

UNDERGRADUATE

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FRIDAY, APRIL 13

ABSTRACTS 2018

Celebrating research, creative
endeavor, and service-learning



We are very pleased you are joining us for the 20th Annual Undergraduate Symposium at the University of Wisconsin–Madison. Our university proudly honors its multifaceted mission of leading edge knowledge discovery and quality undergraduate education. The two meet in the Undergraduate Symposium. Our 20th anniversary is an extraordinary milestone demonstrating our steadfast commitment to providing a Wisconsin Experience to our undergraduate students and the continual initiative they bring to their pursuit of new knowledge.

*Steven M. Cramer, Vice Provost for Teaching and Learning
University of Wisconsin-Madison*

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THE COMPARISON BETWEEN SYMBOLIC AND CONCRETENESS FADING INSTRUCTION IN ABSTRACT MATHEMATICS

Catherine Abitz, John McGinty (Mentor)

The purpose of this research is to compare the effect that symbolic instruction of mathematics has on learning outcomes with concreteness fading instruction. The first phase explores the effectiveness of the two different instructional approaches, and the final phase explores the ways students ground their learning in their cognitive systems in each activity. What is the effect of instructional activities that use symbol notation on learning outcomes in math, compared to instructional activities that use concreteness fading? I expect to find the condition that utilizes only symbolic notation will have similar results as those conditions that use concreteness fading, suggesting that instruction through symbols is just as effective as instruction with objects and icons. This will allow for the improvement of teaching methods involving mathematics.

CONTEMPORARY EMBROIDERY

Alyssa Ackerman, Nancy Mladenoff (Mentor)

My artwork explores themes of womanhood, feminine beauty ideals, and hierarchical art structures through embroidery. My work straddles the trivial divide between crafts and fine art to highlight the beauty, complexity, and breadth of historically undervalued craft materials. I meticulously hand-stitch thousands of individual threads to create portraits that read as paintings. My work is thus a unique blend of the traditional and contemporary as I use time-honored embroidery techniques in a novel and contemporary way. My goal in doing this is to pioneer new ways of using embroidery and bring a medium that has historically been dismissed as women's work deeper into the fine art world.

DETECTION OF LIPO-CHITOOLIGOSACCHARIDES IN YEASTS

Sam Ahler, Tomas Rush (Mentor)

Fungi have countless benefits in drug development in medicine and as a biocontrol agent in agriculture. Lipochitooligosaccharides (LCOs) are the signaling molecules responsible for the endosymbiotic interaction between legume roots (i.e. soybeans) and rhizobium bacteria. Additional investigation has found that species of filamentous fungi have shown to induce root hair branching in biological assays due to their production of LCOs, however nothing is known about LCOs production in yeast fungi. Yeasts are eukaryotic, single-celled organisms and have little known association with plant roots. We will test yeast taxa from Ascomycota and Basidiomycota for the presence of LCOs using root hair branching assays. This investigation could help fill the gap in the knowledge and literature regarding the extent of LCO production in the fungal kingdom.

CHARACTERIZATION OF THE EFFECTS OF TRAR ON THE F-ELEMENT'S TRANSFER REGION PROMOTERS IN E. COLI

Madeline Akbari, Richard Gourse (Mentor)

Escherichia coli generally contain an F-plasmid that is involved in conjugation. A third of this plasmid contains genes involved in producing the structural components of the DNA transport system (transfer region). TraR is a unique protein encoded in this region which can bind to RNA polymerase and negatively regulate ribosome biosynthesis and may also upregulate membrane damage repair pathways. The transfer region has four promoters, *ptrA*, *ptrJ*, *pY*, and *pfinP*, that regulate the transcription of the genes but were also found to be positively regulated by TraR. Therefore, TraR up-regulates its own production along with the production of other transfer genes. Understanding TraR's role in the cell may help to develop a way to control gene expression and cell growth for research or medical purposes.

SPORT SPECIALIZATION CHARACTERISTICS AMONG YOUTH ATHLETES

Joseph Albrecht, David Bell (Mentor)

In our modern culture, youth athletes are under more pressure than ever to develop sport-specific skills in pursuit of scholarships and future athletic careers. Sport specialization is defined as intense training in one sport while excluding others. Current research suggests that prevalence of specialization ranges from 10%-35% in youth athletes. However, specialization is occurring at younger ages and there is a gap in our current knowledge regarding participation patterns in younger athletes, in this case between the ages of 10 and 14. The purpose of this study is to determine sport participation and specialization characteristics in middle school athletes and determine if these factors are associated with injury and illness.

SOCIAL CATEGORIES IMPACT INFANTS' TRUST

Kudirat Alimi, Rachel King (Mentor)

In our lab, we investigate how social categories impact children's thoughts and behaviors. In the present research, we ask how children learn whom to trust, and whether social categories impact children's trust in strangers. We showed children pairs of unfamiliar individuals who differed by their gender, age, race, or spoken language. Each individual offered a toy or food to try, and participants were asked to choose whose food or toy they wished to sample. We measured which person participants chose to take an item from, and whether participants show preferences for one person over another based on social categories. Results suggest that children's social category based trust changes over development. This work has implications for the development of social cognition and intergroup biases.

EVALUATING REPATRIATION AS A DURABLE SOLUTION TO EAST AFRICAN PROTRACTED REFUGEE SITUATIONS

Samuel Allen, Robert Kaiser (Mentor)

Repatriation, or the return of refugees to their countries of origin, has taken precedence as a durable solution to protracted refugee situations (PRS). Repatriation is the most common solution to refugee cases, but modern, aggressive repatriation schemes have had dubious efficacy in preventing PRS from recurring. Using the cases of Burundian and Somali refugees, this study explains why repatriation has taken precedence over other solutions to PRS. This is done by analyzing academic texts, documents from refugee organizations and the author's experiences abroad. This research concludes that aggressive repatriation occurs for a variety of reasons which reap short-term political and economic gains at the expense of durable solutions. It proceeds to evaluate current efforts to make repatriation more durable, as well as proposing new ideas.

PORTRAYAL OF AN 'INNOCENT' GERMAN PUBLIC IN SWEDISH POSTWAR LITERATURE

Kendall Allen-King, Dean Krouk (Mentor)

This project looks at the memory of the war represented in post-WWII literature in Sweden. This research relies primarily upon primary sources. This topic area of a collective memory of the war in neutral Sweden through literature is relatively unresearched. This project asks how Swedish literature was able to provide a different perspective of the German population than many other representations of them from after the war. Swedish authors often show sympathy for German civilians who have been swept up by the Nazi regime and are now forced to suffer through the Allied occupation. This project also asks how these representations of an innocent German public are related to questions of guilt and moral responsibility in Sweden by investigating guilt in postwar Swedish literature.

EFFECTS OF PARTICULATE ORGANIC MATTER ON METABOLIC ACTIVITY OF RIVERBED SEDIMENT MICROBES

Anthony Allison, Matthew Ginder-Vogel (Mentor)

Hydrologic exchange within the hyporheic zone (interface between groundwater and river water) sets limits on the rate of microbial metabolism. Such rates of metabolism cause microbes in the environment to compete for dissolved organic carbon (DOC) sources and create a deterministic selection of the communities forcing them to adapt. Recent studies show that significant quantities of DOC were released from riverbed areas stimulating respiration in the groundwater microbial communities. It is hypothesized that the release of DOC from the riverbed is due to the accumulation and degradation of particulate organic matter (POM). This study examines the influence of POM on the metabolic activity of riverbed sediment microbial communities. Such influence drives deterministic selection altering microbial communities.

DISTRICT LEADERSHIP FOR EQUITY IN RACIALLY DIVERSE SCHOOL SYSTEMS

Wendy Alvarez, John Diamond (Mentor)

In the United States, there continues to be a division among race and class in educational achievement. This project expresses the need to know and understand how district leaders are working towards the equity issues in education. In order to find this out, we look towards the ethnographic method of research in which one studies groups and people as they go about their everyday lives by participating (or shadowing) in their routines. In doing so, we will see how district leaders reflect on equity issues within their regular routines. Districts are already working towards solving the equity issues at hand, but what is not known is how the district leaders, specifically, are addressing the problem of equity in education within their own practices.

APPLYING MACHINE LEARNING ALGORITHMS TO ANALYZE DISPLAY-ADVERTISING RESPONSE

Vanessa Alwan, Paul Hoban (Mentor)

This research consists of applying machine-learning methods to build accurate predictive models for display advertising effectiveness and study factors that increase the probability of conversion. We begin using conversion data from a single day that was chosen because many subjects converted under this campaign with some regularity relative to other campaigns. We are particularly interested in using random forests and neural nets on customer behavior to predict conversion. This is because these methods do not assume a structural form about the data which is important given we have no prior assumptions about the structure of the data. Our goal is to identify certain characteristics that have shown to augment the probability of conversion in order to strengthen current models that are used to predict conversion.

STUDY OF CHILDREN'S THINKING

Mahbuba Amer, Julia Matthews (Mentor)

In The Study of Children's Thinking lab, we broadly investigate how kids learn about the patterns in the world around them. Through interactive research games we examine early scientific thinking in kids, including how kids generalize from one situation to another, transfer math skills to novel problems, and learn about social norms. We find that different forms of instruction lead to more generative or discriminative learning and it appears there are some advantages and tradeoffs to each learning method. The work we are doing is important because understanding how kids think allows us to educate them more effectively and efficiently. Kids are our future and it's up to us to provide them with an adequate education.

DIFFERENTIATION OF DOWN SYNDROME INTERNEURONS THROUGH THE USE OF INDUCED PLURIPOTENT STEM CELLS

Lindsey Amundson, Anita Bhattacharyya Consigny (Mentor)

Down syndrome (DS) is caused by the trisomy of chromosome 21 (Ts21) which leads to impairments in cortical development. This study aims to identify whether interneuron development in DS deviates from that of a typical developing brain. Induced pluripotent stem cells (iPSCs) from DS individuals can be differentiated into neurons to study the development of the brain. Ts21 and euploid iPSCs were differentiated into GABA interneurons, and the percentage of differentiated interneurons was compared. Immunostaining for GABA and neuron markers was used to identify interneurons before performing stereology to assess the number of positively differentiated interneurons via fractionator probe. Comparison of the percentage of GABA interneurons showed some difference between Ts21 and control. These results suggest a lower number of differentiated interneurons in DS.

ONTOGENETIC RELATIONSHIP OF LEAF AREA AND TOTAL BIOMASS ALLOCATION FOR EIGHT HERBACEOUS PRAIRIE SPECIES

Genevieve Anderegg, Jonathan Henn (Mentor)

Biomass, the total mass of a living organism, serves as an important metric in determining the productivity of a plant and the amount of energy invested into specific organs and tissues. Data on several metrics were collected for 8 herbaceous prairie species at evenly spaced intervals throughout a growth period of 20 weeks and analyzed to determine how leaf area increases or decreases as a proportion of total biomass over time. All species demonstrated a decrease in proportion of leaf area over time, displaying a change in plant investment strategies as plants age. Differences in allocation between species can be explained by their phylogeny and evolutionary history. Future studies could gather more complete results by increasing the study period and controlling for changes in photoperiod.

NITRIFICATION IN MICRO AEROBIC COMMUNITIES

Rahim Ansari, Pamela Camejo Medranda (Mentor)

Eutrophication is the biological process in which excess amounts of nutrients, specifically ammonia and phosphorus, pollute bodies of water. This is often due to fertilizer or sewage runoff which contains dangerously high amounts of nutrients. The ammonia and phosphorus encourage algae and other plant growth which increases organic matter and lowers dissolved oxygen in the water. The low amount of oxygen kills off many fish and plant species vital to the ecosystem, thus endangering our ecosystem. To prevent this process, Biological Nutrient Removal (BNR) is used to treat wastewater. BNR utilizes special bacteria and archaea which remove specific nutrients due to their natural metabolic process. These organisms are also placed in micro aerobic environments as to promote BNR in energy conserving, low dissolved oxygen systems.

INVESTIGATING THE ROLE OF TCF19 IN DNA DAMAGE REPAIR IN AD293 CELLS

Lucille Anzia, Dawn Davis (Mentor)

Given the prominence of diabetes in modern American society, maintaining the health of the insulin producing β -cells has become essential. TCF19, a putative transcription factor, has been shown to be active in proliferation and apoptosis of the β -cell. We hypothesize that TCF19 plays a role in DNA damage repair within the β -cell, such that its knockdown followed by treatment with DNA damaging agents will result in less recovery compared to controls. We used siRNA to knockdown TCF19 and etoposide to provoke the double stranded DNA breaks in the human cell line, AD293. After confirmation of knockdown we are now investigating markers of apoptosis and DNA damage, including CHOP, γ -H2AX, and DTX3L. We predict an upregulation of those markers in cells without TCF19.

EXPRESSION OF NUCLEAR TCF7L1 IN MOUSE BETA-CELLS TREATED WITH PALMITATE REDUCED BY GSK3 INHIBITOR

Erin Ard, Barak Blum (Mentor)

Elevated expression of Tcf7l1 is associated with loss of mature beta-cell function. We used wildtype Ob/Ob mice and mice with an inducible Tcf7l1 transgene to understand the physiology of Tcf7l1 in pancreatic islets and alternate signaling pathways. We hypothesized elevated Tcf7l1 expression and localization in the nucleus of obese/induced diabetic mice. Using immunofluorescent microscopy, we showed Tcf7l1 relative expression levels in WT obese/induced diabetic mice. To understand alternate pathway signaling and manipulation of Tcf7l1, we treated pancreatic islets with palmitate and the GSK3 inhibitor, CHIR99021. Tcf7l1 was localized in the nucleus of both mouse models. qPCR of islets treated with palmitate exhibited higher expression of Tcf7l1 and lower expression when treated with CHIR99021. This demonstrates the importance of the mechanisms surrounding Tcf7l1 and beta-cell maturation.

STATE POLICY OPERATIVES: THE HISTORIC DEVELOPMENT OF SOCIAL WORKERS AS AGENTS FOR THE POOR IN CHILE

Alec Armon, Stephen Young (Mentor)

Scholars who study popular poverty alleviation programs, such as Conditional Cash Transfers [CCT], tend to emphasize how they travel globally by following transnational networks of policy experts. My project proposes an alternative approach that develops a more grounded, historical analysis in order to construct a genealogy of poverty politics based on often overlooked, local processes. I draw on archival materials about social welfare programs in Chile in the 1920-40s to explore why the government prioritized training social workers in order to address persistent poverty. I then use this material to show how Chilean policy-makers continue to draw on the moral and political ideas of that era, producing a national CCT program that is more focused on surveillance and moral governance than in other countries.

SITE-SPECIFIC PHOTOCROSSLINKING OF PILB TO PROTEINS WITHIN THE TYPE IV PILUS APPARATUS

Paula Atsaves, Katrina Forest (Mentor)

Type IV pili are extracellular bacterial appendages. In *Pseudomonas aeruginosa*, PilB mediates pilus assembly and extension. This assembly ATPase does not interact with pilin directly, but instead works in conjunction with other proteins to extend the pilus. To identify which amino acids of PilB are involved in protein:protein interactions, we created 23 mutants of PilB capable of incorporating the photoreactive amino acid analogue, pBpa, at surface-exposed sites potentially involved in protein:protein interaction. We utilized UV-photocrosslinking to create covalent bonds between PilB-pBpa and macromolecules within a 4 radius, allowing isolation of partner protein(s) and ultimately identifying the specific amino acids within them that closely approach PilB. Determining the interacting positions of PilB has further implications in creating antimicrobials and preventing pathogen attachment to host.

PERCEPTUAL SEGMENTATION OF OVERLAPPING VISUAL STIMULI BASED ON MOTION SPEED

Emily Ausloos, Xin Huang (Mentor)

In order to interpret everyday visual scenes, they must be segmented into distinct objects or surfaces. The primary goal of this research was to examine the effect of speed and visual noise on one's ability to segment overlapping surfaces. Human subjects viewed two overlapping random-dot patches moving in the same direction at either the same speed or two different speeds. We found that without noise subjects were able to segment multiple speed components when the mean speed was low; but were unable to do so when the mean speed was high. With noise, subjects were unable to segment multiple stimuli regardless of the mean speed or the difference between the speed components. These findings will provide insight into human ability to interpret complex visual scenes.

JUST TEACHER: ETHICAL THINKING IN THE PROFESSION OF TEACHING

Owen Bacskai, Paula Mcavoy (Mentor)

Because of teachers' invaluable roles in fostering our society's future, the issues that affect their work can have enormous consequences on individuals and the public alike. This research investigates common professional dilemmas teachers face in the workplace. The ultimate goal of this investigation is to provide a basis for a book aimed at helping teachers exercise good professional judgment at work. Data for this investigation was gathered through a survey sent to k-12 teachers across the country, which asked them to reflect on professional situations they found conflicting and how they responded to the challenge. Survey responses will be coded by the general theme of the dilemma (i.e. student behavior, grading, etc.), which will allow us to profile the key challenges teachers face at work.

HEK 293 CELLS AND THEIR ABILITY TO UPTAKE PROTEINS VIA TRANSFECTION

Maxwell Bado, Li Feng (Mentor)

Human embryonic kidney cells (HEK) are well known across the scientific community for their unparalleled ability to uptake DNA for a wide range of protein expression. The goal of this project was to insert DNA sequences through a process called transfection and to compare the transfection efficiency. These efficiencies were also compared across different incubation temperatures. This was based on previous research, much of which has been done previously, but not on a comprehensive scale. This measure of efficiency was done by using DNA sequences that synthesize proteins with easily distinguishable properties, like the fluorescent green GFP protein, among others. What was uncovered was the HEK cells indiscriminately expressed all of the proteins even after a decrease in temperature, but with a lower efficiency.

ASSESSING THE ACCURACY OF INDIVIDUALS' ABILITY BELIEFS IN COGNITIVE TRAINING

Tyler Ballweg, C. Shawn Green (Mentor)

A number of researchers (e.g. Wigfield and Eccles, 2000) have described a framework in which individuals' likelihood of engaging in a given task depends upon their beliefs about their current and future ability to perform that task successfully. One critical assumption of this framework is that individuals can accurately estimate their own current, and perhaps more importantly, future abilities. The present study assessed the validity of this assumption by comparing participants' estimates of their current abilities, as well as their predictions of their future abilities, with their actual performance over time on a cognitive training task. Understanding whether individuals accurately estimate their own abilities has implications for designing cognitive training tasks which maximize learning.

EFFECT OF SMALL MAMMAL COMMUNITY ON PATHOGEN PREVALENCE IN NYMPHAL IXODES SCAPULARIS

Shelby Ballweg, Ryan Larson (Mentor)

Since the turn of the 21st century, the incidence of tick-borne disease has been on the rise. In Wisconsin, Lyme disease and Anaplasmosis have quadrupled over the past 20 years. With this rise in disease transmission, it is critical to identify factors that might be affecting the transmission of these pathogens. Ticks normally acquire these pathogens during their first blood-meal. Because they typically feed on small mammals, the small mammal community may influence the pathogen prevalence within a particular area. To examine this relationship, ticks were collected from two locations, each with a unique small mammal composition, and the genomic DNA was extracted and analyzed to determine the pathogen prevalence for *Borrelia burgdorferi* and *Anaplasma phagocytophilum*, the causative agents for Lyme disease and Anaplasmosis.

CHINESE SEMANTICS STUDY

Madison Barker, Mark Seidenberg (Mentor)

My thesis focuses on the role of sublexical semantic activation in reading Mandarin. The language makes use of orthographic units (characters) which contain sublexical semantics which are irrelevant to the overall character-level semantics. The experiment is similar in kind and methodology to Van Orden's (1987) study of phonological interference, but is adapted to investigate the role of semantic processing in character reading. The aim is to directly examine the effects of sublexical components on Mandarin readers' semantic representations through experimental manipulation. We hypothesize in the conditions containing semantic interference, response times will be slower compared to the overall, unrelated, and radical conditions and will have a greater number of incorrect responses for trials that include semantic interference.

THE ROLE OF TET2 HYDROXYMETHYLATION IN FOLATE-ENHANCED SPINAL AXON REPAIR

Bridget Barnes, Bermans Iskandar (Mentor)

We've shown that folic acid enhances regeneration of injured central nervous system axons. Interestingly, while at low doses of folic acid, axon regeneration and DNA methylation increase, at high doses of folic acid, both effects are gradually lost. This implies that there is a demethylating mechanism at play. Recent unpublished data indicate that this demethylation process is mediated by the TET1 enzyme. In this project, we've studied TET2, and found that its expression increases gradually with increasing doses of folic acid, ultimately inhibiting axonal regrowth. By silencing TET2 enzymes, we expect to see greater axonal regrowth at high doses of folic acid compared to low doses. Revealing the mechanism of CNS regeneration is essential in enhancing repair of the injured brain and spinal cord.

METABOLOMICS BASED NMR

Madison Barnett, Carlton Moody, John Markley (Mentor)

The objective of our experiment is to test the effectiveness of a specific diet and exercise routine on people at risk for diabetes. Every week, blood and urine samples of people at risk for the disease (but on the diet and exercise plan) are prepared carefully for 1-H NMR, which allows us to look at the different metabolites within the samples. We hope over time to see metabolites with a known correlation to diabetes decrease, and ones present in a healthier lifestyle increase. We also want to identify new metabolites that are indicators of diabetes whose correlation was previously unknown. The importance of finding effective prevention techniques for diabetes is reflected in an exponentially increasing amount of people being diagnosed in the U.S. today.

EXAMINING VIRTUAL REALITY: REAL-WORLD OR ENTERTAINMENT MEDIA?

Kyle Barron, C. Shawn Green (Mentor)

Recently, there has been significant interest in using Virtual Reality (VR) interventions to produce positive impact for real-world issues. Unfortunately, participants do not always appear to treat the virtual world as reflective of real life, which prevents generalization to the real world. I hypothesized that this failure occurred because participants instead treated VR analogously to other forms of entertainment media (e.g., video games or television). I tested this hypothesis by examining whether participants' visual perception took advantage of certain visual cues that exist in real-life but not in video games or television. This approach could, in turn, offer a way to predict whether new VR interventions will generalize.

CHILDREN'S KNOWLEDGE TRANSFER FROM TOUCHSCREENS TO PHYSICAL OBJECTS

Megan Baryenbruch, Lena Rabinowitz, Yi Tong, Heather Kirkorian (Mentor)

The purpose of this study is to explore whether children can transfer knowledge about novel objects learned on a touchscreen to the same physical objects. The study has two main research questions. The first is whether children are able to recognize an object after viewing it in a video, even when the physical object presented is a different color. The second question explores whether differing levels of interactivity on a touchscreen will affect children's learning. Based on previous research, we predict that touching relevant information on the screen will be related to higher rates of word learning than touching irrelevant information on the screen. We have currently run 59 participants in the age range from 18 to 36 months.

INVESTIGATING THE EXPRESSION AND FUNCTION OF KINESIN LIGHT CHAIN ISOFORMS IN EMBRYONIC ZEBRAFISH

Conlin Bass, Liz Haynes (Mentor)

A critical process in neural development is axon pathfinding, where neurons integrate multiple cues and extend processes that synapse onto specific targets. The motor protein Kinesin-1 influences neuronal development through participating in cargo transport and microtubule dynamics. Kinesin-1 has a heavy chain (KHC) and a regulatory light chain (KLC). Despite the importance of Kinesin-1 transport and the involvement of KLC in human neurodegenerative diseases, the developmental roles of the different KLC genes are unknown. I used in situ hybridization to determine where the KLC2, 3, and 4 genes are expressed in zebrafish. We used the in situ results to inform which KLCs to mutate in zebrafish using CRISPR-cas9 gene editing. We will use microscopy to determine the effect of KLC gene loss on neural development.

EFFECTS OF IN VITRO ISCHEMIC CONDITIONS ON CELL CYCLE REGULATING GENE EXPRESSION IN NEURONAL CELLS

Hunter Batjer, Uma Wesley (Mentor)

Ischemic stroke leads to disabilities and death by disrupting blood flow and causing ischemic injury to the brain. Ischemia causes oxygen depletion and neuronal cell death in the brain. Therefore, our hope is to determine more effective molecular drug targets. Cell cycle regulation is critical for brain protection after stroke. During ischemia and reperfusion, many cell cycle regulatory proteins may alter in their expression levels. Our lab has identified key inflammatory molecules involved in cell cycle regulation in the post-stroke brain. Little is known about the role of these cytokines in cell cycle regulation after stroke. Our current studies provide data on the role of in vitro ischemia that mimics stroke conditions, on the alterations of cell cycle regulatory gene expression levels in neuronal cells.

VISUALIZING THE NUCLEAR NOTCH INTRACELLULAR DOMAIN IN GERMLINE STEM CELLS

Sindhuja Battula, Sarah Crittenden (Mentor)

Notch signaling plays a conserved role in stem cell regulation. In all animals, Notch ligands trigger cleavage of the Notch receptor. This cleavage releases the Notch intracellular domain (NICD), which enters the nucleus to activate transcription of Notch target genes. In *C. elegans*, Notch signaling maintains germline stem cells (GSCs), and its Notch dependent transcriptional activity is graded. I have hypothesized that the NICD is generated in a gradient. To test this idea, we used CRISPR/Cas9 gene editing to tag the NICD at the endogenous locus. I can detect NICD in cells, but for quantitation, I need to increase its signal. To that end, I've created a mutant predicted to stabilize the NICD. My next step is to quantitate the stabilized NICD signal.

EXPLORING ALTERED BLOOD BRAIN BARRIER ENDOCYTOSIS DURING INFECTION

Olivia Bee, Eric Shusta (Mentor)

The blood brain barrier (BBB) is comprised of brain microvascular endothelial cells (BMEC) that possess low endocytosis rates, which contribute to the BBB's ability to separate the circulation from the central nervous system (CNS). Group B Streptococcus (GBS) can penetrate the BBB and cause CNS disease, such as bacterial meningitis. Recently, a human induced pluripotent stem cell (iPSC)-derived BMEC model has been established that is superior to previously utilized models because it can retain BBB properties and known phenotypes during infection. Using this model, we determined that GBS increases endocytosis rates during infection. Ongoing work explores the mechanisms by which GBS alters BBB endocytosis. Our work highlights how the model is being utilized to examine host-pathogen interactions in the context of bacterial meningitis.

CONTROLLING FOR SPEAKER VARIABILITY WITHIN A SPEECH STIMULI DATABASE

Molly Beier, Ellen Peng (Mentor)

Testing how well people understand speech is important for documenting typical function and for diagnosing clinical conditions. Historically, standardized speech corpuses (lists of words or sentences) were developed by different groups and recorded with different talkers; hence introducing confounds to generalizing findings across studies. The Binaural Hearing and Speech Lab has recorded a large SPEECH DATABASE (BHSL-SD) from numerous common speech corpuses. The BHSL-SD includes monosyllabic and bisyllabic words, sentences, and continuous discourse recorded by three different speakers. These materials are unique in their suitability for studying speech perception in a wide age range and in clinical populations. This project involves careful characterization of the speakers, such as fundamental frequency, speech rate, and vowel space, and will contribute to release of the BHSL-SD resource nation-wide.

CLINICAL PHENOTYPES AND INTERGENERATIONAL EXPANSIONS OF FAMILY MEMBERS WITH FMR1 CGG EXPANSIONS

Elizabeth Below, Marsha Mailick (Mentor)

FXS is caused by the expansion of an unstable trinucleotide CGG repeat region (>200 CGG repeats) in the fragile X mental retardation (FMR1) gene on the X chromosome. My project examines intergenerational transmission of CGG repeats within 2- and 3-generation families in which one family member has an expansion of CGGs on their FMR1 gene. With this information, I have mapped the genetics of these families over time by creating pedigrees. In addition, my project has allowed me to examine electronic health records from the families and analyze the potential relationships between CGG repeats and other health-related problems. Overall, I examine these gene variations and determine how CGG expansions are genetically associated with other health-related issues within families across generations versus controls.

HYDROLOGICAL IMPACTS OF AGRICULTURAL LAND MANAGEMENT & PRECIPITATION TRENDS IN THE DRIFTLESS REGION

Josh Bendorf, Christopher Kucharik (Mentor)

This GIS-based study focuses on river discharge patterns in the Driftless Region between 2006 and 2016. This time period captures extreme weather and hydrological conditions, including significant flooding in 2008 and widespread drought in 2012. Such variability in precipitation likely had significant hydrological impacts across the region, and therefore was examined. Changes in agricultural land cover and management were also examined. It is logical to hypothesize that agricultural intensification in hydrologically-sensitive watersheds would have a noticeable impact on streamflow. Slope must also be factored in as one would expect the steepness of the land in production to impact hydrology. The results of this study will hopefully aid in predicting future streamflow trends in response to continued changes in land use and precipitation in this region.

THE ROLE OF MOTOR ASSOCIATIONS IN CONCRETENESS FADING INSTRUCTIONAL DESIGN

Augustin Bennett, John McGinty (Mentor)

Participants in our experiment will demonstrate their process of learning Euler's Theorem in varying contexts of concreteness. The level of concreteness fading during the 30-minute learning period is segmented into 10-minute intervals. The enactive stage utilizes motor code to represent tactile manipulations of objects and the symbolic stage utilizes motor code in calligraphy. Motor activation is not present in the iconic stage. How does the activation of motor code during stages of concreteness fading impact the learned manipulations of symbolic notation that represent 2D geometry? I hypothesize the lack of motor code in the iconic stage lacks the fundamental grounding stage of concreteness fading instruction, and will be the least beneficial to learning outcomes. Affirmation of this hypothesis supports mathematical instruction grounded in motor manipulation.

PROTEIN CLASSIFICATION WITH MACHINE LEARNING

Samuel Berglin, Garvesh Raskutti (Mentor)

Understanding how protein structure affects functionality is an ongoing question in biological engineering, with applications ranging from medicine to pharmaceuticals. In this project, statistical machine learning is applied to classify protein sequences as functional or nonfunctional in order to guide the process of protein engineering. Due to the complexity of the problem, machine learning is commonly applied. In this project, logistic regression, decision trees, and random forests are the models applied to beta-lactamase and cytochrome P450 protein families. While these are standard algorithms, their applications to these specific protein families are not well studied. Strengths and weaknesses of each algorithm are discussed, along with some of the current problems in protein optimization from the view of a statistician.

ADDRESSING MASS INCARCERATION AND ITS EFFECTS ON COMMUNITY THROUGH THE ARTS

Mackenzie Berry, Sara McKinnon (Mentor)

Wisconsin is considered the worst state for Black people to live in the United States with regard to poverty, educational achievement, health, incarceration, and child welfare, according to the 2016 Race to Equity Report. To address the issue of mass incarceration, this project will implement a model created by IdeaxLab of Louisville, Kentucky in which artists collaborate with a community and a health organization to diminish health disparities, which are in this case perpetuated by incarceration. Over the course of the year, a group of currently and formerly incarcerated men have engaged in the creation of an arts project and arts programming of their choosing to ultimately assist with their re-entry after incarceration as a Wisconsin Idea Fellowship and HEX-U Fellowship.

THE LOUISVILLE LIP: MUHAMMAD ALI AS HIP HOP'S FIRST MC

Mackenzie Berry, Sara McKinnon (Mentor)

The Louisville Lip: MC Muhammad Ali is a documentary film which examines Muhammad Ali's vision and influence on the development of Hip-Hop and spoken word poetry. Most accounts of Hip Hop ignore his release of grammy-nominated spoken word album I Am the Greatest with Columbia Records in 1963. Although he was the most visible person to rap and perform poetry on television in the 1960's, his influence on the early artists of Hip-Hop is not often credited. This documentary film historicizes and contextualizes Ali's influence and presence in these traditions and emphasizes the influence of Black women on building and maintaining his career and persona. The project features interviews with prominent figures in early Hip Hop as well as family and friends of Ali.

SEX BIAS IN EXTRACELLULAR MATRIX GROWTH FACTOR PRODUCTION

Gabriela Betancourt, Kristyn Masters (Mentor)

Calcific aortic valve disease (CAVD), is characterized by remodeling of the extracellular matrix (ECM) resulting in thickening and calcification of the heart valve. Previous work from our group has demonstrated differences in the pathogenic response of male and female valvular interstitial cells (VICs) supporting male sex as a principal risk factor for CAVD. Although it is known that females progress down a fibrotic pathway, whereas males follow a calcific pathway, less is known regarding how ECM composition affects growth factor sequestration. Preliminary data suggests that males and females produce different levels of proteoglycans in healthy and diseased states. Understanding how levels of associated glycosaminoglycans change informs how cytokine sequestration influences disease-specific processes like angiogenesis and inflammation. This may allow for development of sex-specific CAVD treatments.

DEVELOPING A MOUSE MODEL OF PANCREATIC CANCER

Hope Beyer, Gopal Iyer (Mentor)

Pancreatic cancer uniquely does not illicit an initial immune response from the body making diagnosis and treatment difficult. Pancreatic tumors are nonresponsive and classified as cold tumors. Using two defined mouse pancreatic tumor cell lines, Panc02 and its metastatic derivative Panc02-H7, we will investigate the recruitment of immune cells to the tumor in C57BL/6J mice by challenging the tumor with pro-inflammatory molecules. The project will investigate various immune cells and measure the expression of these genes by flow cytometry and RNA expression. The anticipated results will be a conversion of the cold tumor to a responsive tumor (hot tumor) that will serve as a model to further therapeutic interventions.

MECHANISM FOR HYPERPOLARIZATION ACTIVATION IN THE SPHCN ION CHANNEL

Alexander Blair, Baron Chanda (Mentor)

Voltage-gated channels are incredibly important in mammalian physiology, especially in the neurological and cardiac systems, because of their role in creating and propagating electrical signals. Hyperpolarization-activated channels are thought to be the source of rhythmic activity that is crucial for pace making in the heart. However, the intramolecular mechanism that allows for hyperpolarization activation is poorly understood. By creating chimera proteins from the hyperpolarization-activated HCN1 channel and the closely related depolarization-activated channel hEAG, we isolated three components of HCN, which together are sufficient for the hyperpolarization phenotype. Additionally while hEAG can function as a ‘split channel’ (with a severed covalent linker between the pore domain and the voltage sensing domain), chimera channels with severed linkers tested so far do not show currents.

INVESTIGATING RECEPTOR DYNAMICS IN CELL SIGNALING USING BAKER’S YEAST

Madeleine Blazel, Anna Kosmach, Claudia Schmitt, Janet Batzli, Michelle Harris (Mentor)

Yeast cells undergo sexual reproduction when mating pheromone, α -factor, binds Ste2 receptors and triggers a signaling cascade. We investigated time-dependent changes in membrane-bound Ste2 levels following treatment with a mutant α -factor that has been shown to bind Ste2 but not initiate signaling. We hypothesized that membrane-bound Ste2 levels in yeast treated with 150nM desTrp1[Ala3] α -factor would decrease significantly from baseline levels. Cells were imaged using epifluorescence microscopy, and Ste2 levels were quantified using ImageJ/FIJI. We found that membrane-bound levels of Ste2 do not change when exposed to desTrp1[Ala3] α -factor, while Ste2 levels in WT-treated yeast were significantly higher than baseline levels at 40 minutes. Our preliminary results suggest membrane-bound Ste2 levels are unchanged in the presence of mutated pheromone.

FUNGAL COLONIZATION OF PRAIRIE GRASSES: DOES IT VARY AMONG SPECIES IN REMNANT AND RESTORED SITES?

Morganne Boppel, Laura Ladwig (Mentor)

Prairie habitats in Wisconsin historically covered 800,000 ha and today, less than 0.1% of remnant prairie remain. Restoration management is converting post-agricultural lands back to prairies. Native plants developed a symbiotic relationship in which arbuscular mycorrhizal fungi (AMF) colonizes plant roots to assist in nutrient uptake and the fungi receives carbohydrates from the plants. It’s not understood if AMFs colonize well in restored prairies. In this study, root samples from 243 plants from remnant and restored prairies were collected to test for the presence of AMF. Staining techniques and quantifying procedures are used to estimate colonization. Soil water absorbency and slope measurements will also be taken at the collection sites. Currently stained roots show more colonization than others but ongoing observations will strengthen conclusions.

TARGETING FALL PREVENTION FOR DEAF ADULTS: A COMMUNITY-BASED YOGA INTERVENTION

Anastasia Bormann, Kristen Pickett (Mentor)

Due to the pathology of their vestibular system, individuals who are deaf or hard of hearing are likely to experience balance difficulties, which may also affect their ability to perform a wide range of activities in their everyday lives. Even more concerning, these individuals' impairments greatly increase their risk of debilitating falls. However, little research has been dedicated to determining effective interventions for adults who are deaf or hard of hearing. Therefore, the purpose of this study is to examine the effects of a community-based yoga class, adapted to suit the needs of this population. The results of our study will provide necessary information for establishing future interventions to improve gait, balance, and ultimately quality of life, in the deaf and hard of hearing community.

INTRANASAL DELIVERY OF ANTIBODIES BYPASSES THE BLOOD-BRAIN BARRIER AND ACHIEVES HIGH CNS LEVELS

Sam Boroumand, Robert Thorne (Mentor)

Passive immunotherapy has become a prominent therapeutic strategy for the treatment of many different neurological disorders. However, delivery of antibodies to the central nervous system (CNS) following systemic administration is significantly impeded due to the blood-brain barrier (BBB). In this study, we demonstrate the potential of intranasal delivery as a non-invasive strategy to bypass the BBB and deliver antibodies (IgG) to the CNS. Quantitative distribution studies of intact, radiolabeled IgG in the CNS of anesthetized rats revealed that intranasal delivery achieved significantly higher antibody levels in the CNS compared to systemic delivery. These findings highlight that the intranasal route can provide a non-invasive, direct, and rapid method for targeting antibodies to the CNS, providing insight into an efficacious therapeutic delivery method to treat neurological diseases.

PERCEIVED SOCIAL SUPPORT IN PARENTS OF CHILDREN WITH AUTISM

Hailey Boyer, Sigan Hartley (Mentor)

Social support for parents of children with autism spectrum disorders (ASD) is an important part of family wellbeing. The purpose of this study is to examine the experience of positive social support (i.e., support efforts experienced as helpful) and negative social support (i.e., support efforts experienced as intrusive) in mothers and fathers of children with ASD and to explore child and family factors associated with social support. The study includes 189 couples with a child with ASD (aged 5 to 12 years). Findings indicated that there is a difference between mothers versus fathers in the experience of positive and negative social exchanges and that parents' depressive symptoms predict level of perceived support. These results have implications for services aimed at parents of children with ASD.

