied on the extinct American Mastodon, *Mammuthus americanus*. Literature provides many opposing hypotheses for the extinction of the Mastodon and other Pleistocene animals, and methodology of these studies will be studied and compared to that of our own. By creating a 3D virtual representation of the Mastodon, in tandem with the state of the art mechanistic model, Niche Mapper, to reconstruct microclimates and Mastodon energy requirements, we can predict the impact that climate change would have on the survivability of the American Mastodon, specifically during the Last Glacial Maximum (21kybp) and the Early Holocene (11 kybp). Tests will be done using 4 different localities of recovered Mastodon fossils (at Chicken, AK, Long Beach, CA, Gainesville, FL, and St. Louis, MO), retrieved from the UC Berkeley index MioMap (Miocene Mammal Mapping Project) and approximating air temperature from climate reconstructions at these locations.

BEETLES AS A MODEL FOR CLIMATE CHANGE RESPONSES IN NATURAL ECOSYSTEMS

Troy Valle, Sean Schoville (Mentor), Entomology

Nebria lituyae is a species of ground beetle, endemic to the state of Alaska that lives in close proximity to glaciers, but has also been observed on nunataks, or rocky habitats exposed in the ice fields. It is unclear whether they have recently invaded nunatak habitats. Population genetic variation provides scientists with a good understanding of the colonization history of species. Minimal genetic variation among the populations on the nunataks would indicate that the beetles have recently colonized these sites. To test this idea, we are comparing genetic variation from beetle populations located throughout the ice fields. Increasing our understanding of the colonization of ice fields will help us understand how populations respond to climate change in natural ecosystems.

THE ISOLATION AND IDENTIFICATION OF THE MOSQUITO LARVICIDAL PROTEIN SECRETED BY XENORHABDUS SP.

Elizabeth Vang, Que Lan (Mentor), Entomology

The aim of this research project is to isolate and identify the larvicidal protein secreted by *Xenorhabdus sp.* A culture of *Xenorhabdus sp.* was inoculated with XAD 16 polymeric resins which absorb the larvicidal protein, as they are produced in the bacteria supernatant. A comparison between the use of methanol and acetonitrile, extracting agents, to elute proteins from the collected XAD 16 resin was examined in order to determine the optimal purification method. Acetonitrile and methanol is then injected through the C18 column using HPLC. Bioassay of all collected samples were conducted against mosquito larvae. It was found that acetonitrile is a better in extracting the larvicidal protein from the XAD 16 resin and caused a higher mosquito larval mortality.

VIRAL POPULATION'S EFFECT ON CANDIDATUS ACCUMULIBACTER PHOSPHATIS CLADE IA AND IIA

Aldo Ventura, Francisco Moya Flores (Mentor), Civil and Environmental Engineering

Candidatus Accumulibacter phosphatis is one of the dominant species in wastewater treatment plants performing enhanced biological phosphorus removal (EBPR). Having collected years of data on EBPR performance, we have set out to determine how viral population at lab-scale reactors affects their stability. We used epifluorescence microscopy as well as flow cytometry in order to count viruses in our samples. We also compared results between these two methods to assess which one we believe to be a better method for viral counts. Results from this project helped us discover a link between viruses and clade dominance in the reactors. We have hypothesized that a growing viral population in the reactors lead to poor performance from *Accumulibacter phosphatis* over time.

IMMUNITY IN ACCUMULIBACTER PHOSPHATIS: CHARACTERIZATION OF CRISPR-SYSTEMS AND ANALYSIS OF PHAGE

Daniel Vigil, Francisco Moya Flores (Mentor), Civil and Environmental Engineering

For decades, wastewater treatment plants have utilized microorganisms that perform enhanced biological phosphorus removal (EBPR) without understanding how communities are formed and maintained. *Candidatus Accumulibacter phosphatis* has been identified as a primary participant in EBPR. Comparative genomics of *Accumulibacter* have revealed an integrated phage and clustered regularly interspaced short palindromic repeats (CRISPR) systems, which confer resistance to mobile genetic elements (MGEs) such as plasmids and phages. To investigate the role of MGEs in *Accumulibacter* community dynamics and evolution, we analyzed seven years of samples from lab-scale reactors for CRISPR DNA using polymerase chain reaction (PCR) and DNA sequencing. In addition, we isolated free viruses from the reactors and studied the prevalence of *Accumulibacter*'s phage by PCR. These results will clarify population dynamics of *Accumulibacter*.

XENORHABDUS SP. AND ITS INSECTICIDAL EFFECTS ON AEDES AEGYPTI

Ross Vitek, Justin Clements (Mentor), Entomology

Xenorhabdus sp. has the ability to produce a variety of proteins that help it kill a host insect. Our research investigates the effects of an unknown protein on *Aedes aegypti* mosquitos. Exposing *Aedes aegypti* larvae, pupae, and adults to different concentrations of protein complex allows us to view the toxicity to mosquitoes. Bioassays were performed via direct exposure to *Aedes aegypti* over 48 hours using these samples. Data shows our unknown protein samples killed 77.4% of *Aedes aegypti* larvae within the 48-hour bioassay period. The pathogenic protein proved to be ineffective in killing *A. aegypti* during pupae and adult stage throughout the experiment; however, the toxin still may hold the possibility to serve as an organic pesticide towards *Aedes aegypti* mosquitoes.

REALITY-BASED LEARNING PROGRAM FOR MEDICAL RESIDENTS/PROFESSIONALS

Alyx Vogle, Aditya Dewanjee, Sumona Saha (Mentor), Medicine

The treatment of disorders of the gastrointestinal system in pregnant women can be difficult to approach for medical professionals not experienced with the obstacles that pregnancy can create. Being able to spot symptoms and correctly diagnose is vital for the physician to provide the patient with quality treatment. Often times, these problems go unresolved or are misdiagnosed and further mistreated. In order to combat this problem, we have been creating interactive cases that allow medical students a reality-based approach to diagnosing pregnant women with gastrointestinal disorders. We used cases that are frequently run across in the medical field and especially cases that are frequently misdiagnosed. The Case Scenario Builder program creates a realistic, educational scenario with immediate feedback that should help the user identify weak areas and provide them with resources, such as medical journals and articles, to develop their understanding further. We are in the first stage of our research, which includes creating the cases that will be used during the research stage. In the second stage of research, we will administer the cases to medical students, residents, and fellows and collect feedback on the effectiveness of the program.

CHARACTERIZING DOPAMINERGIC NEURON LOSS IN DROSOPHILA SCARLET MUTANTS

Katherine Waldeck, Daniel Babcock (Mentor), Genetics

Parkinson's Disease (PD) is a debilitating disease that causes a progressive loss of motor coordination due to degeneration of dopaminergic neurons in the brain. *Drosophila* models of PD have provided insight into this disease, but much remains unknown about the disease. A screen I performed to further investigate the genetic basis behind dopaminergic neuron loss revealed scarlet, previously known only to be responsible for eye pigmentation. I am characterizing the role of scarlet in dopaminergic neuron loss by testing scarlet mutants' lifespan and behavior. I am also determining where scarlet is necessary using RNA interference, identifying potential modifiers of scarlet, and determining whether scarlet mutants modify models of PD. The characterization of this gene will provide more insight into dopaminergic neuron loss in Parkinson's Disease.

AGE-DEPENDENT MICROGLIAL ACTIVATION AND RESPONSE TO MINOCYCLINE TREATMENT AFTER HYPOXIC-ISCHEMIA

Alex Waldman, Peter Ferrazzano (Mentor), Pediatrics

To determine age-dependent differences in microglial activation after ischemic brain injury, we subjected either neonatal (P9) or juvenile (P30) mice to the Vannucci model of neonatal hypoxia-ischemia (HI) and harvested the brains at either day 2 or day 9 post-HI. Regional microglial abundance and activation state was assessed by flow cytometry. Immunohistological staining was used to assess neurological damage (MAP-2) and regional microglia activation/morphology (Iba-1). RTPCR was performed on isolated microglia to assess expression of M1 (pro-inflammatory) vs M2 (anti-inflammatory) genes. The broad spectrum antibiotic, minocycline, was administered post-HI to suppress microglial activation. We hypothesize that microglia in neonatal animals are primed for a pro-inflammatory response to HI, and that inhibition of this response will improve neurologic injury in P9 compared to P30 mice.

DETERMINING GESTATIONAL AGE OF CANINE FETUSES USING ULTRASONOGRAPHY: A DATA COMPARISON

Alicia Walker, Celina Checura (Mentor), Medical Sciences

The purpose of our study was to compare gestational age and fetal measurements in Springer Spaniel-mixed dogs versus established predictive measurements for medium-size breeds. Using B-mode ultrasound, we measured inner-chorionic cavity (ICC), crown-rump length (CRL), and bi-parietal diameter (BPD) in fetuses from two females. Published predictive measurements were: a chart from England et al., 2003, and two equations (Nyland et al., 2002; Yeager et al., 1992). Data collected for ICC and CRL (day 23–44) matched (2 days) the data previously published. However, for BPD (day 44–58), the predicting equations resulted in smaller (2 days) values. In conclusion, established predictive measurements were useful in estimating gestational age for day 23–44. However, the equations were not able to estimate accurate gestational age for days 44–58.

TYROSINE BIOSYNTHESIS IN *MEDICAGO TRUNCATULA*: CHARACTERIZATION OF AROGENATE DEHYDROGENASE ACTIVITIES

Kelly Wallin, Hiroshi Maeda (Mentor), Botany

Because of the importance of tyrosine and its secondary metabolites in the human diet and medicine, an understanding of the biosynthetic pathway in plants is essential. Two pathways for tyrosine synthesis have been found, utilizing arogenate dehydrogenase (ADH; plants) or prephenate dehydrogenase (PDH; fungi and bacteria). In plants, only the legume clade has been shown to have both ADH and PDH activity. Very little is known about ADH and PDH activity in legumes besides soybean; this project sought to express and characterize one possible PDH homolog in *Medicago truncatula*. Kinetic experiments by HPLC and activity assays by spectrophotometer were conducted on purified protein isolated from cloned *E. coli* cells. The results of these experiments indicate that this gene product has ADH (and not PDH) activity.

EXCHANGE NETWORK FOR EXPANDED POLYSTYRENE BIO-SHIPPING CONTAINERS

Jenna Walsh, Emily Baumann, Katelyn Budke, Jared Ottmann,
Craig Benson (Mentor), Civil and Environmental Engineering

Biological research depends on the delivery of temperature sensitive reagents in expanded polystyrene (EPS) containers, thousands of which are delivered to the UW–Madison campus each month. This project seeks to remove 100% of EPS bio-shipping containers from the UW–Madison campus waste stream. We aim to extend the lifecycle of these containers by redistributing them to biotechnology suppliers or recycling those that are unsuitable for shipping. After surveying biotechnology companies and UW–Madison researchers to identify their practices, a lifecycle analysis was performed to compare end-of-life scenarios for the containers. We established a campus collection program, diverting approximately 2,000 EPS containers from landfills every six months. Our project will serve as a model system that can be replicated in research universities and communities around the country.

OSMOLYTE RELEASING PROTEIN TRANSFECTION AGENTS

Kevin Walters, Matthew Aronoff (Mentor), Biochemistry

The efficient delivery of proteins into cells for research and therapeutic use remains a current challenge. Internalization may be effected by pro-drug molecules that associate with proteins to aid in cellular uptake at the cell surface and endosomal escape into the cytosol. The proposed approach includes synthesizing a library of molecules that will employ lipid tails, ester linkages and, more uniquely, degradable pro-osmotic molecules in the attempt to internalize proteins into a cell. Lipid tails will allow for protein-drug associations. Cationic osmolytes should aid in protein-cell membrane associations and endosomal escape through osmotic stress caused by freeing of the osmolytes by esterase hydrolysis. Several molecules have been synthesized and tested to determine cytotoxicity, membrane interactions, liposomal disruption, esterase-substrate activity, and transduction efficiency.

LONG:SHORT RNA RATIOS PRODUCED IN TRANSCRIPTION INITIATION BY *E. COLI* RNA POLYMERASE

Si Wang, M. Thomas Record (Mentor), Chemistry

In my research, I am performing transcription assays with different laboratory preparations of *E. coli* RNA polymerase (RNAP) to compare the production of short (abortive) and long RNA transcripts. Two different preparations of wild type RNAP are being compared with each other and with two different preparations of an overproducer variant (tagged with 6 or 10 histidines at the C-terminal end of the β' subunit). In initial experiments, I observe differences in the short-to-long transcript ratio between wild type and his-tagged RNAPs. The his-tagged RNAP produced fewer short (abortive) products per longer transcript than the WT RNAP. Additional experiments are being performed to quantify and determine the reproducibility of these effects and examine their molecular basis.