UNDERSTANDING A REGULATORY NETWORK GOVERNING SPORE DEVELOPMENT AND METABOLISM IN ASPERGILLUS FUNGI

Ethan Boynton, Jae-Hyuk Yu (Mentor)

Aspergillus nidulans is a model system used to study developmental and metabolic gene regulatory mechanisms. The genes *vosA* and *velB* in *A. nidulans* are crucial to the formation and viability of asexual spores. Genome-wide mRNA expression profiles of the deletion *velB* and *vosA* mutants showed lowered expression of the genes *oefB* and *oefC*. Moreover, protein-DNA interaction study indicated that the promoters of *oefB* and *oefC* were bound by VosA-VelB. The *oefC* gene is predicted to encode a protein with a DNA binding domain, suggesting *OefC* is a transcription factor. *OefB* and *OefC* work to regulate spore formation and metabolic activity and are activated by the VosA-VelB master regulator during spore formation. Results elucidate a regulatory network governing spore development and metabolism in the *Aspergillus* model.

SPEECH RATE AND INTELLIGIBILITY OF SCHOOL-AGE CHILDREN WITH CEREBRAL PALSY

Meredith Braza, Katie Hustad (Mentor)

It is known that children with cerebral palsy (CP) are at high risk for dysarthria, a speech motor disorder which reduces the intelligibility of children's speech and interferes with their ability to verbally communicate. What is not well understood is how speech rate changes in school-age children with CP and how this change contributes to speech intelligibility. This project examines the following characteristics: speech rate (words per minute), intelligibility, and a novel hybrid measure of intelligible words per minute. Participants include 26 school-age children with CP, seen at 3 time points: age 5, 6, and 7 years old, as well as a control group of 30 age-matched typically developing peers. The findings are discussed in relationship to speech interventions for school-age children with CP.

OXIDATIVE POTENTIAL OF AMBIENT AND HOUSEHOLD PM_{2.5} SOURCES IN RURAL CHINA

Collin Brehmer, James Schauer (Mentor)

Exposure to air suspended particles in developing countries has led to a WHO estimated 2.6 million deaths annually. The health effects of particulate matter (PM) may stem from its component's ability to induce oxidative stress in the lungs, but much is still unknown about the sources and chemical components of PM responsible. To investigate the sources and components of PM responsible for oxidative stress, samples of personal and household exposure to PM of women in rural China were collected. The samples were analyzed for metals, water-soluble ions, water soluble organic matter, black carbon, and oxidative potential. Sources and their contributing elements were determined by principal component analysis, and elements from each source were used in univariate regression models to determine their relationship to oxidative potential.

AUTONOMOUS PLATFORM FOR PROTEIN DESIGN

Bennett Bremer, Philip Romero (Mentor)

Understanding the relationship between a protein's amino acid sequence and function is crucial to the development of custom proteins. This project proposes the development of a generalizable platform that utilizes artificial intelligence to rationally design protein sequences with desired properties. The platform is intended to autonomously design informative protein sequences based on a statistical model of the sequence-function mapping, test the function of the sequences through remote utilization of a robotic laboratory, and update the model based on the laboratory results. The model will eventually learn the sequence-function mapping and design a sequence that is optimized for the given property. Future directions could evaluate the platform's ability to generalize to a variety of protein properties and improve the platform's ability to produce optimal sequences.

IMPACT OF ASD SEVERITY ON GESTURE USE IN INDIVIDUALS WITH DOWN SYNDROME AND IDIOPATHIC ASD

Julie Brinkman, Audra Sterling (Mentor)

Individuals with autism spectrum disorder (ASD) display deficits in gesture use, while individuals with Down syndrome (DS) exhibit strengths. Recent research suggests a higher rate of ASD co-diagnoses in individuals with DS compared to the general population. This study examined the effect of ASD severity, derived from the Autism Diagnostic Observation Schedule-2 (ADOS-2), on gesture use in individuals with DS and individuals with idiopathic ASD. Fifteen individuals with DS and 15 individuals with idiopathic ASD participated in this study. ADOS-2 videos were coded for rate, purpose, and type of gestures. Group differences were found in gesture rate and type, but not gesture purpose. The effect of ASD severity on gesture use differed between individuals with idiopathic ASD and individuals with DS.

ADOLESCENT CHILDREN BORN PRETERM HAVE ALTERED AORTIC PULSE WAVE VELOCITIES AT REST

Melissa Brix, Marlowe Eldridge (Mentor)

Adults born very prematurely have been shown to have higher incidence of hypertension in adulthood. Aortic pulse wave velocity (PWV) is the velocity at which the arterial pulse propagates through the circulatory system and is the current gold standard for clinically measuring arterial stiffness, a validated precursor of cardiovascular (CV) disease and early vascular aging. Factors that have been shown to affect aortic PWV include the degree of contraction of smooth muscle around the vessel, arterial wall elasticity, and wall thickness. I hypothesized that individuals born preterm would exhibit higher pulse wave velocities compared to term-born controls. Our preliminary results illustrate that PWV were higher in preterms than controls suggesting an increased risk of adverse CV events and a greater need to implement preventative techniques.

RACIAL DIFFERENCES IN EARLY CHILDHOOD BLOOD LEAD AND ADULT INVOLVEMENT IN THE WISCONSIN COURT SYSTEM

Chantel Browne, Nicole Thomas, Janean Dilworth-Bart (Mentor)

Previous findings suggest risk for involvement in court systems has been linked to early childhood exposures to environmental pollutants such as lead. For this study we will examine correlations between childhood lead exposure dosage and engagement with the court system in adulthood using data from the Systematic Tracking of Lead Levels and Remediation and the Wisconsin Circuit Court Access databases (n = 7858). We will also test the hypothesis that people of color will have a greater number of court cases that will be partially explained by higher early blood lead levels. Findings will also provide insight into how race-based social and health inequities perpetuate racial inequality in both exposure to lead and court involvement.

CHARACTERIZATION OF PLANT BIOMASS DEGRADING MICROBIAL COMMUNITIES

Emanuel Burgos-Robles, Camila Carlos-Shanley (Mentor)

The discovery for renewable fuel sources that can produce clean energy has become a global challenge that is currently being confronted. Biofuel is an alternative that is produced from deconstructing plant biomass to produce energy. Biofuels that rely on the deconstruction of plant biomass are difficult to extract due to the complexity of biomolecules, i.e. lignocellulose, that compose the plant cell wall. However, it has been observed that some microbial communities can deconstruct the intricate structure of a plants biomass. This observation allows us to determine which microbial consortia are effective at degrading these molecules and utilize them as biofuel sources for energy production. In this project, we aim to characterize microbial communities with lignocellulose-degrading traits by performing enrichment cultures using various carbon source substrates.

UTILIZING INSTAGRAM FOR SOCIAL MEDIA PROMOTION

Maggie Bushman, Megan Moreno (Mentor)

Social media promotion can boost an organization's success, however, techniques for a successful social media promotion for research teams remain unknown. The purpose of this study is to evaluate a pediatric research teams' promotional technique on Instagram to increase user engagement. Instagram was selected for this study, as it is currently the fastest growing social media platform. Four different promotional campaigns will be launched in the following semester, including Road to URS and promotions for a summer research program. Engagement will be measured after campaign completion by assessing the frequency of posts, number of followers and number of accounts followed. This study will provide techniques to utilize Instagram for promotion and to provide research teams with a model for increasing user engagement.

FLUORESCENCE KINETIC STUDIES OF DNA UNWRAPPING IN TRANSCRIPTION INITIATION AND DISSOCIATION

Katelyn Callies, M. Thomas Record (Mentor)

PR promoter DNA is bent and wrapped around *E. coli* RNA polymerase (RNAP) in the stable open complex (R_{PO}), as demonstrated by Cy3-Cy5 fluorescent energy transfer (FRET) between dyes on the far-upstream (-100) and downstream (+14) position of DNA. Here we report the use of FRET and PIFE (single-dye fluorescence enhancements that indicate RNAP-DNA contacts) to investigate unwrapping of upstream DNA after NTP addition to initiate transcription, form a short RNA-DNA hybrid and escape from the promoter. We observe two kinetic phases in the decrease in FRET in transcription initiation. In addition, we report the kinetics of unwrapping in dissociation by salt-upshifts. These experiments reveal that salt-induced unwrapping occurs during the conversion of the stable open complex to the unstable open intermediate, before DNA closing.

TRANSFORMATION OF MnO₂ DURING BPA OXIDATION OVER REPEATED EXPOSURE

Gabrielle Campagnola, Christina Remucal (Mentor)

Bisphenol A (BPA) is a synthetic compound used in manufacturing polycarbonate plastics and is commonly detected in surface water due to its incomplete removal in wastewater treatment. BPA is an endocrine disrupter, which can endanger fish and other aquatic life. Manganese oxides are strong oxidants and have the potential to be used as a removal system for phenolic compounds, including BPA, in water treatment. To determine the potential of this application, batch reactors are used to determine the effects of solution conditions on the redox reaction between manganese oxides and BPA. Identical aerobic and anaerobic reactors show that the presence of oxygen has no effect on the BPA oxidation rate. Reactors at varying pH show that the reaction rate increases under acidic conditions.

SINGLE-MOLECULE FRET STUDIES ON NASCENT PROTEIN FOLDING BY A CUSTOM-ASSEMBLED CONFOCAL MICROSCOPE

Tess Carlson, Silvia Cavagnero (Mentor)

A custom-assembled confocal microscope designed for single-molecule Förster Resonance Energy Transfer (FRET) experiments, that I designed and assembled over the last 1.5 years, will be used to examine the conformations of newly-synthesized peptides bound to the ribosome. Data regarding photon arrival time, FRET efficiency and anisotropy of these ribosome-bound nascent chains (RNCs) will be simultaneously collected. Specific conformational subpopulations can be distinguished and analyzed separately (Specific Aim 2). Fluorescence correlation spectroscopy experiments on the same system will be used to verify the system alignment and the free diffusion of ribosomes in solution (Specific Aim 1). These experiments will provide new insights into conformational states and intramolecular interactions of RNCs that have been previously undetectable due to ensemble averaging in bulk experiments.

NOVEL EPIGENETIC MODIFYING AGENTS UPREGULATE TUMOR ANTIGEN EXPRESSION IN PROSTATE CANCER CELLS

Kristin Carlson, Erika Heninger (Mentor)

Prostate cancer (PC) cells evade immune detection and response through various mechanisms, including epigenetic repression of cancer testis antigen (CTA) expression. New age hypomethylating agent SGI-110 shows promise as a novel epigenetic modifying agent (EMA) against solid tumors. We tested SGI-110, alone and in combination with histone deacetylases LBH589 and MS-275, on several PC cell lines. Gene expression induction of 28 CTAs was determined through quantitative RT-PCR. We found that EMAs induced expression of a broad panel of CTAs, demonstrating the efficacy of these agents in the enhancement of tumor antigen expression in PC cells. The results from this study encourage further investigation of SGI-110 with LBH589 and MS-275 as a combinatory treatment against solid tumors in PC.

THE SPACIAL-NUMERICAL ASSOCIATION

Joao Catao, Percival Matthews (Mentor)

Understanding fractions is very important in early math education. It allows people to achieve success later on with more advanced concepts. However, many children and adults struggle with fractions because they fail to correctly understand the sizes or magnitudes of numerical fractions. In our current work, we are exploring how people think about the magnitudes of fractions. I will present an overview of experiments in which undergraduate students completed tasks designed to investigate how they understand fraction magnitudes in multiple formats, including using numbers and non-symbolic representations, like pairs of line segments. Looking into students' non-symbolic intuitions about fractions helps us study their numerical understanding of fractions.

STUDENT PERSPECTIVES REGARDING AN EDUCATIONAL TECHNOLOGY-MAKING CONNECTIONS BETWEEN VISUALS

Shehrose Charania, Miranda Zahn (Mentor)

The project's main goals are to uncover how students can be supported to learn with visuals STEM fields. In the current Educational Psychology research, we aim to understand how students connect concepts shown by multiple visuals to understand course content. Students worked with a user-friendly educational technology which facilitated their use of models to answer conceptual questions related to Chemistry. The tutor helps students gain representational competencies, or the ability to make connections surrounding the concepts shown by different visuals. After working with the technology for 11 weeks, students gave feedback to the research team about their experience and certain themes from these responses will guide future modifications. Students' qualitative reports indicated that students learn about abstract concepts most effectively by connecting multiple visuals.

PRODUCTION OF NANOMATERIALS USING BOTTOM-UP DESIGN

Vedantika Chaudhary, Wenxiao Pan (Mentor)

The aim of this project is to design nanomaterials from bottom up via computer simulations. We use molecular dynamics (MD) simulations to attain understanding of and control over nanoscale building blocks (e.g., nanoparticles and polymers) that can assemble into target nanostructures. I have participated in this project for using the software VMD (Visual Molecular Dynamics) to visualize molecular structures that are the outputs of MD simulations. My next step will be using LAMMPS (Large-scale Atomic/Molecular Massively Parallel Simulator) to run MD simulations, which runs through the details of the structure, and then produces a readable file of the coordinates and details of the representation of the chosen molecules. The predictions from MD simulations will then be used to guide the design of novel nanomaterials.

LPS PRIMED EXOSOMES CAN EDUCATE MACROPHAGES TO PROTECT MICE FROM LETHAL IRRADIATION

Charlie Childs, John Kink (Mentor)

The use of radiation therapy treatments and events of unwanted radiation exposure have generated interest to find therapies that protect against side effects of Acute Radiation Syndrome (ARS). ARS from high levels of radiation can cause fatal conditions like bone marrow failure leading to infections, anemia and excess bleeding. Mesenchymal stem cells (MSCs) have many healing properties and release exosomes which activate macrophages that regulate the immune system and promote tissue repair. In this study, we found that MSCs cultured with bacterial lipopolysaccharide (LPS) produce exosomes that can effectively enhance or educate macrophages. These macrophages were able to significantly mitigate ARS symptoms in mice after a lethal dose of full body radiation. These results show potential for a novel cell therapy to manage ARS symptoms.

MUTATIONS IN LYN KINASE CAUSE CHANGES IN NEUTROPHIL FUNCTION AND MIGRATION

Julia Chini, Anna Huttenlocher (Mentor)

The Src Family Kinase (SFK) Lyn has important regulatory roles in immune cells including neutrophils, through tyrosine kinase activity and adaptor functions. Patients with systemic neutrophil-induced inflammation have been shown to have *de novo* germline mutations in Lyn, Y508* and Y508F. The purpose of this study is to evaluate the physiological, cellular, and biochemical effects of this mutation, and further understand the role of Lyn Kinase in neutrophil function. Kinase activity assays showed increased phosphorylation of the SFK substrate, SAM68, by both mutants. In addition, chemotaxis assays of PLB-985 cells using transwell migration assays and microfluidic devices, showed that Y508* and Y508F cells have significantly increased migration compared to WT Lyn. Our data supports the role of Lyn as a positive regulator of migration.

OVERLAPS IN FISH DIET STRUCTURE IN TWO NORTHERN TEMPERATE LAKES

Matthew Chotlos, Jake Vander Zanden (Mentor)

To investigate interspecies relationships, researchers are conducting a whole-lake manipulation where they will remove centrarchids from an experimental lake in northern Wisconsin. A reference lake nearby will also be monitored. The trophic position of each species was calculated based on the weighted diet contents. We constructed food webs for June, July, and August of 2017 in each lake. In both the experimental lake and the reference lake, centrarchid and walleye diets show overlap. We will continue collecting diet information for both lakes throughout the removal beginning in 2018. Due to diet overlap, we suspect decreasing centrarchid populations will benefit walleye populations. The 2017 food web structures will act as a comparison to determine how the removal of these fishes affects the lake food web.

CLONING ANTIBODY VARIABLE FRAGMENTS FOR ISOLATING MONOCLONAL ANTIBODIES

Tighe Christopher, Matt Reynolds (Mentor)

Our lab has previously isolated an antibody specific for the rhesus macaque major histocompatibility complex (MHC) class I molecule, Mamu-A1*001 with phage display technology. However, this approach is time consuming, labor-intensive, and can prove unreliable when attempting to distinguish between antibodies that bind similar molecules. Therefore, we are exploring alternative methods for isolating monoclonal antibodies (mAbs) that bind various non-human primate (NHP) MHC allomorphs. We aim to optimize a cloning system which will reliably produce novel mAbs from mRNA isolated from single-cell sorted antibody secreting cells. Once isolated, specific anti-MHC antibodies are useful to areas of research pertaining to MHC typing, characterizing MHC on cell surfaces, and tracking donor-recipient chimerisms post transplantation.

MITIGATION OF HEAT STRESS INJURY ON POTATO BY TARGETED CALCIUM SUPPLEMENTATION

Ryan Chua, Jiwan Palta (Mentor)

Potato is a cool season crop, and high temperature stress is known to drastically reduce plant growth and tuber production. Our study aimed to study possible mitigation of heat stress injury by root zone calcium. Using Biotron controlled environment rooms potatoes were grown at different concentrations of calcium fertilization to examine general plant growth at optimal and elevated temperatures. Results indicate damage to the plant from heat stress can be lessened by certain levels of calcium, and the calcium concentration required for the maintenance of growth increased as compared to normal growing temperatures. The study suggests that calcium supplementation could be used to alleviate heat stress injury to the potato plants.

EVALUATING THE EFFECTS OF ENVIRONMENTAL ESTROGEN INDUCED PROLIFERATION OF HUMAN PROSTATE CELLS

Adetola Coker, Will Ricke (Mentor)

Estrogens have been implicated in the development and maintenance of Benign Prostate Hyperplasia (BPH/LUTs). An emerging field of non-genomic estrogen signaling via G-protein coupled receptor (GPR30/GPER) occurs rapidly in the cytoplasm. When estrogens mediate their effects through GPER30 this can cause transactivation of epidermal growth factor receptor (EGFR). EGFR activation can stimulate various signaling cascades that regulate cell functions such as proliferation and survival. Exogenous estrogens can also bind to ERs to facilitate nongenomic responses. We evaluated the effects of bisphenol A (BPA) exposure on EGFR phosphorylation in human prostate cells. Our results indicate that a physiologically relevant dose of BPA (10 nM) induced GPR30 mediated transactivation of EGFR and its downstream targets, extracellular signal-regulated kinase (ERK), which could contribute to proliferation of prostate cells.

WESTERN BLOT: PROTEIN ASSAY

Olatomiwa Coker, Sathish Kumar (Mentor)

Evaluation of Renin-Angiotensin System Proteins Using Western Blotting: There is a well-established association between protein dysfunction and different pathophysiological conditions including hypertension. In this lab, we examine the properties of blood pressure in mice to help us understand how these diseases might affect the human endocrine system. The aim of the present study is to determine protein levels of important RAS proteins such as angiotensin receptors (AT1R, AT2R) and endothelial nitric oxide synthase (eNOS) in the blood vessels of control and hypertensive rats using western blotting. Western blotting requires transferring proteins on to a membrane in order to see bands produced by the different protein levels. This process allows us to determine the level of the protein used in our research.

LARGE-SCALE AUTOMATIC CLASSIFICATION OF ONLINE ADVERTISEMENTS

Kou Colin, Garvesh Raskutti (Mentor)

Modern approaches to text classification are widely used in the social science research taking advantage of machine learning and the increasing availability of text data. The purpose of this project is to develop an algorithm that can automatically classify political and non-political ads at large scale. We trained a set of classification models with a human-labeled dataset of online ads and compared the performance of these models. Since the classical classification algorithms have some limitations in dealing with large volume of data, parallel computing and dimensionality reduction are needed. Our results will add to the study of text mining in social sciences and be a complement to traditional methods such as keyword matching.

ACCELERATING MULTISLICE STEM SIMULATIONS THROUGH CORRELATION TO CONVOLUTION METHODS

Aidan Combs, Dane Morgan (Mentor)

Most current scanning transmission electron microscopy image simulation methods, including the commonly-used multislice method, require computation times that are too large for use in certain applications in high-resolution materials imaging. Other very high-speed simulation methods, such as the convolution method, are not accurate enough for use in these applications. We present a method that generates a convolution image and then uses a multivariate polynomial fit to a dataset of corresponding multislice and convolution images to correct it. We develop and validate this method using simulated images of Pt and Pt-Mo nanoparticles and find that for these systems, once the polynomial is trained, the method runs about six orders of magnitude faster than the multislice method while achieving root-mean-square error of 8-10% relative to multislice.

PHYLOGENETIC RELATIONSHIP OF CALLIRHOE AND NAPAEA (MALVACEAE) FOR THE EVOLUTION OF SEXUAL SYSTEMS

Jacob Cosby, Melody Sain (Mentor)

I am investigating the relationship between flowering plant species in the genera Callirhoe and Napaea Using the polymerase chain reaction to isolate and sequence the Granule Bound Starch Synthase I gene. I am using statistical analyses of the resulting sequences to build a phylogenetic framework for these species within the Malveae plant tribe. The goal is to determine whether the sexual dimorphism of Napaea, with separate male and female plants, could be partially homologous to the gynodioecious condition of Callirhoe, with male, female, and hermaphroditic plants. Secondly, I will use my data to analyze the nature of Callirhoe scabriuscula. By comparing the genetic diversity of the federally listed endangered, *C. scabriuscula*, with other Callirhoe, in the hopes this will help guide possible conservation efforts.

EFFECT OF CLUSTER SIZE ON STEM CELL-DERIVED ISLET-LIKE CLUSTER (ILC) GENE EXPRESSION AND FUNCTION

Andrew Curran, Sara Sackett (Mentor)

Developing an ideal beta cell replacement therapy for treatment of diabetes that strives towards generating an abundant supply of functional beta cells from human pluripotent stem cells (hPSC) is of critical importance. We are developing novel approaches to improve the stepwise in vitro differentiation of hPSC into more functional ILCs. Preliminary data from analyzing specific ILC populations of differing size ranges suggests that ILC size plays a role in influencing specification and functionality. We are investigating the impact of ILC size by generating size-restricted populations through sequential sieving (100um/300um pores) and then evaluating the gene and protein expression profiles with quantitative PCR and immunohistochemistry, and assessing their functionality through glucose-stimulated insulin secretion assays, to determine what ILC size conditions facilitate optimal endocrine specification and function.

IDENTIFYING THE MOTIVATIONS OF POLITICAL DONORS IN WISCONSIN USING COMPUTATIONAL METHODS

Ross Dahlke, Michael Wagner (Mentor)

Previous research into the motivations of political donors has primarily focused on access-oriented donors-large dollar special-interest actors. However, the 2016 presidential election revealed the power of online, small-dollar donors and their potential to dramatically alter political elections. My research asks the question: What motivates political donors in State Senate and State Assembly races in Wisconsin? My analysis finds a link between candidates discussing certain issues online and donations specific donor communities. However, the statistical creation of donor communities is much more tied to geography than to specific policy issues. More broadly, this finding shows that consideration of geography and the political issues that impact physical communities should play a greater role in the study of political donors and political communications.

ISSUE SALIENCE IN POLITICAL TELEVISION ADVERTISING IN WISCONSIN DURING THE 2016 PRESIDENTIAL ELECTION

Ross Dahlke, Michael Wagner (Mentor)

The 2016 presidential election has seen a large disparity in political television advertisement spending. Bloomberg estimates that Clinton outspent Trump by \$137.4 million on television advertising during the 2016 general election. Many scholars have studied political television advertising, its effects on voters and what influences a campaign's narrative. Moreover, we hypothesize that ongoing campaign events trigger advertising decisions. To test this hypothesis, we use television data to collect all advertisements shown in Milwaukee, WI. Our analysis unites scholarly research with hand-coded data in an effort to determine which issues received saliency in television advertisements throughout the campaign and if campaign news influenced issue saliency in television advertisements. This research hopes to provide insight into categorical trends of issue saliency in the Milwaukee media market.

DISCRETE APPROXIMATIONS TO STOCHASTIC DIFFERENTIAL EQUATIONS

Yuqing Dai, Wai-Tong Fan (Mentor)

Stochastic Differential Equation (SDE) is a prominent tool in modeling system in many applied sciences including biology, physics, and finance. Exact solutions of SDEs are rare, so discrete approximations, discrete processes used to approximate solutions of SDEs, are often employed in numerical analysis (E.g. Euler-Maruyama method) to gain insights about these processes. This paper will focus on stochastic analysis of discrete approximations to SDEs.

IDENTIFICATION OF LIPID PRODUCING STREPTOMYCES STRAINS

Josh Daniels, Charlotte Francoeur (Mentor)

The increasing demand for energy resulted in the search for effective, renewable sources of fuel. Microbial synthesis of high energy lipids is of interest as bacteria produces other valuable bioproducts such as various antibiotics by members of the *Streptomyces* genus. This study explores microbial production of triacylglycerol (TAG) as a potential source of the biofuel precursor. Samples of YEME containing microbial strains belonging to the *Streptomyces* genus and were screened for concentrations of TAG following a 7-day incubation period. In order to quantify TAG, we measured the fluorescence of Nile Red dye added to 100uL of each sample. We discovered variation of lipid quantity after screening around 80 strains. We then performed analysis of fatty-acid synthesizing clusters in the bacterial genomes using ANTISMASH software.

DETERMINING THE ROLE OF ANNEXIN A6 IN CELL MEMBRANE REPAIR

Jenny Day, William Bement (Mentor)

All cells are susceptible to membrane damage, which if left unrepaired, leads to cell death. To cope with damage, cells utilize a calcium-dependent repair system that reseals the plasma membrane and repairs the cortical cytoskeleton. Due to their calcium-dependent, lipid-binding activity, the annexins are potential repair response participants. I therefore hypothesized that annexin A6 plays an active role in the repair response. To test this hypothesis, I investigated A6 function in *Xenopus laevis* oocyte repair using fluorescence imaging and biochemical assays. Consistent with a potential role in repair, GFP A6 was intensely and rapidly recruited to wound sites and addition of exogenous A6 promoted the wounding response.

PAPPAA PROMOTES NEURONAL SURVIVAL BY REGULATING MITOCHONDRIAL FUNCTION

Emily Daykin, Marc Wolman (Mentor)

Development of a successful therapeutic treatment of sensorineural hearing loss hinges on understanding the molecular-genetic factors that regulate hair cell survival. Through characterization of a zebrafish mutant, we identified a novel role for the gene pregnancy associated plasma protein-aa (pappaa) in promoting hair cell survival. We found that pappaa mutant larvae show reduced hair cell survival when exposed to the aminoglycoside neomycin, a hair cell toxin. Pappaa stimulates local insulin-like growth factor-1 (IGF1) signaling. We also found that pappaa mutant hair cells possess dysfunctional mitochondria that produce higher levels of ROS and exhibit hypersensitivity to known mitochondrial toxins. Taken together, our results suggest that pappaa promotes hair cell survival by attenuating mitochondrial ROS production through the IGF1 signaling pathway.

DOES THE EXPERTISE OF THE DEMONSTRATOR AFFECT STRATEGY ADOPTION IN MATHEMATICS?

Nidhi Deepu Rajan, Martha Alibali (Mentor)

When learning mathematics, students often see their peers using different strategies to tackle the same problem, and they may be unsure about whether to adopt those strategies. They may use information about the person demonstrating the strategy to help them decide. Our study tests whether students vary in their adoption of a strategy according to whether the demonstrator is an expert or a non-expert. Students view two different strategies for solving complex mathematical story problems, one from a supposed expert (an Engineering major) and one from a non-expert (an English literature major). We are investigating whether the expertise of the demonstrator influences the likelihood that students adopt the strategy. Findings have implications for understanding peer learning in educational settings.

THE PERSISTANCE OF RITUAL IN FEMINIST CONTEMPORARY ART

Stuart Deets, Shira Brisman (Mentor)

In the postmodern moment, feminist performance artists use the seemingly anachronistic principles of ritual to reveal sources of new knowledge which can only be acquired through the female body, while also undermining assumptions about their bodies. First, I will put forth a definition of ritual and it may be observed in the work of performance artists. Then, I will consider works that belong to this category (in particular Janine Antoni, Ana Mendieta, and Marina Abramovich,) and what their choice of ritual as a device means for their work and for understandings of spirituality in the contemporary art world. Finally, I conclude by discussing the future of ritual and the future of feminist performance art.

USING DUAL IMMUNOTHERAPY CHECKPOINT BLOCKADE TO OPTIMIZE ANTITUMOR EFFECTS IN RESPONSE TO DNA VACCINE IMMUN

Lauren Delmastro, Douglas McNeel (Mentor)

Prostate cancer affects about 1 in 9 men. Prostate cancer antigens (PCAs) make it an ideal target for advanced immunotherapy. DNA vaccines encoding PCAs with artificially high-affinity epitopes leads to more T-cells but also increases the inhibitory checkpoint PD-1 and leads to inferior antitumor effects. Similarly, mini-intronic plasmids induce poor tumor outcomes due to increased LAG3 on T cells. The antitumor effects of each vaccine were restored when combined with either PD-1 or LAG3 blockades. Using HLA-A2-expressing mouse models engineered with PCA-expressing tumors, we examine the in vivo antitumor efficacy of high affinity or MIP PCA expressing plasmids when combined with antibodies blocking PD-1, LAG3, or combined and hypothesize that vaccinations with concurrent blocking of both receptors will further enhance anti-tumor responses.

EXPLORING THE MECHANISMS OF AXON REGENERATION IN THE CENTRAL NERVOUS SYSTEM

Allison Dentice, Bermans Iskandar (Mentor)

I am currently investigating the effect of DNA methylation via folic acid supplementation on axon regeneration in the Central Nervous System(CNS) with the hope of understanding the mechanisms of spinal cord regeneration after injury. Our lab's previous studies show that folic acid supplementation results in increased spinal axon regeneration via DNA methylation. However, after reaching a certain dose of folic acid, the effect decreases back to baseline (i.e. a biphasic curve). We believe the decline is in part due to the Ten Eleven Translocase(TET) enzymes, as they cause the demethylation of DNA. My presentation will discuss our efforts to test levels of TET in spinal cord injured rats, problems encountered, results thus far, and plans for the future.

INVESTIGATION INTO PAR1 INHIBITION IN PANCREATIC CANCER

Mitchell Depke, Dustin Deming (Mentor)

Coagulopathies are a hallmark of pancreatic ductal adenocarcinoma (PDA), wherein PDA cells and the associated micro-environment express increased levels of protease-activated receptor-1 (PAR1). PAR1 is the best characterized of the PAR G-protein-coupled receptor family. Increased PAR1 expression mediates invasion, metastasis formation, and resistance to chemotherapy. In this study we employed patient-derived spheroids cultures, murine PDA spheroid cultures, and KPC mice, to determine if inhibiting PAR1 with vorapaxar enhances the sensitivity of these cancers to gemcitabine, reduces spheroid growth, alters immune cell infiltration, and affects the Rho, ERK1/2, VCAN, and PI3K pathways. A better understanding of PAR1 inhibitors will help us define PAR1 inhibition as part of standard chemotherapy, novel combination regimens with targeted therapies, and potential combinations with immuno-oncology agents.

OBSTRUCTIVE SLEEP APNEA IS ASSOCIATED WITH LOWER MEMORY FUNCTION IN MIDDLE-AGED ADULTS

Brittany Derynda, Barbara Bendlin (Mentor)

The purpose of this study was to assess the effect of OSA on memory, and test whether axonal degeneration is a mechanism for cognitive dysfunction. Apnea hypopnea index (AHI) was determined using polysomnography among 73 cognitively healthy adults. Neuropsychological testing was completed, with a lumbar puncture to determine CSF concentrations of NFL. Memory was assessed with the Rey Auditory Verbal Learning Test (RAVLT). Covariate-adjusted linear regression analyses examined the relationship between AHI and memory performance. There was a significant negative correlation between log transformed AHI and RAVLT trials 1-5 and Long Delay Trial 7 ($p < 0.05$) controlling for age, sex and education. OSA was associated with lower memory performance. Additional studies are needed to determine the neural correlates of cognitive dysfunction in OSA.

IN UTERO AND LACTATIONAL DIOXIN EXPOSURE MAY ALTER INNERVATION OF MOUSE PROSTATE

Tyler Didier, Anne Turco (Mentor)

Exposure to the environmental contaminant, dioxin, during pregnancy and lactation predisposes mice to lower urinary tract dysfunction (LUTD). LUTD is commonly found in men 60 and older, and causes weak urination stream, urgent urination, or difficulty urinating. It is unclear what causes men to develop LUTD earlier in life or with increased severity. At day 13 of pregnancy, mice were given oral dioxin or corn oil. Prostate sections were collected at postnatal day 9 and 50, stained with immunofluorescent markers for epithelial cells (e-cadherin), smooth muscle (ACTA2), and nerves (TUJ1), imaged with a confocal microscope, and quantified for nerve density. We hypothesize tissue exposed to dioxin will have greater nerve density on stromal tissue compared to the control group.

DETERMINING AND VISUALIZING THE VALIDITY OF ATMOSPHERIC REMOTE SENSING DATA

Alexander Diebold, Jonathan Gero (Mentor)

Accurate and efficient quality control (QC) of observational data is critical in experimental science. This project aims to provide thorough, fast, and automated QC of data from the Atmospheric Emitted Radiance Interferometer (AERI), a ground-based instrument developed at UW for remotely sensing meteorological properties of the atmosphere. We use time series analysis and statistical methods, such as outlier detection, power spectral analysis and signal cross correlation to identify suspect data. Each of 25 tests generates a percentage QC score of data validity likelihood, and from these an aggregate QC score is made. A visualization of these scores is used to quickly identify problematic subsystems. Real-time operation of this program allows for quick detection of errors so fixes can be made as soon as possible.

A TRUTH COMMISSION FOR WI? REPAIRING CULTURAL TRAUMA AMONG NATIVE TRIBES

Megan Diermeier, Thomas Dubois (Mentor)

This project explores the parallels between the deculturalization of the WI Indian American tribes and the Indigenous Inuit population in Greenland. By studying the ways in which the dominant state power has inflicted cultural genocide on both peoples, I highlight the need for redress by Denmark and the United States in the form of truth-seeking and reconciliation commissions. The political basis for this redress is provided in Article 8 of the UN Declaration on the Rights of Indigenous Peoples, a consensus document. I use the example of Greenland's Reconciliation Commission (est. 2014) to provide a framework for possible exploratory institutions in WI. Furthermore, I analyze ICWA and Act 31 as forms of redress and ask if they adequately mitigate the cultural trauma experienced by WI tribes. What more can and should be done by the State of WI and the Federal Government to reverse the effects of colonization?

FRESHMEN'S FINSTAS: DO THEY HELP OR HINDER THE HIGH SCHOOL ADJUSTMENT?

Molly Doerr, Leslie Aguirre, Bradford Brown (Mentor)

The rapidly expanding use of social media among high school students over the past decade has generated concerns among adults about teens' Internet activities. One concern involves finstas, or fake Instagram accounts that might be the source of cyber-bullying and exacerbate unhealthy interactions. To learn more about these accounts we interviewed 30 high school freshmen as part of an exploratory study of the role of social media in the transition to high school. Initial analyses reveal that having finstas is not just normal, but expected, especially among adolescent females. Students described these accounts as more private and visible only to a selective group of peers. The nature of the finsta accounts tend to be more authentic and personal compared to adolescents' more public accounts.

THE VALIDITY OF THE QUICK RENAL MRI IN PEDIATRIC KIDNEY DISEASE

Tsewang Dolkar, Thomas Leffler (Mentor)

Acute pyelonephritis is a severe infectious inflammatory disease in the kidney causing renal scarring and can come from bacterial invasion of the renal parenchyma. Children born with or who deal with problems in their urinary tract system are likely to be exposed to acute pyelonephritis. The current diagnosis method for acute pyelonephritis is by a DMSA scan which is very time consuming and can take three hours to complete scans. Our project explores a type of technology that will be better for children and less time consuming. Our project identifies patients who have had acute pyelonephritis, then we test the patient and use both DMSA and Quick MRI scans on the patients so we can compare the results to test for sensitivity and specificity.

INTERFACE BETWEEN BICAUDAL-C AND RNA

Sonam Dolma, Michael Sheets (Mentor)

Bicaudal-C (Bic-C) is a regulatory RNA binding protein essential for embryonic development. Despite Bic-C's biological importance, little is known about the mechanism of how it recognizes and binds its specific mRNA targets. I used biochemical methods to analyze the interface between Bic-C and RNA. I used UV cross-linking to covalently attach Bic-C to its RNA substrate. Cross-linking experiment results show that the formation of a protein-RNA complex is specific to Bic-C and a known target RNA generated from the 3'UTR of the *cripto1* mRNA. My results showed that cross-linking slows down or otherwise alters the trypsinization of Bic-C. Although trypsinization is impacted by cross-linking, the addition of RNA doesn't impact trypsin breaking down protein in both cross-linked samples or samples that have not been cross-linked.

FUNCTIONAL DIVERSIFICATION OF THE ESCRT-III RELATED GENE ISTL8 IN ARABIDOPSIS THALIANA

Isaac Dopp, Kaija Goodman (Mentor)

The Endosomal Sorting Complexes Required for Transport (ESCRT) facilitate the degradative sorting of integral membrane proteins. ESCRT consists of five conserved multimeric protein complexes that sequentially recruit to the endosomal limiting membrane, recognize ubiquitinated cargo, and induce a negative invagination of the endosome, trapping protein cargo into small, intraluminal vesicles. In *Arabidopsis thaliana*, the homologue of the ESCRT-III related protein, Increased Sodium Tolerance 1 (IST1), has undergone multiple duplication events producing a set of 12 paralogous genes, named the IST1-Like (ISTL) gene family. This study will use mutant analysis, microscopy, and molecular biology to understand the role of one ISTL gene, ISTL8. Through a split-ubiquitin yeast-2-hybrid assay, I will test a novel protein interaction between ISTL8 and the exocyst complex.

SOUVENIRS FALL PRINT ISSUE

Sophia Dramm, Jim Rogers (Mentor)

Souvenirs is a collection of travel and multicultural experiences from undergraduates at UW-Madison. We publish a biannual print magazine and maintain a website year-round. Students abroad contribute to online blog posts, while staff members write regular pieces about stories or advice from their times abroad. Our mission is to provide a space for students to share their skills and lessons learned from traveling and to provide readers with quality information while inspiring wanderlust. With an entirely new staff last fall, we rebuilt our brand image and established our publication at UW as a premier source of information for travelers.