UBIQUITOUS KEYBOARD FOR SMALL MOBILE DEVICES: HARNESSING MULTIPATH FADING FOR FINE-GRAINED KEYSTROKE

J.J. Wang, Kaichen Zhao, Xinyu Zhang (Mentor), Electrical & Computer Engineering Department

A well-known bottleneck of contemporary mobile devices is the inefficient and error-prone touchscreen keyboard. We propose UbiK, an alternative portable text-entry method that allows user to type on conventional surfaces. UbiK enables text-input experience similar to that on a physical keyboard, but it only requires a keyboard outline printed on the surface or a piece of paper atop. The core idea is to leverage the microphone on mobile devices to accurately localize the keystrokes. To achieve centimeter scale granularity, UbiK extracts and optimizes the location-dependent multipath fading features from audio signals, and takes advantage of dual-microphone interface to improve signal diversity. Our experiments demonstrate that UbiK is able to achieve above 95% of localization accuracy. Field trial shows that UbiK can significantly improve text-entry speed.

TROY PROJECT

Bai Yang Wang, Anna Christenson, Duncan Carlsmith (Mentor), Physics

Muon tomography or muography is a technique for deep imaging using cosmic muons (heavy electrons) produced in cosmic ray air showers in the atmosphere. Cosmic muons can penetrate many meters of rock and are suited for archaeological and geological exploration. Troy project aims to reconstruct 3D image of large scale subsurface archeological structures located in Turkey, based on attenuation and scattering measurements of such Cosmic muons. Current model of detector has been completed and commissioned by UT High Energy Physics Laboratory. Detection accuracy was validated through comparison of data reconstruction and empirical data. Our current goal is to improve reconstruction algorithm.

HIVEMIND

Tenzin Wangdhen, Duncan Carlsmith (Mentor), Physics

Hivemind is a quad-copter controlled via a brain-controlled interface (BCI). The user will interact with the drone using an electroencephalogram (EEG) machine. They can either directly control the drone or select from a menu of pre-programmed missions, via the EEG interface, which would command the drone to “hover,” “land,” “pickup newspaper,” etc. The user will be able to see through the eyes of the drone and select missions via our graphical user interface (GUI) on a monitor packaged with the product. The quad-copter will also have a robotic arm attached, which will enable it to pick up and interact with objects via BCI.

ASCT NARRATIVES: CHILDREN WITH INCARCERATED PARENTS

Nicole Wargon, Melissa Hantman, Hilary Runion (Mentor), Human Development and Family Studies

This investigation is based on our ongoing study of Children with Incarcerated Parents. We have gathered qualitative data regarding children’s narrative responses to the Attachment Story Completion Task (ASCT). We believe that the array of responses selected is a quality representation of our research on this topic thus far.

THE EFFECTS OF DEVIL’S ADVOCATE, NATURAL DISSENT, AND DISSENT FROM AN ADVISOR IN A CONVERSATION

Cory Washington, Lyn Van Swol (Mentor), Communication Arts

This research studies dissent types and its effects on thought complexity and attitude change. Communication arts department students received extra-credit in one course for participating. At a computer, participants read dialogue of a three person group conversation about milk with a dissent technique. Two were positive towards milk, the other dissented. Dissent included a devil’s advocate (Da) who agreed with others but “played” Da, dissent from an advisor (Dav) who wasn’t in the consensus process, or natural dissent. Participants did a pre-conversation and post-conversation survey on their feelings about milk and typed ten arguments, for or against milk. Arguments were coded for levels of differentiation, persuasiveness, validity, and stance on milk. Preliminary findings show Dav effectively increasing consideration of different viewpoints and attitude changes.

SULFUR AND CALCIUM’S EFFECTS ON ALFALFA AND ITS COMMON PATHOGEN APHANOMYCES EUTEICHES

Quinn Watson, Damon Smith (Mentor), Plant Pathology

Aphanomyces euteiches is a soil-borne oomycete that causes *Aphanomyces* root rot on a number of field crops in Wisconsin. Recently, decreasing trends in atmospheric sulfur deposition due to environmental protection measures have been correlated with an increasing abundance of *A. euteiches* in alfalfa fields. This project investigated the relationship between sulfur source and concentration on the growth of *A. euteiches* in vitro and the development of *Aphanomyces* root rot in alfalfa in planta. A similar follow up study was conducted using calcium in order to eliminate the possibility of calcium acting as an inhibitor of *A. euteiches* in planta. No direct inhibition of *A. euteiches* by sulfur in vitro and no effect of sulfur or calcium on the development of *Aphanomyces* root rot were identified.

EFFECT OF METHYLPHENIDATE ON IMPULSIVITY AND TEMPORAL DISCOUNTING

Sarah Weber, Luis Populin (Mentor), Neuroscience

Decision-making is a cognitive process that is compromised by impulsivity. This study tested the hypothesis that methylphenidate, a psycho-stimulant used to treat attention deficit hyperactivity disorder (ADHD), of which impulsivity is a major symptom, would affect the subjects’ decision making in a dose-dependent manner, making them more calm. We used a temporal discounting task in which monkeys had to choose between receiving a smaller reward immediately (SS) and a larger reward later (LL). The data show that the subjects’ decisions shifted from their general preference of SS to LL at the lowest doses of methylphenidate, which resulted in an increase in the magnitude of the rewards earned during an experimental session. These results have implications for the treatment of ADHD.

MAPPING A DROSOPHILA MUTATION ASSOCIATED WITH THE LOSS OF DOPAMINERGIC NEURONS

Kaitlin Weissappel, Daniel Babcock (Mentor), Genetics

Parkinson’s disease (PD) is one of the most common neurodegenerative diseases, characterized by motor deficits due to the loss of dopaminergic (DA) neurons. A previous screen examined a collection of *Drosophila* mutants known to have some type of neurodegeneration, but there was no known information about their DA neurons. We found that the strain HR-7 loses DA neurons with age. To identify the mutation responsible for this loss of DA neurons, we will utilize recombination mapping to find the location relative to physical markers of known locations. To further narrow the location, we will use deficiency mapping, consisting of small, defined deletions spanning the entire genome. Finally we can use DNA sequencing to pinpoint the specific genetic lesion.