ESTIMATING THE PHOSPHORUS BUDGET OF THE LAKE MENDOTA WATERSHED FROM 1992 TO 2012

Kayla Edwards, Eric Booth (Mentor)

A major contributor to long-term water quality problems in lakes - including harmful algae blooms - is phosphorus (P) accumulation in the upstream watershed. Therefore, the accumulation of P was evaluated for the Lake Mendota Watershed improving previous P budgets by Kara and Bennett. New estimates for livestock feed demand used agricultural census data from zip codes that best match the watershed. Feed demand estimates also improved, driven by a change in dairy feed P concentration starting in 2002. Overall the feed imports and agricultural exports were previously underestimated resulting in a higher net accumulation rate in the watershed. Pet food imports and stream export data were also incorporated in the P budget. More recent data shows manure digesters decreased the overall P in the watershed.

BELONGING IN COLLEGE

Mae Edwards, Malika Toguem, Bradford Brown (Mentor)

For most students, adjusting to college life is challenging. For many students of color, attending a Predominantly White Institution (PWI) increases the complexity of challenges as they transition to college. Part of the Peer Relations Study Group, this study explores students' experiences in developing a sense of belonging. Feeling marginalized on campus or lacking a sense of belonging can affect students' academic performance and emotional well-being. Through in-depth interviews, this study considers how underrepresented college students grapple with finding a sense of belonging at a PWI. Preliminary analyses suggest that friendships are integral in providing a foundation and support system with others with similar interests. This research joins a history of studies on college adjustment with a specific focus on underrepresented students in higher education.

LITHIC ARTIFACTS AND SHIFTING ECONOMIES IN EPICLASSIC MEXICO: A STUDY OF OBSIDIAN USE AT CHICOLOAPAN

Emily Eichstedt-Anderson, Sarah Clayton (Mentor)

Obsidian was the most important material for making stone tools in prehispanic Mexico, which were fundamental in ancient people's lives. This project examines the changing use of obsidian by inhabitants of the ancient settlement of Chicoloapan (AD 500-900). Chicoloapan developed during a time of pivotal change. It grew as a powerful state collapsed, which disrupted trade across central Mexico and led to the formation of new networks. Obsidian comes in a variety of colors corresponding to different sources; green obsidian comes from one source, which had been controlled by the state. We examine how access to green obsidian among local households changed in response to the collapse of economic networks. These data advance an understanding of changing economic strategies in the face of political unrest.

RICH DIVIDENDS: THE POLITICAL ECONOMY OF CORPORATIONS IN EDUCATION

Ismail El-Hassan, Kathryn Moeller (Mentor)

Over the past decades, corporations have become increasingly prevalent in the world of education. This study seeks to examine how corporation influence public education. With a focus on technology corporations, the study draws on interview data, document analysis, and scholarly literature to gain a more thorough understanding of the logics and effects of the corporatization of education.

THE EFFECT OF SCHOOL DISTRICT CURRICULUM ON CHILD EXECUTIVE FUNCTION IN MADISON AREA

Johanna Ellefson, Alison Fieldbinder, Edward Hubbard (Mentor)

Executive function (EF) refers to a set of skills that help to focus on relevant information, ignore irrelevant information and maintain critical information in memory. EF helps achieve goals and finish tasks including academically relevant skills such as time management and attention. This study will collect scores on the Minnesota Executive Function Scale (MEFS) in 2nd-6th grade children and will compare those scores to their school district's curriculum. By testing children from multiple school districts surrounding Madison, we hope to correlate their scores on the MEFS test to curriculum taught at these schools and investigate potential effects of different curricula on EF. These findings may give insight into potential problems or benefits of curricula currently in use in Madison area elementary-schools.

LOCALIZED STEM LEARNING WITH LEM

Jonathan Erbe, Brendan Eagan (Mentor)

Education leaders have called for practice-based and place-based STEM learning. One method of meeting this demand is to use Virtual Internships which provide authentic practice- and place-based experiences for students, such as role-playing as urban planners. Unfortunately, it has previously been difficult to provide local or customizable versions of this curriculum. To address this problem, we are building the Local Environmental Modeling (LEM) system to allow users to choose characters, interactive map traits, land-use types, and indicator effects all set in a user's location. Because users make land-use decisions about their own city, they may have an increased sense of ownership and familiarity which may encourage engagement and learning. Therefore, LEM can provide localized and customized STEM curricula that are accessible in one user-friendly application.

BAYESIAN GENERALIZATION IN EMOJIS

Jacqueline Erens, Joe Austerweil (Mentor)

We explore how attributes and relations contribute to reasoning under uncertainty for stimuli commonly seen in online communication - emojis. We used the Bayesian Generalization Framework to model how people generalize a novel property across stimuli when shown triplets of emojis sharing either a common relation, common attribute, both, or neither. We then conducted a behavioral experiment investigating the strength of attributes and relations when generalizing. In three of four conditions, participants and the model learned the relevant dimensions to use when generalizing after viewing three training triplets. However, for triplets with both a common attribute and relation the model gave more weight to common attributes than participants did. This suggests people are strongly, but not completely, biased towards using relations when reasoning about emojis.

EFFECTS OF MANAGEMENT STRATEGIES ON MICROBIAL COMMUNITIES IN WISCONSIN POTATO FIELDS

Alissa Erickson, Richard Lankau (Mentor)

Microbiota in soil communities, such as bacteria and fungi, add to the multi-functionality of biologically healthy soil, and specifically aid in crop growth and disease suppression. In the scope of our study, we know that broad-scale and fine-scale microbial diversity are associated with higher tuber yield and suppression of common scab disease respectively. Further, microbial communities in potato fields across Wisconsin vary depending on the differing management strategies of potato growers and the geographical location of the surveyed fields. For this study, 40 soil and root samples from 14 growers were collected, DNA extractions and PCR reactions were performed for both fungal and bacterial sequencing. Studying the effect that management practices have on microbial communities can lead to more sustainable management strategies.

EXPLORING SURGERY RESIDENTS' SELF-REGULATED LEARNING PROCESSES IN AN ONLINE ENVIRONMENT

Gabrielle Every, Sarah Sullivan (Mentor)

Advances in educational technology become exceedingly beneficial to medical residents if used in the most effective way. In the early 2000s, the Surgical Council on Resident Education (SCORE) developed a competency-based curriculum and an online portal for surgery residency programs across the nation to subscribe to. However, little research has been done to study factors that lead to the most effective learning in this environment. In our study, we aim to categorize different approaches to learning from the portal, and develop a predictive model of learning. By comparing data from surveys and think-aloud interviews to an assessment of learning, we will characterize residents' use of the SCORE portal. From this information, we will be able to suggest learning strategies that lead to better learning outcomes.

HOW DRAWING PROMPTS CAN HELP STUDENTS ENHANCE THEIR DRAWING OF VISUAL REPRESENTATIONS IN CHEMISTRY

Roman Fabry, Sally Wu (Mentor)

Many undergraduates taking chemistry courses struggle to learn visual representations of atoms. To address this issue, students worked with a technology, Chem Tutor, in two sessions one week apart, to draw different representations of atoms. These students were randomly assigned to receive one of three drawing prompts: a generic prompt to simply draw an atom, a focus prompt to include certain aspects of an atom in their drawing, and a compare prompt to compare their drawings to visual representations of an atom. Across the three prompts, we coded students' drawings for accuracy and expect to find an improvement in drawing accuracy for students who received the specific prompt. These findings will offer insight into how specific drawing prompts can enhance learning in chemistry.

THE EFFECT OF NON-STEROIDAL ANTI-INFLAMMATORY DRUG USE ON NEUTROPHIL EXTRACELLULAR TRAP FORMATION

Lauren Fahmy, Miriam Shelef (Mentor)

Rheumatoid arthritis is an inflammatory autoimmune disease that most commonly affects the joints. Neutrophil extracellular traps (NETs) may contribute to disease pathogenesis by displaying autoantigens that are targets for pathogenic autoantibodies. Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used to reduce inflammation and pain in rheumatoid arthritis. NSAIDs increase NETosis in vitro, but it is not known if NSAIDs induce NETosis in vivo. Therefore, the present study determined if NSAID use correlates with NET frequency in rheumatoid arthritis patients and healthy controls. No difference in NET frequency was found between NSAID users and non-users in rheumatoid arthritis patients or controls. These results suggest that although NSAIDs can drive NETosis in vitro, typical in vivo NSAID use does not significantly alter NETosis.

THE CHANGES IN HOST-MICROBE METABOLOME DURING HIBERNATION

Madelyn Falk, Fariba Assadi-Porter (Mentor)

By studying the hibernation of ground squirrels, this study will investigate symbiotic metabolic relationships between microbiota and the host in extreme conditions; during summer with high nutrient availability and hibernation due to long-term starvation. I hypothesize that gut microbiota produce different amounts and species of small molecules (metabolites) in summer vs. hibernation that are used by, and affect the physiology of, the host. NMR spectroscopy and ¹³C-substrate isotopic tracers will be used to measure and identify microbiota metabolites. This will allow me to identify metabolic changes induced by microbiota, which may affect host's metabolism and survival during hibernation. This study will deliver insight into biochemical switches and microbiota metabolism during hibernation and how this may be applicable to the future.

HYBRID METHODS FOR WELL-MIXED COUPLED CHEMICAL REACTION SYSTEMS

Liancheng Fang, Wai-Tong Fan (Mentor)

This project investigates the trade-off between the accuracy and the computational time of deterministic and stochastic approaches. We propose and analyze a rigorous hybrid method for the simulations of coupled chemical reaction systems.

INFORMATICS SKUNKWORKS: PEROVSKITE STABILITY

Ebenezer Fanibi, Benjamin Afflerbach (Mentor)

Our study focuses on determining the stability of perovskite materials, a commonly found subset of metals. Perovskites are useful for many applications, including fuel cells and solar power. Determining the stabilities of a wide composition range of materials is an expensive and time-consuming process. Our research team utilizes developments in Machine Learning to systematically search a wide range of compositions of these materials and predict their stabilities. In our research, we have looked a variety of machine learning models and analyzed their accuracy of predicting material stability. We hope to determine which compositions are most promising for experimental groups to synthesize. In doing this research, we have gained knowledge into how informatics can work with science and engineering.

THE ROBUSTNESS OF EPISTEMIC NETWORK ANALYSIS TO AUTOMATED CODING ERRORS

Cayley Farrell, Maria Sanchez, Vanessa Wu, Brendan Eagan (Mentor)

In today's world, individuals have moved away from coding written communication data by hand and instead, have developed automated coding processes. Although this greatly speeds up analysis time, it allows for potential coding errors to occur. One analysis technique that can utilize this type of coded discourse data is Epistemic Network Analysis (ENA), which identifies, quantifies, and visualizes the connections among data in an easily interpretable way. Since there is a possibility that ENA will encounter coding mistakes, it is necessary for us to understand how robust ENA is to small amounts of error. Thus, we took a data set that we were familiar with, introduced different amounts of errors, and analyzed how the results of our ENA models were affected by the inaccuracies.

QUANTIFYING PANCREATIC LIPID CONTENT: CORRELATION WITH MARKERS USED IN ASSESSING TRANSPLANTABILITY

Austin Feeney, Sara Sackett (Mentor)

To characterize the transplantability of donor pancreata, several clinical parameters are assessed. Although increased age and BMI correlate with poor outcomes, leading to many pancreata not being recovered, these parameters may not directly correlate to visual pancreata quality and fat content (%FC). We sought to determine how BMI and other parameters correlate with %FC. The %FC of 29 pancreata was quantified using the Folch method. When all pancreata were analyzed for %FC versus BMI, we found no correlation. After stratifying by sex, %FC and age were significantly positively correlated for the male subgroup only. Currently, BMI is used as a marker for healthy pancreata; however, it does not correlate with %FC, which could ultimately serve as a more objective marker of organ quality.

DEVELOPMENT OF BROAD-SPECTRUM PEPTIDOMIMETIC INHIBITORS OF PARAMYXOVIRAL FUSION

Brian Ferrer, Victor Outlaw (Mentor)

Paramyxoviruses are responsible for numerous human illnesses including human parainfluenza, lower respiratory infections, and fatal encephalitis. Viral pathogenesis of this family is highly dependent on class I-viral fusion, which is mediated by fusion (F) proteins. F proteins contain a C-terminal heptad repeat (CHR) anchored to the viral envelope and an N-terminal heptad repeat (NHR) that extends and inserts into the host cell membrane. The two heptad repeats fuse together and form a 6-helix bundle (6HB), which merges the virus and host cells. 6HB formation can be blocked by peptidomimetics that functionally and structurally mimic segments of the CHR. Using cyclic beta amino acids and stapled peptides to decrease proteolysis, we have synthesized novel peptidomimetic inhibitors as potential antiviral therapeutics.

POLICIES SURROUNDING FATHER INVOLVEMENT IN CHILDREN'S EDUCATION

Paige Fisher, Janean Dilworth-Bart (Mentor)

Past research has found that positive parental involvement is related to positive educational outcomes across a variety of grade levels. Due to lack of research, father involvement regarding education is unknown and specifically, Black father involvement. The purpose of this study is to compare current policies and programs supporting father involvement in the school system and how fathers want to be engaged by schools. A thematic content analysis of semi-structured interviews with 30 Black fathers and father-figures from Dane County with at least one school-aged child was conducted. This poster will summarize common themes of the interviews and analyze the parental engagement efforts done by the programs Head Start, Project CARE, and Early Training Project.

EFFECTS OF HERBIVORY AND WILDFIRE ON STABILITY OF POST-FIRE DECIDUOUS STANDS IN INTERIOR ALASKA

Ryan Fitzsimmons, Winslow Hansen (Mentor)

Alaskan boreal forests are experiencing warming at twice the rate of the global average, increasing the frequency and severity of wildfires. The increasingly severe fires are initiating profound change in post-fire tree species composition as pre-fire stands dominated by black spruce transition to aspen dominance post-fire. We conducted a factorial simulation experiment to ask: Under what combinations of herbivory and fire, will early successional deciduous stands transition back to spruce dominance or non-forested states? Preliminary results suggest stands will eventually transition back to spruce dominance, without any subsequent disturbances after 200 years. The persistence of spruce dominance on the Alaskan landscape may offer a glimpse at the resilience of forested ecosystems around the globe.

DISTAL SOCIODEMOGRAPHIC IMPACTS ON INFANT TEMPERAMENT

Ashley Ford, Bailey Immel, Hill Goldsmith (Mentor)

Maternal socioeconomic factors may impact the temperament of their infants. Using data from a longitudinal study on infants (N=149) and their mothers, sociodemographic factors of family income, mother's age, and mother's education were correlated with the infant temperament. The infant's temperament was measured through both behavioral observations and maternal perceptions measured via questionnaires about infant. Preliminary results suggest that older mothers have infants who are less emotionally positive according to both observations and maternal report. Also, mothers who attained more education had infants who showed lower sensitivity to their situational context and less wariness of strangers. Explaining the processes that might lead to these associations of distal socioeconomic factors and infant behavior is the next task in this research.

MICROSTRUCTURE AND FORMATION OF OIDS

Matthew Frazier, Pupa Gilbert (Mentor)

Ooids are spherical carbonate (CaCO_3) structures formed in shallow, high-energy ocean environments, found in sediments throughout the geologic record and into the present. Though they have been extensively studied, their formation mechanism is unknown. Through a study of their microstructure, I have shown the essential characteristics of ooid formation and suggest a model for their growth. Essential to this study was development of a novel optical microscopy technique for imaging crystal orientation in carbonate crystals and a MATLAB program for analysis of crystal orientation data. This program analyzes crystal orientation data, in 2D images, segments the image into grains, or crystallites, produces orientation angle distribution data, and measures jaggedicity at grain boundaries, a measure of the size of constituent particles from which grains were formed.

WORD ORDER OF SUBORDINATE CLAUSES IN MENOMINEE

Allison Fujimoto, Monica Macaulay (Mentor)

This project looks at the word order of subordinate clauses in the endangered Algonquian language Menominee. While work has been done on main clause structure of Menominee, there has been little investigation into subordinate clauses. Data was collected by analyzing a corpus of 35 texts from Leonard Bloomfield's 1928 Menomini Texts. The data was then coded and sorted by type of subordinate clause and word order. Preliminary findings show, among other things, that subordinate clauses consistently take only one argument before the verb. Main clauses are not as limited, and can contain up to three arguments before the verb. In addition, conjunct order clauses that are subordinate to independent order clauses do not show a preference for the argument coming before or after the verb.

USING BIO-ELECTRODE IMPEDANCE ANALYSIS TO DETECT FLUID OVERFLOW IN HEALTHY WOMEN IN GUATEMALA

Isabelle Gallagher, Devika Suri (Mentor)

Maternal health is particularly vulnerable in low-resource settings. Body composition is an anthropometric measurement that can be a strong indicator of overall maternal health status. Bio-electrode impedance analysis (BIA) is a non-invasive, portable instrument that allows for fast and accurate measurements of body composition in a healthy population. However, the validation of BIA detecting fluid overload is still unknown. This project, led by the Center for Studies of Sensory Impairment, Aging, and Metabolism (CeSSIAM), recruited healthy female volunteers in Quetzaltenango, Guatemala to perform an exploratory body composition analysis. Upon consumption of two liters of water, BIA was able to detect a significant increase in total body and extracellular water in the volunteers. Implications of this study will advance maternal health interventions and investigations.

SLEEP QUALITY, INFLAMMATION AND BLOOD SUGAR REGULATION IN JAPAN AND THE U.S.

Natalie Galles, Christopher Coe (Mentor)

The current analyses investigated the influence of self-reported sleep quality (PSQI Global Sleep Score) on inflammatory physiology (CRP, IL6), and glycosylated hemoglobin (HA1c) in Japan and America. We hypothesized that poor overall sleep would increase CRP, IL6, and HA1c in both countries, potentially with varying strength and clinical significance. Linear regression analyses were used to compare Caucasian- and African-American participants from the Midlife in the US project (MIDUS, n=1200) to adult Tokyo residents in the Midlife in Japan project (MIDJA, n=382). Controlling for participant age, sex, and BMI, preliminary analyses indicate self-rated sleep quality predicts HA1c, but not CRP nor IL6, in American populations. In keeping with other reports, Japanese adults appeared healthier, and these physiological indices were not as strongly affected by sleeping behavior.

AGE-RELATED CHANGES IN MIDDLE CEREBRAL ARTERY PULSATILITY INDEX

Samuel Gallo, Jill Barnes (Mentor)

High pulsatility of the blood flow in the cerebral arteries is implicated in the progression of Alzheimer's disease and other types of dementia; however, the age-related changes of cerebral pulsatility is unknown. This study sought to determine the relationship between age and cerebral pulsatility index (PI) of the middle cerebral artery (MCA) at rest and during a vasodilatory stimulus. We compared cerebral PI between healthy young adults (20 - 34 y) and healthy older adults (50 - 69 y) who were physically active. All participants underwent an MRI scan to evaluate MCA PI at rest and during hypercapnia. We hypothesized that older adults would have a higher MCA PI at rest and during hypercapnia compared with younger adults.

WHY FEMINIST PEDAGOGY MATTERS IN THE SOCIAL JUSTICE ORIENTED WRITING CENTER

Jesus Galvan, Catherine Marotta (Mentor)

It is evident that the Writing Center's ongoing trainings of instructors and undergraduate tutors reflect values of social justice education, but it could also be argued that feminist pedagogy is implicitly reflected in current practice. With this in mind, original research was conducted to assess how Writing Center personnel practically and hypothetically put their social justice oriented training into practice through their interactions with students. It was found that Writing Center personnel, in instances of offensive language and/or biases manifested through student writing, must quickly decide whether they should address the issue or let it go. This will ultimately inform writing tutors of a potentially useful way to explain unequal power dynamics in one-on-one interactions, and to further promote peer collaboration among diverse student populations.

IDENTIFYING POTENTIAL RISK FACTORS OF CHILDHOOD OBESITY THROUGH AGE SIX

James Gannon, Pamela Kling (Mentor)

Background: It has been proposed that the developmental origins of adult metabolic diseases begin early in life, perhaps explaining the mechanisms behind why obese children are at greater risk than children of healthy weight to become obese adults. Recent data indicate potential early life risk factors (RF) for obesity and even suggest these RF have an additive impact. Methods: RF were analyzed retrospectively using a cohort of 316 mother-infant pairs prospectively collected for iron deficiency anemia. Results: Various RF during both gestation and at time of delivery were correlated with accelerated child weight gain by 12 months of age. We anticipate this trend to persist through six years of age. Conclusion: The early gestational and neonatal environment may be critical to one's long-term metabolic health.

GLITCHED: EXPLORING AVENUES FOR EDITING OF DIGITAL MEDIA

Hayley Ganslaw, Julie Ganser (Mentor)

Glitched works to edit photographs by purposefully corrupting image files in order to turn them into multicolor, pixilated visuals. This project was started as a way to recreate an effect that occurred when an image was accidentally corrupted in a way that created something very visually engaging. A process converting image files to a format that can be opened in sound editing software was able to recreate the effect. The sound wave that results from this image is altered using a variety of effects and is then converted back to an image file. Through this process, visual and audio data are combined in a way that references the nature of digital technology and leads viewers to acknowledge the influence of digital means across mediums.

INDUCTION AND SCREEN OF MATERNAL EFFECT MUTATIONS IN ZEBRAFISH

Clara Garcia, Francisco Pelegri (Mentor)

Maternal RNAs are essential for normal development during embryogenesis. Past research has shown that the depletion of maternal factors can impact cellular division, left-right patterning, and other cellular activities. In order to identify novel maternal effect mutations in zebrafish, our lab uses a forward genetic approach that harnesses the power of gynogenesis in zebrafish. We induce mutations with a chemical mutagen, ENU. With early pressure, we create homozygous mutants in one generation by inhibiting meiosis. Currently, we are screening embryos for mutations. We have identified two new maternal effect mutations as well as adult mutations in pigment. This suggests that a gynogenesis screen can be used to identify adult mutations in conjunction with the identification of maternal effect mutations.

USING SIMULATIONS TO IMPROVE RADIO TELESCOPE DESIGN FOR 21 CM TOMOGRAPHY

Kevin Gayley, Celeste Keith, Peter Timbie (Mentor)

Radio astronomy allows us to probe celestial bodies at long wavelengths. Neutral hydrogen gas radiates at a wavelength of 21 cm thanks to the so-called spin flip transition, lending it a unique spectral signature that is easy to detect and map. We created simulations of radio dishes for two large telescopes: the Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX) in South Africa and the Tianlai Pathfinder Project in China. Utilizing a program called Computer Simulation Technology, we simulated several important parameters. Accurately simulating telescope response patterns will allow for more informed design choices as well as deeper understanding of systematic effects. We have found that our results match well with the simulations of other groups, as well as preliminary data from the real telescopes.

IS TIMING EVERYTHING?: THE ROLE OF TIME AND INTENSITY IN SUCCESSFUL THIRD-PARTY INTERVENTIONS

Jason Geissler, Andrew Kydd (Mentor)

This research seeks to understand how the successes and failures of third-party interventions to stop violence in intrastate conflicts relate to how long into the conflict the intervention takes place and how intense the fighting is at the time of intervention. Timing of third-party interventions has been increasingly identified as an important variable in conflict duration analysis. This research takes a trusted approach using robust data to analyze several specific intervention strategies by estimating three Cox duration models to evaluate the efficacy of these intervention strategies in ending violent conflict considering the timing of intervention.

AN EXPLORATION OF THE CORRELATION BETWEEN FICTION EXPOSURE AND THEORY OF MIND

Natalie Ghaffari-Nikou, Maryellen MacDonald (Mentor)

Fiction invites us to experience and adopt the cognitive states of complicated and unpredictable characters. Researchers have hypothesized that this experience interpreting others' emotional states while reading fiction can improve people's Theory of Mind (ToM), the ability to conceptualize another's mental state in the real world. The present study investigates this claim by using a literature exposure measure, called the Author Recognition Test (ART), and ToM measure, the Geneva Emotion Recognition Test (GERT). 108 UW-Madison undergraduates participated. Results showed a positive nonsignificant correlation between exposure to literature and ToM, such that higher literature exposure (ART scores) were associated with better ToM (higher GERT scores) ($p < .07$). These results suggest that a correlation may exist between literature exposure and ToM, necessitating more research.

PRELIMINARY ANALYSIS OF INTIMATE PARTNER VIOLENCE AND RELATIONSHIPS OF MIGRANT WOMEN IN THAILAND

Kate Giguere, Stephanie Koning (Mentor)

Myanmar's turbulent political past and current military rule has left hundreds of thousands of ethnic minorities displaced. Many people affected or threatened by land confiscation and/or violence flee to neighboring countries. We are investigating the possible association between the degree of volition a mother had in her migration and intimate partner violence (IPV). From this preliminary analysis, the volition of migration is associated with partner relationships in complicated, unclear ways. More research must be done to determine to what extent and how the volition of migrancy is associated with IPV.

NEGATIVE IMPACTS OF INVASIVE ZEBRA MUSSELS ON NATIVE MUSSELS: MADISON LAKES' NEXT EXTIRPATION?

Alyssa Ginther, Vince Butitta (Mentor)

Native mussels play a critical role in ecosystem functioning and maintaining water quality. Currently, only 30% of native mussel populations are considered stable; habitat degradation, flow management, and invasive species such as the zebra mussel have been the primary drivers of population declines. Invasive zebra mussels which attach to the shells of native mussels, recently invaded the Yahara lakes watershed (Dane Co, WI) in 2015. To monitor the health impacts of the zebra mussels on native populations, we sampled glycogen levels from native mussels possessing varying loads of zebra mussel fouling from four local lakes. Preliminary data suggests native mussels with more attached zebra mussels produce less glycogen, indicating lower energy reserves and poorer health condition.

RECIPE 4 SUCCESS

Jessica Gomez, Robert Nix (Mentor)

Children growing up in poverty have lower self-regulation skills, which puts them at risk for academic failure and obesity. This study evaluates a program, Recipe 4 Success, which teaches Early Head Start parents to scaffold their children during snack prep lessons. The research question is whether parents can apply skills learned from the program to a different context (playing games with their children). Families are recorded in a semi-structured play interaction before and after the intervention and research assistants code parents' scaffolding behaviors. In the pilot study, parents who participated in the intervention showed more sensitivity in scaffolding in two of the three tasks. These results demonstrate that the program has positive benefits for parents' scaffolding, which can influence the child's health and education.

OUTCOME EXPECTANCY'S INFLUENCE ON RESULTS FOLLOWING A SYMPTOM MANAGEMENT INTERVENTION FOR CANCER

Michael Gonzales, Kristine Kwekkeboom (Mentor)

Expectancy, one's belief that a treatment will or will not work, is thought to exert a powerful effect on health outcomes. This study will determine if outcome expectancy moderates the effect of a cognitive-behavioral (CB) symptom management intervention on global impressions of symptom change, and if subsequent satisfaction with symptom management is mediated by outcome expectancy. A secondary analysis will be conducted using data from a randomized controlled trial of a brief CB intervention for the pain, fatigue, and sleep disturbance symptom cluster in patients receiving chemotherapy for advanced cancer. Mediating and moderating relationships will be analyzed using regression. Results will be discussed with respect to implications for nurses in providing patient education about symptom management, and communicating accurate, realistic expectations for relief.

T-CELL RECEPTOR REPERTOIRE OF DECIDUAL MUCOSAL-ASSOCIATED INVARIANT T-CELLS

Madhu Gowda, Aleks Stanic-Kostic (Mentor)

Mucosal-associated invariant T (MAIT) cells are a recently discovered subset of T-cells involved in microbial defense. They recognize the microbial metabolites of vitamin B in complex with antigen-presenting molecule MR1. As the maternal-fetal interface is now understood to contain microbial species, the role of MAIT cells in maintenance of pregnancy is under investigation. MAIT antigen reactivity is determined by their unusual T-cell receptor (TCR) repertoire, which is currently undefined at the maternal-fetal interface. We will determine the unique TCR repertoire of decidual (pregnancy endometrium) MAIT cells. MAIT cell RNA will be extracted and the variable CDR3 region sequenced from periphery and decidua. We expect the CDR3 sequenced diversity to be unique in the decidua and may lead to important clinical diagnostics in pregnancy.

EXPLORATORY DECISION-MAKING IN EARLY ADOLESCENCE

Anna Grassy, Seth Pollak (Mentor)

When adolescents make decisions, they often must decide whether to explore their environments (gather new information to extend potential future choices) or exploit what they know to be good choices. Since adolescents may benefit in the long-term from using novel information, we predict that exploration during early adolescence will be related to reward seeking. To test this hypothesis, participants ($n = 24$) completed computer tasks to gauge exploration tendencies and completed questionnaires to measure behavioral activation (approaching a reward) and behavioral inhibition (avoiding something unpleasant). Data show a positive correlation between exploration and behavioral activation, $r = .405$, $p < .09$, as well as behavioral inhibition, $r = .408$, $p < .09$. Results suggest that adolescents with higher exploration tendencies are more sensitive to both rewards and to aversive experiences.

BROODING AS AN INTERMEDIATE STEP BETWEEN CHILDHOOD ANXIETY AND ADOLESCENT DEPRESSION

Daniella Greenfield, Hill Goldsmith (Mentor)

We examined brooding (i.e., repetitive thoughts about one's problems and their consequences) during early adolescence as a moderator of the link between childhood anxiety and subsequent depressive symptoms in a longitudinal sample of 596 participants. Neither self-reported nor mother-reported overanxiousness or separation anxiety during childhood predicted adolescent depression. However, overanxiousness predicted brooding ($\hat{I}^2 = .101$, $p < .05$), and brooding predicted depressive symptoms ($\hat{I}^2 = .274$, $p < .01$). Additionally, we found that using a ratio of brooding to distraction (i.e., turning one's attention away from one's depressive symptoms) was predictive of depressive symptoms ($\hat{I}^2 = .283$, $p < .01$). The indirect pathway between childhood anxiety and adolescent depression via brooding during early adolescence suggests possible intervention targets.

HIP-HOP THROUGH THE LENS OF THE MADISON NEWS MEDIA

Aiyana Groh, Iffat Bhuiyan, Jen Holland, Mari Verbeten, Randy Stoecker (Mentor)

At the request of local non-profit Urban Community Arts Network (UCAN), undergraduate students at University of Wisconsin-Madison's Department of Community and Environmental Sociology analyzed newspaper articles to understand local media portrayals of Hip-Hop. We collected and analyzed 354 newspaper articles for a variety of characteristics, ranging from location of content, to race of individual or groups in the article, to overall attitude of the author towards Hip-Hop. These findings indicate a potential bias in the way Hip-Hop articles are written in the Madison print media, though there is variation by publication. These biases support the dominant narrative of the racialized violent reputation Hip-Hop has in Madison.

INVESTIGATING THE IMPACT OF OXIDATIVE STRESS ON AGE-RELATED RETINAL PHENOTYPES AND NEURODEGENERATION

Nathan Gruenke, Erica Macke (Mentor)

Oxidative stress and inflammation play a major role in the progression of aging. The small kinky tail mouse (skt) exhibits age-dependent retinal abnormalities and neurodegeneration at 8 weeks of age. Prior to this, skt mutants exhibit an increase in inflammation at 4 weeks of age. This suggests that inflammation and oxidative stress drive aging in skt mice. To investigate whether oxidative stress is the primary defect, an antioxidant, N-Acetyl-L-Cysteine (NAC), was administered to skt mice. The treated mutants exhibit a significant increase in total and activated microglia in the brain and retina compared to non-treated mutant controls at all time points. These results suggest that a surplus of NAC plays a role in the activation of microglia along with cell differentiation during development.

CHARACTERIZATION OF UNIFORMITY OF MOCU BILAYERS USED FOR SUPERCONDUCTING X-RAY DETECTORS

Rachel Gruenke, Dan McCammon (Mentor)

Our group develops thin-film superconducting detectors called Transition Edge Sensors (TES) for high resolution x-ray spectroscopy. To ensure that all devices are patterned similarly, the deposition and milling processes must maintain uniformity in device thickness, roughness, resistivity, and purity. Therefore, this project checked test wafer uniformity in four ways: (i) measuring Cu resistivity as a proxy for thickness, (ii) scanning step heights for Cu and Mo films, (iii) analyzing the roughness of the bilayers, and (iv) dip-testing samples to find the residual-resistance ratio (RRR) of the Mo and Cu as a proxy for transition temperature and purity, respectively. From this data, we could determine that the entire wafer was uniform to a standard that would allow every device to work properly.

EVALUATION OF ACADEMIC AND CAREER PLANNING

Yuhe Gu, Chenli Wang, Robin Worth (Mentor)

Academic and Career Planning (ACP) is an ongoing process developed by the Wisconsin Department of Public Instruction to prepare students in grades six to twelve to make informed decisions about postsecondary education and career options. The evaluation project is designed to account for variations in implementation across Wisconsin school districts and to provide a deep understanding of the strengths and limitations of ACP for improvement. The evaluation utilizes a mixed-methods design with quantitative and qualitative measures to determine the how schools implement ACP based on the presence of infrastructural elements. Quantitative measures employ an analysis of survey responses demonstrating school or district leaders' perspectives on implementation of ACP. Qualitative measures involve collecting ACP relevant information from school websites and conducting case studies of selected districts.

TWO SIDES OF THE SAME COIN: WRITING TUTOR STYLES AT UNIVERSITY OF WISCONSIN–MADISON

Erin Guarnieri, Emily Hall (Mentor)

Can a writing tutor, who knows little about class content, effectively help a student with their writing? This is what I set out to explore by interviewing content-specific and generalist tutors' approach, style, and troubleshooting at UW Madison. I found that there are many content gaps on both sides and that an effective tutor is not defined by their content knowledge. My research is significant because students perceive certain tutors to be more competent and a change in advertising can attract a wider range of students with generalist tutoring. In addition, universities that can not afford to have both types of tutoring centers should feel more at ease that they are still providing students with strong writing resources when they have generalist tutors.

EVIDENCE FOR A SYNERGISTIC RELATIONSHIP BETWEEN G. VAGINALIS AND N. GONORRHOEAE

Miriam Guevara, Joseph Dillard (Mentor)

Bacterial vaginosis (BV) is a vaginal disorder where *Gardnerella vaginalis* (GV) is the main colonizer and gonorrhea is a sexually transmitted infection caused by *Neisseria gonorrhoeae* (GC). Clinical studies show that women with BV are more likely to acquire gonorrhea and vice versa. We hypothesize that GV and GC are involved in a synergistic relationship. This project has shown that GV grows significantly better when co-cultured with GC. Growth of GC was not affected. We also concluded that the bacteria do not need to be in physical contact for this to occur and the synergy requires live bacteria. These results provide evidence that GV and GC have a synergistic relationship which may be the reason for increased risk of acquisition of BV and gonorrhea.

ANALYSIS OF STIMULATORY FACTORS THAT DRIVE DEVELOPMENT OF NEUTROPHIL-DENDRITIC CELLS

Michael Gui, Bruce Klein (Mentor)

Neutrophils, mediators of the innate immune response, are typically considered short-lived and terminally differentiated leukocytes. However, recent literature suggests certain neutrophils differentiate further and become long-lasting cells that express dendritic cell surface markers. These neutrophil-dendritic cell hybrids (PMN-DCs) have the properties of neutrophils and dendritic cells, providing the capacity to contribute in both the innate and adaptive immune response. However, the origin and function of these neutrophil derived hybrid cells remains poorly understood. Previous studies using murine neutrophils and feeder cells producing unknown signals have implicated granulocyte macrophage colony-stimulating factor (GM-CSF) as the primary determinant of neutrophil differentiation. By using a HoxB8 neutrophil cell line, this study will determine the signals that induce neutrophil differentiation without feeder cell interference.

RESTORING EXPRESSION OF MHC PROTEINS IN PROSTATE CANCER VIA EPIGENETIC MODIFICATIONS

Harshitha Gungurthi, Aaron Strauch, Erika Heninger (Mentor)

In the U.S., prostate cancer (PC) persists as one of the most lethal cancer forms among men, affecting on average one in nine men. PC cells have been found to be able to evade the immune system via the suppression of genes responsible for cells' expression of certain major histocompatibility complex (MHC I) proteins, which function to present antigens that alert the immune system to a threat. Using a LNCaP cell line to approximate human solid tumor PC growth, we have been administering epigenetic modifying agents (EMAs), such as hypomethylating agent SGI-110 and histone deacetylase LBH-589 and SNDX-275, in varying concentrations and in conjunction with one another in attempts restore the expression, analyzed by means of real time qPCR, of MHC I in cells.

FINE MOTOR AND SPATIAL SKILLS IN YOUNG CHILDREN

Samuel Halama, Karl Rosengren (Mentor)

This study investigates the relationship of young children's spatial reasoning and fine motor ability. A novel mental paper folding task is being developed to assess spatial reasoning in children ages 3.5- to 8-years-old. Children will be assessed on their fine motor ability using a series of folding tasks. Currently, the mental paper folding task is being piloted on an adult sample to ensure the measure's functionality. Shortly, children will be recruited at the Madison Children's Museum to participate in the study. We expect to find a positive correlation between fine motor and spatial abilities. This finding would demonstrate a connection between cognitive and motor processes potentially providing motivation for implementing a fine motor intervention to improve spatial reasoning in younger children.

PGFM PROFILES IN THE SECOND MONTH (D 39-53) OF BOVINE PREGNANCY

Caleb Hamm, Milo Wiltbank (Mentor)

Pregnancy maintains the corpus luteum (CL) by secreting interferon-tau during month one (ruminants) but through undefined processes during month two. During month one, pulses of oxytocin induce pulses of prostaglandin F₂I₂ (PGF) from non-pregnant uterus inducing CL regression and these are suppressed in pregnant cows. This study evaluated whether PGF pulses were suppressed in pregnant cows during month two. Blood was collected bi-hourly for 56 hours in pregnant cows (Days 39–56) that received three pulses of oxytocin (n=4) or saline (n=6). Surprisingly, PGF pulses occurred in both controls (5/6) and treated (3/4) cows with greater peak concentrations (P<0.05, 72.6 vs 99.1 pg/ml) and peak amplitude (P<0.10) in treated cows. Thus, PGF secretion is not suppressed during second month of pregnancy and another process maintains CL.