**STEP-UP: SKILLS TRAINING IN EMERGENCY PRACTICES
UNIVERSITY OF WISCONSIN–MADISON PARTNERSHIPS**

Elizabeth Wendt, Heidi Busse (Mentor), Surgery

The Sidama Zone of Ethiopia's SNNPR is experiencing high morbidity and mortality rates due, in part, to lack of access knowledge and skills surrounding emergency health care. STEP-UP aims to increase youth knowledge, empowerment, and interest surrounding emergency care. Results of a pilot program demonstrated an increase in knowledge, empowerment, and interest surrounding emergency health care. The challenges of language and cultural barriers revealed critical knowledge related to improving content development and delivery for STEP-UP offerings this summer. STEP-UP will train students at Hawassa University in CPR, First Aid, basic hygiene, and emergency preparedness, and empower them with facilitation and teaching skills so they can disseminate this information to their school and communities through a three-tier approach of curriculum development, instructor training, and outreach.

**DECREASED URETHRAL LUMEN AND INCREASED PROSTATIC DUCTS
IN T+E2 TREATED MICE DETERMINED BY 3D RECON**

Qican Weng, Maximiliano Cisneros, William Ricke (Mentor), Urology

C57BL/6 and BALB/c mice were treated with testosterone (T) and beta-estradiol (E2) to mimic the effects of benign prostatic hyperplasia (BPH) in older men. The purpose of this experiment is to analyze the quantitative data on the morphology of the urethra and prostate. T+E2 treated mice display narrowing of urethra and increased number of ducts of prostatic urethra. Using fixed and stained tissue sections and BioVis3D to compute a three-dimensional recon of the urethra, we hypothesize a decrease in urethra volume and increase in prostatic ducts in treated mice compared to the control.

**CELL-TO-CELL VARIABILITY IN CARDIOMYOCYTE CONTRACTILE PROPERTIES:
EFFECTS OF AGE AND SUBSTRATE**

Mac Weninger, Gary Diffie (Mentor), Kinesiology

Myocardial contractile function diminishes with age and may be related to altered fuel utilization. We isolated cells from hearts of young (6–Month) and old (36–Month old) rats and measured properties of shortening of cells in the presence of glucose versus oleate (fat). We hypothesized that myocytes from old hearts would have altered contractile function in the presence of oleate. Instead, we observed that age had a more pronounced negative effect on myocyte contractile properties when glucose was utilized. In addition, we found that there was a greater range in shortening properties across cells from aged hearts, indicating heterogeneity of age effects. We measured the expression of genes related to mitochondrial function and both carbohydrate and fat metabolism to determine the mechanism for the age effects.

A THEORETICAL APPROACH TO SOCIAL JUSTICE

Mariel White, Stephen Quintana (Mentor), Counseling Psychology

Within the field of counseling psychology, professionals ground their practice in social justice ideals when working with marginalized and underrepresented groups. As researchers, our main goal is to investigate how different people develop a social justice consciousness, or orientation, over time. First, we conducted semi-structured interviews with both social justice experts and students returning from a service learning trip to Central America. Through analysis of these interviews, we were able to draw out six prevalent domains influencing the formation of a social justice consciousness. These include: motivation, theory of change, perceptions of the other, self-reflection, and goals of social justice work. We hope to use this knowledge to promote social justice training with professionals, including administrators, teachers, and future researchers.

SPEECH INTELLIGIBILITY AND VOWEL ACOUSTIC SPACE IN SPEAKERS WITH DOWN SYNDROME

Alyssa Wild, Hourii Vorperian (Mentor), Waisman Center

Individuals with Down syndrome (DS) often have reduced speech intelligibility, and efforts have been made to discover the acoustic and articulatory correlates of intelligibility reduction. This project focuses on the four extreme vowels in the words 'heat-hoot-hat-hot', which define an articulatory and acoustic space for vowel production. Recent work shows that DS speakers have reduced acoustic contrast in the high vowels 'heat-hoot' and low vowels 'hat-hot'. This study's objective was to determine if these vowel pairs have reduced contrast in perceptual word identification. Adult listeners transcribed words produced by speakers with DS ages 4 to 40 years. Vowel identification errors showed a developmental trend with frequent confusion of the low vowels in 'hat-hot'. Findings support a strong relation between acoustic measures and intelligibility in DS.

EXCAVATING IN COLLECTIONS: A RE-DISCOVERY AND ANALYSIS OF ARCHAEOLOGICAL GUATEMALAN CERAMICS

Tasia Williams, Danielle Benden (Mentor), Anthropology

Since the 1890s, University of Wisconsin faculty and graduate students in the Department of Anthropology have collected ethnographic and archaeological objects as part of field expeditions. Record keeping of this important material culture hasn't always been ideal, and much of the contextual information about these objects has been lost or misplaced. A recent re-discovery of archaeological Guatemalan pottery in the Anthropology Collections provides an excellent case study for additional research. Through this work, the original donors, the sites at which the ceramics were found, and the archaeological context of these pottery fragments has been better understood. This research, along with the creation of a finder's guide for these ceramics, will facilitate archaeology education by providing important contextual information on this pottery.

REDUCED DIPHTHERIA ANTIBODY CONCENTRATIONS IN LUNG TRANSPLANT PATIENTS

Matt Williams, Mary Hayney (Mentor), Pharmacy

Diphtheria is caused by gram-positive bacteria that has been virtually eliminated due to widespread vaccine use that is given every 10 years. Little information regarding the effectiveness of the vaccine in immunosuppressed lung transplant patients exists. We hypothesized that lung transplant patients would have lower antibody concentrations compared to healthy individuals. An ELISA kit was used to measure the antibody concentrations in serum. Our results show that healthy individuals (mean 3.38 IU/ml; SD 6.54) had a higher antibody concentration than lung transplant recipients (mean 0.85; SD 1.95), t-test; $p < 0.003$, even though the time since their last vaccines were about the same (between 6 and 7 years). Future studies are needed to determine if lung transplant patients should be vaccinated more frequently than every 10 years.

THE EFFECT OF AMMONIUM ON THE EXCHANGE COMPLEX OF SODIUM-BENTONITE GEOSYNTHETIC CLAY LINERS

Samuel Wilson, Sabrina Bradshaw (Mentor), Geological Engineering

Geosynthetic clay liners (GCLs) are used as a liner component in Municipal Solid Waste (MSW) containment systems due to their low hydraulic conductivity. The hydraulic conductivity of GCLs varies depending on the type and concentration of cations in the containment liquid and thus the exchange complex. Ammonium is a primary component of MSW leachates and its effects on the hydraulic conductivity of GCLs are not understood. In order to determine these effects, GCLs were permeated with ammonium solutions of varying concentrations representative of MSW leachates and monitored for hydraulic and chemical equilibrium. Ammonium in the exchange complex was determined using a lithium bromide extraction technique. Ultimately, hydraulic conductivity testing indicated that average MSW ammonium concentrations would not significantly alter the hydraulic conductivity of a GCL.