THE PATIO TOMATO PROJECT

Caroline Hanson, Jeri Barak-Cunningham (Mentor)

In the Madison School District alone, 50% of students qualify for free/reduced lunches. Over the summer months, these supplemented meals are less available, and the budgets of these children's families drastically limit the amount of unprocessed foods that can be purchased. To combat this, I partnered with The River Food Pantry to host workshops that distributed fully matured, potted tomato plants into the community. Container gardening requires less maintenance than community gardens while producing high yields. The workshops included demonstrations on how to care for potted tomato plants, recipes for affordable dinners featuring fresh tomatoes, and gardening-oriented crafts for children. The goal of these workshops was to introduce and excite the community towards container gardening as a low-input method of urban agriculture.

SUPPRESSORS OF ADH2 MUTATION IN ARABIDOPSIS

Caroline Hanson, Hiroshi Maeda (Mentor)

Tyrosine is an amino acid synthesized in plants through a regulated biochemical pathway known as the Shikimate Pathway. Knockout of the last step enzyme, arogenate dehydrogenase (ADH), leads to slowed growth with yellowing, reticulate leaves in *Arabidopsis thaliana*. Chemically-induced random mutations have suppressed this compromised phenotype. To identify the causative mutation to suppress this phenotype, the B12 (Col background) suppressor line was crossed with a different wild-type ecotype (Ler). Map-based cloning of F₂ population, using recombination frequencies along 15 INDELs markers, suggests that the mutation is localized on chromosome 2. Identification of this suppressor mutation will increase our understanding of what relationship the reticulate phenotype has to maintaining the plants' tyrosine homeostasis and downstream regulation of the Shikimate Pathway.

DEVELOPMENTALLY APPROPRIATE EXPLANATIONS ON INCARCERATION TO CHILDREN WITH JAILED PARENTS

Brooke Hanson, Julie Poehlmann-Tynan (Mentor)

This data comes from a randomized controlled multisite efficacy trial that evaluated Sesame Street's initiative for young children with incarcerated parents. Seventy-one children age 3 to 8 years and their families were recruited from four jails in two states. This analysis focuses on how caregivers explain to children their parent's incarceration. Children of incarcerated parents are often not given truthful and developmentally sensitive explanations on why their parent is not present, which has been associated with attachment insecurity and difficulty coping. Fifteen codes were used to characterize what caregivers told children and these codes were used to decide how appropriate the explanations were based on the child's age. This study showed that children who were given honest information showed positive affect and behaviors during visits.

HIGH RESOLUTION STRUCTURE OF THE CARDIAC MYOSIN ROD

Mathew Hargreaves, Michael Andreas (Mentor)

The purpose of this study is to determine the structure of the cardiac myosin rod; a coiled-coil protein which has been resistant to high-resolution structural studies in the past. The myosin rod is fundamental for anchoring myosin in muscle for contractile force. The Rayment Lab has determined structures of 21 overlapping fragments of the myosin rod using X-ray crystallography. Combined with a previously published S2 structure, 85% of the myosin rod has been supported by crystal structures. The immediate project goal will be to construct a complete molecular model of cardiac myosin. This model will serve the purpose of understanding the organization of the thick filament. The long-term project goal will be to determine how mutations within the cardiac myosin rod result in cardiomyopathies.

REACTIVITY OF THE INTERNAL CAROTID ARTERY TO HYPERCAPNIA IN HEALTHY ADULTS

Emily Hartwig, Jill Barnes (Mentor)

Both age and impaired blood flow reactivity of the major vessels supplying the brain are associated with an increased risk of cerebrovascular disease. The effect of age on blood flow reactivity in healthy adults is still unclear. Therefore, the purpose of this study was to determine the effects of aging on blood flow reactivity to hypercapnia in the left internal carotid artery (ICA). Blood flow through the left ICA was measured using duplex ultrasound at rest and during 4% and 6% hypercapnic gas inhalation. Reactivity was calculated as the percent change in the ICA flow response at each level of hypercapnia in young and older adults.

SERVER DEVELOPMENT FOR MULTI-AGENT SIMULATION WITH SYNCHRONO

Dylan Hatch, Asher Elmquist, Dan Negrut (Mentor)

Synchrono is a framework for the simulation of agents in an environment on a network of participating computers. In Synchrono, the term agent means any independently acting entity within a simulation. This includes robots, human users, vehicles, etc. For example, researchers interested in developing autonomous vehicle software will be able to use the Synchrono framework to simulate vehicles in an environment with other vehicles, which are being simulated on different computers. This allows large-scale testing of driving software before use in physical vehicles. Synchrono will enable users to simulate agent dynamics using Project Chrono, an open source dynamics engine. In this context, Synchrono provides a network interface and a server that connects simulations of geographically scattered agents. This presentation outlines the Synchrono server's development progress.

HOW CULTURE INFLUENCE PARENTS' EMOTIONAL IMPACT ON CHILDREN'S MOTIVATION

Quanfa He, Yuri Miyamoto (Mentor)

This study explores cultural differences in the relationship between the perceived parental vicarious emotion and child's motivation. Vicarious emotion is defined as emotion felt for the action of another individual. Results from this study could contribute to a more nuanced and culturally sensitive understanding of parenting and education.

OPTIMIZATION OF CHCA MATRIX APPLICATION FOR CRUSTACEAN NEUROPEPTIDES FOR MALDI-MSI

Kylie Helfenbein, Amanda Buchberger (Mentor)

Neuropeptides are signaling molecules between the nervous system and the rest of the body. For understanding these messengers, the crustacean nervous system can be used as a well-defined model suited for global analysis. The distribution of these regulatory molecules has been studied by matrix-assisted laser desorption/ionization (MALDI) mass spectrometry imaging (MSI). Sample preparation is especially crucial to analysis, specifically proper matrix application for extraction of the molecules. Beta-dihydroxybenzoic acid (DHB) is utilized more frequently for crustacean neuropeptide MALDI-MSI, but another matrix, alpha-cyano-4-hydroxycinnamic acid (CHCA), should be investigated due to its complementary nature to DHB. This study demonstrates the optimization of the application CHCA matrix using an automated TM-Sprayer. Our results expect to provide comprehensive approach to further comparative studies, including those to crustacean stress.

REINDEER POLITICS: SAMI ART IN PROTESTING NORWEGIAN ENVIRONMENTAL POLICY

Kathryn Hendrickson Gagen, Larry Nesper (Mentor)

The indigenous Sami people of Scandinavia have historically practiced reindeer husbandry as a livelihood, reserving the exclusive ethnic right to herd reindeer in Norway. Their ability to continue this cultural tradition hinges on Norwegian bureaucratic decisions that often ignore Sami interests. Recent environmental legislation enforcing the mandatory culling of reindeer has ignited conflict concerning indigenous rights in land management. Examining Sami protests through public art installments, I demonstrate how current reindeer reduction policies directly conflict with Norway's ratification of the International Labor Organization's convention regarding indigenous peoples' rights to preserve and develop their cultures, thus continuing a destructive legacy of Norwegian colonization. To reconcile this discrepancy, I suggest alternative approaches to understanding environmental management that better reflect Sami traditional knowledge in maintaining sustainable reindeer husbandry.

REGULATION OF ASYMMETRICALLY SEGREGATED CARGOES IN MITOTIC NEURAL STEM CELLS

Helen Heo, Darcie Moore (Mentor)

Neural stem cells (NSCs) can self-renew and generate new neurons through asymmetric divisions. During NSC divisions, certain cellular components, or cargoes, are inherited in a biased manner between daughter cells. These cargoes include the old centrosome, ciliary membrane, midbody, RNA-binding protein staufen, vimentin, and ubiquitinated proteins. Whether these cargoes are co-inherited is not known. To determine the relationship of inheritance between these cargoes in NSCs, we will visualize segregation and determine if positive and negative cargoes are separately inherited. To establish interdependence of cargo inheritance, we will knockdown or overexpress proteins of different cargoes to determine how these changes affect cellular behavior. Understanding the relationships behind biased NSC cargo inheritance will provide insight into mechanisms of stem cell aging and rejuvenation, as well as cancer.

EFFECTS OF 2,4-D HERBICIDE DMA4™ ON EMBRYONIC DEVELOPMENT OF YELLOW PERCH (PERCA FLAVESCENS)

Eric Herbert, Gavin Dehnert (Mentor)

2,4-Dichlorophenoxyacetic acid (2,4-D) is the active ingredient in a systemic herbicide to control broadleaf aquatic plant species, such as Eurasian Milfoil, throughout Wisconsin and the rest of the midwest. Embryonic and developmental life stages are also when fish are most susceptible to xenobiotics. These herbicides are often times applied in early spring to prevent the growth of Eurasian Milfoil and the application of this chemical tends to correspond with the time that these fish are at the critical stages of development. Therefore, our experiment is determining how environmentally relevant 2,4-D affects survivorship rates of yellow perch at embryonic and developmental stages.

AI-DRIVEN PROGRAM SYNTHESIS FOR COMPUTER SCIENCE EDUCATION

Evan Hernandez, Jerry Zhu (Mentor)

In an ideal world, programmers would dictate specifications to a computer, and the computer would program itself. This is known as program synthesis, the process of mapping abstract intentions to physical programs. While program synthesis is difficult in full generality, it is tractable in well structured domains. Here, we focus on the domain of computer science education. Imagine a young programmer, who attempts to write a program, but falls short of finishing it. We show that such partial programs, together with a well-defined user intention such as a drawing, can be efficiently completed using classical AI search techniques. We then demonstrate how program completion can be used to automate and enhance educational programming environments such as Google's Blockly or MIT's Scratch.

EVALUATING PD-L1 EXPRESSION THROUGH FLORESCENCE MICROSCOPY

Camila Hernandez, Jennifer Schehr (Mentor)

Cancer treatments still lack efficiency in most patients. PD-L1, a protein on tumor cells, allows cancer evasion, and expression of PD-L1 varies among patients and could predict drug response. Drugs that target PD-L1 reactivate the immune system. To evaluate the protein, we propose a minimally invasive test using circulating tumor cells (CTCs). Before testing patient samples, we sought to stain and evaluate PD-L1 expression on a cell line using fluorescence microscopy. This test had consistent quantification of PD-L1 expression, demonstrating that the test is reliable enough for patients. PD-L1 testing identifies patients who might respond better to treatment, and further directions are to treat identified patients with the blocking of PD-L1 in order to reactivate the immune system and destroy the cancer cells.

COMMUNITY-BASED PARTICIPATORY RESEARCH (CBPR) TO UNDERSTAND LATINX MENTAL HEALTH

Ananya Herroo, Larissa Duncan (Mentor)

Over 40% of the Latinx community reported having mental stress in Wisconsin revealing the lack of mental health care access and quality in the state. The Latinx community's experiences with trauma as a result of the immigration process, social and cultural discrimination, and isolation are well documented. This exploratory study at Centro Hispano of Dane County, will utilize CBPR to understand how this community copes with stressors. Qualitative data will be collected through observations of workshops and conversations with community health workers (promotoras de salud). A key element will be understanding my perspective as an outsider, someone not from the Latinx community, which has the potential of strengthening the research rigor and my ability to engage in meaningful community work in the future.

COSMIC RAY PRODUCTION IN COMA GALAXY CLUSTER

Molly Hetzel, Joshua Wiener (Mentor)

We have translated the process of cosmic ray production in the Coma galaxy cluster to a Python script. The astronomical process begins when high-velocity protons in the galaxy collide via proton-proton hadronic collisions and produce pions. The pions that are charged decay into electrons which, with sufficient energy and in the presence of a magnetic field, emit synchrotron radiation. This radiation relates to a surface brightness value that is meaningful from our perspective on Earth. In our code, we first assumed a form of the electron distribution function and carried this out to achieve surface brightness. In a second and more precise method, we derived the electron distribution function. Our goal is to see how well our model fits reality.

THE ROLE OF COMMUNITY-BASED ORGANIZATIONS IN RACIAL DISCOURSE

Jessica Heumann, Bianca Baldrige (Mentor)

In recent years, discourse surrounding race and the disparities that negatively impact people of color has increasingly pervaded educational spaces. However, often overlooked is the role played by non-school educational spaces, and this study works toward a better understanding of the strategies and conversations these organizations use to discuss race with Black youth. Historical mapping, narrative collection, and discourse analysis were conducted in the city of study, and were followed by interviews with specific community members involved in organizations that work with Black youth. Preliminary findings indicate that impediments to meaningful conversation lie in White sensitivity, as well as colorblind approaches to race. Particularly in liberal contexts, it is imperative to realize the continuing disparities in communities and the methods employed to confront them.

ANALYSIS OF THE ROTATIONAL SPECTRUM OF CHLOROPYRAZINE AND IT'S ISOTOPOLOGUES

Phoenix Higgins, Brian Esselman (Mentor)

We have measured, assigned and least squares fit the rotational spectrum of chloro-[35]-pyrazine and chloro-[37]-pyrazine from 230-360 GHz. The ground state spectra for each isotopologue has been measured previously in the microwave region and has now been extended into the millimeter-wave region of the spectrum resulting in a more accurate determination of their rotational constants and quartic centrifugal distortion constants. The rotational spectra of several vibrational states of chloro-[35]-pyrazine including n24, n17, and 2n24 and chloro-[37]-pyrazine including n24 and n17 have been observed, measured, assigned, and least-squares fit for the first time.

EFFECTS OF PLANT-INDUCED RHIZOSPHERE PH CHANGES ON LAMOTRIGINE UPTAKE IN SOILS

Rebecca Hoehn, Liz Miller (Mentor)

Many ionizable organic contaminants are present in treated wastewater used to irrigate crops and can be taken up and accumulated by plants. Contaminant phytoavailability may be altered by root exudates in the rhizosphere. Nutrient levels and nitrogen source can alter root exudation; higher levels of nitrate cause root-mediated increases in rhizosphere pH, leading to different fractionation of ionizable contaminants than may be present in bulk soil. Our data suggests that sorption of lamotrigine ($pK_a = 5.7$) increases with high levels of soil organic matter and with the addition of root exudates in low carbon soils, thus lowering bioavailability. Through soil-based uptake experiments, we are testing to see if lamotrigine uptake into wheat (*Triticum durum*) tissue is altered by nitrogen mediated pH changes in the rhizosphere.

THE INSTITUTIONAL REPRODUCTION OF SEX IN BIOMEDICINE

Lauren Hoffarth, Sophie Romero, Madeleine Pape (Mentor)

This project examines how sex differences are reproduced as binary, biological, and distinct from gender at an institutional level, specifically via the U.S National Institutes of Health's policy titled Sex as a Biological Variable, SABV. This policy mandates the examination of sex differences across NIH funded basic and pre-clinical research. By examining the policy development, we ask: How do certain forms of difference come to be presumed as biological and privileged within US biomedicine? How do actors outside the NIH influence policy? What factors prevent policy-makers from re-conceptualizing sex as complex and intertwined with gender? Using interview and textual data, we show the institutional context for biomedical policy-making excludes the recognition of sex entangled with gender, and health as influenced by this interaction.

THE UNIVERSITY OF WISCONSIN RUNNING INJURY AND RECOVERY INDEX

Evan Hoffins, Evan Nelson (Mentor)

Patient-reported outcome (PRO) measures are commonly used in health care to measure a patient's functional ability and determine the effectiveness of care. Available PRO measures are specific to a body region, diagnosis or condition and are infrequently activity-specific. The University of Wisconsin Running Injury and Recovery Index (UWRI) is a new measure of running-specific disability. The purpose of this project was to investigate if a runner's preferred event performance affects an individual's UWRI score. Data was collected via an electronic survey during a clinical encounter for a running-related injury. The strength of association between running event performance and UWRI score was analyzed utilizing R statistical software. This project assessed the measurement stability of the UWRI in clinical situations.

ASSOCIATION OF MULTIPLE TLR6-TLR1-TLR10 SNPS WITH PRETERM BIRTH SUGGESTS EVOLUTIONARY BIAS

Caitlin Hoffman, Wenxiang Luo (Mentor)

Preterm birth (PTB) is the leading cause of neonatal mortality. Infection is a major causative factor for PTB. The first line of defense against infection is the innate immune system, and the portal of entry is the Toll-like receptor (TLR). Genetic variation including single nucleotide polymorphisms (SNPs) in TLRs is associated with susceptibility to infectious diseases. We sought to determine whether SNPs in genes in the TLR6-TLR1-TLR10 cluster are associated with PTB. We previously reported that 3 SNPs in TLR1 were associated with PTB. Here, we found a significant association between TLR6 SNP (P249S) and PTB in a Wisconsin newborn cohort. We have shown that multiple SNPs in this gene cluster are associated with PTB, suggesting a potential evolutionary selection bias contributing to preterm birth.

DEVELOPMENT OF A CARDIAC MODULE FOR eSCHOOLCARE, AN ONLINE RESOURCE FOR SCHOOL NURSES

Shane Hoffman, Lori Anderson (Mentor)

It is alarming when a student presents to the school nurse's office with symptoms that appear to be cardiac in nature. Fortunately, many of these presentations are either not cardiac related or are not life-threatening. The school nurse must recognize these situations and take appropriate actions. This project's purpose was to add evidence-based information to a cardiac module for the eSchoolCare web program, which gives school nurses guidance on caring for students with chronic conditions. A literature review was performed to provide information related to the two most common events associated with pediatric cardiac complaints: syncope and chest pain. The module also includes information on medications and therapies and gives guidance on how students should be cared for at school.

CREATION OF PAX6D INDUCIBLE CELL LINE WITH CRISPR/CAS9

Brianna Hoffmann, Yunlong Tao (Mentor)

Pax6 is a transcription factor essential for eye development, having multiple isoforms. The Pax6(Δ PD) isoform is uniquely expressed in the retina of mice, however its specific function in retina development is unknown. We aim to create an inducible cell line in embryonic stem cells to test the PAX6D (homolog for Pax6(Δ PD) in humans) isoform function in human retina development. Genome editing tool CRISPR/Cas9 and the Tet-on system were utilized to generate a doxycycline inducible PAX6D transgenic line. PAX6D fused with FLAG-tag was cloned and inserted into the AAVS1 site of the human genome by CRISPR/Cas9. We confirmed PAX6D isoform expression by functional tests. We have successfully built an inducible cell line to be utilized for future studies of the function of PAX6D in retina development.

THE ROLE OF THE MECHANICAL ENVIRONMENT IN 3D AXON OUTGROWTH

Drew Hollender, Timothy Gomez (Mentor)

The positioning of axons at their proper synaptic targets is vital for normal function in neural networks. Developing axons are regulated by complex sensory endings called growth cones, which translate extracellular mechanical and chemical guidance cues into guided axon outgrowth. Recent evidence highlights the importance of mechanosensitive ion channels in mediating substratum elasticity-dependent axon guidance. Here, we characterize the role of the mechanical environment in axon guidance by developing human neurons within three-dimensional collagen matrices. Together, these experiments will provide a detailed model for the local and global effect of mechanosensitive properties in mediating axon guidance, furthering our understanding of the molecular basis for neural network assembly within developing human embryos.

THE DEVELOPMENT OF THE UNIVERSITY OF WISCONSIN RUNNING INJURY AND RECOVERY INDEX

Meaghan Holub, Evan Nelson (Mentor)

The UWRI is a patient-reported outcome measure designed to evaluate limitations in running ability. Runners anecdotally reported individual running characteristics (age, experience, teams, coaching, shoe) that may influence an individual's motivation or ability to run. The purpose of this research project was to examine the association between runner specific characteristics and the limitations of running-related injuries. Running ability was measured using the University of Wisconsin Running Injury & Recovery Index (UWRI). The association between running characteristics and UWRI score was evaluated with point biserial correlations to understand how individual characteristics influence UWRI scores. This project enhances the understanding of the UWRI psychometric properties; ultimately contributing a useful tool for running-related injury management in sports medicine.

CRITICAL PERIOD IN GESTATION MEDIATES TRANSGENERATIONAL EFFECT OF FOLIC ACID IN CNS REGENERATION

Felissa Hong, Bermans Iskandar (Mentor)

Folic acid (FA) show enhanced spinal cord regeneration, and that the effect is inherited down multiple generations (F1-F4) in part via DNA methylation mechanisms. These results prompted us to test the key period in gestation that mediates the folate effect. Preliminary analysis shows that the effect is maximized in the F3 generation if FA is given to the F0 parents at gestational days 16 to 20. This experiment aimed to examine in vivo spinal regeneration in the F4 generation whose F0 progenitors were treated at intervals during gestation. Results of this study will provide insight into the peak timing of FA supplementation, which could help in understanding mechanisms of not just CNS repair, but other clinical conditions that benefit from folate.

MASS SPECTROMETRIC ANALYSIS OF NEUROPEPTIDES IN CRUSTACEAN HEMOLYMPH

Mengzhou Hu, Kellen Delaney (Mentor)

Hemolymph carries and transports neuropeptides between tissues in crustacean open-circulatory system. However, detecting neuropeptides in hemolymph is always challenging. Therefore, we conduct experiments to test how pH of extraction solvent, molecular weight cutoff pore-size, the storage method (i.e., dry versus in solution), DHB extraction and different instruments with different ionization sources (i.e., matrix-assisted laser desorption/ionization (MALDI) LTQ-Orbitrap-XL and electrospray ionization (ESI) coupled to a Q Exactive instrument) affect the detection of neuropeptides in hemolymph. Based on the optimized protocol, we design gender comparison and feeding experiments to compare different presence and quantity neuropeptides. In the feeding project, we also use continuous time points to track the tendency of neuropeptide expression changes. Recently, we incorporate a method validation to account for biological and experimental variability.

POPULATION GENETICS FOR A HAPLOID MODEL WITH MULTIVARIATE MULTINOMIAL DISTRIBUTION

Congfang Huang, Wai-Tong Fan (Mentor)

The role of selection and randomness in population genetics is investigated. More precisely, we consider a population model with constant population size N which has N different alleles initially. The population dynamics is governed by a Markov process with multivariate multinomial distribution. We study how many generations it takes for the population to have a uniform type of gene and the probabilities of each gene types to dominate the population. Our method involves both stochastic analysis and computer simulations. Relations between the probability of fixation and the selection coefficients is obtained and presented in an explicit way.

PROLIFERATION OF DOWN SYNDROME PROGENITORS IN IPSC MODELS

Leslie Huang, Anita Bhattacharyya Consigny (Mentor)

Down syndrome (DS) is a developmental disorder due to trisomy of chromosome 21. In this study, we investigate the role of sonic hedgehog (SHH) in the development of interneuron progenitors from human pluripotent stem cells to identify possible differences in the proliferation of DS interneurons that lead to the characteristic reduction of interneurons in DS individuals. Interneuron progenitors were analyzed using a cell proliferation assay that incorporates analysis of DNA content with S- and M-phase specific markers. Analysis consistently revealed reduced EdU expression in the DS cell line compared to the control. These data provide evidence that fewer DS interneuron progenitors undergo the synthesis phase, suggesting a difference in the mitogenic effect of SHH on cell proliferation between DS and unaffected individuals.

FORAGE QUALITY ANALYSIS OF INTERMEDIATE WHEATGRASS AND LEGUME INTERCROPS

Isabella Huizar, Nicholas Leete (Mentor)

Kernza is a potential grain and forage crop, that has been shown to have environmental benefits. The objective of this project was to evaluate the forage quality of kernza planted with various forage intercrops. In the 2017 growing season, kernza and forage intercrops were sampled from the field, dried, weighed to measure yield, and ground for forage quality analysis. Forage quality was measured through crude protein analysis and neutral detergent fiber and acid detergent fiber digestions. This determined how much of the plant is digestible for ruminant animals to consume. We conclude that kernza is best grown with the intercrop alfalfa, resulting in them not affecting each other's forage yield or quality.

SIMULATING EMRE, A MULTIDRUG RESISTANCE TRANSPORTER

Grant Hussey, Katherine Henzler-Wildman (Mentor)

EmrE is a multidrug resistance transporter in *Escherichia coli* that utilizes the proton motive force to drive drug efflux. Despite extensive study, we do not fully understand how EmrE achieves proton-coupled transport. I developed both a stochastic Gillespie simulation and a deterministic mass action kinetics simulation to test the feasibility of a new scheme of transport proposed by my lab. However, discrepancies still exist between these simulations and laboratory assays. My project focuses on refinements to my computer simulations in order to better understand how EmrE achieves drug transport.

FEEDING CHALLENGES FOR CHILDREN WITH AUTISM SPECTRUM DISORDER: A NATIONAL SURVEY

Molly Hussey, Nicole Nelson, Yasmeena Ougayour, Karla Ausderau (Mentor)

Children with autism spectrum disorder (ASD) experience increased rates of feeding challenges that affect eating, behavior, and family mealtime. These concerns can negatively affect the child's nutrition, health, participation, and emotional connection among family members. The purpose of this study was to describe the primary feeding concerns among parents of children with ASD to better understand and characterize these challenges. A cross-sectional national survey with 404 caregivers of children with ASD ages 2 to 12 was conducted. The survey focused on the areas of sensory, behavior, health, and oral motor skills for children with ASD. Families were asked to describe their most significant feeding concern impacting their child's ability to eat and participate in family mealtime, which will be reported.

PERCEPTION OF STATE: FACILITATING OBJECT DETECTION BY ACTIVATING ITS ALTERED OR UNALTERED STATE

Jessie Hwang, Emily Ward (Mentor)

When recognizing objects, we typically think of characteristic features such as color, shape, and texture. But are there other aspects of an object, such as its current state (e.g. broken or not), that we also perceive? The goal of this behavioral experiment is to explore whether objects in the same state activate the brain in a similar way. In the experiment, we showed participants a rapid stream of object images that could be either in the same state (e.g. all broken) or different states. Participants looked for a specific target object in the stream. This allows us to evaluate whether congruent states will cause a target object to be recognized faster. If so, this would suggest that object state is similar to other object features.

CODING NEWS STORIES ABOUT BLACK PROTESTS 1994-2010

Chelsea Hylton, Pamela Oliver (Mentor)

The purpose of this project is to collect new data about Black protests between 1994 and 2010. There is very little research on the Black movement between the end of the Civil Rights Movement and the rise of the Black Lives Matter movement. On this project we read news articles using a special software program and the Mozilla browser. Within the articles we decide if an article describes a Black protest and, if so, look for names, dates, places, and the actual type/form of protest.

PREDICTING NON-MEDICAL PRESCRIPTION DRUG USE AMONG COLLEGE STUDENTS

Reese Hyzer, Megan Moreno (Mentor)

Non-medical prescription drug use (NMPDU) is common on college campuses nationwide and has negative psychological and physical consequences. Self-efficacy, how people perceive their capability in accomplishing tasks, has been linked to NMPDU in adolescents. Little is known about other predictors of adolescent NMPDU. The purpose of this study is to test self-efficacy, alcohol use, peer influence, other substance use, and gender as possible predictor variables of NMPDU among college students. Secondary analysis of data from interviews of college juniors from a longitudinal study will be analyzed using linear regression. Results will help identify risk factors for NMPDU among college students, leading to better recognition and prevention.

USING GENOME EDITING TO PREVENT IMMUNE REJECTION OF HESC-DERIVED ISLETS

Marina Ignatowski, Sara Sackett (Mentor)

Diabetes, despite treatment advances, is a world-wide epidemic. For T1 diabetics, transplanting pluripotent stem cell (hESC) derived islets offers an alternative to cadaver transplantation, the only current means of eliminating the need for insulin. Yet, transplantation is limited by insufficient organ supply and side effects of immunosuppression. To overcome current limitations, we are exploring whether TALEN-based modulation of key immune response genes, CTLA4 and PD-L1, and use of CRISPR/Cas9 technologies to target cell surface expression of HLA I/II, can significantly reduce the allorecognition of, and adaptive immune responses to transplanted allogeneic hESC-derived islet-like clusters. We performed comprehensive characterization and pluripotency testing of the modified hESCs using quantitative (QPCR, western blot) and qualitative (IHC) methods before beginning to study the impact of these modifications on immunogenicity.

ENGINEERING THE LIGAND SPECIFICITY OF AN ALCOHOL SENSING BIOSENSOR

Matthew Incha, Brian Pflieger (Mentor)

Alcohols have long been used as fuel sources and as commercial solvents. One alcohol, isobutanol, is used in many industrial applications and has potential as a fuel. Due to its high desirability, much work has been done to cleanly produce isobutanol in bacteria; however, there are limited tools available to optimize isobutanol production. Recently, an n-butanol responsive allosteric transcription factor (aTF), BmoR, was employed to maximize n-butanol production. In this work, BmoR was further characterized in vivo for future application in a mutagenesis-based screen to modify its ligand specificity toward isobutanol.

HEALTH AND RACIAL EQUITY EVALUATION

Kaitlyn Jackson, Richelle Andrae (Mentor)

The Health and Racial Equity Evaluation assesses the initiatives of Public Health of Madison and Dane County on their health and racial equity elements in their organization. With an overarching goal that health outcomes in Dane County will not be determined by any group status, the Health and Racial Equity Team is leading PHMDC in incorporating equity into agency operations to reach all in need of service. Acknowledging the significant disparities in health is not only timely but necessary. Through surveys, focus groups, and analyses of frameworks, we have created action plans, health equity guides, and quarterly reporting for PHMDC that create trackable health and racial equity goals that align with the PHMDC's strategic plan of committing to equity and inclusion in their work.

NEURONAL CELL PROTECTION BY GALECTIN 3 UNDER ISCHEMIC CONDITIONS

Jacob Jaeger, Uma Wesley (Mentor)

Ischemic stroke causes death and disability by obstructing blood supply to the brain leading to neuronal cell death and brain inflammation. A cytokine called Galectin 3 (Gal-3), is significantly upregulated in rat brains following focal ischemic stroke. In this study effect of Gal-3 on neuro-protection, and expression of apoptotic and angiogenic genes. Effects of Gal-3 on cell viability and gene expression were assessed using neuronal cells engineered to overexpress Gal-3-GFP. Immunofluorescence staining and polymerase chain reaction were used. Our results show that Gal-3 protects neuronal cells under ischemic condition by upregulation of survival and pro-angiogenic genes. Overall, we show that Gal-3 promotes angiogenesis and cell survival potentially through regulation of angiogenic and survival factors. Gal-3, thus may be involved in post-stroke brain repair and recovery.

OPTIMIZING THE TRANSPLANTATION OF HPSC-DERIVED BETA CELLS BY PRE-VASCULARIZATION OF SITE

Vansh Jain, Aida Rodriguez, Daniel Tremmel, Sara Sackett (Mentor)

For the treatment of diabetes, an ideal beta cell replacement therapy aims to provide a sufficient supply of insulin producing cells and identify a well vascularized site for clinical transplantation. Our research aims to address these critical needs through examining novel approaches to pre-vascularize the subcutaneous site in mice prior to transplanting human pluripotent stem cell-derived islet-like clusters (hPSC-ILCs). Utilizing a foreign body response through placement of angiocatheters to increase vascularization, we are studying hPSC-ILCs function and survival in pre-vascularized and naïve subcutaneous sites. Histological staining techniques and computer software are being used to quantify vascularization. Furthermore, we are testing whether hPSC-derived endothelial cells can enhance neovascularization and hPSC-ILCs survival without the need of a prevascularization phase with angiocatheter placement.

HYPOXIA-INDUCED MICRORNAS CORRELATE WITH CHANGES IN HISTONE METHYLATION IN MICROGLIA

Anna Janke, Jyoti Watters (Mentor)

Hypoxia, a hallmark of sleep-disordered breathing, enhances CNS inflammation, and causes long-term cognitive dysfunction. Neuroinflammation is regulated by multiple microRNAs including miR210 and miR146. Although hypoxia-induced microRNA transcription has been well-studied, little is known about their regulation by epigenetic mechanisms in any cell type. We tested the hypothesis that dynamic changes in chromatin activation (histone H3K4me3) and repressive marks (H3K27me3) are induced by hypoxia, and regulate hypoxia-induced microRNA expression in microglia, CNS resident immune cells. We identified miR146 and miR210 isoform responses to hypoxia and inflammatory stimulation in microglial cultures, and then designed a chromatin immunoprecipitation assay to assess histone methylation dynamics at the gene body of these microRNAs. Preliminary results suggest that changes in chromatin marks correlate with differential microRNA expression.

FINDING PRIVATE NORBERT: HOW HISTORICAL RESEARCH AIDS THE RECOVERY OF WWII MIAS

Emma Jardas, David Harrisville (Mentor)

The United States is one of the only countries with a dedicated, systematic method for recovering the remains of missing soldiers. Despite decades of work, nearly 1,300 WWII soldiers from Wisconsin are still considered MIA. This project researches the history of MIA recovery efforts in WWII through the case of MIA soldier Pfc Norbert. Official government reports, historical maps and aerial footage, and military histories help to illuminate the circumstances of Pfc Norbert's disappearance. Preliminary results indicate that wartime recovery efforts in New Guinea were imperfect and unorganized. A final recommendation for the recovery of Pfc Norbert will be made. The recovery of remains is important for military morale and family closure and is a token of governmental reverence for each soldier's sacrifice.

HIGH-ORDER NUMERICAL METHODS FOR PARTIAL ORDER DIFFERENTIAL EQUATIONS

Yeltsin Jean-Pierre, Yingwei Wang (Mentor)

Partial Differential Equations (PDEs) describe a large variety of phenomena such as sound, heat, fluid dynamics, elasticity, or quantum mechanics. PDEs come from multi-dimensional systems, systems where there can be several dependent or independent variables, which can be hard to solve. High-performance computers made it viable to obtain numerical solutions to PDEs. Better approximating the solutions to PDEs will lead to better models including drug delivery, spread of disease, hurricane tracking, economics, and more. Spectral methods are methods used in computational mathematics and scientific computing to numerically solve PDEs. We learn how to implement spectral methods in Matlab to solve PDEs. In this research we incorporate orthogonal polynomials, polynomials that have a dot product of 0 within an interval, in a method to solve PDEs.

THE EFFECT OF BILINGUALISM ON SIGN LANGUAGE ACQUISITION

Lihanzhi Jiang, Margarita Kaushanskaya (Mentor)

Previous studies have shown that bilinguals learn new words more efficiently than monolinguals due to more phonetic input and better inhibitory control. The current research focuses on the generalization of such effect to a non-oral modality. We examine whether simultaneous bilinguals have an advantage in learning signs in American Sign Language (ASL) compared to English monolinguals and whether bilinguals are better at learning phonologically related signs. We hypothesize that bilinguals will have shorter reaction times and higher percent correctness overall. We also predict that though both groups will perform better on phonologically unrelated signs, bilinguals will struggle less on phonologically related signs. If no difference was found, then we could conclude that bilinguals' advantage in word learning does not apply to the non-oral domain.

SPECTROSCOPIC INVESTIGATIONS OF A RARE TYROSINE-CYSTEINE CROSSLINK IN MAMMALIAN CYSTEINE DIOXYGENASE

Richard Jodts, Thomas Brunold (Mentor)

Cysteine dioxygenase is a non-heme iron enzyme that catalyzes the dioxygen-dependent oxidation of L-cysteine to cysteine sulfinic acid, a key step in sulfur metabolism. Crystal structures of CDO revealed the presence a covalent crosslink between the C93 and Y157 active site residue - a rare post-translational modification. Interestingly, the formation of this crosslink leads to a 20-fold increase in the turnover rate of CDO. However, the mechanism by which this cross-link promotes CDO catalysis remains debated. To address this issue, we have prepared the Y157F, C93G, and C93M CDO variants and investigated these species using EPR and MCD spectroscopies in the presence of substrate (analogues). Our data provide compelling evidence that the role of the crosslink is to suppress solvent coordination to the active site.

PERCEPTUAL RICHNESS INFLUENCES LEARNING AND GENERALIZATION FOR CHILDREN AND ADULTS

Taylor Johnson, Erin Condon, Ryan Hassett, Ashley Haut, David Menendez, Karl Rosengren (Mentor)

Children and adults typically reject drastic life cycle change. One possibility is that the life cycle diagrams used during metamorphosis lessons have too many perceptual details, which has been shown to constrain transfer. In this study, children and undergraduates were asked to endorse or reject different types of change for various animals both before and after a metamorphosis lesson. Children viewing a perceptually rich diagram learned better from the lesson, while undergraduates did not. Children's transfer did not differ based on the richness of the diagrams, while undergraduates transferred more with a perceptually un-rich life cycle diagram. This study shows that the effects of external representations on learning and transfer depend on age; therefore, teachers should take these factors into account when designing lessons.

STEM CELL DERIVED GnRH NEURONS RESPONSE TO KISSPEPTIN10 AND SENKTIDE

Courtney Johnston, Ei Terasawa-Grilley (Mentor)

The hypothalamic GnRH neuron plays a pivotal role in the regulation of reproduction. Previously, this lab reported that GnRH neurons derived from embryonic stem cells (ESC) release the GnRH peptide in a pulsatile manner at approximately 50 minute intervals. In this study, I examined whether they respond to the kisspeptin agonist, human kisspeptin10 and neurokinin B agonist, senktide. Using a perfusion system ESC-GnRH neurons were exposed to either kisspeptin-10, senktide or vehicle, while perifusates were collected at 10-min intervals. GnRH in perifusates was measured by radioimmunoassay. Results indicate that in the ESC-GnRH neurons, kisspeptin-10 stimulated GnRH release. In summary, ESC-GnRH neurons respond to a kisspeptin signal similar to that reported in vivo. ESC-GnRH neurons response to senktide remain to be investigated.

THE EFFECTS OF NaCl CONCENTRATION ON ANTIBIOTIC-PRODUCING BACTERIA GROWTH

Orli Jona, Sarah Hahn, Joshua Pultorak (Mentor)

Antibiotic resistance is a current epidemic that is leaving previously curable maladies untreatable due to the rapid evolution of pathogenic bacteria. As part of the Small World Initiative, the purpose of this laboratory experiment was to isolate antibiotic-producing bacteria that can be used to fight common human pathogens. We manipulated the NaCl concentration of LB agar media to determine if varying salt concentrations selected for antibiotic producing species. We hypothesized that as NaCl concentration increased, the number of antibiotic-producing bacteria would also increase. The results indicated a statistically significant increase in the proportion of antibiotic-producing isolates found with increased NaCl in the environment, thus supporting our hypothesis. Further investigation of sodium chloride treatment in agar media is recommended.

A SLOW COOKED SOLUTION? CROCKPOTS AS A TOOL FOR BUILDING FOOD AGENCY IN LOW-INCOME COMMUNITIES

Lauren Jorgensen, Lauren Jorgensen, Sophia Lawrence, Claire Barrett (Mentor)

The purpose of the Slow Food UW/Odyssey Project partnership is to support food sovereignty by addressing barriers to individuals' food agency and community-level barriers to accessing healthy, affordable, culturally appropriate food. Our two year community-based participatory research (CBPR) with twenty-four participants has explored how and to what extent slow-cookers can alleviate the time stress and schedule coordination associated with cooking from scratch using fresh ingredients. Using mixed-methods, including surveys, interviews, and participatory photovoice, this study examines the mechanisms that affect food agency. Our findings will illuminate the efficacy of slow-cookers as a strategy for increasing food agency, particularly with respect to incorporating nutritious, seasonal foods into the diets of families living at or below the poverty level.

LONG QT2 IPSC MODEL

Abbie Joyce, Li Feng (Mentor)

In this project we are using human pluripotent stem cells that have been reprogrammed from the dermal fibroblast of a patient who was diagnosed with LQT2 syndrome. We have differentiated this hiPSC into cardiomyocytes to create the specific cell model for disclosure of the disease causing mechanisms of this patient. I took responsibility of verifying that our cell model has the disease causing mutation and also verifying that there are no additional mutations through the following three experiments: extracting genomic DNA from the cell, using PCR exemplifiers of the specific fragments of the disease causing gene *KCNH2*, and using Sanger Sequencing to verify the mutations information. Results are inconclusive at this point.

EXAMINING HABITABILITY OF EXOPLANETS; DIRECTED EVOLUTION IN EXTRATERRESTRIAL ENVIRONMENTS

Maria Kalambokidis, Eric Wilcots (Mentor)

For thousands of years, humans have wondered, Are we alone? Now, we may be able to answer this question through the detection of exoplanets--planets orbiting stars other than our Sun. My project aims to go beyond the conventional ideas of a habitable zone by examining the likelihood of plate tectonics and radiation exposure for each exoplanet. I used the physics toolkit BurnMan to compare the interior structures of exoplanets to planets within our solar system. Moreover, I simulated these high-radiation environments in the laboratory, conducting a directed evolution experiment with *C. elegans* and their resistance to gamma radiation. I expect to find evidence that tectonic activity is common beyond our solar system, and evolution of eukaryotic life could occur in these predicted extraterrestrial environments.

INVESTIGATING THE ROLE OF YEAST MITOCHONDRIAL YLR253W AND YPL109C IN OXIDATIVE PHOSPHORYLATION

Keith Kamer, Zachary Kemmerer (Mentor)

The ancient UbiB family of proteins exist in all three domains of life. In yeast, there are three UbiB family members (COQ8, YLR253W, YPL109C), while the human genome contains five UbiB family genes, ADCK1-5. Importantly, these mammalian homologs have connections to human health, with mutations resulting in various diseases and tissue-specific tumor viability. The Pagliarini Lab has made significant progress on one of these UbiB proteins, COQ8, elucidating structurally important motifs. Through conserved ATPase activity, COQ8 maintains the biosynthetic complex responsible for producing Coenzyme Q, a key redox-active lipid required for mitochondrial energy production. However, the other UbiB proteins remain poorly characterized. Using blue native PAGE and in-gel activity assays, my projects aims to understand how YLR253W and YPL109C function in mitochondrial oxidative phosphorylation.

SEX DIFFERENCES IN THE EFFECTS OF CHILDHOOD PHYSICAL ABUSE ON ALEXITHYMIA IN PSYCHOPATHIC OFFENDERS

Radha Kanchana Karthik, Michael Koenigs (Mentor)

Psychopathy is a personality disorder characterized by lack of empathy, callousness, and criminal versatility. Researchers have found increased alexithymia, the inability to identify/describe emotions in oneself, in psychopathic criminal offenders. While prior studies have investigated associations between childhood maltreatment and psychopathy in men, the effects of these variables in women and on alexithymia have not been examined. Using data collected from participants at Oshkosh and Fox Lake Correctional Institutions, we will explore interactions between childhood physical abuse, psychopathy, and sex, predicting that psychopathic females with a history of childhood physical abuse will have the severest alexithymia. Due to the massive emotional and financial burden psychopathic criminal offenders place on society, there is a pressing need for research on and successful treatment of this disordered personality.

APPLYING DATA SCIENCE TECHNIQUES TO CHOICE-BASED CONJOINT ANALYSIS

Huang Kang, Neeraj Arora (Mentor)

Choice-based conjoint analysis has long been used in marketing research. With the emerging power of data science in marketing analytics, it is of interest to see whether the data science approaches would help. Two aspects are studied: various machine learning models and techniques that deal with class imbalance problem.

PROBING CONFORMATIONAL MOTIONS UNDERLYING ANESTHETIC DRUG ACTIONS IN A LIGAND-GATED ION CHANNEL

Sritejasvinithi Karimikonda, Cynthia Czajkowski (Mentor)

Signaling in the brain depends on rapid opening and closing of pentameric ligand-gated ion channels (pLGICs). Various drugs including anesthetics and ethanol exert their functional effects by binding to these channels, but the structural mechanisms underlying how these drugs allosterically enhance pLGIC function are largely unknown. Previous studies have shown that agonist-mediated channel opening is associated with an inward tilting of the extracellular binding domain (ECD). Here, we are using site-directed spin labeling of the prototypical pLGIC, GLIC, and double electron-electron resonance (DEER) spectroscopy to examine if ethanol or propofol drug binding in the transmembrane domain is associated with ECD motions. We show that structural mechanisms underlying ethanol and propofol drug effects are different than agonist-mediated motions.

SUPPORTING MATERNAL AND CHILD HEALTH THROUGH OBESITY-PREVENTION STRATEGIES

Jaylina Karmacharya, Amy Hilgendorf (Mentor)

Childhood obesity is influenced by multiple community factors, which include the health system, transportation system, and food system. However, through the implementation of different strategies, communities may work to lower the risk and prevalence of obesity, including breastfeeding promotion and improved maternal clinical care practices. Through interviews and observation, we highlight a case study of an integrated community-based effort to promote maternal and child health and address obesity risk. This case study will be featured on a website with information on recommended strategies to counteract obesity locally and, through this research, help to inform communities of ideas and resources to improve the health of children.

CHARACTERIZATION OF STEM-CELL DERIVED CARDIOMYOCYTES VIA TOP-DOWN PROTEOMICS

Hannah Karp, Ying Ge (Mentor)

Cardiomyocytes (CMs) generated through induced pluripotent stem cell (iPSC) technology are a clinically relevant in vitro model of heart disease, facilitating greater understanding of disease mechanisms and identification of therapeutic targets. iPSC-CM maturation is critical for utilization experimentally as an approximation of the endogenous tissue, and comprehensive characterization is necessary for clinical translation. Top-down proteomics quantitatively analyzes all protein isoforms and their post translational modifications (PTMs), and is high throughput, making it an ideal for characterization of iPSC-CM and maturation assessment. This project developed a standardized proteomic method for characterizing iPSC-CMs maturity, by comparing quantifiable changes in sarcomeric isoforms and associated PTMs in endogenous cardiac tissue to iPSC-CMs, via top-down high-resolution mass spectrometry based proteomics.

STRATEGIES TO IMPROVE GERMINATION SUCCESS IN THE ENDANGERED PRAIRIE BUSH CLOVER (*L. LEPTOSTACHYA*)

Anushri Kartik-Narayan, Brandon Bruce, Olympia Mathiaraman, Michelle Harris (Mentor)

Lespedeza leptostachya is a federally threatened prairie species found in the upper Midwest. One factor contributing to its scarcity is low germination which may be due to a seed hull that restricts water intake. We were interested in how seed hull degradation (scarification) affects germination. We investigated strategies to improve *L. leptostachya* germination including sandpaper scarification, smoke scarification, and hull removal. We hypothesized that seed hull removal and scarification would increase germination in *L. leptostachya* seeds compared to seeds with intact hulls. Germination was significantly improved in sandpaper scarified seeds, particularly for seeds without hulls. These findings indicate that seed hull presence may prolong dormancy. Our continued work may provide insights about the evolutionary history of *L. leptostachya*'s germination strategies and its propagation within prairies.

EFFECTS OF MANGANESE AND (P)PPGPP HOMEOSTASIS IN BACILLUS SUBTILIS

Adam Kaufmann, Jue Wang (Mentor)

The bacterial nucleotide signal (p)ppGpp is an important signal for stress survival and antibiotic tolerance. Although it is well-established that (p)ppGpp synthesis is regulated by nutrient availability, it is unclear whether its level is also under the influence of other growth-essential nutrients such as biometals. Here we tested the potential role of cellular manganese in effecting (p)ppGpp levels in *Bacillus subtilis*. Using a set of Mn²⁺ uptake or efflux mutants, we found that Mn²⁺ imbalance in the cell can influence cellular (p)ppGpp levels. Though the exact mechanism has yet to be elucidated. We hypothesize that Mn²⁺ imbalance can be another signal that may influence (p)ppGpp homeostasis and potentially antibiotic tolerance.

SHORING UP AUTOCRACY: PARTICIPATORY TECHNOLOGIES AND REGIME SUPPORT IN PUTIN'S RUSSIA

Sarah Kear, Hannah Chapman (Mentor)

This project theorizes that autocratic states use participatory technologies to mobilize citizens and sustain public support. We specifically look at Russia's Direct Line, a yearly televised event in which Russian President Vladimir Putin answers pre-chosen questions submitted by Russian citizens. Participatory technologies are elite-mass communication strategies that promote two-way interaction between citizens and leaders. This project is important because the use of participatory technologies mobilizes citizens in a political system where citizen participation historically has been at a minimum. When citizens feel included in the political process it bolsters their opinion and support towards the autocratic state. For this research, we used content analysis to analyze citizens' questions and whether they are consistent with public concerns.

INFLUENCE OF LASER STRUCTURING ON FRICTION STIR TOOLS

Mory Keita, Frank Pfefferkorn (Mentor)

The objective of this research is to evaluate whether laser-structuring friction stir tools with micro-scale sinusoidal features can influence process properties such as temperature, forces, and displaced materials (e.g., flash) during Friction Stir Welding. The focus of this study is to analyze the effect that laser remelting has on FSW tools. This will be done by first examining the results of laser structuring on H-13 tool steel samples, and later by laser structuring on FSW tools. Evaluation of the performance of the structured FSW tools will be done by in-situ measurement of temperatures and forces, and flash. The hypothesis of this research is that by using laser structuring on the friction stir tool will result in a reduction in temperatures, forces, and displaced material.

EXPLORING THE NATURE OF GALAXIES WITH ABUNDANCE GRADIENT ANOMALIES

Celeste Keith, Christy Tremonti (Mentor)

Disk galaxies are known to have radial oxygen abundance gradients with their centers being more chemically enriched than their outskirts. The average abundance gradient has recently been shown to correlate with stellar mass. We report on a systematic search for galaxies with abundance gradient anomalies using 2-D spectroscopy from the Sloan Digital Sky Survey IV MaNGA. We construct nebular oxygen abundance maps, velocity maps, and H-alpha maps for 814 moderately inclined disk galaxies. We use the Zooniverse interface to identify and classify the most interesting cases. These classifications will be used to create an automated pipeline that will quantify metallicity variations in the galaxy population. This pipeline will help us better understand the processes that shape the radial abundance gradients of disk galaxies.

REPRESENTING FLUID DYNAMICS AS A RIGID-BODY DYNAMICS PROBLEM WITH FRICTION AND CONTACT

Conlain Kelly, Dan Negrut (Mentor)

The purpose of this project is to understand whether fluid motion can be accurately represented as a very large collection of rigid spheres. The motion of fluids is traditionally modeled using the Navier-Stokes equations, whereas rigid body motion is governed by the Newton-Euler equations. This work attempts to achieve a high-resolution discrete representation of a continuum problem using a large count of bodies interacting via frictional contact. If possible, the use of rigid-body dynamics to simulate fluid dynamics would potentially open doors to new modeling approaches in many fields, including turbulence and fluid-solid interaction. Moreover, this technique would allow for faster simulations since its solution algorithm maps very well to modern Graphics Processing Unit (GPU) computing architectures.

IMPLICATION OF HOMER1C IN HIPPOCAMPAL COGNITIVE AGING BY TARGETED GENOME EDITING

Michael Kessler, Corinna Burger (Mentor)

Addressing age-related cognitive decline is crucial with the aging population now on the rise. This study aims to understand the role of the scaffolding protein homer1c in the aging process. Homer1c has been shown to successfully rescue deficits associated with cognitive decline in rats, but further research is required to determine whether the protein is necessary for successful cognitive aging. Using CRISPR/Cas9, we are now able to target the particular exon responsible for homer1c using a guide RNA, isolating its role in the hippocampus. We anticipate rats with removal of homer1c function will develop significant cognitive impairments, validating the role of homer1c in successful cognitive aging. Our findings could propose a potential therapeutic target for preventing or reversing learning and memory impairments with age.

DARK NIGHT OF THE SOUL: ADVERSE EFFECTS OF MEDITATION IN THE WEST

John Kinney, Gudrun Buhnemann (Mentor)

The recent surge in the pervasiveness of meditation in the West has been driven in large part by its reported health benefits, with research on the topic similarly centered on health outcomes. However, little emphasis is placed on the possible adverse effects of meditation. In my paper I examine three recent studies, all of which show that such negative effects are frequent and can be severe. I then place these adverse effects in their religious context, shedding light on the roles they play in the traditions they originate from. I argue that those who seek health benefits should avoid meditation techniques like vipasana, and should instead practice techniques such as loving kindness (metta) meditation. Finally, I argue that a change in the culture surrounding meditation in the West is necessary.

INVESTIGATING THE EFFECTS OF EPIGENETIC MODIFYING AGENTS ON IMMUNOGENICITY IN PROSTATE CANCER

Madison Kircher, Joshua Lang (Mentor)

Prostate cancer (PC) is one of the leading causes of cancer death for men in North America. Targetable antigens, processed by the antigen processing machinery (APM) and displayed via the MHC I complex, are essential for efficient T-cell mediated immune responses. Co-stimulatory molecules are involved in sustaining and differentiating this response. Epigenetic modifying agents (EMAs) may enhance tumor antigen presentation by up-regulating immune-related genes, leading to more efficient tumor clearance. This study investigates the effects of EMAs on expression of APM, MHC Class I, and co-stimulatory elements in the immune deficient LNCaP PC cell line compared to the immune competent RWPE1 normal prostate cell line. The hypomethylating agent SGI-110 and the histone deacetylase inhibitor (HDACi) Entinostat were chosen as EMAs for this study.

EXAMINING MUTUAL EXCLUSIVITY WITH MULTIPLE ALTERNATIVE CATEGORIES IN PRESCHOOL CHILDREN AND ADULTS

Rebecca Kish, Haley Vlach (Mentor)

Children tend to demonstrate a mutual exclusivity bias and generalize novel category labels to new objects when children are presented with one alternative category. This study examined children's mutual exclusivity bias when presented with two alternative categories. Preschool-aged children and adults learned two categories in a feature space that were separated by an unlearned intermediate region. Participants were then presented with a categorization task, and we hypothesized participants would apply a novel label to the unlearned intermediate region. The results showed neither adults nor children used the novel label, and adults were more likely to use learned labels in the intermediate region. These findings suggest that contrast between multiple alternative categories may decrease individuals' tendency to generalize novel labels to new objects.

A FLUX BALANCE ANALYSIS MODEL OF CANDIDATUS ACCUMULIBACTER PHOSPHATIS CLADEIIA

Matt Kizaric, Francisco Moya Flores (Mentor)

Enhanced Biological Phosphorous Removal (EBPR) is an integral part of the biological nutrient removal system commonly used in wastewater treatment. The major organism responsible for EBPR is *Candidatus Accumulibacter phosphatis*, an unclassified type of Betaproteobacteria closely related to *Rhodocyclus*. Though *Accumulibacter* has been used in wastewater treatment plants for decades, their physiology is not fully understood. Recent advancements in meta-genomic and RNA expression profiling have allowed for Genome-scale Models (GEMs) that define the biochemical pathways of an organism. In this study, we annotated an *Accumulibacter* clade IIA genome and analyzed its physiological potential. Using the Flux Balance Analysis (FBA) technique, we were able to simulate the *Accumulibacter* undergoing EBPR and create a predictive model that highlights the complex and diverse physiological states of the organism.

ASSESSING THE ENVIRONMENTAL AND ECONOMIC IMPLICATIONS OF GROUND GRANULATED BLAST-FURNACE SLAG

Tyler Klink, Angela Pakes Ahlman (Mentor)

Portland cement is the basis of most concretes used in American construction practices. However, producing portland cement is an energy-intensive process that emits large amounts of carbon dioxide, resulting in high production costs and environmental impacts. To reduce impacts, recycled materials are used as substitute cementitious material. Ground granulated blast-furnace slag (GGBS) is a viable recycled material used as cement substitution. To evaluate environmental and economic impacts of portland cement compared to GGBS, I am proposing a life cycle assessment and life cycle cost analysis of U.S. Highway 45 in Kenosha County, which was recently repaved using 30% GGBS and 70% portland cement. By comparing the blended cement to 100% portland cement, the environmental and economic benefits of using GGBS can be quantified.

ROBOTICALLY ASSISTED SONIC THERAPY (RAST) FOR NON-INVASIVE RENAL ABLATION IN A LIVE PORCINE MODEL

Emily Knott, Timothy Ziemlewicz (Mentor)

Robotically assisted sonic therapy (RAST) is an emerging tumor ablation modality based on histotripsy, a non-invasive and non-thermal method to destroy target tissue via focused ultrasound. The purpose of this study was to evaluate renal RAST in a live porcine model. Eleven renal RAST ablations (2.5cm diameter, lower pole) were performed with a clinical prototype system, and evaluated with CT and histopathology. CT findings include near-prescribed ablation measurements and rapid ablation resorption over 4 weeks. Histology showed complete lysis inside the ablation zone with no urinary leaks, main vessel thromboses, or adjacent organ injuries. RAST demonstrated complete destruction of target renal tissue sparing the central collecting system, a unique advantage over thermal ablation, and supporting RAST for future clinical tumor ablation.

MEA OPERAE

Dianne Kotsonis, Collette Stewart (Mentor)

I am interested in the relationship between self care and one's obligations and interests. A desire to take care of myself both physically and mentally when unsure of what impact that would have on my relationships spurred this idea. People recommend taking care of yourself so you can better take care of others, but what happens when you have never been your own priority? In my work I will explore these questions. What does it take to give to yourself so you can properly heal? By self care do you take your time away from your loved ones? Through discussion and movement creation I will explore self care, its role in one's life, and its impact on one's relationship with the world.

GENDER EFFECTS OF A SOCIAL BELONGING INTERVENTION

Megan Kowieski, Stacy Priniski (Mentor)

My thesis will be based off a social belonging intervention administered within the two year schools in Wisconsin for introductory biology, chemistry, and psychology. The goal was to help underrepresented student, such as first generation and minority students, feel that they belong both academically and socially in college. This was done by framing feelings of belonging uncertainty as being normal and temporary by having the participant read others' stories of overcoming similar feelings. For my thesis I will be conducting a secondary analysis of this study by looking at gender differences in how effective the intervention was.

SOLDIERS IN STONE: LEGIONARY RECRUITMENT IN THE LEGIO II PARTHICA

Tristan Krause, Marc Kleijwegt (Mentor)

The Syrian city of Apamea was the winter quarters for the legio II Parthica during the first half of the third century C.E. Today there are over one-hundred tombstones of fallen legionaries at the ruined city dating from the legion's creation by Emperor Septimius Severus in the late 190's C.E. to the mid-third century. The funerary inscriptions and sculptured reliefs reveal a host of information about these Roman legionaries, including ethnic background, position within the legion, bonds with other soldiers, and contemporary military equipment. This research project analyzes this new epigraphic evidence and provides a nuanced picture of the geographic origins and ethnic backgrounds of soldiers from the II Parthian Legion during the frontier and army reforms of Emperor Septimius Severus.

CLUSTERING POLITICALLY ACTIVE TWITTER WITH VARIMAX

Emma Krauska, Karl Rohe (Mentor)

Twitter has an increasing political impact. To identify communities with differing political beliefs and discover salient issues, I use Twitter data to create a matrix X , with 1 in the i,j -th cell if user i follows user j , or 0 otherwise. Instead using traditional spectral clustering strategies, I use VariMax, a factor analysis tool. VariMax computes a rotation R that maximizes the sample variance of the squared elements of XR (akin to kurtosis). This makes most elements of XR close to zero, similar to sparsity. I show how Varimax helps in post-processing of spectral estimators in simulations, and create a two-stage estimator for spectral analysis of social networks with a complementary R package, in collaboration with Prof. Karl Rohe and PhD student Muzhe Zeng.

FINE MAPPING DOMESTICATION GENE(S) RESPONSIBLE FOR PHENOTYPIC EXPRESSION OF MULTIPLE TRAITS IN MAIZE

Kyle Krueger, John Doebley (Mentor)

The domestication of maize has produced many phenotypic changes from its teosinte ancestor, such as increased ear size and conversion of tassels on the lateral branch into an edible ear. In a hybrid population consisting of 600 individuals spanning across 20 different lines, we measured several domestication traits including number of rows on an ear, number of kernels on a row, and percentage of male spikelets on an ear. This experiment aims to identify the causative gene(s) within a 7Mbp region on chromosome 1 in maize that is associated with those phenotypes. In doing so, we can learn more about the genes that brought upon the phenotypic change from teosinte to maize.

COLD TOLERANCE ADAPTATIONS IN THE EASTERN SUBTERRANEAN TERMITE, RETICULITERMES FLAVIPES

Avery Kuhlow, Sean Schoville (Mentor)

Termite species in North America cause significant damage to wood products. Northern populations are typically rare and must adjust their behavior and physiology to survive colder temperatures. Cold hardiness in the eastern subterranean termite (*R. flavipes*) is not well understood, although tolerance has been shown to ebb with seasonal variation. To better understand cold tolerance physiology and potential for adaptation, we tested for critical thermal minimum (muscle immobilization) and supercooling point (cell freezing). Comparing values geographically and temporally aids in the examination of whether cold tolerance has increased in the north or increases as seasonal temperatures decrease. This research broadens our understanding of cold tolerance evolution and can be used to predict the species' spread in relation to climate change and the resulting economic impact.

CHALLENGES OF OPIOID-RELATED SUBSTANCE USE TREATMENT IN RURAL WISCONSIN

Maanil Kumar, Ryan Westergaard, Wajiha Akhtar (Mentor)

To understand the magnitude of the opioid epidemic and health related consequences of overdose death, HIV, and hepatitis C in rural Wisconsin, we created a large-scale online survey platform intended to reach approximately 1200 individuals in northern Wisconsin. To understand street prices and availability of drugs, we mined mainstream substance-associated online communities including StreetRX and Bluelight. We analyzed documents published by the Agency for Healthcare Research and Quality to learn the obstacles in provision of treatment for patients with opioid related substance use disorders. These challenges include stigma, lack of adequate medical awareness, provider hesitation, and geographic/socioeconomic barriers. The survey is tailored to include content relating to such impediments as well as demographics, sexual and drug history, support-system availability, and personal barrier related questions.

THE ROLE OF AMINO ACIDS ON MAMMARY SIGNALING AND MILK PROTEIN SYNTHESIS

Madison Kurth, Sebastian Arriola Apelo (Mentor)

Signaling pathways, activated by essential amino acids (EAA), regulate production of milk proteins. The mechanistic Target of Rapamycin complex 1 (mTORC1), a signaling pathway, contains nutrient and hormonal signals that participate in regulating milk protein synthesis. This research examined the role of amino acids in mTORC1 signaling and milk protein synthesis. mTOR activation was examined through six EAA treatments at 0%, 5%, 10%, 30%, 100% and 300% of lactating cow plasma concentrations with the EAA profile found in casein. mTOR was activated by EAA in a saturable fashion, reaching a plateau at concentrations lower than current plasma amino acid concentrations of lactating cows. The results suggest that dietary protein could be decreased without compromising milk protein production, and reducing N excretion to the environment.

POST-DISASTER CONVERGENCE ON TWITTER

Ting An Lai, Megan Moreno (Mentor)

Post-disaster social media exposure has been shown to associate with distress reduction during disaster recovery. Previous studies have used the Post-Disaster Convergence Model (PDCM) to evaluate public's behaviors of entering disaster sites with key categories including supporting and mourning. However, little systematic understanding of post-disaster social media content is known. The purpose of this study is to examine the content of post-disaster posts on Twitter after the Las Vegas Shooting by applying the PDCM. Using the search term #LasVegasShooting, 50 public posts will be collected from Twitter. Selection criteria includes being posted within one week after the event. Posts will be classified into categories based on the PDCM and into emergent categories. Findings may support insights into social media usage for disaster recovery.

THE RELATIONSHIP BETWEEN CELL MEMBRANE LEAKAGE AND STRESS TOLERANCE IN BARLEY

Brandon Lam, Ramamurthy Mahalingam (Mentor)

An increasing demand of breweries and feed as well as the increasing frequency of extreme weather patterns has led to the improvement of barley's tolerance to heat and drought to become a necessity. Prior research has indicated that in the presence of a stressor (e.g. heat and drought), there tends to be a decrease in overall production and electrolyte leakage in barley. This considered, the objective of this project is to determine whether or not there is an association between cell leakage and tolerance to heat and drought in barley and whether conductivity can be used a biological marker to determine stress tolerance. Measuring conductivity to determine tolerance would be more time and cost-reducing than previous methods thus benefitting future research in barley tolerance.

MEASURING THE VOCAL TRACT USING MRI AND ACOUSTIC PHARYNGOMETRY: A COMPARISON

Abigail Lamers, Houri Vorperian (Mentor)

The size and shape of the mouth and throat contribute to the unique way each person sounds. Acoustic Pharyngometry (APh) is a non-invasive technique that uses the reflection of sound waves to measure the airway and assess its patency. To assess APh measurements' accuracy, we compared it against MRI measurements. Three men and three women performed APh in the upright and supine body position and had MRI scans in the supine body position. Findings revealed that length measurements were comparable. However, APh cross-sectional areas and volumes were noticeably larger than MRI. Although MRI measurements represent anatomic measurements more accurately, APh does successfully capture the overall oral and pharyngeal measurements and may be a useful method for the study of speech development and speech disorders.

EXPLORING THE RELATIONSHIP BETWEEN RACE/ETHNICITY AND STUDENTS' ATTITUDES ABOUT ANIMALS IN RESEARCH

Jinyi Lan, Jennifer Dykema (Mentor)

There is increasing interest among social scientists about people's attitudes towards the use of animals in research. This project explores the relationship between race/ethnicity and students' attitudes towards the use of animals in research. I conduct a review of the literature on attitudes and analyze data from a survey of students at UW-Madison. Past research focuses nearly exclusively on the relationship between gender and attitudes about animals in research; race is rarely examined. A goal of the study is to explore relationships between race/ethnicity and other variables such as students' knowledge about animals in research and their trust in UW's enforcement of federal laws. Results indicate a significant relationship between race/ethnicity and trust in UW's law enforcement.

POSSIBLE MECHANISMS OF BILINGUAL ADVANTAGE ON CREATIVITY

Kendra Lange, Joe Austerweil (Mentor)

Bilinguals are purported to be more creative than monolinguals, but the mechanism for this bilingual advantage is still unresolved. Others have challenged the existence of bilingual advantages in general. We examine existence as well as hypothesized semantic network difference based mechanisms for the relationship between bilingualism and creativity here by measuring creativity and fluency for monolinguals ($n = 42$) and bilinguals ($n = 29$). The fluency measure allowed us to analyze the structure of individuals' semantic networks. We found no differences in creativity between monolingual and bilingual participants, with a Bayesian test showing substantial evidence for the null hypothesis. We did find that aspects of semantic network structure predicted creativity. These findings suggest that the bilingual advantage does not exist in the realm of creativity.

MATERNAL CORTISOL TRAJECTORIES AND INFANT STARTLE

Kaylin Langer, Hill Goldsmith (Mentor)

We examined relationships between prenatal maternal cortisol patterns and infant startle at six-months. Latent class growth analyses indicated three unique classes of maternal cortisol trajectories. The low intercept maternal profile exhibited flat diurnal cortisol slopes and was negatively correlated with six-month infant startle ($r = -.20$, $p = .024$), perhaps reflecting an association between blunted maternal cortisol regulation and reduced reactivity to stressors in offspring. In contrast, a typical maternal cortisol profile was positively correlated with infant startle ($r = .21$, $p = .019$), perhaps indicating a healthy awareness of, and reactivity to, environmental cues in offspring. Results highlight potential mother-to-infant-offspring psychobiological effects early in life.

HOW DO CHILDREN'S IDEAS ABOUT SCIENCE RELATE TO THEIR SCIENCE KNOWLEDGE AND VOCABULARY?

Sarah Langer, Taylor Dworak, Natalie Jacobson, Haley Vlach (Mentor)

Previous research has looked at children's ideas about science and their science knowledge, but not yet how the two might be related. In this study, we assessed preschool and early elementary school children's general word knowledge, science knowledge, and science vocabulary, and had them draw two pictures of a scientist. Results revealed that general word knowledge, science knowledge, and science vocabulary were all significantly correlated with each other. In particular, the total amount of science words children knew predicted their science knowledge above and beyond their age and general word knowledge. Continuing research will investigate the ideas about science and scientists that are reflected in children's drawings, and how these drawings relate to their science knowledge and vocabulary.

BADGERS, STEP UP! ALCOHOL PREVENTION, BYSTANDER INTERVENTION AND LEADERSHIP DEVELOPMENT PROGRAM

Alexander Latham, Jenny Rabas (Mentor)

Badgers Step Up! is an interactive presentation encompassing Alcohol Risk Reduction Strategies, Bystander Intervention and Leadership. We aim to increase student knowledge and use of low-risk drinking behavior, prevention efforts and intervention. Registered student organizations must send one delegate to Badgers Step Up each calendar year and new Panhellenic members must attend specific Greek Life programs. The presentation is delivered by two facilitators who utilize reflective listening and open-ended questions to draw key concepts from group dialogue. Some key concepts include that 86% of RSO members report drinking in low-risk manners, and that intervention is often quick, easy and important. Post-program-assessments display increases in prevention and intervention confidence. Badgers Step Up! embodies the Wisconsin Idea by empowering students to intervene in and prevent high-risk scenarios.

DEVELOPMENT OF NICKAL2 DETECTOR FOR ABSOLUTE MEASUREMENT OF AL LINE RADIATION ON MST

Nick Lauersdorf, Abdulgader Almagri, Daniel Den Hartog, Paolo Franz, John Goetz, Patrick Vanmeter, Lisa Reusch (Mentor)

The Madison Symmetric Torus (MST) is a plasma physics experiment with an aluminum vacuum vessel, resulting in aluminum impurities in the plasma. Atomic line emission from these impurities dominates the 1.5keV - 2.1keV region of the x-ray spectrum, hampering x-ray bremsstrahlung-based temperature measurements. These lines are typically filtered out by using thick filters, however, this restricts the temperature measurements to greater than 1 keV and discards valuable information about the plasma. Based on a ROSS filter, we designed NICKAL2, a detector that uses multiple filters made of varying element concentrations to create spectral bins in which the dominant signal is the line radiation, thus absolutely quantifying the Al line emission. This will enable accurate measurement of temperature less than 1 keV and retain useful information.

INVESTIGATION AND CHARACTERIZATION OF PIVOTAL PUF PROTEINS IN C. ELEGANS STEM CELLS

Kimberley Law, Judith Kimble (Mentor)

Stem cells are crucial in development and regeneration. Our focus has been on the regulatory network controlling *C. elegans* germline stem cells (GSCs). We first discovered two PUF RNA binding proteins, PUF-3 and PUF-11, as potential GSC regulators. We next epitope tagged each protein to confirm their expression in GSCs with immunostaining. To understand their biological roles, we used CRISPR gene editing to generate null alleles, and used a series of genetic tests to show that both proteins function within a central PUF hub of the GSC regulatory network. I am now exploring their specific roles in that hub. PUF RNA binding proteins are conserved stem cell regulators and investigating their function and regulation is broadly relevant to our understanding of animal development.

QUANTITATIVE TRAIT LOCUS (QTL) MAPPING OF INFLORESCENCE TRAITS IN MAIZE-TEOSINTE HYBRID POPULATIONS

Samuel Lawton, Alessandra York (Mentor)

Maize (*Zea mays* ssp. *Mays*) was domesticated from teosinte (*Z. mays* ssp. *parviglumis* and ssp. *Mexicana*) about 9,000 years ago in the Balsas River Valley. During the process of domestication by the ancestral people, traits were selected over others resulting in emerging morphological differences. For this investigation, I examined the genetic architecture of staminate spikelet percentage (STAM), ear branch number (EB), and tassel branch number (TBN). Each trait was analyzed in five maize-teosinte hybrid populations. Genetic and phenotypic data were collected, and QTL mapping was subsequently performed on each population separately using R/qtl. Significant QTL were found to be present for STAM, EB, and TBN in various populations. By mapping different populations of maize-teosinte hybrids, more accurate predictions of QTL locations can be made.

SYNTHESIS AND ISOLATION OF 1-CYANO-2,3-BUTADIENE, A NOVEL COMPOUND

Danny Lee, Samuel Kougias (Mentor)

Analysis of the interstellar medium and other astronomical objects reveals an abundance of cyano containing molecules. Saturn's largest moon Titan, for example, has a thick nitrogenous atmosphere with photochemical processes thought to resemble that of Earth's before it could sustain life. Titan is also currently the sole celestial body aside from Earth with surface liquids; some hypothesize that such an environment could support life by a new form of biochemistry absent of oxygen. Further studies of these proposed nitriles could give us clues as to how life began here or what to look for to find life elsewhere in the universe. Physical data will be collected on this novel compound, 1-cyano-2,3-butadiene, as well as rotational spectroscopy for easy detection in extraterrestrial environments.

ATTITUDE AND KNOWLEDGE OF PERSONAL FINANCE CONCEPTS OF COLLEGE UNDERGRADUATES

Uriel Lee, Linda Francetic Lepe (Mentor)

This project focuses on finding the most efficient ways to distribute and teach financial concepts to underclassmen in college, particularly first-generation students and minorities since, historically, they have had less access to this essential information than others. Through literature reviews and surveys taken by students at UW-Madison, the information found in this study will be applied to the curriculum of personal finance classes. We will examine students' attitudes and knowledge of personal finance concepts so that the course can be tailored to teach what is unknown or daunting, so the content in the class can be applicable and meet the lives of young college students.

UNDERSTANDING CULTURAL MEANINGS OF COLORS AND EMOTIONS IN HMONG POPULATION

Tshachee Lee, Maichou Lor (Mentor)

The study's purpose was to understand how Hmong people associate colors to emotions. Five focus groups (N=15) were conducted in the Hmong community. In the focus groups, participants were given 14 color cards and asked to select colors that they thought corresponded with each emotion as it was read to them. Findings revealed that colors have cultural meanings. Participants associated positive emotions (happy, trust, hope) most frequently with bright colors (white, yellow and pink) and negative emotions (sad, stress, fear) with dark colors (black and brown). Colors chosen based on culturally perceived meanings of the colors. Majority consistently shared that white means pure while black means darkness and impure. Findings highlight the need to use colors cautiously with the Hmong as colors have cultural meanings.

QUANTIFYING SOIL GRAVEL CONTENT USING IMAGE ANALYSIS

Richard Lee, Alfred Hartemink (Mentor)

Coarse Fragments (CF) in the soils commonly known as gravel, affects several soil functions. It restricts rooting depth and volume, and there is a negative correlation between crop yield and CF: more CF in the soil, less crop yield. The purpose of this study is to test out a new method called Image Analysis, using a computer program that characterizes the CF. Before using the method of Image Analysis, we collected over 2,000 soil samples from a farm near the end moraine. We separated the CF from the soil and took images of the CF. From the images, we analyzed the amount of CF, the shape and size distribution

THE COLOR OF FEMINIST FUTURE

Emma Leeper, Claire Wilson (Mentor)

Feminism is a very relevant issue of today; I have chosen young, female subjects to comment on the empowerment of women in current society. Surrounded by words illustrating diversity, unity and identity, these figures symbolize inclusivity and connectivity, and how ideas can turn to actions and conceptual power with connections to people and the environment. I fear that society is not providing the foundation for feminine empowerment, and it is time for the younger generation to become more active in feminine strength. The strength of our society will be built through connections we have with each other. While this piece only depicts young women, I hope to see change in all subjects of equality: including--but not limited to--race, sexuality, age and gender.

CONCRETENESS FADING IN LEARNING ABSTRACT MATHEMATICAL CONCEPTS

Taylor Lees, Mitchell Nathan (Mentor)

Concreteness fading suggests that concepts should be introduced through a sequence of forms that begin with concrete instantiations and transition toward abstract instantiations. We will utilize concreteness fading to teach an abstract mathematical concept to UW Madison undergraduates using various sequences of enactive, iconic and abstract representations. Progress will be measured using a pre and post-test. Will a group learning abstract mathematical concepts through a sequence of forms that utilize more sensory information, like the enactive form, have better learning outcomes than groups learning concepts through sequences of forms with less sensory information, like the iconic or abstract forms? We hypothesize that the instructional methods that combine the greatest variety of sensory information will result in the greatest learning.

KINETIC INDUCTANCE DETECTORS FOR FUTURE MISSIONS TO OBSERVE THE COSMIC MICROWAVE BACKGROUND

Ryan LeFebre, Tylor Adkins, Peter Timbie (Mentor)

The cosmic microwave background (CMB) is fundamental to observational cosmology as it offers information about the early universe and provides evidence for the big bang theory. Currently, the study of the polarization anisotropy of the CMB is of much interest because it can put forward solutions to otherwise unsolved problems in cosmology. Using electromagnetic field analysis software programs we were able to design a planar polarimeter chip utilizing kinetic inductance detectors (KIDs). KIDs are ideal for detecting and studying the polarization of the CMB because they are highly multiplexable and this is one advantage our chip has over current polarimeters in use.