CHARACTERIZING FUNCTIONS OF THE PROLINE-RICH-REPEAT DOMAIN IN UBQLN2

Logan Wilz, Randal Tibbetts (Mentor), Human Oncology

Ubiquilin (UBQLN) proteins function as ubiquitin-binding molecular chaperones. Mutations in UBQLN2 cause dominantly inherited neurodegenerative diseases. These mutations are clustered in a unique proline-rich-repeat (PRR) domain not found in UBQLN1. We therefore hypothesized that the PRR distinguishes UBQLN2 from the highly similar UBQLN1. To better understand the function of the PRR, we examined protein stability and cellular localization of UBQLN1 and UBQLN2. Our data indicates that UBQLN2 is less stable than UBQLN1, both under basal conditions and during protein-folding stress. When analyzed by microscopy, we observed UBQLN2 forms unique punctate structures, suggesting that the PRR modulates multiple aspects of UBQLN biology. These findings provide insight into the function of the PRR, and will hopefully contribute to an improved understanding of the molecular mechanisms of neurodegeneration.

“CALLING ALL COUPLES!” IDENTIFYING EFFECTIVE RECRUITMENT METHODS FOR THE STUDY OF ROMANTIC RELATION

Cecilia Winfield, Lauren Papp (Mentor), Human Development and Family Studies

Studies involving romantic partners are crucial for learning about characteristics and implications of romantic relationships. We currently recruit couples from two different relationship stages: 55 young-adult dating couples and 50 midlife “empty nest” couples, whose grown children have left the home. The purpose of the proposed study is to determine which general recruitment methods are most effective in both generating the most contacts from potential participants and yielding the most actual participants. We hypothesize that paper flyers posted in campus and community locations will be most effective for the young adult study, while mediated communication from trusted sources (e.g., e-mail bulletins) will be most effective for the empty nest study. Our findings will be applicable to other investigators who rely on multiple recruitment strategies.

HEALTH BY MOTORBIKE

Aubrey Winkie, Araceli Alonso (Mentor), Gender and Women’s Studies

Health By Motorbike is an incredible organization I was privileged enough to intern with through the UW–World Wide Internship Program. With this organization I traveled to rural villages in southeastern Kenya and worked to empower women with the knowledge of health education and prevention methods. Through this internship I also started a community library/ safe space for the girls and women in the community to take refuge in whenever needed. I then began the Moringa Tree Project working to combat issues with malnutrition and food insecurity in the area. I have just applied for a WIF to further fund this project. Furthermore, I created the Making Education Possible Campaign for a group of orphans in my mentoring program; raising funds for them to stay in school and starting an animal husbandry project for a sustainable solution to some of their issues. In Lunga Lunga, I also interned with the local clinic, working on the child nutrition and vaccination program. This internship experience allowed me to take the lead on several projects and vastly expand my knowledge about community development and NGO work in developing countries. I would love the opportunity to present the work I accomplished through this opportunity. I would present the information with the hopes of inspiring others to get involved with this work and take a semester to participate in the wonderful WW Internship program the UW offers.

A RETROSPECTIVE ANALYSIS OF THE ONCEPT MELANOMA VACCINE FOR CANINE ORAL MELANOMA: AN INTERIM REPORT

Stephanie Woodfill, Michelle Turek (Mentor), Medical Sciences

Oral melanoma is the most common canine oral tumor. It is locally invasive and highly metastatic. Prognosis is poor for most affected dogs. The aim of this ongoing retrospective study is to evaluate the clinical outcome of dogs with oral melanoma treated with Oncept and local therapy (surgery, radiotherapy). Clinical endpoints, including progression-free survival and overall survival, are being evaluated. Seventy cases have been collected from six institutions and additional submissions are anticipated prior to the Undergraduate Symposium. Data analysis will be performed on all cases accrued before 4/1/2014. The findings will add to the limited body of literature that aims to determine the benefit, if any, of Oncept for this disease, and may generate more questions for future prospective randomized controlled clinical trials.

THE DYNAMIC IN VIVO INTERACTIONS BETWEEN PP2A A AND B SUBUNITS

Tongyu Wu, Hui Chen (Mentor), Oncology

Protein phosphatase 2A (PP2A) is a crucial type of Ser/Thr phosphatase protein that controls eukaryotic cell cycles, directly involving cell development and proliferation. PP2A consists of a dimeric core enzyme composed of structural A and catalytic C subunits, as well as a regulatory B subunit. Recent studies have revealed that the diverse B-type subunits can be one of the essential sources of specified regulation that is required for intricate cell dividing cycle. To visualize and detect in vivo PP2Aa and B subunits interaction, we first fused cyan fluorescent protein (CFP), yellow fluorescent protein (YFP) and Renilla luciferase (Rluc) in frame separately with the two subunits. Human embryonic kidney cell, HEK 293, was then used as the experiment model. Data was collected and analyzed based on fluorescence resonance energy transfer (FRET) and bioluminescence resonance energy transfer microscopy (BRET). By measuring the excitation and emission wavelengths of both the donor and the acceptor fluorophors, we were able to determine if fluorescent resonance energy was transferred from the donor to the acceptor. FRET and BRET assays enable us to study PP2Aa and B subunit interaction in a living cell and in a real time, and therefore infer the interaction intensity and mechanism.

PRINKART

Minghui Wu, Dan Mccammon (Mentor), Physics

Nowadays, you can carry your laptop, tablets, cell phones anywhere and anytime, but have no portable way to make a permanent copy of the screen when needed. I proposed to make a special paper, which can make a permanent color copy of the image shown on the screen simply by placing the paper on the screen and running your hand across it. The paper contains photosensitive microcapsules filled with dye precursors. When the paper is compressed, this allows light penetration from the screen which immobilizes the dye precursor. Further pressure ruptures the capsules and allows the sensitive precursor to react with a developer in the paper, forming a permanent color image.