MUTILATION LAW AND PHYSICIAN EXCLUSION PROTECTIONS: A CALL FOR REGULATION

Morgan Lentz, Thomas Leffler (Mentor)

Twenty-six states have laws that specifically criminalize female genital mutilation (FGM), in addition to the federal statute, allowing for the prosecution for a crime that would otherwise typically be prosecuted under some form of an assault charge. We identified and evaluated these laws for physician exclusion protections in order to create an ideal law. My role within the study was to perform background literature research on the relevant statutes regarding FGM within the United States, after which, my mentor and I performed an analysis on the available US statutes and created an ideal statute. This project exemplifies the need for reform in FGM policy. Our abstract was accepted for presentation at the 2018 Wisconsin Urological Society Annual Meeting in Milwaukee, WI.

PATIENT-PROVIDER COMMUNICATION: IDENTIFYING PATTERNS IN HOW PATIENTS INTRODUCE CONCERNS

Emily LeSage, Elizabeth Stephens, Kristen Pecanac (Mentor)

Listening to what is important to patients is critical to providing patient-centered care. We studied patient-provider communication patterns, focusing on how patients brought up their concerns. We audio recorded patient conversations on daily rounds and on admission to the hospital. We used conversation analysis to analyze the data for patterns in the types of sequences patients used to express their concerns. Our preliminary findings indicate that when the provider asked questions, patients often expressed their concerns. In other conversations, the provider would express their concerns and the patient would either align with those concerns or find a socially acceptable way to reorient and express their own concerns, which were usually driven by social priorities. These results can inform providers how to make care more patient-centered.

EXAMINING FLOWERING TIMES OF NATIVE PLANTS IN THE BIOCORE PRAIRIE

Alder Levin, Seth Mcgee (Mentor)

Aldo Leopold began documenting flowering dates of Wisconsin prairie plants nearly 100 years ago. Since then, there have been increased efforts to record flowering dates of Wisconsin natives, studies show that most prairie species are flowering earlier compared to Leopold's time. There's currently a lack of scientific literature on longitudinal phenological research focusing on individual plants. This study seeks to observe the flowering times of individuals from many prairie species over multiple years. By using the same individuals, confounding variables related to genetic diversity and microclimate are reduced, and phenological observations can be more closely associated with yearly environmental changes like temperature, precipitation, and snow depth. I hypothesize that most prairie plant species will exhibit earlier flowering dates in successive years of this study.

RHETORIC OF THREADED INTERFACE & COUNTERPUBLICS IN ONLINE SPACES

Lillie Levin, Robert Asen (Mentor)

This project explores the rhetoric in threaded interface on Social Networking Sites (SNSs), specifically using Twitter and Reddit as case-studies. Complex discursive interactions occur (1) between the users participating on such sites and the developers who encode the site affordances, (2) between these users and these technologies, and (3) between the developers and these technologies, each through interface as a physical artifact. The multi-directional relationship between humans, technologies, and democratic discourse is explored under the framework of rhetorical analysis and theorization. This study concludes with an additional consideration of the role of affordance and rhetorical situation in counterpublic formation, and the reshaping of space on these sites in order to house counterpublics and their subsequent rhetoric.

HOME IS WHERE THE RACISM IS ...

Julia Levine, Jenna Loyd (Mentor)

Home is where the racism is a collection of portraits, interviews, and historical material that will be displayed in a gallery show on May 16–18. The work was completed between Fall 2016 and 2018, through collaboration with folks from around Wisconsin, all of whom aim to dismantle deeply embedded racism within their communities. The driving questions of this work are personal: what drives folks in their work? What does equality look like to them? What the activists share is a sense of urgency, an appreciation for those who came before, and a dedication to their communities. This collection seeks to elevate and draw connections between these stories, ultimately providing a space for discussing community transformation in Wisconsin.

NEXT GENERATION BIOFUEL: UNDERSTANDING GENETIC PATHWAY OF FFA PRODUCTION IN RHODOSPSEUDMONAS.PALUSTRIS

Grace Li, Elizabeth Donohue (Mentor)

Fatty acid plays an important role in maintaining cell functions. In particular, furan-containing fatty acid act as antioxidants in neutralizing radical oxygen species in the cell. Additionally, this furan-containing fatty acid can also be burned as biofuel which is a clean source of energy. Here we propose a mechanism of polyunsaturated furan-dimethyl fatty acid synthesis in Rhodopsuedomonas,palustris, a photosynthetic bacteria capable of breaking down lignin in corn stover. In order to validate this mechanism and better understand it, we propose to use complementation plasmid method in combination with Fatty Acid Methyl Ester identification experiment to relate each individual gene in pathway with its product.

THE ROLE OF HEPATIC RICTOR ON ENERGY METABOLISM

Amy Lin, Sebastian Arriola Apelo (Mentor)

Rapamycin, a FDA approved chemotherapy and immunosuppressant drug, is an inhibitor of the mechanistic target of rapamycin (mTOR) protein kinase. Dysregulation of hepatic gluconeogenesis and other side effects of rapamycin can be mimicked by hepatic Rictor deletion. Our proteomic analysis of Rictor knock-out (RKO) hepatocytes suggested that higher gluconeogenesis was sustained by increased fatty acid beta-oxidation. This results in an overflow of carbon to the mitochondria. While CO₂ production is unaltered in RKO hepatocytes, fasted (but not refed) hepatic RKO mice, isolated hepatocytes from those mice, and RKO Aml12 cells presented higher levels of BHBA as compared to WT controls. In conclusion, Rictor deletion results in an overall reprogram of hepatic energy metabolism.

BETWEEN BUSHES AND BATHROOMS: SANITATION IN ANCIENT GREEK HOUSEHOLDS

Yusi Liu, Nick Cahill (Mentor)

Well-developed Roman latrines are intensively studied by modern scholars yet less attentions are on the earlier stage of toilet development in ancient Greece. Modern scholarships have not adequately addressed the issue of Greek toilet, its development, and architectural relations. This paper addresses the issue of sanitation in ancient Greece, with special attention to toilets in household, by re-examining the assumed private toilet facilities and inspecting relation to household settings and to social and cultural structure. Through studying inscriptions, vase paintings, ancient text, and archaeological evidence, this project hopes to shed new light on the little acknowledged issue of sanitation in ancient Greece.

ELUCIDATING THE ROLE OF REGULATORY COMPONENTS OF INTRINSIC TERMINATION IN E. COLI

Margaret Liu, Rachel Mooney (Mentor)

In *Escherichia coli*, RNA Polymerase transcribes RNA in a coupled transcription-translation complex with the ribosome as it reads the newly synthesized RNA to initiate protein synthesis. The transcriptional termination is key to the regulation of gene expression. There are two mechanisms of termination: Rho-dependent and intrinsic termination. In this study, we looked at the regulatory role of accessory factors and structural components in intrinsic termination. We altered the activities of these regulators and used a fluorescent reporter assay to investigate the effects upon the function of an intrinsic terminator sequence in *E. coli*. We would anticipate that alterations of regulatory components that normally promote intrinsic termination would result in an increase in reporter expression. Our findings will contribute to the understanding of intrinsic termination regulation.

IMPACTS OF CULVERT BLOCKAGE ON STARKWEATHER CREEK INUNDATION

Allison LoBue, Anita Thompson (Mentor)

Impervious areas increase overland flow and decrease time of concentration, leading to higher stream flow rates. Debris in streams can block culverts and other flow structures, reducing conveyance capacity and increasing head loss, potentially leading to local flood inundation. Flooding can cause water damage, increase spread of pollutants and contaminants, and is of concern in the Starkweather Creek, an impaired urban water, and its watershed. This research aims to identify the relationship between culvert blockage and flood inundation area in the Starkweather Creek Watershed by modeling the east branch of the creek in HEC-RAS using multiple design storms. Critical blockages will be identified, as not all culverts will have an equal flooding impact in the watershed.

THE CHANGING NATURE OF EDUCATION LOAN DEBT AND DEBT BEHAVIORS IN YOUNG ADULT HOUSEHOLDS

Josiah Locke, Fenaba Addo (Mentor)

Aggregate student loan debt has grown rapidly since the mid-1990s. Not only do more young adults have it, the average amount outstanding has also increased. This has raised concerns among policy makers, academics, and stake holders about whether young adults will be able to repay this debt and the consequences of holding this debt for later life outcomes. Using nationally representative cross-sectional data on U.S. young adult households collected every three years between 1995 and 2016 from the Survey of Consumer Finances, we examine trends in student debt and its relationship with credit and debt behaviors. We are particularly interested in bankruptcy rates and credit constraints given the punitive nature of loan delinquencies on one's credit and the inability to discharge student loan debt in most bankruptcy courts. This project will shed light on the role that education loan debt has played in the shifting financial lives of young adult households over the past twenty years.

ADULT ROLE MODELS IN SCIENCE (ARMS) HIGH SCHOOL TUTORING PROGRAM

Lindsi London, Anna Courtier (Mentor)

The Adult Role Models in Science (ARMS) High School Tutoring Program promotes equity, diversity and success in science learning among underrepresented teens in the Madison community. Many high schools in Madison-area offer tutoring options for students with hopes to improve academic performance and confidence in essential subject areas. While English and math are very well supported, science-focused tutoring is essentially non-existent in local Madison schools. Volunteer science tutors address this issue by providing students in the community academic support in advanced science courses. Tutors also function as role models by answering questions about education at the university level.

KEEP YOUR ENEMIES CLOSER: THE BENEFITS OF ADVICE FROM OPPONENTS

Marco Lopez, Lyn Van Swol (Mentor)

People receive advice that can often improve decision-making. Advice from someone who thinks differently may be beneficial. Yet, their advice may be unlikely to be implemented. The purpose of this study is to see the impact an advice, from a friend or foe, can have on a person's decision-making. Participants received advice about the score of an upcoming football game from either a fellow fan or a fan of the opposing team. Participants either received advice before predicting the score or after making a prediction. Generally, people are more likely to accept advice if they have not already decided. It was found that participants most accurately predicted the game's score when receiving advice from an opponent when the participant had not yet made a prediction.

ELUCIDATING THE ROLE OF NEUTROPHILS IN ONCOGENIC MASS FORMATION

Meng Lou, Davalyn Powell (Mentor)

In recent years, the innate immune system has been increasingly implicated in cancer prognosis. Here, we developed a glioblastoma tumor-initiation model by transforming astrocytes with a constitutively activated form of kRasV12 in hopes of elucidating the contribution of neutrophil presence to tumorigenesis and progression. The role of tumor suppressor protein p53 in relevance to this model remains largely unconfirmed. By expressing the oncogene in different p53 backgrounds, we demonstrate an increase in abnormal growth and mass formation in the absence of p53. Treatment with a neutrophil recruitment inhibitor SB225002 in the absence of p53 decreases abundance of mass-formation. Further experimental design perturbing immune cells has the potential to identify novel pathways which coordinate cancer-immune system interactions and modulate progression of glioblastoma and other cancer types.

THE ROLE OF KISSPEPTIN IN THE DIFFERENTIATION OF NEURAL PROGENITOR STEM CELLS

William Lundeen, Ei Terasawa-Grilley (Mentor)

GnRH neurons regulated by kisspeptin (KP) neurons in the hypothalamus play a central role in control of reproductive function. It has been reported that during stem cell differentiation, exposure of neuroprogenitor cells to KP promotes the stem cell differentiation process into GnRH neurons. This lab also confirmed this finding. Thus, this study tests the hypothesis that during the early development of GnRH neurons endogenous KP transiently stimulates GnRH neuronal differentiation and subsequent neuronal growth. Preliminary analysis with RT-PCR and gel electrophoresis indicated that KP mRNA was present in the culture of primitive neuroprogenitor stage in embryonic stem cell development. DNA sequencing from the dissected gel band will confirm the presence of KP mRNA.

CHARACTERIZING NAK THROUGH SITE-DIRECTED MUTAGENESIS AND ELECTROPHYSIOLOGY

Gina Luu, Katherine Henzler-Wildman (Mentor)

NaK is a bacterial ion channel and, like many bacterial channels, it is not known what causes the channel to open and close. The proposed research will use NaK ion channel mutants to compare its structure to its function through quantifying ion flux. NMR studies performed by the Henzler-Wildman lab have identified that these mutants are important in controlling gating (opening and closing). We hypothesize that the N-terminal helix of NaK fits tightly against the base of the closed channel and mutations that disrupt this interaction increase the open probability. I will test the hypothesis developed from the NMR data that mutants in the N-terminal region of NaK increase the open probability, and thus the net ion flux through the channel.

RELATIONSHIP OF GENETIC POLYMORPHISMS IN GST-PI AND LYMPHOMA IN BOXER DOGS

Brianna Lynch, Joanne Ekena (Mentor)

The purpose of this research is to investigate the relationship of two genetic polymorphisms and lymphoma in boxer dogs. Lymphoma is more prevalent in boxers than other breeds, suggesting a possible genetic factor at play in addition to environmental exposures. This study investigates polymorphisms of the GSTP1 gene, an enzyme responsible for detoxifying harmful molecules in the body. One polymorphism of interest occurs in a regulatory region of the gene known as 3UTR, and the other occurs in Exon 2. The results of the sequencing can be used to determine the frequency of the polymorphisms in boxer dogs compared to non-boxer dogs. Identifying polymorphisms associated with higher lymphoma risk will bring a stronger understanding of the causes and mechanisms of cancers in dogs.

DEIFYING BEAUTY: YANG GUIFEI'S CULTURAL LEGACY AND MANIFESTATION AS KANNON IN SENNYU-JI TEMPLE

Alexa Machnik, Yuhang Li (Mentor)

Meeting at the interstices of art historical and anthropological studies, this thesis investigates the Yokihi Kannon, a Chinese Buddhist statue of Yang Guifei as a manifestation of Kannon located in the Sennyu-ji Temple in Kyoto, Japan. This paper situates the statue in a broad cultural context to challenge prevailing assumptions about its composite identity. Relocated from China in the thirteenth century, the statue gradually amassed a dual gender identity, where it was repackaged as the Yokihi Kannon during the Edo period (1615-1868). Drawing on concepts of value transformation and icon reconstitution, as well as surveying Yang Guifei's cultural legacy in Japan, this study will contribute a new way of addressing the present state of a relocated Buddhist statue that illustrates the complexity of transcultural exchange.

USING VELOCITY ANISOTROPY TO TRACE MAGNETIC FIELD STRENGTH IN STAR FORMING MOLECULAR GAS

Alecio Madrid, Audra Hernandez (Mentor)

We investigate the limitations of using the two point structure function (SF) on molecular line emission data to gauge the relative strength of magnetic and turbulent energy in star forming Giant Molecular Clouds (GMCs). Magnetohydrodynamic (MHD) theory provides an elegant framework for studying the evolution of magnetically confined turbulent eddies which play a critical role in star forming interstellar gas. The foundation of this approach was developed on the premise that at small scales sufficiently strong magnetic fields will anisotropically confine turbulent oscillations leaving a statistical fingerprint detectable via velocity field observations. We find that there are significant limitations to using SF analysis as an independent tool, but we believe it will be a robust complement to methods such as dust polarization.

THE ROLE OF TRANSCRIPTION FACTOR 19 IN PANCREATIC BETA CELL PROLIFERATION AND APOPTOSIS

Bilal Malas, Dawn Davis (Mentor)

Transcription factor 19 (tcf19), a putative transcription factor implicated in Type1 and Type2 diabetes, drives adaptive β^2 -cell proliferation in mice and may be involved in DNA damage repair. My project involved phenotyping pancreata from wildtype (WT) and whole body Tcf19 knockout (KO) mice via immunofluorescence staining for TUNEL and Ki67, corresponding to apoptosis and proliferation respectively. My results showed no significant difference between these lean, healthy mice, which was expected because non-stressed β^2 -cells rarely divide or succumb to apoptosis. I am currently phenotyping pancreata from WT and KO mice with streptozotocin, a β^2 -cell specific toxin, inducing diabetes. Though incomplete, KO mice are trending towards increased apoptosis suggesting a role for Tcf19 in repairing DNA damage. These data may implicate Tcf19 in diabetes treatment.

RACIAL DIFFERENCES IN CONFIDENCE IN POLICE: ANALYSIS OF POSSIBLE EXPLANATIONS AND WITHIN-RACE PATTERNS

Amy Maniola, Pamela Oliver (Mentor)

There is a widely proven association between race and confidence in police. To explore possible mediations (or explanations) of this association and test for within-race relationships, I analyze Gallup survey data on confidence in police collected between 1994 and 2015. Using OLS regression to test for mediation, associations within racial groups, and trends over time, I find that: 1) Racial differences in confidence in police, especially black-white differences, cannot be explained by urbanity, socioeconomic status, or political views. 2) While racial minorities generally report lower levels of confidence in police than whites, these differences vary in magnitude depending on minority. 3) Racial groups experience different trends in confidence in police overtime and by region.

HOW STUDENTS CORRECT THEMSELVES WHEN PROMPTED TO DRAW IN CHEMISTRY

Zainab Manzoor, Sally Wu (Mentor)

Often, instructors prompt students to draw in order to explore ideas or to solve problems. The intervention has been little researched in Education- how do students engage with prompts to draw? My research investigates how participants change a drawing when they verbally identify that they have drawn something incorrectly by either adding on, crossing out, or replacing what they drew. In an experiment, students were asked to draw different chemistry atoms via an educational technology. This study can provide insight to how students engage with drawing prompts commonly used by instructors and has possible implications for how drawing may support learning. Instructors can use the results to help students engage with drawing prompts.

CONNECTING THE DOTS FROM COURSEWORK TO ASSESSMENT AND INTERVENTION IN SPEECH LANGUAGE PATHOLOGY

Lindsay Markworth, Courtney Seidel (Mentor)

In the Department of Communication Sciences and Disorders, a portfolio ties together academic, assessment, and intervention experiences. The framework of Bloom's Taxonomy was used to apply course content knowledge to real world situations during an independent study. Higher level critical thinking skills were promoted via an intervention experience for a kindergartner in the areas of articulation and phonological awareness. This experience led to tutoring for the same child on pre-literacy skills, which was furthered by collaboration with an assessment team on the cause of this child's speech, language, and academic needs by conducting an assessment for Central Auditory Processing Disorder (CAPD). This project summarizes a timeline of this single subject study and illustrates significant growth as a student becomes a critical thinking clinician.

ILLUMINATION, THE UNDERGRADUATE JOURNAL OF HUMANITIES

Maria Fernanda Martinez Rodriguez, Jim Rogers (Mentor)

Illumination provides a beautiful space for Undergraduate Students to showcase their written and creative works in an award-winning print issue and website. The print issue is published once per semester and includes works in the genres of poetry, fiction, and creative non-fiction, as well as art from students throughout Campus. The website is updated bi-weekly by a permanent team of Staff Writers. The publication has been internationally recognized twice through the Pacemaker Award by the Associated College Press. This, along with the continued success of the journal in hosting the works of the creative community on Campus has made Illumination the premier venue for student literature and art at the University of Wisconsin-Madison.

PREDICTORS OF ACL RECONSTRUCTION OUTCOMES NINE MONTHS AFTER SURGERY

Alexis Mashl, David Bell (Mentor)

Significant neuromuscular and biomechanical deficits are associated with high rates of second ACL injury. These mechanics are exhibited in many patients post anterior cruciate ligament reconstruction (ACLR) which can lead to poor surgical outcomes. There is a gap in knowledge currently about what metrics early in rehabilitation are predictive of surgical outcomes at the end of rehabilitation. During rehabilitation, this information can positively impact clinical decisions during rehabilitation in order to improve care and outcomes. The objective of this study is to determine if clinical tests (drop landing mechanics, strength, and sport readiness scores) collected four months post-ACLR are predictive of patient reported outcomes at nine months post-ACLR.

DEVELOPMENT OF THERANOSTIC ALKYLPHOSPHOCHOLINE ANALOGS

Chris Massey, Joseph Grudzinski (Mentor)

Despite investment and innovation over the last 40 years, chemotherapy has led to a modest increase in survival of around three months for patients with the most common types of cancer: lung, prostate, colorectal, and breast. Current chemotherapy drugs are typically non-targeting, cause cytotoxicity, and can lead to resistance. Exploiting the fact that tumor cells contain higher levels of phospholipid ethers compared to healthy cells, alkylphosphocholines (APC) have an ability to localize and undergo prolonged selective retention in many human cancer types which is confirmed in vivo by radiolabeling the APC with a PET radioisotope (PET-APC). Therapeutic agents can be synthesized by radiolabeling the APC with beta or alpha particle emitters (TRT-APC). By employing a theranostic approach, PET-APC surrogates can help develop TRT-APC.

CONCRETE FADING: ENCODING INFORMATION FROM DIFFERENT NEURAL INPUT MECHANISMS

Jay May, John McGinty (Mentor)

Concreteness fading is the notion of how concepts should be introduced a specific arrangement in order to facilitate learning of abstract concepts in mathematics. The specific arrangement is presented in three forms: enatic representation, iconic representation and symbolic representation. The purpose of this study is to understand how these representations from former to later will improve the process of learning. Undergraduate participants from UW-Madison will engage in experiments, apply a series of pre-and post-tests followed by in-depth interview in order to understand the subjects thought-process. What is the relationship between instructional activities that utilize enactive activities, iconic activities, and symbolic activities for improving learning outcomes in geometry? My hypothesis is that the activities that utilize both iconic and symbolic activities will yield the best results.

REVISIONS OF AN EDUCATIONAL TECHNOLOGY WITH MULTIPLE VISUAL REPRESENTATIONS TO ENHANCE STEM LEARNING

Joziah Mays, Miranda Zahn (Mentor)

Science, Technology, Engineering, and Mathematics (STEM) fields rely heavily on visual representations to communicate information and abstract concepts. Success in STEM is partially based on competence in spatial skills and the skills to decode visual representations to gain meaning. Research has shown that college students struggle in STEM fields when they lack understanding of visual representations. The current project addresses this problem by offering undergraduate students studying chemistry a semester-long tutor program that promotes their abilities to create and understand multi-dimensional visual models of chemical compounds. Students are trained in their conceptual knowledge of the material using fixed-alternative and open-ended questions. Anonymous data collected from the tutor program allow the researchers to iteratively develop the tutor to more effectively increase students' chemistry content knowledge.

THE EFFECT OF PHOSPHORUS REMEDIATION METHODS ON BACTERIAL COMMUNITIES IN LEAD (PB) CONTAMINATED SOIL

Kristin McAdow, Douglas Soldat (Mentor)

Lead is a nearly ubiquitous contaminant of urban soils. Children are particularly sensitive to Pb, and lowering exposure to Pb is essential to health. Soil microorganisms are crucial to soil organic matter cycling in soils, yet little is known about how soil Pb affects soil microorganisms. This research studies how soil amendments influence soil microbial structure and activity on Pb contaminated soil in Wisconsin. Soil physical and chemical properties were quantified for analysis in addition to DNA sequencing at 0, 45, and 91 days. Results found that compost and fish bone meal were the most effective treatments at reducing bioaccessibility and caused the greatest shifts in bacterial community structure. The pH of the soil was found to be a great determinant of microbial community structure.

UTILIZING MACHINE CHIPS FROM SUBTRACTIVE MANUFACTURING FOR ADDITIVE MANUFACTURING FEEDSTOCK

Matthew McAllister, Frank Pfefferkorn (Mentor)

This work investigates the potential of using milling to create machine chips for feedstock in additive manufacturing. Subtractive manufacturing is when products are created through material removal processes such as drilling, turning, and milling. In contrast, additive manufacturing is when material is added in a layer by layer fashion to create these new products. The majority of metal additive manufacturing feedstock is powder, created through atomization. The increasing trend of combined additive-subtractive manufacturing creates room for more novel additive feedstock creation. Several methods for producing feedstock from machined chips were evaluated and the feasibility of each is reported.

CHARACTERIZATION OF MULTICELLULAR ORGANOIDs FOR DISEASE MODELING

Hannah McBride, William Daly (Mentor)

Rett Syndrome is a neurodevelopmental disease caused by a mutation in the MECP2 protein leading to cognitive and developmental abnormalities. We used induced pluripotent stem cells, derived from healthy and Rett syndrome patients and differentiated them into Neural Progenitor Cells (NPCs), Endothelial Cells (ECs), Microglia, and Pericytes to create a cerebral organoid mimicking the developing human brain. The precursor cells and assembled organoid were used to characterize the phenotypical differences between healthy and diseased cells and tissues. Individual cells and assembled organoids were stained with cell markers to characterize phenotypical components of the organoid. We focused initially on the pericytes populations looking at differences in pericyte markers such as Desmin, SM22a, and NG2. Using similar neural and vascular markers we aim to characterize similar differences within the assembled healthy and diseased organoids.

MUSIC AND LANGUAGE: CAN SONG HELP INFANTS LEARN THE MEANINGS OF NOVEL WORDS?

Michaela McCabe, Jenny Saffran (Mentor)

The ability to map a label to its referent is integral to overall language development. Although growing evidence suggests that music facilitates language, no prior study has assessed the effects of singing on this skill. This study examined the effects of song vs. infant-directed speech (IDS) on infants' ability to map novel words to objects. Twenty-one to twenty-three-month-old infants were presented with both sung and spoken phrases introducing novel objects. Participants were then tested on their ability to determine correct word-object pairs. We hypothesized that the sung phrases would facilitate word learning equally as well as, if not better than, the IDS phrases. These projected results could have clinical implications for intervention in children with language delays and disorders.

THE EFFECTS OF CALORIC RESTRICTION ON ENDOMETRIOSIS IN RHESUS MONKEYS

Kellen McCormick, Joseph Kemnitz (Mentor)

Moderate caloric restriction (CR) extends health span and lifespan of a range of species, including rhesus monkeys as shown in a 30-year longitudinal study at UW-Madison. The UW study includes subjects that either underwent 20-30% food restriction (R) or were allowed to eat freely (C). Female rhesus monkeys have reproductive physiology that is very similar to women, including the development endometriosis. We retrospectively examined health records in terms of regularity of menstrual cycles and diagnosis of endometriosis. C and R monkeys did not differ significantly in menstrual frequency, but 47% of C monkeys compared to 27% of R monkeys developed endometriosis. This analysis suggests that CR has a significant protective effect on the development of endometriosis, but mechanisms are yet to be elucidated.

HIGH-RESOLUTION ANALYSIS OF CAV3, NAV1.5, KIR2.1 PROTEIN ASSOCIATIONS IN A MACROMOLECULAR COMPLEX

Elise McCune, Lee Eckhardt (Mentor)

Caveolin-3 (Cav3) is a scaffolding protein found in caveolae in cardiomyocytes that integrates and regulates proteins such as ion channels. Together, these units are called macromolecular signaling complexes. Clinical mutations in Cav3 can affect ion channel function for potassium inward rectifier Kir2.1 and cardiac sodium channel Nav1.5. However, it is not known if Cav3, Nav1.5, and Kir2.1 are in one macromolecular complex. To answer this question, I used complementary high-resolution techniques: Super Resolution Stimulated Emission Depletion (STED) Microscopy and Electron Microscopy. STED analysis of immunostained rat and human ventricular tissue revealed co-localization of Kir2.1, Nav1.5 and Cav3 down to a resolution of approximately 60 nanometers. Electron microscopy has revealed caveolar structures; however, continued method adjustments are being made to localize the proteins of interest.

INFLUENCE OF TOOL SURFACE TEXTURE ON FRICTION STIR WELDING

Allison McDougal, Frank Pfefferkorn (Mentor)

The objective of this research is to examine how surface textures on friction stir tools affect aluminum welds. Friction stir welding is a solid-state welding process that joins workpieces without melting the material, but by heating and plastically deforming the material around a rotating tool. Comparative friction stir welding of aluminum experiments are run on a 3-axis CNC milling machine with smooth and textured friction stir tool shoulders. It is hypothesized that surface texture causes workpiece material to stick to the tool shoulder under lower loads, resulting in less flash and deeper stir zones. The results of this research are important for understanding how to reduce waste, increase weld size, and improve the aesthetic appearance of the joint surface in friction stir welding.

MODELING THE EFFECTS OF INTERSEEDED AND CONVENTIONAL CORN-ALFALFA ROTATIONS ON SOIL EROSION

Ashley McGoey, William Osterholz (Mentor)

Conventional corn and alfalfa crop rotations in Wisconsin cause substantial soil erosion. A potential way to mitigate this erosion is to simultaneously plant corn and alfalfa in the same field (also known as interseeding), with a transition into alfalfa production the following season. RUSLE2 was used to model soil erosion in an interseeded corn-alfalfa cropping system, and compared to a conventional corn-alfalfa rotational cropping system. RUSLE2 will be coupled with ArcGIS to model soil erosion across a larger scale for both cropping systems. The erosion reduction potential of the interseeded system will be calculated.

AFRICAN AMERICANS FIGHTING ALZHEIMER'S IN MIDLIFE

Emma McKeel, Carey Gleason (Mentor)

Despite being at a higher risk of developing dementia than non-Hispanic whites, many minority groups are underrepresented in Alzheimer's research. Although many African Americans express interest in contributing to scientific discoveries, especially those benefiting their community, numerous factors contribute to reduced participation, including historical mistreatment and racial bias as well as practical factors like transportation and time commitments. This Alzheimer's disease prevention study works to create a community-specific approach to recruitment and retention in the African American community through building trust and relationships. Additionally, it provides participants with feedback and opportunities to address lifestyle factors affecting risk for Alzheimer's disease. This programmatic approach to outreach and retention offers a model for including diverse communities in research and prioritizing the importance of diversity in scientific inquiry.

FRET & PIFE INDICATE PROMOTER DNA INTERACTS WITH RNA POLYMERASE TO FACILITATE OPEN COMPLEX FORMATION

Christina McNerney, M Thomas Record (Mentor)

We report stopped flow fluorescence kinetic studies of open complex formation at \hat{I} PR promoter DNA labeled at far-upstream and downstream positions with Cy3 and/or Cy5 fluorescent probes. We determine the time course of forming the closed complex (CC) ensemble (10ms-3s at 19C), in which the upstream and downstream duplex DNA are bent and wrapped on RNAP. Cy3 to Cy5 FRET detects wrapping, and single-dye PIFE detects transient contacts of the far-upstream DNA with the downstream cleft, and contacts of the downstream DNA as it is bent into the cleft. Subsequently (3s-400s) we determine the time course of the isomerization of the CC ensemble to OC, in which contacts of the upstream DNA with the downstream cleft are released.

A LASER-BASED METHOD FOR MEASURING WALL-VAPOR INTERFACE TEMPERATURE

Mari McPheron, Gregory Nellis (Mentor)

Annular flow consists of a liquid film flowing against a pipe wall with vapor flowing through the core. There are many heat transfer applications of annular flow, including liquid fuel rockets and chemical reactors. A laser-based technique has been developed to optically measure the temperature at the wall-liquid film interface. In order to determine the heat transfer coefficient, the wall-vapor interface temperature must be known. This technique, however, has not been applied to vapor temperature measurement when the liquid film dries out. A test setup has been developed to determine the ability of this technique to measure temperature at the wall-vapor interface.

PEASANT POLITICS AND PLURINATIONALISM: CONSTRUCTING THE ZAPATISTAS THROUGH DISCOURSE ANALYSIS

Isaac Mehlhaff, Amy Gangl (Mentor)

This paper asks two main questions: How does a group reclaim, revive, and reassert an identity other than that of the nation-state? What are the mechanisms by which the group pursues national autonomy based on its purportedly unique identity? The paper turns to the Zapatistas of southeast Mexico as a case study, using discourse analysis to demonstrate how plurinational groups construct unique national identities in the shadow of an overarching nation-state. The paper then identifies the necessary components of a theory of plurinational group formation and employs Gramsci's theory of hegemony to offer a framework for constructing such a theory.

ENHANCING TYROSINE ACCUMULATION IN ARABIDOPSIS THALIANA BY INTRODUCING TYR-INSENSITIVE MUTATION

Yusen Men, Hiroshi Maeda (Mentor)

Tyr is an important amino acid in protein synthesis in all living organisms. It serves as a precursor for countless secondary metabolites. However, Tyr production and derived metabolites are usually subject to negative feedback control on ADH enzymes in plants. Previous in vitro experiments demonstrated that a single mutation (D241N) in *Arabidopsis thaliana* ADH2 (AtADH2) enzyme reduced Tyr sensitivity. Thus, this study aimed to transform this AtADH2 D241N enzyme into wild-type *Arabidopsis* plants. Extensive biochemical and physiological analyses demonstrated that expression of this mutated enzyme elevated the Tyr level and secondary metabolites in vivo with a reduction in Phe level. These results indicate that Tyr-insensitive enzyme could direct carbon flow away from Phe biosynthesis and accumulate more Tyr production in plants.

DANCERS, WARRIORS, AND THE BODY ON DISPLAY: DECONSTRUCTING JEAN LÉON GÉRÔME'S ORIENTALISM

Hoyon Mephokee, Nancy Marshall (Mentor)

If art is meant to be seen, can a painting of a body in private be truly private? Why do the same figures seem appear in multiple paintings? By studying the Orientalist paintings of nineteenth-century French artist Léon Gérôme's, this project seeks to answer questions and investigate the ways Gérôme constructed his vision of the Orient, a place that the West defined itself against. Gérôme has historically been dismissed by critics for creating meaningless paintings that pandered to the masses; however, by studying his paintings of the Oriental body on display, this paper argues that he actually plays with convention and expectation in fascinating ways. The result are paintings that are visually complex and challenging, and that destabilize but ultimately reinforce the Occident-Orient binary.

THE EFFECT OF DRY-PERIOD HEAT STRESS ON MAMMARY MTOR SIGNALING

Emma Meyer, Sebastian Arriola Apelo (Mentor)

Heat stress has long-lasting metabolic effects, including decreased milk and milk protein production. The mechanistic target of rapamycin complex 1 (mTOR) protein kinase regulates milk protein mRNA translation and degradation. We collected mammary biopsy samples from six lactating cows exposed to heat stress during the dry period, and six cooled cows on day 42 of lactation, and determined expression of mTOR substrates. Proteins that increase translation and are stimulated by mTORC1 phosphorylation, including S6 kinase and its substrate ribosomal protein S6, were downregulated by gestational heat stress. Conversely, ULK1, an enzyme that initiates protein degradation and is inhibited by mTOR, was expressed at higher levels in gestational heat stressed cows. In conclusion, dry-period heat stress results in mammary metabolic remodeling to conserve nutrients.

LONG-TERM CELLULAR RESCUE EFFECTS OF NUTLIN-3 IN A MOUSE MODEL OF FRAGILE X SYNDROME

Jessica Miller, Xinyu Zhao (Mentor)

Fragile X syndrome (FXS), the most common single-gene contributor to autism spectrum disorders, is caused by absence of fragile X mental retardation protein (FMRP). FMRP loss leads to increased neural stem cell (NSC) activation, decreased neuronal production, and cognitive deficits. In our 2016 publication, we treated 8-week-old, FMRP deficient mice (Fmr1 KO) with Nutlin-3. Nutlin-3 treatment corrected neurogenic and cognitive deficits in Fmr1 KO mice 4 weeks post-treatment. However, the crucial question remained: does correcting NSC over-activation in young-adult mice rescue long-term neuronal production, identifying Nutlin-3 as a viable FXS treatment? Preliminary behavioral data suggested that cognitive rescue persisted in Fmr1 KO mice 16 weeks post-treatment. After quantifying NSC activation and neuronal differentiation, we found that Nutlin-3 leads to long-term neurogenic rescue 16 weeks post-treatment.

DISTINCT ROLES OF BRANCHED-CHAIN AMINO ACIDS (BCAAS) IN THE METABOLIC RESPONSE TO LOW-PROTEIN DIET

Blake Miller, Dudley Lamming (Mentor)

Obesity is an ever-increasing problem world-wide. Manipulation of dietary composition has become a potential intervention through production of beneficial metabolic health effects. Specifically, low-protein diet significantly improves glycemic control and promotes leaner body composition. Previously, we have shown restriction of branched-chain amino acids (BCAA: Valine, Leucine, and Isoleucine) can recapitulate many of these effects. However, contribution of individual BCAAs to the metabolic benefits of low-protein diet is unknown. Using an add-back paradigm in which mice were fed low-protein diets supplemented with normal dietary levels of individual BCAAs, we find supplementation with isoleucine and valine attenuates the beneficial effects of low-protein diet, increasing adiposity and decreasing glucose tolerance. These findings provide evidence for the key role of isoleucine and valine in metabolic benefits of low-protein diet.

ISOLATING BRETTANOMYCES YEAST TO BETTER UNDERSTAND ITS IMPLICATIONS ON INDUSTRIAL FERMENTATION

Caroline Miller, Chris Hittinger (Mentor)

Well-defined yeast starter cultures, usually made up of *Saccharomyces* species, are harnessed to make most industrially fermented products; however, with rising demand for sustainable energy and a booming market for authentic, niche foods, there has been a push to discover wild yeast alternatives. These yeasts are unassociated with and not dispersed by humans intentionally. Specifically, the genus *Brettanomyces* has vast potential to improve sensory complexity of beer, control microbial spoilage in wineries, and produce second generation biofuels. *Brettanomyces* has never been isolated in the United States, outside of breweries. To learn more about its genetic diversity and ecology, I will use modified protocols to isolate *Brettanomyces* from soil samples collected from UW Madison's Lakeshore Preserve.

LINKING CLINICAL, NEURAL, AND PERCEPTUAL MEASURES OF GLAUCOMA

Nathaniel Miller, Bas Rokers (Mentor)

Glaucoma is a common visual disorder characterized by retinal ganglion cell death and optic-nerve damage, leading to progressive visual field loss and blindness in its late stages. Previous animal-model, as well as human MRI and post-mortem studies have shown gray- and white-matter cortical degeneration, but the precise pathology of these changes is unclear, particularly at the level of the optic nerves. Diffusion MRI is a promising technique to assess optic nerve integrity that may enable early diagnosis and monitoring of disease progression. We found evidence of compromised structural integrity of the optic nerves in subjects with glaucoma. Our methods demonstrate the utility of dMRI as a diagnostic tool in human glaucoma that can link the structural, functional, and neural markers of a visual impairment.

IMPROVEMENT OF TOUGHNESS OF POLYMERIC MATRIX COMPOSITES USING ADDITIVELY MANUFACTURED REINFORCEMENTS

Matthew Milostan, Pavana Prabhakar (Mentor)

Delamination is a common failure in fiber composites subjected to various loads. Polymer reinforcements in between the layers of the composite has shown to improve damage resistance and durability of these composites. Additive manufacturing, using 3D printing, has shown to increase the interlaminar shear strength when used for printing reinforcements over the carbon-fiber layers before construction of composite. In this project, polymer reinforcement from a 3D printer is used to improve fracture toughness of carbon-fiber laminates. The reason for improvement in interlaminar properties from printed reinforcement has been investigated by understanding the bond quality between resin in carbon-fiber and printed reinforcements. Factors affecting the bond quality was explored, and bonding strength between 3D-printed polymer reinforcement and carbon-fiber laminate has been quantified with a T-peel test.