SUPER EFFICIENT WAY TO SAVE LIVES IN OR ROOM

Jie Wu, Jiamin Chen, Bingjie Liu, Tingmao Wang, Jingshan Li (Mentor), Industrial and Systems Engineering

Meriter Hospital is looking to increase the efficiency of medical assistants (MA) in their supplies pick-up process on weekdays for Operation Room (OR) under the same workload. Management current has thought over three alternatives to increase the efficiency: adding one more elevator, centralized pick-up place, and adding one more MA during 8 a.m.—4 p.m. Meriter Hospital is interested in seeing the simulation outcome of these three alternatives and determining whether or not to implement them.

CHERENKOV TELESCOPE ARRAY: A NEXT-GENERATION TELESCOPE FOR VERY-HIGH-ENERGY GAMMA RAY PHOTONS

Tianyao Wu, Laura Brandt, Justin Vandenbroucke (Mentor), Physics

The Cherenkov Telescope Array (CTA) project is a next-generation ground-based gamma-ray instrument. CTA builds on the technique of detecting gamma-ray induced particles in the atmosphere through Cherenkov radiation. Currently the CTA Consortium consists of over 1000 scientists. Since the electronic signal from Cherenkov radiation is only a few nanoseconds long, the information has to be stored in a silicon chip for a short time. Each channel of the chip has 16,384 storage cells. We studied the performance of each of the storage cells. After it is built, we can detect gamma ray photons between 30 GeV and 300 TeV, the highest energy photons ever detected. This information can be combined with data from other telescopes like Fermi and IceCube.

BIOMASS VARIATION OF FLYING INSECTS AROUND THREE NORTHERN WISCONSIN LAKES

Touyeng Xiong, Paul Schilke (Mentor), Forest and Wildlife Ecology

Flying insects are an important food source for birds, bats and even other insects. I want to find out how the total flying insect biomass and biomass for the five most common insect orders varies as a function of distance from a lakeshore. Sticky traps were placed in transects oriented perpendicular to the lakeshore around three lakes in northern Wisconsin at distances: 0, 5, 10, 20, 40, 80, and 160 meters, with 0 at the lake edge. Traps were changed weekly from June to mid–August 2013, insects were measured and identified to the lowest taxonomic unit possible, and biomass was estimated from length using allometric equations. I expect to find that insect biomass will decrease as distance from the lake increases.

LAMININ β 2'S INTERACTION WITH MOTORNEURONS

Zeeshan Yacoob, Randolph Ashton (Mentor), Biomedical Engineering

In the Ashton Lab we are attempting to create culture surfaces that will simulate a neuromuscular junction thereby enabling us to control the length of cholinergic neurons grown in vitro. This in turn will lead to the generation of motoneurons of specified lengths that could then be used to study diseases, the effects of chemicals or even transplanted into patients. Currently scientists are unsure which protein in the synaptic basal lamina stimulates the formation of axonal terminals. However, studies done in rats have implicated the carboxylic terminus of laminin β 2 (LAMB2). All in all, the goal of this project is to find out if recombinantly produced fragments of LAMB2 would be able to induce the formation of axonal terminals in hiPSC derived neurons.

THE EFFECT OF DIFFERENT PRETREATMENT METHODS ON BIOMASS CONVERSION BY ENZYMATIC HYDROLYSIS

Shu-Ching Yang, Xuejun Pan (Mentor), Biological Systems Engineering

Lignocellulosic biomass is one of the most abundant resources to generate biofuels. It mainly consists of cellulose, hemicellulose, and lignin. The sugars from cellulose and hemicellulose can be converted into bioethanol; however, the recalcitrance of biomass resulting from the crystalline structure of cellulose, the presence of hemicellulose and lignin, and rigid heterogeneous structure of the biomass matrix needs to be overcome before cellulose can be efficiently hydrolyzed into glucose. Pretreatment is an essential operation to remove or reduce the native recalcitrance of biomass. This study is to investigate the effects of two different pretreatment methods on biological conversion of lignocellulosic biomass. Acid pretreatment using 3% sulfuric acid and alkali pretreatment with 3% sodium hydroxide were conducted on corn stover. The effect of each pretreatment was evaluated by enzymatic hydrolysis of the pretreated biomass. Contents of sugars and lignin were also analyzed after each pretreatment to see the effect of each method.

REVIEWING DIFFERENT METHODS OF ANALYZING HAND LEVEL ACTIVITY

Linda Yang, Robert Radwin (Mentor), Biomedical Engineering

The Institute of Medicine estimates of the economic burden of WMSDs, as measured by compensation costs, lost wages, and lost productivity, are between \$45 and \$54 billion annually. The Bureau of Labor Statistics reported 26,794 Carpal tunnel syndrome cases involving days away from work in 2001. The purpose of the research is to maximize human capabilities in the workforce by reducing musculoskeletal diseases and injuries. This research specifically observes the hand region where the wrist tendon and median nerve is prone to injuries such as the carpal tunnel syndrome. To do so, the task is to quantify repetitive hand motion by measuring Hand Activity Level (HAL). HAL is a scale from 1–10 that measures the amount of strain on the hand. Previous methods used to observe hand motion HAL lacked accuracy and were unsuitable for extended observation periods due to lack of precision in video recording and lighting. For the factory videos collected from UC-Berkeley, Latko, and Niosh, a panel of selected observers reviewed the videos to estimate HAL, but this presented issues since the human eye may not detect subtle differences. This research has led to improving video analysis so that HAL can be computed more accurately. An equation utilizing frequency, period, duty cycle, speed, and velocity to measure hand motion has been developed using multi media video task analysis that tracks the hand position. Data from lab experiments will be compared to the subjective HAL's to verify the equation and develop new methods of tracking repetitive hand motion.

THE MECHANISM OF DOSAGE COMPENSATION IN WILD YEAST STRAINS

Mun Hong Yong, Audrey Gasch (Mentor), Genetics

Dosage compensation is a cellular mechanism that controls the expression of genes with an abnormal copy number in the cell to ensure gene expression at normal levels. While lacking in lab yeast strains, dosage compensation has been observed in wild yeast strains with aneuploidy. To investigate the mechanism of dosage compensation in yeast, plasmids containing one single gene were inserted into yeast cells. This process introduces an extra copy of the gene into the cell, which allows us to study dosage compensation in the absence of aneuploidy. Data from this project showed that dosage compensation in yeast does not act on the extra gene on plasmids, suggesting that the mechanism may require a higher level chromosomal structure to control gene expression.

PERCEPTIONS OF PATIENTS REGARDING TRANSMISSION-BASED ISOLATION PRECAUTIONS: A QUALITATIVE STUDY

Riley Young, Nasia Safdar (Mentor), Medicine

Contact isolation for reducing transmission of multidrug-resistant organisms (MDROs) may be associated with adverse consequences for patients. We examined the perceptions of contact isolation among hospitalized patients with MDRO colonization or infection. Semi-structured interviews with inpatients colonized or infected with MDROs were conducted. Thirteen patients were interviewed. Eight themes were identified: impact on the patient, family/visitors, staff, care, understanding of isolation, effectiveness of isolation, benefits and disadvantages of isolation, and compliance. Twelve of 13 patients did not feel personally effected by contact precautions. Eleven patients identified infection reduction as a benefit of contact precautions. Most patients had a positive or neutral view of isolation precautions. Our findings have implications for infection control practices of patients with infection or colonization by MDROs.

RESEARCH ON THE INFLUENT OF THE LENGTH OF STAY ON RESIDENTS' LONG TERM CARE FACILITY ADJUSTMENT.

Zhiyuan Yu, Ju Yoon (Mentor), Nursing

The purpose of this research is to examine the influence of length of stay in long term care facilities on residents' life adjustment. Data was collected from four nursing homes and two assisted living homes in Madison area by interviewing residents with the use of validated questionnaires. A total of 113 cognitively intact residents completed questionnaires and further residents are still under recruitment. Regression analysis was employed using SAS statistical software. Controlling for age, gender, race, ADL function and type of facilities, length of stay was significantly associated with the life adjustment for long-term care residents ($\beta=0.34$, p-value 0.0009). Study finding indicates that longer length of stay might lead to better residents' life adjustment; however, further exploration why and how it influences should be warranted.

MECHANISMS OF DNA MISMATCH REPAIR IN BACILLUS SUBTILIS

Elise Zamzow, Sabari Sankar Thirupathy (Mentor), Bacteriology

Bacteria possess a strong bias for genes to be encoded on the leading strand. Co-orientation of replication and transcription is thought to reduce mutagenesis, while lagging strand genes (head-on; HO) experience higher mutagenesis. However, the underlying mechanisms are not clear. Here, we investigated the role of DNA mismatch repair (MMR) on a hotspot mutation at the promoter in HO orientation in the bacterium *Bacillus subtilis*, using mutation assays, PCR and sequencing. Preliminary results suggest that MMR efficiency might be different between intergenic and intragenic regions. To study this further, we are currently developing a novel mutation reporter employing blue-white screening. Cumulatively, our results will give insights into aspects of mutagenesis and mechanisms underlying human diseases like cancer, as MMR is conserved from bacteria to humans.

LECTINS AND THE HUMAN INNATE IMMUNE SYSTEM

Luke Zarling, Darryl Wesener (Mentor), Biochemistry

Lectins are proteins that recognize glycoconjugates. Human intelectin-1 (hIntL) is a soluble lectin in the innate immune system, and its biological role is not well understood. Recently, the Kiessling Group has shown that hIntL binds the monosaccharide galactofuranose (Galf), the thermodynamically disfavored and less common isomer of galactopyranose (Galp). Galf is found on the cell surfaces of bacteria but is absent on the surface of mammalian cells. Protein x-ray crystallography was pursued to explore hIntL-Galf binding. Robust expression and purification protocols were optimized, but protein concentrations required for crystallography were not obtained due to protein aggregation and precipitation. Currently, we are attempting to circumvent this problem through the development of new protein truncation constructs.

EFFECTS OF ENDOTHELIN-1 AND LOADING ON THE MECHANICAL PROPERTIES OF EX VIVO TRABECULAR BONE

Ryley Zastrow, Aaron Bishop, Heidi-Lynn Ploeg (Mentor), Mechanical Engineering

Osteoporosis is a major health concern for individuals over the age of fifty, its prevalence expected to rise given the rapidly aging population and increasing longevity. However, there is no guaranteed strategy to preserve bone health and prevent osteoporosis as the mechanical properties of bone and biochemical processes governing bone response to stimuli are poorly understood. This study measures the rate of change in stiffness of human bone cores exposed to both mechanical loading and Endothelin-1. Bone samples are housed in ex vivo bioreactors which allow for compressive testing to be performed on the bone cores. The study follows a 2x2 factorial design with treatments of Endothelin-1 and/or loading. It is hypothesized that Endothelin-1 will act synergistically with compressive loading to increase human bone stiffness.

CONTRIBUTIONS OF POSTPARTUM DEPRESSION AND MOTHER-INFANT INTERACTION QUALITY TO INFANT DEVELOPMENT

Brenna Zatto, Roseanne Clark (Mentor), Psychiatry

Postpartum depression (PPD) occurs in 10–15% of women and in as many as 50% of women living in poverty. This significant public health problem poses a considerable risk to maternal functioning, the mother-infant relationship, and infant development. However, little research has been conducted on how the severity of symptoms a mother experiences with PPD, her life circumstances, and her interactions with her infant, may affect her infant's development. This study proposes to assess mothers with PPD on depressive symptoms, anxiety, parenting and life stress, history of childhood trauma, the interaction with their infants, and infant development prior to participating in a mother-infant therapy group for PPD. An analysis of co-variance will be used to compare mothers severity of depressive symptoms, life circumstances, mother-infant interaction, and infant development co-varying for maternal education. Results are expected to demonstrate that the more severe a mother's symptoms, presence of trauma history and current stress, the lower quality her interaction is with her child and the more delays in infant development. This study will be valuable in documenting the contributions of depressive symptoms and other factors on mother-infant interaction quality and infant development, documenting the necessity of a relational approach for treatment for PPD.

ASSESSING PATIENT EDUCATION MATERIAL ON HEALTH CARE-ASSOCIATED INFECTIONS USING A SYSTEMATIC APPROACH

Caroline Zellmer, Nasia Safdar (Mentor), Medicine

Patient education is important for the prevention of healthcare-associated infections (HAI) and there is plethora of literature on patient centered tools for promoting education and engagement. However, the applicability and utility of these educational tools for the end-user (patient) is unclear. We undertook a systematic assessment of patient education materials for surgical site infection using a validated evaluation tool- The Patient Education Materials Assessment Tool (PEMAT). Preliminary results of this tool have found that most available score poorly on the PEMAT. The PEMAT evaluates the domains of actionability and understandability from a patient perspective. Future work will involve adapting or changing the patient education materials to improve comprehension, ease of understanding, and applicability to improve patient outcomes.