ADVANCING SILVOPASTURE IN WISCONSIN

Nicole Minerva, Diane Mayerfeld (Mentor)

This research project assesses whether silvopasture, the managed integration of trees with pasture, can benefit Wisconsin's farmers and environment. This project addresses animal welfare, social considerations, and environmental impacts (tree health, soil compaction, and vegetation changes). The four treatments are silvopasture, grazed woods, open pasture, and ungrazed woodland control. This presentation will focus on the animal welfare component. Animal welfare is analyzed through observations of behavior and signs of heat stress. Looking at correlations between access to shade and daytime temperature differentials, preliminary observations indicate that shade increases animal welfare. The final results of this project may impact Wisconsin's agricultural techniques.

EFFECT OF LAKE-PEAT STATE SHIFT ON CARBON ACCUMULATION RATES IN NORTHERN WI KETTLE LAKE ECOSYSTEMS

Matthew Mirkes, Sara Hotchkiss (Mentor)

The past behavior of terrestrial and aquatic ecosystem carbon pools can reveal key thresholds and boundary conditions for future climate and disturbance scenarios. Few studies have attempted to understand carbon dynamics across peat-lake ecosystems. Development of peatlands around lakes is linked to episodic peat expansion events corresponding to periods of high-magnitude water level changes. The lake-peatland state shift can be categorized into three phases: the lake phase, peatland expansion phase, and lake isolation phase. Here we focus on two isolated kettle lakes in northern Wisconsin, high and low in the water table. Loss-on-ignition performed on peat and lake sediment cores across a time gradient allows us to analyze the relationship between peat and lake sediment carbon accumulation rates during each lake state shift phase.

CHANGES IN NITROGEN CYCLING DURING TROPICAL FOREST SECONDARY SUCCESSION ON ABANDONED PASTURES

Sanober Mirza, Erika Marin-Spiotta (Mentor)

Humans have altered nitrogen (N) cycling in terrestrial ecosystems, affecting their potential to sequester carbon (C) and help mitigate climate change. Reforestation can recover N stocks and fluxes. Successional trends in N mineralization and nitrification vary across studies, with some showing greater rates in agricultural soils or in mature forest soils, compared to early successional forests. Here we measured N cycling rates in tropical secondary forests on former pastures. We found a significant effect of forest age on soil N mineralization and nitrification rates, but no effect of bulk soil N. We observed patterns between mineralization and nitrification with N-fixing tree species and with the particulate organic matter fraction, suggesting that this pool, which represents recent plant inputs, is a source for microbial N.

LONG-TERM EFFECTS OF CHILDHOOD SEXUAL ABUSE ON EMOTION RECOGNITION IN MALE OFFENDERS

Arielle Mitchell, Michael Koenigs (Mentor)

There has been little research examining the long-term effects of childhood sexual abuse on emotion recognition in adults. Childhood maltreatment is a risk factor for the development of externalizing personality disorders characterized by deficits in emotion recognition. However, the precise relationship between particular types of childhood maltreatment and subsequent deficits in emotion recognition remain unclear. The current study aims to characterize this relationship using accredited assessment tools such as the CTQ to measure severity of childhood maltreatment, stimuli from the Chicago Face Database to measure emotion recognition, and a sample of incarcerated adult male criminal offenders.

THE RELATION BETWEEN CHILDREN'S RECOGNITION OF EMOTION AND SOCIAL POWER CUES

Jean C Molina Gonzalez, Kristin Shutts (Mentor)

As part of the Social Kids Lab, we investigated correlations between two tasks related to social cognition with 4K students (ages 4 and 5). First, we measured participants' emotion identification abilities for the six primary emotions (sadness, fear, happiness, anger, surprise, disgust). Next, we measured their attention to social power cues (posture, body size, audience attention). We consider participant performance on each measure in isolation, and we also test the correlation in performance between the two measures. The results will shed light on the development of understanding nonverbal behaviors, which has implications for parenting and educating.

THE IMPACT OF OPIOID-TREATED CHRONIC LOW BACK PAIN

Arielle Mora Hurtado, Aleksandra Zgierska (Mentor)

Patients can experience a significant impact of Opioid-Treated Chronic Low Back Pain (CLBP) on their daily lives and quality of life. In this large 52-week randomized controlled trial (N=766), participants with opioid-treated CLBP, recruited from three sites across the U.S., were assigned to either Mindfulness Meditation or Cognitive Behavioral Therapy intervention groups to see if these therapies can help them better manage their CLBP. In the initial phase of the study, participants complete a video-recorded activity, during which they are asked about the impact of CLBP on their life. Qualitative responses from 30 randomly-chosen participants (10 per site) were transcribed and will be evaluated using qualitative analysis methodology to establish common themes describing the impact of opioid-treated CLBP on the affected individuals.

ADDRESSING RURAL POVERTY IN AMERICA: A CASE STUDY OF SALINE COUNTY, ILLINOIS

Claire Morse, Leann Tigges (Mentor)

Rural poverty is persistent in the U.S. regardless of social and governmental movements to ameliorate the conditions it engenders. I investigate underlying causes of rural poverty by examining Saline County, Illinois, characterized by persistent, concentrated childhood poverty. Primarily using the U.S. Census American Communities Survey, I obtain data regarding demographics, industry, and employment in Saline which I analyze with respect to contemporary social services and policy. Reformation of welfare and social services generated an insufficient social safety net. In Saline, lacking access to social support combined with prolific single mother households, and concentration of precarious service industry jobs, fosters an environment where poverty prevails. While the findings are specific to Saline County, the identified drivers of poverty can be extrapolated to localities across the nation.

TRANSCRIPTIONAL CONTROL OF KIR6.2 BY CYCLIN-DEPENDENT KINASE 2

Kara Mortensen, Matthew Merrins (Mentor)

Any alteration in the function of pancreatic beta cells can have devastating effects on cellular metabolism, potentially causing one of several forms of diabetes. Cyclin-dependent kinase 2 (CDK2) has a well-established role in the G1/S cell cycle transition of proliferating beta cells; however, the impact of its activity in quiescent cells is less clear. To examine the role of CDK2 in glucose homeostasis, we used a beta-cell specific CDK2 inducible knockout (CDK2-iKO) mouse model. In beta cells lacking CDK2, we observe an increase in glucose-stimulated insulin secretion. We also measured a corresponding decrease in mRNA expression levels of Kir6.2, a major subunit of the ATP-sensitive potassium (KATP) channel. These findings reveal that CDK2, by regulating Kir6.2 expression, reduces insulin secretion from pancreatic beta cells.

INFLUENCE OF THE MICROBIAL COMMUNITY ON CORN AND SOYBEAN PLANTS UNDER GREENHOUSE CONDITIONS

Winnie Moy, Marian Lund (Mentor)

Microbes play an important factor in the environment, agriculture, and public health. Soil microbes cycle nutrients, control pathogens, improve soil structure, and enhance plant growth, making them essential for the ecosystem. However, the relationship between soil microbes and plants is not yet fully understood, due to our complex ecosystem. This study examines the role of the microbial communities of continuous corn, continuous soy, and annually rotated soil on the growth and biomass of corn and soybean. This experiment will be conducted under greenhouse conditions to determine if the microbial communities of soil transplant treatments function similarly to the original soil they came from. The results will improve our understanding of the impact microbial communities have on plant health and help further improve our ecosystem.

UNDERSTANDING THE ROLE OF PROSTATE FIBROSIS IN MOUSE MODELS OF HORMONE-INDUCED URINARY DYSFUNCTION

Brett Mueller, Kyle Wegner (Mentor)

Most aging men will experience urinary dysfunction including increased urinary frequency and urine retention. This dysfunction is linked with stiffening of the prostate which surrounds the urethra and can obstruct urine flow. Manipulating the hormone levels in mice to recapitulate the hormonal environment in aging men results in similar urinary dysfunction. This study tests the hypothesis that hormone-induced urinary dysfunction results from fibrosis in the prostate. Male mice were exposed to either slow-release hormone implants for varying durations (1, 4, and 8wks) or received sham implants. Collagen density was quantified in the prostate and revealed no differences between hormone-exposed and sham mice. A significant increase in fiber length and diameter was observed over time in sham mice, indicating a role for aging on prostate stiffening/fibrosis.

INTERLOCKING MICRO-ARCHITECTURE DESIGN FOR POLYMERS

Amaya Munoz, Pavana Prabhakar (Mentor)

Desired qualities of materials often work in contradiction with each other. In our research, we specifically address how we can develop a hybrid material containing both high-stiffness and high-damping (low vibrations). We found evidence that an interlocking pattern for materials gives us advantages over monolithic materials. Interlocked materials can be pre-fabricated and then assembled to meet any needs. We are combining a high-damping polymer with a stiff polymer and creating an interlocking pattern based off of researched geometries, resulting in what we hope is an isotropic material that feels the same level of stress in all directions. We will confirm these hypotheses by performing various stress tests on these materials, to see how they handle stress.

ASSESSMENT OF BUPRENORPHINE PROVIDERS AND OPIOID RELATED HOSPITALIZATIONS IN RURAL WISCONSIN

Michael Murray, Wajiha Akhtar (Mentor)

In response to a recent outbreak of HIV in Scott County, Indiana, the National Institutes of Health have recognized and requested research to reduce HIV, hepatitis, and related comorbidities among people who inject drugs in rural communities. In order to assess vulnerabilities by county, we analyzed hospitalization rates from opioid overdose and buprenorphine (a medication intended for opiate addiction reduction) providers to find which counties in Wisconsin have high rates of hospitalization and availability of treatment. We found that 70% of rural counties in Wisconsin have no buprenorphine providers which is more than triple that of the urban counties (21.88%). The highest opioid related hospitalization rates in Wisconsin are among rural counties without available treatment which displays concern in the lack of necessary resources.

IMPLICIT NEGATIVE ATTENTION BIAS PREDICTS BRAIN WHITE MATTER MICROSTRUCTURE IN ADOLESCENTS

Annika Myers, Hill Goldsmith (Mentor)

We compared negative attention bias, the tendency to implicitly focus on negative information while overlooking positive and neutral information, to fractional anisotropy (FA) levels in the left and right uncinate fasciculus (UF). Adolescents (n=100, ages 13-19, M=16.1, SD=1.69) completed the Affective Go/No-Go task, which required rapidly identifying words as positive, negative, or neutral. Negative attention bias was sampled from commission and omission errors for positive and negative words. FA of the left UF was negatively associated with negative commissions (b= -.006, p= .013). FA of the right UF was negatively associated with positive and negative omissions (positive: b= -.008, p=.001, negative: b= -.005, p=.024). Impaired UF integrity may relate to deficits in emotional processing and a tendency to categorize positive and neutral information as negative.

ASSESSING OUTCOMES OF CYSTECTOMY PROCEDURES

Julian Nazareth, Vania Lopez (Mentor)

Many patients with advanced stages of bladder cancer need to undergo a bladder cystectomy, which consists of the full or partial removal of the bladder and the creation of a urinary diversion is created. My lab will analyze data from patients undergoing cystectomies at UW Hospitals in order to assess the outcomes of the surgery in relation to patient care. REDCap will be used to look for trends in patient data. The goal for the project is to create a database that will help to improve patient care.

STITCHING TOGETHER SOCIAL, ENVIRONMENTAL, AND ECONOMIC SUSTAINABILITY IN RURAL COSTA RICA

Brooke Nelson, Anna Ostermeier, Kyle Powers, Cathy Middlecamp (Mentor)

This project addresses three overarching sustainability issues in Perez Zeledon, Costa Rica: unnecessary landfilling of materials, lack of income generating opportunities in rural areas, and gender inequality. UpTica, a non-profit organization in Perez Zeledon, positively impacts rural communities by introducing upcycling as an approach to creating alternative income sources and learning experiences for local women. By supporting UpTica's expansion efforts, this project bolsters UpTica's social benefits of supporting women, reducing gender inequality, encouraging cross-gender collaboration, and strengthening the local economy by sourcing, producing, and selling locally.

SUPPORTING PARTICIPATION FOR FAMILIES WITH CHILDREN WITH AUTISM AND CULTURAL INSTITUTIONS

Nicole Nelson, Molly Hussey, Yasmeena Ougayour, Karla Ausderau (Mentor)

Families and children with autism spectrum disorders (ASD) can have a difficult time participating in traditional family-friendly public institutions. The purpose of this study was to identify if and how cultural institutions are supporting family participation for children with ASD. A national survey (N=49) was administered to characterize the programs, adaptations, accessibility, and degree of inclusivity of cultural institutions. The majority of the institutions (N=41) described ways they are working to provide a more inclusive environment for children with ASD. The specific results of the survey will be presented.

GENETIC RESISTANCE OR SUSCEPTIBILITY IN NOVEL RAT STRAINS AND IMPLICATIONS OF TRAUMATIC BRAIN INJURY

Haley Nemeth, Thomas Sutula (Mentor)

The purpose of this study is to discover how genetic backgrounds in novel Sprague-Dawley strains of rats contributes to the susceptibility or resistance to long term consequences after traumatic brain injury such as post traumatic epilepsy and post-traumatic stress disorder. This study uses two strains of mice that were bred to be vulnerable or resistant to progressive effects of repeated evoked seizures. A repeated stimulation to the brain is used to alter neural circuits and produce the spontaneous seizures that are characteristic of epilepsy to determine the rat's susceptibility or resistance to epilepsy. Data collected is used to determine a link between the location of traumatic brain injury and genetic background and develop a treatment for traumatic brain injury that is effective for humans.

ROLE OF AF9 IN SOMATIC CELL REPROGRAMMING

Edwin Neumann, Coral Wille (Mentor)

Cell differentiation to a specific lineage can be reversed by forcing the overexpression of transcription factors common to embryonic stem cells, thus generating induced pluripotent stem cells (iPSCs). This process is highly inefficient, though, meaning that there exist many epigenetic barriers to cellular reprogramming. One such barrier is Dot1L-mediated methylation of H3K79, a histone tail modification, of lineage-specific genes. The protein AF9, a binding partner of Dot1L, has been shown to increase reprogramming efficiency, likely by targeting Dot1L to genes that promote cell lineage switching. AF9 has multiple other binding partners which affect transcriptional elongation, however, so it is important to determine the exact mechanism by which this protein influences cellular reprogramming through functional binding domain mutations.

INVESTIGATION OF THE STRUCTURE-FUNCTION RELATIONSHIP OF B. SUBTILIS SSB MONOMER INTERFACES

Thanh Phuong Nguyen, Katarzyna Dubiel (Mentor)

Single-stranded DNA-binding proteins (SSBs) play critical roles within genome maintenance in bacteria. *E. coli* SSB binds and protects ssDNA intermediates and interacts with over 20 DNA replication and repair proteins. While SSB has been studied extensively in *E. coli*, much less is known SSB's *B. subtilis* homologs (SsbA and SsbB). Both bind ssDNA and function as tetramers, however SsbB lacks the critical region responsible for protein interactions. Recently, the Keck lab crystallized *B. subtilis* SsbA which revealed a unique interface between SsbA monomers, which was not present in the SsbB structure. We hypothesize mutations at the monomer interface will allow for mixed SsbA-SsbB tetramers. With these experiments, we hope to determine if these monomer interfaces are necessary and sufficient to prevent mixed-tetramer formation in vivo.

PREDICTING THE GLASS FORMING ABILITY OF BULK METALLIC GLASSES USING RANDOM FORESTS

Vanessa Nilsen, Michael Hibbard, Dane Morgan (Mentor)

The coefficient of thermal expansion (CTE) influences the performance of concrete significantly; however, the experiments for measuring concrete CTE are both time consuming and expensive. As such, physical measurements of concrete CTE are not frequently made. Instead, empirical equations based on historical data and concrete composition, known as "Level-2" and "Level-3" prediction methods, are typically employed to predict a given concrete mix's CTE. However, there have not been any studies exploring the prediction of concrete CTE using machine learning methods, which have shown strong predictive capabilities for other concrete properties. This study shows the CTE of the Wisconsin concrete mixes using random forests yields higher accuracy than the empirical equations.

PREDICTING THE COEFFICIENT OF THERMAL EXPANSION OF WISCONSIN CONCRETE USING RANDOM FORESTS

Vanessa Nilsen, Michael Hibbard, Dane Morgan (Mentor)

The coefficient of thermal expansion (CTE) influences the performance of concrete significantly; however, the experiments for measuring concrete CTE are both time consuming and expensive. As such, physical measurements of concrete CTE are not frequently made. Instead, empirical equations based on historical data and concrete composition, known as Level-2 and Level-3 prediction methods, are typically employed to predict a given concrete mix's CTE. However, there have not been any studies exploring the prediction of concrete CTE using machine learning methods, which have shown strong predictive capabilities for other concrete properties. This study shows the CTE of the Wisconsin concrete mixes using random forests yields higher accuracy than the empirical equations.

WILD YEAST (YEAST EXPLORATION AND ANALYSIS SCIENCE TEAM) PROGRAM

Napoleon Nosker, Dana Opulente (Mentor)

This project investigates the diversity of single-celled fungi (yeasts) that exist within natural habitats. In the Hittinger Lab, the Wild YEASTs program has samples from across the country, collected from various substrates and habitat types. I will focus on enriching for yeasts at multiple temperatures, an unconventional practice, to determine the effect this has on which yeasts are isolated from a sample. To determine the effect of temperature on enrichment, I will grow samples at three distinct temperatures. I expect to find that there will be a correlation between the number and diversity of strains isolated from the different temperatures and the sampling environment.

PERICYTE PHENOCONVERSION IN RESPONSE TO TGF-BETA AND CXCL-12

Steven Oakes, Chad Vezina (Mentor)

Aging men are at risk for developing urinary symptoms characterized by incomplete bladder emptying. Benign prostate enlargement has been identified as one cause of urinary symptoms but cannot fully account for all cases. There is strong evidence that an aging related increase in prostate collagen content also contributes to urinary dysfunction. To develop therapies that reduce prostate collagen content, it is necessary to identify the prostatic cell type that synthesizes collagen and the signaling pathways that drive collagen synthesis. This project tested the hypotheses that prostate perivascular cells (pericytes) are a source of prostatic collagen synthesis and that CXCL12 and TGF-Beta signaling pathways drive collagen synthesis in these cells. The tests will advance the field by determining whether prostatic pericytes are capable of synthesizing collagen.

EARLY TRANSPLANTATION INTO A VESICOSTOMY & METHODS OF PYELONEPHRITIS DETECTION

Ebenezer Ojo, Thomas Leffler (Mentor)

Within this lab there has been an ongoing search for the usefulness of vesicostomy surgeries and also the methods on treating pyelonephritis. Our department specializes in pediatric urology therefore vesicostomy surgeries have been used in order to suppress the harmful effects of oligohydramnios. Our results have shown that early transplantation/vesicostomy surgeries are safe for children and can lead to a functional bladder. We took three patients with a history of renal failure at around a 2-3 years of age and performed our early transplantation into a vesicostomy and received positive results in most patients. Now we are currently analyzing appropriate ways to detect acute pyelonephritis, which is an inflammation of the kidneys due to a bacterial infection. Current methods include a Quick MRIs & DSMA.

EXPLORING RACE AND EDUCATIONAL OPPORTUNITY FOR BLACK YOUTH

Annette Okafor, Bianca Baldrige (Mentor)

This year, I have been a part of Professor Bianca Baldrige's research project exploring racial discourse and educational opportunity for black youth. Professor Baldrige's research explores how community-based educational spaces (like after school programs) help black youth talk about race and educational opportunity in a community she calls Pleasant Ridge. In Pleasant Ridge, vast racial disparities exist between blacks and whites. This study includes interviews with youth workers, analysis of print media, observation of community events, and focus groups with Black high school students. Preliminary findings show that conversations about racial disparities in Pleasant Ridge avoid acknowledgement of structural and institutional racism in the city. Through these findings and my personal involvement transcribing interviews, the goal is to educate the larger community and encourage change.

WATCHING SPORTS AND ITS ASSOCIATION WITH VARYING EMOTIONAL RESPONSE STYLES

Jason Oliva, Lauren Gresham (Mentor)

The Midlife in the US (MIDUS) study is a longitudinal study examining the health and well-being of Americans as they age. Through MIDUS, this particular study explores whether there was a difference in emotional responses to viewing emotion-eliciting pictures between people who never watch sports, watch sports 1-6 times/week, vs. those who watch sports +7 times/week. Using psychophysiological measurements of the corrugator muscles, we found people who watched sports 1-6 times a week showed the largest sustained positive emotional reactions to emotion inducing stimuli. On the contrary, people who watched sports +7 times/week showed the lowest sustained positive emotional reactions, suggesting that people with shorter sustained positive emotional responses may seek positive stimuli more frequently.

EFFECTS OF MICROSCALE ELEMENT GEOMETRY ON AGGREGATE BEHAVIOR OF GRANULAR MATERIAL

Nicholas Olsen, Dan Negrut (Mentor)

This project aims to develop a distributed-memory framework for simulating large-scale granular problems and to apply it to the phenomenon of hopper flow. Granular material is exceedingly common in industry, as it is a common form taken on by raw materials. Next to water, granular material is the second most simulated aggregate material in industry. As such, improved simulation infrastructure for testing granular material behavior has great value. This project investigates the effects of element geometry on the overall behavior of granular material in a simple hopper at a resolution achievable only with a distributed-memory simulation engine.

NEON: SPEAKING IN A GRAPHIC LIGHT

Ben Orozco, Helen Lee (Mentor)

I have always been drawn to graphics found in illustrations, logos, and signs that condense our experiences to essential shapes. In the process of translating images into their fundamental forms, they become official and matter-of-fact, but also simultaneously playful and charismatic. Neon is a process of glasswork that manipulates tubes of glass into simple motifs and lettering. The end result shares many contradictions with that of the graphic form: flat and three dimensional, simple and complex, serious and playful, real and imagined. I use this in-between to explore new possibilities of making meaning in a luminous and historical craft.

THE HIGHS & HURTS OF HEROIN: PUBLIC ATTITUDES AND SPATIAL CONSEQUENCES FOR TREATMENT

Anna Ostermeier, Caitin Hartnett, Michelle Johnson, William Gartner (Mentor)

Over the past twenty years, heroin has become one of the most deadly street drugs available in the United States. This national narrative is reflected in Madison, Wisconsin, where increasingly, city agencies are allocating resources towards combating this epidemic. The purpose of our research is to spatially assess the diverse attitudes of Madison residents in regards to heroin addiction, and how these attitudes impact treatment options and access within the area. To gain an understanding of the existing treatment landscape in Madison, we interviewed an array of experts in the field. Additionally, we surveyed members of the Madison community via social media networks and e-mailed Madison's Neighborhood Associations, receiving over 500 responses from the majority of Madison's ZIP codes.

GENETIC MODIFIER LOCI OF MOUSE TMEM 135 MUTATION IDENTIFIED BY QUANTITATIVE TRAIT LOCUS ANALYSIS

Jacob Otto, Akihiro Ikeda (Mentor)

Regulation of mitochondrial dynamics through Transmembrane 135 (Tmem135) is critical for protection from environmental stress and for controlling the progression of retinal aging. Over expression of Tmem135 in transgenic mice results in accelerated aging in the eye and pathologies observed in age-dependent retinal diseases. The identification of genes that modify these pathological phenotypes may improve our understanding of the disease mechanisms and lead to new treatment strategies. This project attempts to identify Tmem135 modifier loci using F2 intercrosses (B6-TgTmem135 x FVB-WT and FVB-WT x B6-TgTmem135). Hemizygous Tmem135 transgenic F2 mice were selected for genotyping with a panel of SNP markers and phenotyping by histological analysis of retinal degeneration. Genotype and phenotype data will be used for QTL analysis to map modifier loci.

A ROUTE TO EFLORNITHINE ANALOGS VIA OXIDATIVE ALLENE AMINATION

Lucas Oxtoby, Jennifer Schomaker (Mentor)

Eflornithine is a fluorinated amino acid analog that effectively treats African Trypanosomiasis (sleeping sickness). Eflornithine operates by irreversibly inhibiting ornithine decarboxylase, an enzyme that plays a key role in the biosynthesis of polyamines, which are a class of compounds that promote the growth and proliferation of diseased cells. Although eflornithine analogs with varying, stereospecific halogens on C-1 have been investigated, analogs also featuring stereospecific halogens on C-3 have not been explored. Introducing new moieties at this position forms a substitution pattern known as an aminated stereotriad, which is a motif found in numerous biologically active natural products with known anti-cancer and anti-parasitic properties. Current progress on this synthetic procedure will be reported along with future plans for screening biological activity.

PRODROMAL ANXIETY IN THE PINK1 -/- RAT MODEL OF PARKINSON DISEASE

Natalie Pahapill, Cynthia Spiotta (Mentor)

Identification of non-motor signs occurring in a prodromal stage of Parkinson Disease (PD) enables earlier detection, diagnosis, and intervention. PD-related anxiety appears early in disease manifestation, prior to onset of cardinal motor signs. In this study, we used the Elevated Plus Maze, a behavioral test of anxiety, in the Pink1 -/- genetic rat model of early-stage PD. We hypothesized that this test would demonstrate significant genotype differences. Pink1 -/- rats (10 months old) and age-matched controls were analyzed for the time/frequency in open vs. closed arms. Our pilot data suggests that Pink1 -/- rats have increased anxiety measures, spending more time in closed arms. These data will help validate the progression of anxiety in the Pink1 -/- rat and allow further investigation of early-stage PD.

AROMATASE EXPRESSION IN NEURONS AND GLIAL CELLS OF THE MONKEY HYPOTHALAMUS

Molly Pappin, Ei Terasawa-Grilley (Mentor)

Recent studies in this lab indicate that estradiol is synthesized and released in the stalk median eminence (S-ME) of the hypothalamus and stimulates gonadotropin releasing hormone (GnRH) release. However, the cell type that synthesizes aromatase, the enzyme responsible for the conversion of androgens to estradiol, is unknown. In the present study, it was examined whether neurons or glial cells express aromatase using double fluorescent immunohistochemistry of the monkey hypothalamus. For markers of neurons and glia, β -tubulin and glial fibrillary acid protein (GFAP), respectively, were used. Although aromatase, β -tubulin, and GFAP were immunostained individually, co-localization is unclear, because of high autofluorescence of hypothalamic tissues. Currently, I am working to resolve this problem using suppressants for autofluorescence.

GENERATION OF GENE-EDITED HUMAN PLURIPOTENT STEM CELL (HPSC) LINES FOR STUDYING FMRP FUNCTIONS

Molly Parries, Xinyu Zhao (Mentor)

Fragile X syndrome (FXS) is a neurodevelopmental disorder. DNA methylation of the FMR1 gene halts transcription of Fragile X Mental Retardation Protein (FMRP) in FXS. This RNA binding protein plays an important role in neuronal development. We explored gene regulation by FMRP in human pluripotent stem cell (hPSC) derived neural progenitor cells (NPCs). The hPSCs differentiate into NPCs, which differentiate further into forebrain neurons. We used three cell lines: H1 (hESC), H13 (hESC), GM1 (iPSC). We created a FLAG-tagged line for each to identify mRNA targets using crosslinking immunoprecipitation (CLIP-seq). We generated FMRP KO lines using CRISPR-Cas9 to analyze differential gene expression in FMRP-deficient cells. Developing these lines allowed us to look at specific mRNA targets and major pathways impacted by FMRP deficiency.

STUDYING ARGININE AND LYSINE'S EFFECT ON THE COILED COIL SYSTEM WITH A FLUORINE TAG

Alexander Passow, Naomi Biok (Mentor)

Hydrophobic interactions play a large role in governing protein folding and help stabilize coiled coil systems. Hydrophobicity is shown to be affected differently by guanidinium and ammonium ions. Arginine and lysine, two cationic amino acids, have guanidinium and ammonium groups respectively, and therefore are each expected to have different effects on hydrophobic interactions. To help understand how arginine and lysine effect peptide hydrophobicity, and how this influences the stability of coiled coils, this study will examine Fluorine NMR shifts with changing methanol concentrations, to see how much methanol it takes to break down a dimeric coiled coil into monomer helices.

UNCOVERING TEACHING METHODS

Siddharth Patel, John McGinty (Mentor)

Certain teaching methods may be more effective than others, and looking at the neurological pathways that encode the stimuli associated with the teaching strategies, one can improve their understanding of an effective method. Volunteer students from UW-Madison will be taught Euler's theory in geometry. Students will be randomly assigned to 30 mins of one of four teaching conditions (instruction through symbolic notation, through objects transitioning to diagrams to symbols, objects to symbols, and diagrams to symbols). A pre and post-test will be given. How do students' descriptions of their learning experience relate to the most effective method? Objects to diagrams and then to symbols is expected to be the most effective. This study aims to help teachers choose a curriculum that is beneficial to all.

INVESTIGATING THE ROLE OF HP1^γ IN EMBRYONIC STEM CELL DIFFERENTIATION

Nikita Patel, Zafirah Zaidan (Mentor)

The ability of embryonic stem cells to differentiate into any cell type in the body has led to fascinating research on human development and regenerative medicine. During differentiation, there is an observable increase in histone H3K9 methylation, a hallmark of heterochromatin. The family of HP1 proteins play an essential role in mediating heterochromatin formation. Among the 3 HP1 proteins, α , β , and γ , each have different functional roles within the cell to repress gene transcription. Despite the considerable evidence highlighting HP1 γ 's regulation of heterochromatin formation, few studies have investigated its role during cell differentiation. Therefore, the goal of my research is to investigate the role of HP1 γ in embryonic stem cell differentiation and determine the functional domains of HP1 γ that are responsible for proper differentiation.

YOGA AS A PROMISING TREATMENT FOR POST-TRAUMATIC STRESS DISORDER

Katherine Paxon, Gudrun Buhnemann (Mentor)

This paper clarifies the relationship between modern yoga and its psychological effects on those who are diagnosed with Post-Traumatic Stress Disorder (PTSD). Increased attention to alternative therapies in the American medical community has led to yoga attracting greater attention, particularly within mental health fields. I critically examined various research studies that targeted at-risk groups who experienced PTSD at a higher rate than that of the average population. These studies explored several aspects of the disorder, and identified a promising decrease in hyperarousal symptoms, due in large part to the meditative aspects of yoga. Through critical analysis of the results presented from the various studies, it can be concluded that yoga holds a high potential as an alternative therapy for those with PTSD.

IMPACT OF STANDING DESKS & MOVEMENT BREAKS ON ELEMENTARY SCHOOL STUDENTS' PHYSICAL ACTIVITY LEVELS

Samuel Pelot, Elizabeth Larson (Mentor)

The World Health Organization proposed that increased daily physical activity may have a positive impact on students academic achievement, cognitive skills and attitudes toward school (Ucci et al., 2015). This project will compare physical activity levels of elementary school students (3rd-5th grade) using standing desks with those using traditional furniture. Five classrooms were movement permissive (provided AlphaBetter Standup desks with pendulum footrest bars and movement break curriculums). The other three classrooms used traditional furniture and no movement breaks. All students, with their parents consent, wore pedometers tracking steps per day for five days pre- and post-intervention. Data were analyzed to examine levels of physical activity in classrooms using standing desks as compared to traditional classroom furniture by time (pre- and post-intervention), and grade level.

INSTITUTIONAL LITERACY LIMITATIONS AND APPROACHES EMERGING TO COMBAT THEM

Diana Pena-Moreno, Maggie Bertucci Hamper (Mentor)

This project evaluates the role of creative writing in working-class, college students. Through an ethnographic study and grounded theory, this project explores how institutions limit the literacy skills of working-class, college students and examines the methods used to fight institutions, such as creative writing as an option in schools. I find a positive relationship between creative writing and non-traditional students, although the initial focus of research were mothers. Although it is already known that marginalized college students tend to struggle academically, this project hopes to lay the foundation for new approaches to teaching by introducing creative writing as an additional option in the grading process.

ESSENTIALIST VIEWS ON MENTAL ILLNESS: EFFECTS ON STIGMA AND PERCEIVED TREATMENT EFFICACY

Danielle Peters, Karl Rosengren (Mentor)

People with mental illness are often stigmatized. One cause of stigmatization is essentialist beliefs, beliefs that mental illness is caused by a specific, discrete, and stable cause. In my experiment, I manipulated essentialist beliefs about mental disorders to examine the impact on stigmatization and perceived treatment effectiveness. Using artificial mental disorders, I manipulated descriptions to emphasize essentialist, non-essentialist, or essentialism-neutral characteristics about each disorder. Participants rated their willingness to interact with the person and how effective they believe drug treatment and talk therapy will be. Analyses explored the impact of essentialism on people's stigmatization of mental illness and perceived efficacy of treatments. This work has implications for anti-stigma campaigns and for factors that may influence whether or not someone with a mental illness seeks treatment.

ROLE OF BRAIN ESTROGEN RECEPTOR ALPHA ON MENSTRUAL CYCLICITY IN FEMALE RHESUS MONKEYS

Siri Peterson, David Abbott (Mentor)

We hypothesized that eliminating expression of ERalpha (ERa) in the arcuate nucleus (ARC) will disrupt ovulatory menstrual cycles in female rhesus monkeys. At the beginning of the study, the ARC of the ERa silenced group was infused with adeno-associated virus 8 containing silencing RNA (shRNA) that prevents ERa translation. The controls received virus containing a scrambled sequence shRNA that doesn't affect cell function. After treatment, menses were observed daily and enzymeimmunoassays were performed on 2-3 times weekly blood samples to measure progesterone levels signifying ovulation (>1ng/ml). The luteal phases of the ERa subjects tended to be of shorter duration than those of the controls. These findings suggest that regulation of menstrual cycles is not entirely dependent on ARC ERa, but it may play a role.

GENETIC AND BIOCHEMICAL CHARACTERIZATION OF SUPPRESSORS OF TYRA2 (SOTA) IN ARABIDOPSIS

Yar Xin Phang, Hiroshi Maeda (Mentor)

Tyrosine (Tyr), Phenylalanine (Phe), and Tryptophan(Trp) are aromatic amino acids (AAAs) which plays important roles in human health, plant growth, defence and reproductions. In microbes, AAAs negatively feedback regulated DHS, the first enzyme in Shikimate pathway. However, the regulation of DHS is still unknown in plants. Therefore, I will study the regulation of the key enzymes in Shikimate and AAAs pathway of Arabidopsis. This may provide insights for the future studies to improve the production of AAAs and plant natural products. After EMS mutagenesis, the production of Tyr was recovered and Phe production increased. In this project, I am identifying the site of suppressor mutations that recover growth of Tyr-deficient mutants and analyse the enzymatic activities of DHS1, DHS2 and DHS3 genes in mutant plants.

CELL DEVELOPMENTAL AGE AND ROSETTE FORMATION IN HPSC-DERIVED PHOTORECEPTOR TRANSPLANTS

Alexander Pitts, Allison Ludwig (Mentor)

Photoreceptor cell loss is a leading cause of blindness globally, and while no therapies currently exist for these patients, pre-clinical animal studies are focused on disease modeling and photoreceptor replacement therapies using retinal organoids. Preclinical studies in our lab have occasionally revealed an off-target rosette morphology among groups of transplanted photoreceptors. While these rosettes are not ideal for transplant functionality, they may prove useful for modeling diseases of the outer retina as they protect the fragile outer segments of photoreceptors. Although developmental age of transplanted cells is suspected to be a factor in rosette formation, no studies to date have examined this relationship. This study is therefore aimed at quantifying rosette formation in vivo via immunohistochemistry in transplants of varying developmental age.

A PACKED BED REACTOR FOR CHEMICAL ECOSYSTEM SELECTION EXPERIMENTS ON THE ORIGINS OF LIFE

Alex Plum, David Baum (Mentor)

While theories concerning the origins of life are plentiful, experimental procedures to test them are in short supply. Our lab has developed an experimental procedure to generate chemical systems capable of growth and adaptive evolution. We incubate complex mixtures of organics with mineral grains and impose selection through serial transfers, analyzing for evidence of life-like chemical assemblages. I am designing a packed bed reactor to serve as a reaction vessel for continuous chemical ecosystem selection experiments. This would facilitate automation of the serial transfer process, continuous flow of organic precursors over the mineral phase, and a reduction in generation time and material waste. This approach may provide critical insights into the origins of life on Earth and its potential to arise elsewhere in the Universe.

IMPACTS OF GENOTYPE, ENVIRONMENT, AND GXE INTERACTIONS ON STAND PRODUCTIVITY IN A WOODY BIOFUEL CROP

Jen Proud, Olivia Cope (Mentor)

The purpose of this work is to advance the potential for use of aspen (*populus tremuloides*) as a woody biofuel feedstock through improved understanding of the effects of genotypic variation, competition, and their interactions, on stand productivity. Objectives are to: 1) assess how genotypic variation and intraspecific competition interact to affect biomass production and genetic composition at the stand level, and, 2) evaluate how genotypically-determined growth-defense tradeoffs and competitive environment influence resistance to insect attack at the individual tree and stand levels. Methods incorporate standard field physical and physiological measurements and laboratory chemical analyses. Results will advance understanding of ecological and evolutionary factors that influence the genetic composition and function of forest ecosystems and inform efforts to use aspen for biofuel plantations.

DEALING WITH ‘DRAMA’: HIGH SCHOOL FRESHMEN’S INVOLVEMENT WITH PEER TENSIONS ONLINE

Ashley Prudhom, Bradford Brown (Mentor)

As middle adolescents transition into high school, peer interactions can involve gossip, conflicts, or aversive interactions’ what teens refer to as ‘drama.’ Social media use, a nearly universal element of the high school transition, can intensify or mollify drama, but the details of social media’s role in drama have not been previously investigated. In an exploratory, qualitative study of 38 high school freshmen from varying ethnic and socioeconomic backgrounds, we examined students’ participation in and reactions to drama. We found substantial variability in their experience with drama, and how drama originating online is exploited into drama in everyday life. We identified three major drama-provoking factors: how often individuals utilize social media, parental and self-identified rules, and personal normative practices.