SEPARATING HOFMEISTER AND COULOMBIC EFFECTS OF SALTS ON DNA HELIX FORMATION

Yurun Zhang, M. Thomas Record (Mentor), Chemistry

Inorganic salts exhibit nonspecific Coulombic and specific (Hofmeister) interactions with biopolymers. Different Hofmeister effects of different salts arise from their different interactions (favorable or unfavorable) with hydrocarbon surface. Salts like Na₂SO₄ stabilize folded proteins because of their unfavorable interaction with the largely-hydrocarbon surface exposed in unfolding, but no salt stabilizes a 50% AT DNA hairpin at high concentrations. We propose the origin of this difference is that the nucleobases surface exposed in DNA unfolding is primarily polar and not hydrocarbon-like. Here we report 1) measurement of salt-base interactions by solubility and 2) separation of Coulombic and Hofmeister effects on DNA hairpin helix formation by UV spectroscopy. We find that Na₂SO₄ stabilizes 100% AT helices because of its unfavorable interaction with thymine methyl groups.

A RAPAMYCIN-RELEASING PERIVASCULAR POLYMERIC SHEATH PRODUCES HIGHLY EFFECTIVE INHIBITION OF INTIMAL

Yifan Zhou, Lianwang Guo (Mentor), Surgery

Intimal hyperplasia causes stenosis (narrowing) of the vasculature lumen. There has been a lack of perivascular drug-delivery measures applicable upon open surgical procedures, which suffer high rates of failure due to the development of neointimal plaque. Here, we found a poly(ϵ -caprolactone) (PCL) formulation that is highly effective in preventing intimal hyperplasia through perivascular delivery of rapamycin in an animal model. Particularly, PCL delivery system produced optimal outcomes for mitigating neointima with its steady, fast, near-linear release of rapamycin and durable integrity. PLC also demonstrated excellence in balloon-injury animal, showing pronounced reduction in intimal hyperplasia without endothelial impairment and thrombosis. Thus, PCL sheath may provide a useful template for devising effective perivascular delivery methods particularly suited for preventing stenosis following open vascular surgeries.

RATIONAL DESIGN OF H₂S FLUORESCENT PROBES FROM QUANTUM CHEMICAL CALCULATIONS

Yacong Zhou, Donna Bates (Mentor), Wisconsin Energy Institute

H₂S is an important signaling molecule and its detection is crucial in the diagnosis of many diseases. The main purpose of this study is to propose a rational mechanism for the addition of H₂S to coumarin indolenium (CouMC), which is a fluorescent H₂S probe. The carbons at ϵ 1537;- (or 1,2-) and ϵ 1543;- (or 1,4-) sites of the quaternary ammonium nitrogen in CouMC are two probable reactive centers. The optimized structures and charge distribution of CouMC was optimized by B3LYP/DTF method. The result suggests that the 1,2- site is more electropositive than 1,4- site. Therefore, the H₂S addition is more likely to occur on the 1,2-carbon due to its a more electronically favorable mechanism. More precise results will be obtained by natural bond orbital (NBO) analysis.

MATHEMATICAL MODELS FOR RECOMBINANT MICROORGANISMS FERMENTATION PROCESSES

Ronghui Zhu, Gheorghe Craciun (Mentor), Mathematics

Recombinant microorganism expression systems have been extensively used in fermentation processes to produce useful biological products. Productivity, plasmid stability and cell viability are major concerns in these systems, and are affected by a number of controllable parameters, including temperature, dilution rate, nutrient supplement method, promoter strength, induction level, etc. We present mathematical models that analyze the effects of some of these parameters. Our numerical simulations results are consistent with published experimental results. Using our models we find that controllable parameters have optimal points and show how to find the optimal state of the system to realize maximum productivity.

INVESTIGATION INTO THE DISTINCTIONS BETWEEN SYNOPTIC AND LAKE EFFECT SNOW NEAR MARQUETTE, MICHIGAN

Mitch Ziesemer, Tristan L'ecuyer (Mentor), Atmospheric & Oceanic Sciences

Lake effect snow greatly impacts the Great Lakes region since it can result in large quantities of snow to fall that influence the local economy and societal choices. Lake effect snow is a product of cold weather outbreaks that can be guided by surface wind orientation and other local surface weather characteristics. A 2012–13 winter data set of radar reflectivity from Marquette, Michigan provides the foundation to create algorithms and plots to gain a further understanding of lake effect snow events and refining differences between synoptic scale and lake effect snow events.

THE ROLE OF NERVOUS WRECK IN DENDRITIC BRANCHING AND GROWTH IN DROSOPHILA

Gregory Zilberg, Kathaleen O'Connor-Giles (Mentor), Genetics

Receptor-mediated endocytosis is fundamental for regulating neuronal growth. For instance, clathrin-mediated endocytosis of cell surface receptors is a key mechanism by which neurons dictate synaptic number and size. Experiments at the neuromuscular junction, a model synapse in *Drosophila*, demonstrated the protein Nervous Wreck (Nwk) negatively regulates presynaptic growth through interaction with the endocytic machinery. Expanding on these previous results, we have demonstrated that Nwk localizes both presynaptically and postsynaptically in the adult central nervous system. To determine the role of Nwk in postsynaptic growth, we are measuring Nwk regulation of the complexity of dendritic arbors in the adult central nervous system. Further, by examining subcellular colocalization with known components of the endocytic machinery, we will resolve the molecular mechanism by which Nwk acts in dendrites.

POLLEN VIABILITY OF CONVENTIONAL AND ROUNDUP READY ALFALFA VARYING WITH TEMPERATURE AND TIME

Ross Ziobro, Johanne Brunet (Mentor), Entomology

The outcrossing potential of crops is a topic of concern in agriculture, especially for transgenic crops. Preliminary results suggested that Roundup Ready alfalfa pollen had higher viability than conventional alfalfa pollen, and therefore might have a higher outcrossing potential. In fall 2013 we compared the viabilities of pollen from two alfalfa cultivars at different temperatures and with varying lengths of exposure to these temperatures. Our results support the preliminary results that transgenic alfalfa pollen is more viable than conventional alfalfa pollen and this is true at different temperatures and at different times of exposure to these temperatures. Future research will examine pollen viability in more cultivars.