CHILDREN’S LEARNING FROM INTERACTIVE eBOOKS: RELEVANT VS. DISTRACTING FEATURES

Mary Pulvermacher, Heather Kirkorian (Mentor)

The purpose of the present study was to examine if distracting features in eBooks affect children’s learning. Preschoolers (3-5 years, N=104) were read one of three books: Distracting Interactivity, where activating irrelevant features advanced the story, Relevant Interactivity, where the story proceeded by activating a relevant feature, and Noninteractive, where the story proceeded without any activation. Participants were then tested on their word learning. Contrary to our predictions, our results found that Distracting Interactivity did not hurt learning, and Relevant Interactivity did not help learning. These findings show that future research is needed to determine which specific types of interactive features affect children’s learning from eBooks.

THE INDUS VALLEY SCRIPT: A CORPUS COMPILATION AND STATISTICAL ANALYSIS OF POTTERY INSCRIPTIONS

Daniel Quigley, Jonathan Kenoyer (Mentor)

A new direction in the analysis of the undeciphered Indus script as found on pottery, and a comparison of sequences of signs with those seen on Indus seals and tablets, is examined via statistical methods. We examine and categorize the Indus script as it is extant on pottery sherds found at major Indus sites and sites in the Gulf region via statistical analyses of sign frequencies and string lengths. Due to a wider distribution and varying utility of pottery as opposed to seals, it may be expected that there are forms of strings and symbols not normally present on seals, and yet are prevalent on the pottery specimens. This provides a new perspective on the nature of Indus writing use.

THERMAL AND ELECTRICAL FINITE ELEMENT MODELING FOR THE OPTIMIZATION OF ELECTROCHEMICAL EXPERIMENTS

Jake Quincey, Adrien Couet (Mentor)

In electrochemical experiments, complex geometry leads to distributions of current and potential lines that are non-optimal on the sample under investigation. The calculation of both the electrical and thermal distribution within an experimental facility, in this case, the autoclave of the Environmental Degradation of Nuclear Materials Lab, provides means to optimize future experiments to obtain the best results and assist in the interpretation of current results. During this work, both the thermal and electrical modeling was done using the finite element method in the multiphysics framework MOOSE. The results obtained from the code provides insight into the effects around the edges of multiple electrochemical experiments being conducted and demonstrate areas that need further engineering to obtain the best experimental results.

INTERFACIAL REACTIONS OF N₂O₅ WITH SALTY SOLUTIONS

Sarah Quinn, Tom Sobyra (Mentor)

Gas-microjet scattering experiments were performed with N₂O₅ on a salty water surface. Understanding the reactive uptake of N₂O₅ into aerosols is crucial to the study of the atmosphere because the uptake of N₂O₅ is correlated to the concentration of ozone in the troposphere and the lifetime of methane. Uptake values of N₂O₅ into solution were measured by comparing the incident signal of the N₂O₅ beam from an inert glass surface to the signal remaining after interaction with the liquid microjet. The reactive uptake off two aqueous solutions (8m), LiBr H₂O and LiCl H₂O, were measured and compared. Initial results show both solutions yielded uptakes higher than the literature value for pure water.

MISREPRESENTATIONS: A PARENTAL DIARY STUDY OF CHILDREN'S ACTION ERRORS

Chantel Raimer, Karl Rosengren (Mentor)

Researchers have begun to use the term action errors to refer to instances when a child attempts to perform an action on an object that does not allow for its successful completion. Studies have identified three sub-types of action errors; scale (i.e., child attempting to get into toy car), grasping (i.e., child attempting to pick up grapes from a photograph), and media (i.e., child attempting to hand an object through Skype). Our current study attempts to further document these errors in a broader context with a more generalizable population. Our results will allow for more converging evidence on the three sub-types as well as create a better understanding of the developmental trajectory of when these errors occur and decline between infancy and young childhood.

SITE SPECIFIC CHEMICAL FUNCTIONALIZATION OF SCFVS THROUGH AN INTEIN-LINKED SECRETION PLATFORM

Rasika Ramanathan, Eric Shusta (Mentor)

Protein functionalization creates modified protein populations to engineer a particular function, such as improving binding affinity. However, producing uniformly modified populations while minimizing adverse functional effects is a major challenge. One method of achieving this is through intein-mediated functionalization. Intein is inserted before the protein of interest and cleaved out following induction with a reducing agent. The amino acid just before the intein (1-residue), significantly impacts the cleavage yield. By characterizing the effect of the -1-residue across three platforms (bacterial, eukaryotic, and mammalian cell culture), we aim to engineer of the intein-scFv fusion to achieve a higher yield of cleaved material.

ASSOCIATIONS OF INFANT BRAIN AND GUT MICROBIOME

Alysha Rameshk, Douglas Dean III (Mentor)

Animal studies have shown that the gut microbiome plays a crucial role in underlying brain mechanisms such as metabolism and myelination, however there has been little to no investigation of this relationship in humans. A recent study has shown that gut microbiota populations were found to be associated with cerebrospinal fluid (CSF) biomarkers of Alzheimer's disease (Vogt et al., 2017). Measures from the mcDESPOT (Deoni et al., 2008) multicomponent relaxometry technique and high-throughput 16S rRNA sequencing from a cohort of typically developing infants will be utilized to examine the interactions between brain development and infant gut microbiota. Infant brain and cognitive measures were found to be associated with relative abundancies of bacteria phylum, suggesting an emerging relationship between gut microbiota and infant brain development.

HYDROGEN EMISSION IN THE EARTH'S UPPER ATMOSPHERE

Arianna Ranabhat, Susan Nossal (Mentor)

We are investigating how the solar cycle, a major source of natural variability in the upper atmosphere, affects hydrogen Balmer-alpha emissions. Hydrogen in this region is a byproduct of lower atmospheric chemical reactions involving H₂O, CH₄, H₂, OH, and CH₂O, some of which are greenhouse gases. We used data taken by the Wisconsin H-alpha Mapper Fabry-Perot (WHAM) interferometer to analyze emission intensities of hydrogen in the Earth's upper atmosphere. Using calibration and the Voigt-fit spectral fitting code, I plotted Balmer-alpha emission intensity during solar cycle minimums and maximums and fit polynomials to the data. I will continue plotting Balmer-alpha emission data from the northern hemisphere and compare to previous work, and then analyze data from the southern hemisphere.

IMMUNOTHERAPY OF 9464D+GD2/3 NEUROBLASTOMA

Kayla Rasmussen, Amy Gurel (Mentor)

Improving current treatments for high-risk neuroblastoma is a major focus of cancer immunotherapy due to the poor prognosis for this disease, which affects infants and children. We hypothesize that a combined immunotherapy regimen of IL-2, hu14.18K322A, and anti-CTLA-4, together with radiotherapy, will produce significant antitumor effects leading to complete cures with long-term immune memory. In this study, we used the murine 9464D+GD2/3 neuroblastoma model to test the antitumor efficacy of our combined immunotherapy regimen with radiotherapy. Our results suggest that the combination of radiotherapy and immunotherapy can produce antitumor effects in the 9464D+GD2/3 neuroblastoma model. Future experiments will aim to enhance the observed effects by adding anti-CTLA-4 to the treatment regimen and optimizing the dose of radiotherapy in the hopes of producing complete cures.

ANALYSIS OF TUMOR SURVIVAL RESPONSE TO NUTRIENT DEPRIVATION IN A MICROFLUIDIC MODEL

Shujah Rehman, Melissa Skala (Mentor)

The purpose of the project is to observe how tumor cells survive to nutrient starvation. Multiple previous reports have shown that hypoxia, nutrient starvation, and acidosis are hallmarks of solid tumors, appearing consistently in the tumor microenvironment; which forces tumor cells to adapt, turning them more resistant to therapy. Therefore, in this project a microfluidic platform will be used to study these survival and resistance mechanisms. By using different microscopy techniques, including pH, the metabolic phenotype, cell proliferation and autophagy monitoring, we will study these survival and resistance mechanisms. By creating a platform that successfully mimics the tumor microenvironment and different nutrient conditions, along with advanced Optical Metabolic Imaging platforms, the interplay between drug effectiveness and nutrient deprivation is elucidated.

SYNTHESIS AND CHARACTERIZATION OF A CATIONIC HOMOPOLYMER ACTIVE AGAINST CLOSTRIDIUM DIFFICILE

Casey Ritts, Leslie Rank (Mentor)

Nylon-3 polymers have been shown to exhibit antibacterial activity against *C. difficile*, a bacterium known to cause widespread nosocomial infections (CDI) that currently do not have a consistently effective treatment option. Nylon-3 polymers are composed of β lactam monomers, which easily react with each other to form polymer chains under conditions of catalytic base. These polymers are relatively easy to synthesize, and won't undergo proteolytic degradation in the body. These monomers can be made with unique side chains that effectively give each polymer different properties. Recently a library of polymers was screened and a top hit was discovered. However, the structure and the synthetic route of the monomer were unreported. This project focuses on the dual multi-step synthetic routes used to elucidate the structure.

CHRONIC ABSENTEEISM IN ELEMENTARY SCHOOLS

Maia Rivoire, Eric Grodsky (Mentor)

Chronic Absenteeism, defined as missing 18 or more school days, is a widespread and impactful crisis in elementary schools across the US today. Students suffering from chronic absenteeism during elementary school experience lower test scores, lower grades, higher expulsion rates, and poor mental health throughout their academic career. Using national data, this paper illustrates the contours of chronic absenteeism by defining the disproportionate effects of Chronic Absenteeism based on student health, socioeconomic status, and race, as well as highlight potential solutions. This paper seeks to prompt discussion surrounding chronic absenteeism by highlighting demographic patterns, causes, effects, and potential solutions to chronic absenteeism.

MALES' CHILDHOOD FAMILY EXPERIENCES AND RISK FOR ALCOHOL-RELATED PROBLEMS IN YOUNG ADULTHOOD

Josephine Robertson, Allie Barringer, Valerie Burnett, Kathryn Ryser, Lauren Papp (Mentor)

Negative experiences within the family system early in life have been linked to excessive alcohol use in young adulthood. Males in this age demographic report more occasions of binge drinking compared to their female counterparts and may experience risky consequences of their drinking. The current study explored the risk for alcohol-related problems based on negative family environments and parental divorce among 49 males who were recruited as part of a larger study on dating relationships. Results from a multiple linear regression indicated that childhood families marked by disengagement and riskier environments (but not the occurrence of divorce) were significant predictors of alcohol-related problems. The project will discuss implications for efforts to reduce and prevent risky drinking, as well as future directions for research.

MITOCHONDRIA ADAPTATION BETWEEN CROSSTALK PROTEINS IN THE SECRETORY PATHWAY

Nick Robinson, Luigi Puglielli (Mentor)

N^ε-lysine acetylation of newly-folded proteins within the ER maintains quality control and proteostasis. The acetylation machinery includes the ER membrane acetyl-CoA transporter AT-1/SLC33A1, and acetyltransferases which catalyze the reaction, ATase1/2. A gene duplication in AT-1/SLC33A1 has been associated with intellectual disabilities and autistic-like features expressed by patients. Genetic alterations in AT-1/SLC33A1 change the cytosolic acetyl-CoA pool and causes the mitochondria to adapt. Changes in the ER acetylation machinery lead to mitochondria adaptation and cytosolic metabolic shifts, suggesting crosstalk between various proteins along the pathways. We will probe for specific genes involved in the mitochondria fuel source uptake - including acyl-carnitines, glutamate, and pyruvate transporters. This data will give us further insight into mitochondria adaptation and cross-talk occurring in models of acetyl-CoA dysregulation.

FITNESS, AGING AND THE BRAIN: OBJECTIVES AND PROCEDURES

Christine Rogers, Ozioma Okonkwo (Mentor)

Past research indicates that increased physical activity corresponds to a reduction in Alzheimer's disease (AD) pathology. However, many of these studies assessed physical activity using questionnaires, which are limited by self-report response bias, and examined the elderly, not adults in midlife when AD related alterations begin to accumulate. In the Fitness, Aging, and the Brain (FAB) study, VO₂ peak, an objective measure of cardiorespiratory fitness, is examined in relation to AD pathology (i.e. A β 42, P-tau181, and T-tau) in asymptomatic middle-aged adults with family history of AD. Higher VO₂ peak is hypothesized to be related to an AD biomarker profile reflective of decreased AD pathology. Findings will contribute to the current evidence associating an active lifestyle to positive health outcomes.

AUTOMATED CODING METHODS IN TRANSACTIVE DISCOURSE

Melanie Rogers, Drew Huang, Brendan Eagan (Mentor)

A crucial aspect of assessing the development of moral reasoning is identifying transactive discourse patterns. Efficiently and reliably identifying, or coding, for this type of interaction has proven difficult to achieve. At the same time, with increasingly large amounts of data, many researchers find themselves with another impossibility: coding (annotating or categorizing) large datasets manually. This poster will present a solution to both of these problems. Our results demonstrate it is possible to reliably code for transactive discourse using an automated approach. Specifically, we will discuss a methodology of developing and validating automated coding structures, using the online web tool, nCoder, that Epistemic Games Group has built to support automated code creation and validation in the context of identifying different types of transactive discourse.

DISAGREEING WITH DESPOTS: TOLERATION OF COLLECTIVE ACTION IN CHINA

Benjamin Rolsma, Yoshiko Herrera (Mentor)

The Chinese party-state has both voiced and practically demonstrated a strong aversion to popular collective action. However, thousands of collective action events, often quite critical of Chinese government policies, are permitted every year. This research examines why these events are not repressed. It considers the role that state legitimacy concerns, information gathering, and modernization may play in creating openings for mass action. It raises important questions about the sustainability of China's unique form of authoritarianism.

EFFECTS OF DIURNAL CORTISOL AND SLEEP ADEQUACY ON COGNITIVE AGING

Alexander Romantz, Ozioma Okonkwo (Mentor)

As the U.S. population ages, the prevalence of Alzheimer's disease (AD) and related impairment increases. Evidence suggests some AD risk is associated with modifiable risk factors, and can be reduced by changes to lifestyle and environment. Sociobehavioral and biological stress pathways are potentially modifiable, and are implicated in many chronic diseases, but their role in cognitive health is unclear. We will examine associations of two relevant variables, sleep adequacy and the stress hormone cortisol, with cognitive function and key AD biomarkers in a sample of healthy older adults. We hypothesize dysregulated cortisol and poor sleep predict poorer cognitive function and increased AD-related pathology. Our findings will offer insight into two modifiable factors, stress and sleep, that may influence cognition and preclinical AD in aging populations.

CELL MEMBRANE LEAKAGE AND TOLERANCE TO STRESSORS SUCH AS HEAT AND DROUGHT

Jenna Rosinski, Ramamurthy Mahalingam (Mentor)

As global temperatures rise, finding crop lines tolerant to stressors such as heat and drought are necessary. To save time and resources, a test on cell membrane leakage could be performed on 2-week old barley plants. Through an ion conductivity test on the tissue of the plant, one can analyze the stability of the cell membrane by how many ions are released. If many are released, the plant has poorer stability and a leaky membrane. We hypothesize that this leaky membrane is an indicator of how well a barley plant will perform in a stressed environment. This will be tested by comparing the tissue ion conductivities of different lines of barley plants to biomass data collected on their performance in actual heat and drought.

PARENT-CHILD INTERACTIONS AND BEHAVIORAL VARIABILITY AMONG CHILDREN WITH AND WITHOUT ADHD

Karly Rosinsky, James Li (Mentor)

ADHD is a prevalent neurodevelopmental disorder that leads to poor academic, social and health outcomes over the course of development. During early childhood, negative parenting behaviors play a central role in the genesis of many childhood disorders, including ADHD. However, relatively little is known about the parent-child dynamic among children with ADHD, and how this dynamic unfolds over time. This research is particularly important given the emerging evidence that children with ADHD exhibit inconsistency in their performance across several domains, suggesting that parent-child dynamics might vary depending on how the child is behaving that day. Using a variety of methods, including observational data, self-report measures, and the use of a novel smartphone-based assessment strategy, I investigate how parents and children with ADHD influence one another.

INCIDENTS OF THE 2016 ELECTION

Joie Ross, Barry Burden (Mentor)

For all polling places in Wisconsin, incident logs completed by poll workers provide a record of irregularities on election day. However, the current coding system used by election officials has not been updated since the implementation of modern optical scan and direct recording electronic machines. This systematic breakdown has resulted in an increased ambiguity within incident reports. This research examines incident logs from the 2016 election in Wisconsin and classifies the administrative data using a set of newly developed codes in an attempt to provide clarity about election day incidents. Accordingly, the dataset contains methodical insight of the commonality of different incidents as well as analyzing and comparing the results with similar studies.

EVALUATION OF CX43 PROTEIN LEVELS IN CONTROL FEMALE RATS COMPARED TO FEMALE RATS EXPOSED TO NICOTINE

Jordan Ross, Sathish Kumar (Mentor)

Hypertension is present in one third of adults. The cause of high blood pressure is unknown. Possible causes can be attributed to fetal origins and especially smoking during pregnancy. To understand the development of hypertension we look at gap junctions specifically Cx43. (Connexins affect blood pressure) In this study we examined Cx43 protein levels in resistance blood vessels and compared these levels between the smoking and control offspring of the rats. Through the utilization of western blotting and densitometry we were able to determine the protein levels. Previous results have alluded to the link of parental exposure to nicotine and the decreases of Cx43 levels in offspring blood vessels which may in turn affect blood pressure. Future studies will examine mRNA and examinations of Cx43.

SOLAR LIGHTING IN RURAL KENYA

Max Roth, James Ewald, Mary Claire Mancl, Maxwell Roth, David Seamon, Megan Sweet, Lesley Sager (Mentor)

For the past year and a half, our group has developed and iterated a design for an inexpensive and accessible way to provide lighting to people in rural Kenya who don't have access to electricity. We created a simple, low cost, and easy to make design for a solar light that has a housing made out of used water bottles, which is a readily available resource in the regions we were targeting. This winter break, our team was able to travel to Kenya with the help of the Morgridge Center for Public Service's Wisconsin Idea Fellowship and implement our project. While there, we successfully educated and helped 100 women and girls make their own lights that will benefit their schoolwork and household income.

EFFECTS OF ASD DIAGNOSIS AND GENDER ON PARENTAL ATTRIBUTIONS OF POSITIVE CHILD BEHAVIOR

Helen Rottier, Sigan Hartley (Mentor)

The objective of the current study was to identify the effect of autism spectrum disorder (ASD) and gender on parental attributions of positive child behavior. Analyses of attribution ratings indicated mothers (N= 188) and fathers (N = 187) of children with ASD rated positive behaviors as less internal, less stable, and less controllable than mothers (N = 187) and fathers (N = 185) of children without ASD. There was no difference in parental attributions between male and female children for parents of children with ASD and fathers of children without ASD. Mothers of children without ASD rated the positive behaviors of female children as more controllable compared to male children. Future research directions and implications for family interventions are discussed.

TEACHING EULER'S METHOD THROUGH OBJECTS, DIAGRAMS, AND SYMBOLS

Jack Rouleau, John McGinty (Mentor)

Teachers use myriad methods when instructing students because what works for one student isn't guaranteed to work for another. The purpose of this study is to observe how different teaching methods of Euler's Theorem work on students who'll be taught via one method, two, or all three methods. The three modes of instruction are through objects, diagrams, and symbols. Participants will take a pre- and post-test to demonstrate learning. My research question is: Which teaching methods, combination of methods, or order of methods be best at teaching Euler's Theorem? My hypothesis is that students who receive all three methods will learn the material the best. Hopefully, studies like this will lead to more methods of instruction being implemented in classroom at all levels.

CHARACTERIZATION OF HIGHLY CONSERVED YVCJKL OPERON IN METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS

Drew Rust, JD Sauer (Mentor)

The rise in antibiotic-resistant bacteria such as Methicillin-Resistant Staphylococcus aureus (MRSA) accentuates the need for novel antibiotics. An operon containing several potential virulence factors of unknown function has been identified in *S. aureus* known as the yvcJKL operon. These proteins are potential drug targets due to their highly conserved nature and critical role in growth and virulence in other prominent pathogens. In this study, we utilized transposon mutants in yvcJ and yvcL to assess phenotypes critical to biofilm formation and beta-lactam antibiotic resistance. yvcJ mutants were found to be hypersensitive to beta-lactams and displayed hyper-biofilm formation relative to wild-type. yvcL mutants was indistinguishable from wild-type in either phenotype. Taken together, the phenotypes associated with yvcJ deletion suggest that it may be a potential antibiotic target.

GROWTH AND SOIL MOISTURE RESPONSES OF INTERMEDIATE WHEATGRASS

Patricia Ryou, Kate Ivancic (Mentor)

Thinopyrum intermedium (intermediate wheatgrass), commercially known as Kernza, is a dual-purpose perennial crop used for human and animal consumption. Intermediate wheatgrass may reduce nutrient leaching and be more drought tolerant compared to annual crops, making it more environmentally and economically sustainable. This study's goal is to understand Kernza growth and soil moisture response under four nitrogen (N) treatments (0N, 45 kg N ha⁻¹, 90 kg N ha⁻¹, and red clover intercrop) alongside corn silage + 200 kg N ha⁻¹. The study's objectives are to 1) measure soil moisture, 2) quantify root mass, and 3) calculate forage yield. The ongoing experiment is a two year study with a randomized complete block design in Arlington, Wisconsin. Preliminary results show greatest root activity under high nitrogen treatments.

CHILD SELF CONTROL IN THE RECIPE 4 SUCCESS INTERVENTION

Anuradha Saini, Kabir Bedi, Ye Rang Park (Mentor)

In the Recipe 4 Success intervention, which is embedded within Early Head Start home visits, parents living in poverty are taught how to provide sensitive scaffolding to promote toddlers' self-control skills. Families are randomly assigned to receive the 10-week intervention or continue to participate in standard home visits. At the beginning and end of the study, all families completed extensive assessments, including videotaped parent-toddler interactions and an adaptation of the marshmallow test to measure toddler self-control skills. Difference scores across the 10-week period were calculated for children's self-control skills. This difference was statistically significantly different ($p < .05$) between the intervention and control groups, indicating that Recipe 4 Success was more effective in improving children's self-control skills than Early Head Start as usual.

GAIT PARAMETERS IN WALKING TASKS IN EARLY-STAGE PARKINSON'S DISEASE

Christine Samuelsen, Corinne Jones (Mentor)

Declining motor function, particularly gait, is a hallmark of Parkinson's disease (PD). While there is research asserting gait deficiencies in PD, we aimed to see how these impairments manifest in early-stage PD. Fifteen patients with early-stage PD were compared to thirteen healthy age/sex-matched controls. Subjects walked across a GAITRite mat in the following manners: forward, backward, completing a dual-task, fast, and tandem. Repeated measures ANOVA was used to assess effects of health and task on velocity, step width, step time, and step length. Patients with PD walked with significantly slower velocity ($p=0.0004$), decreased step width ($p=0.008$), and decreased step length ($p=0.0004$) across all tasks. These findings support decreased limb function in PD patients, and can be used to improve recognition and treatment of mobility issues.

ASSESSING ACADEMIC PARTICIPATION OF LAND GRANT UNIVERSITY PROFESSORS BY GENDER

Maria Sanchez, Bradford Barham (Mentor)

This project examines the scholarly activities and productivity of agricultural and life science faculty at 52 major US Land Grant Institutions. A unique dataset allows comparisons in 2005 and 2015. We explore whether the increasing proportion of women faculty is leading to similar performance across genders or achievement gaps as reported in other countries with comparable data. We compare faculty participation in two types of university-industry relations: academic commercialization (e.g. patenting and start-ups) and academic engagement (e.g., sponsored research and collaborative research with industry scientists). We also compare performance across journal articles, research funding, and graduate student training. Initially, we find very little evidence of gender gaps, and that academic engagement is more prevalent and lucrative form than academic commercialization for men and women faculty.

EVA THE ENGINEER: ENCOURAGING YOUNG WOMEN AT THE INTERSECTION OF ENGINEERING AND SUSTAINABILITY

Morgan Sanger, Renee Olley, Angela Pakes Ahlman (Mentor)

Eva the Engineer is an interactive elective course developed and taught by UW-Madison undergraduate engineering students to young women in Madison-area middle schools. The primary goal of the program is to educate, excite, and encourage young women to pursue science, technology, engineering, and mathematics (STEM) fields. Hands-on activities are used to teach lessons on the principles of civil engineering, sustainability, and women in STEM. Life cycle assessments, water use and water treatment, concrete, and the use of recycled materials in construction applications are just a few of the sustainability-focused engineering principles to which the students are exposed. By presenting examples of successful female engineers, as well as allowing young women to explore the engineering field interactively, students envision themselves succeeding in STEM fields.

THE EXPLORATION OF CENTROSOMAL PROTEIN 170 AS A SUBSTRATE OF POLO-LIKE KINASE 4

Madilyn Sass, Mark Burkard (Mentor)

The centrosome is the major microtubule organizing center of the cell consisting of two centrioles, whose duplication is regulated by Polo-like kinase 4 (PLK4). It is important to determine how PLK4 acts to drive centrosome amplification—a hallmark of cancer cells. Centrosomal Protein 170 (CEP170) is a protein recruited to the mother centrioles subdistal appendages and was identified as a possible substrate of PLK4 in an unbiased mass spectrometry screen. Using in vitro kinase assays, we determined that CEP170 is a substrate of PLK4, and we have mapped the phosphosites. Ongoing work will determine the function of this phosphorylation. Understanding CEP170s interaction with PLK4 will advance our knowledge of how PLK4 regulates centriole duplication and could further our overall understanding of centrosome amplification.

REDUCING SPINAL CORD INJURY-INDUCED NEUROPATHIC PAIN WITH FOLIC ACID

Sydney Sauer, Gurwattan Miranpuri (Mentor)

Millions of people suffer from spinal cord injury (SCI)-induced neuropathic pain (NP). MMP-9 and MMP-2 are genes that regulate NP post-SCI. Inhibiting these two genes has been proven to suppress MMP expression and reduce NP in rats after undergoing a spinal cord ligation (SCL). Past research has shown that rats that underwent SCL can recover functionally while NP alleviates. We hypothesize that folic acid will suppress MMP-9 and MMP-2 expression in the late and early phase respectively. I will be completing a western blot analysis to identify expression levels of MMPs to assess the effectiveness of folic acid in pain regulation. If it is successful, we can validate that there is a new way to treat spinal cord injury-induced NP.

TROPHIC SHIFTS IN WISCONSIN LAKES AFTER INVASION BY BYTHOTREPES LONGIMANUS AND DREISSENA POLYMORPHA

Marco Scarasso, Jake Vander Zanden (Mentor)

Invasive species can have profound effects on the ecosystems they invade, including altering the food-web structure of the system. Lake Mendota and Lake Monona have suffered biological invasion by zebra mussel (*Dreissena polymorpha*) and spiny water flea (*Bythotrephes longimanus*) in the past two decades. Using stable isotope data from before and after these invasions, changes in trophic structure and productivity within the study area will be revealed through shifts in various species' trophic positions and benthification. This project also aims to generate data for future isotope studies within these lakes through comprehensive sampling of species, as well as contribute to a potential long-term food web dataset.

THE BENEFITS OF ENACTIVE LEARNING ON UNDERSTANDING

Gabrielle Schaap, Mitchell Nathan (Mentor)

The purpose is to explore how the physical manipulation of objects influence students' understanding of mathematical concepts. I will investigate how teaching through enactive activities combined with iconic and symbolic teaching add or diminish the understanding of a math concept. My research question is, What is the effect of instructional activities that utilize physical manipulation of objects compared to iconic and symbolic methods of teaching? Four input conditions will be used: enactive teaching, followed by iconic teaching then symbolic teaching; enactive teaching, followed by symbolic teaching; iconic teaching, followed by symbolic teaching; symbolic teaching only. My hypothesis is, the use of physical manipulation of objects will provoke greater learning outcomes. This important research will foster effective learning strategies for teachers to use in the classroom.

INVESTIGATIVE JOURNALISM: PURSUIT OF AN ACCURATE TRUTH

Luke Schaetzel, Deanne Hall (Mentor)

This project looked at the issue of concussion and brain trauma in football. Mainly, the goal was to search for root, systemic problems that may or may not be holding the sport back from properly addressing the issue. In interviewing 13 University of Wisconsin football players, coaches, former player Chris Borland and top researchers like Dr. Bennet Omalu, this goal was met. At the end of the process, it became clear current players were willingly disregarding the science of concussion and brain trauma, while the education these players receive on the topic is woefully inadequate. In finding the systemic truth of the issue, it has become clear more needs to be done in football than mere rule changes. A complete culture needs to be changed.

THE ROLE OF NEUROTRANSMITTER SIGNALING ON TRAUMATIC BRAIN INJURY OUTCOMES IN DROSOPHILA

Amanda Scharenbrock, David Wassarman (Mentor)

Traumatic brain injury (TBI) is a leading cause of mental health problems around the world. Currently, no treatments exist for TBI. Using our *Drosophila melanogaster* (fruit fly) model, we have evidence that activation of the adrenergic nervous system following a TBI leads to poor outcomes. Adrenergic receptors are targets of neurotransmitters such as epinephrine and norepinephrine. I have found that β -blockers, which inhibit adrenergic receptors, significantly reduce intestinal permeability. I propose to follow up on this finding by determining (i) whether intestinal permeability leads to hyperglycemia following TBI, (ii) whether diet following TBI affects the ability of β -blockers to inhibit intestinal permeability, and (iii) whether genetic background affects the ability of β -blockers to inhibit intestinal permeability. Ultimately, these studies may lead to treatments for TBI.

OXYTOCIN INDUCES SEX-SPECIFIC CHANGES IN TERRITORIAL DEFENSE BY PAIR-BONDED CALIFORNIA MICE

Juliette Schefelker, Catherine Marler (Mentor)

Monogamous pair bonding allows for coordination of complex social behaviors via division of labor. While oxytocin influences pair bonds, its role in division of labor and territorial defense is unknown. We studied oxytocin's role in territorial defense by pair-bonded California mice, which use stable defense strategies where either one or both individuals approach an intruder. Intranasally administered oxytocin prior to a territorial intrusion revealed sex-specific differences in defense strategy and vocal communication. When only females received oxytocin, pairs increased the use of a divided, female-only defense strategy. When only males received OT, call duration was shortened but defense strategy was unchanged. An additive effect of OT was seen when both individuals received OT, with pairs showing increased divided defense and shortened calls. (NSF Grant IOS1132419)

FIELD VERIFICATION OF PORCINE ADENOVIRUS ASSAY

Tina Marie Schmansky, Sharon Long (Mentor)

In Wisconsin, agricultural practices create a high potential for contamination of groundwater used for drinking water from livestock manure. Amendments to the Clean Water Act of 1972 have been successful in reducing fecal contamination found in public and private water in the United States. However, problems in detecting and removing fecal pollution have not been entirely eliminated. Enhancing the toolkit of available, accurate and efficient methods for determining the presence of fecal materials in water supplies is vital to both environmental quality and public health. Fecal Source Tracking (FST) contains a subset of toolkits including Microbial source tracking (MST) which focus specifically on microbial targets. The FST assay being evaluated in this study is porcine adenovirus using an established human adenovirus assay as a comparison.

THE EFFECTS OF PHENYLEPHRINE, TROPICAMIDE, AND TETRACAINE ON OPTOKINETIC TRACKING IN THE S334TER RAT

Karina Schmidt, Allison Ludwig (Mentor)

Visual function assessment in rat models via optokinetic tracking (OKT), a widely used visual test for rodents, is a cornerstone of preclinical cell replacement therapy studies for retinal degeneration. Phenylephrine, tropicamide, and tetracaine are three ophthalmic medications commonly used to anesthetize or dilate rat's eyes for examination during preclinical studies. Although these drugs are suspected to affect OKT performance for several days after use, there are no published washout times for effects on vision in the S334ter rat, a recently developed model for retinal degeneration. In order to implement more efficient schedules for preclinical studies involving multiple tests, this study is aimed at determining the chronological effects of these three commonly used medications on OKT performance over a two week period in the S334ter rat.

GENDER DIFFERENCES IN END-OF-LIFE CANCER BLOGS WRITTEN BY AYAS

Sophia Schmidt, Megan Moreno (Mentor)

Cancer is the fourth leading cause of death among adolescents and young adults (AYAs) in the U.S., causing more than 10,000 deaths annually. Increasingly, young adults are turning to blogs to share their cancer experiences. The purpose of this study is to determine if self-identified gender affects online end-of-life communication by AYA cancer patients. Content analysis and Linguistic Inquiry and Word Count (LIWC) analysis will be used to examine gender differences in blogs written by AYAs facing terminal cancer. Variables will examine common behaviors and sentiments at three stages of death awareness and acceptance, as framed by Timmermans' awareness of death theory. The findings from this study may help adapt care and support systems to better meet the unique end-of-life concerns of this age group.

HARVESTMEN IN THE PHILIPPINES (ARACHNIDA: OPILIONES)

Stephanie Schmidt, Prashant Sharma (Mentor)

The Philippines constitutes a biodiversity hotspot for conservation priority as well as a key theater for diversity discovery and biogeographic inquiry. The arachnofauna of the Philippine archipelago is poorly understood. Here I describe three new species of harvestmen (daddy-long-legs) from the large southern island, Mindanao. Using a combination of light microscopy and scanning electron microscopy, I detail the sexually dimorphic characteristics of each species. This work represents the first records of the families Stylocellidae (suborder Cyphophthalmi) and Tithaeidae (suborder Laniatores) in Mindanao, suggesting that multiple harvestman lineages have crossed biogeographic barriers in their colonization of the Sunda Shelf archipelago.

PLA2G16 AS A BIOMARKER IN PROSTATE CANCER DETECTION

Adam Schultz, David Jarrard (Mentor)

We discovered significantly aberrant PLA2G16 DNA methylation in patient's urine samples associated with prostate cancer using microarray and validated by measuring DNA methylation in prostate biopsy tissues. DNA methylation is an epigenetic alteration that acts to regulate gene expression. DNA was extracted, amplified using biotinylated primers, and pyrosequenced to quantify DNA methylation. Samples from patients with prostate cancer showed higher methylation compared to samples from patients without prostate cancer ($p < 0.05$). A multiplex model incorporating PLA2G16 CG3 and clinical information was performed (AUC 0.8112, $p < 0.05$). Gene expression was significantly lower in tumor-associated samples and correlated with increased methylation ($r = -0.6957$, $p < 0.0001$); this is relevant because PLA2G16 is a tumor suppressor. PLA2G16 methylation alteration in patient urine sample can be used as a non-invasive assay for PCa diagnosis.

EPITHELIAL QUANTITATION OF HISTOLOGICALLY NORMAL PROSTATE BIOPSIES PREDICTS PRESENCE OF CANCER

Adam Schultz, David Jarrard (Mentor)

We examined whether epithelial content of histologically normal prostate tissue could predict the presence of associated prostate cancer using computer image analysis. Cancer negative prostate biopsies from patients with and without cancer were stained with either H&E or pan-cytokeratin (epithelial cell marker) and imaged using inForm and Vectra software. Mean epithelium percentage for patients with cancer was higher compared to those without cancer in the original data set (44.9% vs 38.8%, $p = 0.0006$, AUC 0.65) and on independent validation (47.3% vs 41.8%, $p = 0.004$, AUC 0.62). Pan-cytokeratin demonstrated epithelial cell percentage was not significantly different ($p = 0.75$). Histologically normal prostate biopsies from men with and without cancer suggests an increased epithelial component, unlikely secondary to increased cell number, detectable with computer image analysis.

EFFECTS OF MATERNAL TRAUMA AND MAJOR DEPRESSION ON THE NEURAL NETWORKS OF THEIR OFFSPRING

Kyrie Sellnow, Josh Cisler (Mentor)

Maternal mental health during pregnancy is influential in the healthy psychological development of the child. Children of mothers with Major Depressive Disorder (MDD) during pregnancy often exhibit cognitive, social, and behavioral dysfunction, and maternal trauma exposure increases the risk of child psychopathology. However, there is a lack of research investigating the child's neural network activity as a possible mediating factor. The present study used fMRI to conduct an Independent Component Analysis to examine the influence of prenatal depression and history of childhood trauma on connectivity of select neural networks in the children from twelve mother-child dyads. Maternal trauma histories were reported with the Childhood Trauma Questionnaire, and depression severity over the duration of the pregnancy was measured by the Beck Depression Index.

AUTOPHAGYS ROLE IN HEAD AND NECK CANCER RESISTANCE TO RADIATION THERAPY

Gopika SenthilKumar, Randy Kimple (Mentor)

Radiation therapy (RT) is used as a curative treatment for patients with head and neck squamous cell carcinoma (HNC). However, despite decades of research into improved treatments, therapeutic resistance remains a major challenge for this malignancy; over 40% of patients with HNC develop recurrent disease. Preliminary data suggests that autophagy, a process by which cells self-degrade and utilize internal components to promote survival during times of stress, acts as a cytoprotective mechanism during RT and plays an important role in therapeutic resistance in HNCs. We hypothesize that blocking autophagy may improve therapy outcomes by reducing the likelihood of resistance. We will investigate the molecular mechanisms by which radiation induces autophagy and study the effects of various autophagy inhibitors on HNC sensitization to RT.

THE COMMON SYMBIOSIS PATHWAY IS REQUIRED FOR ECTOMYCORRHIZAL FUNGI TO COLONIZE POPLAR TREES

Jonathan Setzke, Kevin Cope (Mentor)

Arbuscular mycorrhizal (AM) and ectomycorrhizal (ECM) fungi form mutualistic associations with many plants species. AM fungi use the common symbiosis pathway (CSP) to colonize plants; however, no molecular signaling pathway has been identified for ECM fungi. Recently, our lab discovered that ECM fungi produce lipochitooligosaccharides (LCOs), the same signaling molecule produced by AM fungi to activate the CSP. We therefore hypothesized that ECM fungi also use the CSP to colonize plants. To test this, we used RNA interference to reduce the expression of three CSP genes and subsequently evaluated LCO-induced lateral root formation and ECM colonization in wild-type and transgenic lines. We discovered that non-sulfated LCOs trigger lateral root formation in a CSP-dependent manner and that full ECM colonization requires multiple components of the CSP.

DESIGN FOR FAULT TOLERANT QUANTUM ERROR CORRECTION CODE

Hele Sha, Robert Joynt (Mentor)

Standard quantum error correction fixes errors on qubits, but identification of errors can be imperfect. Our research focuses on designing generalized quantum error correction schemes that work with imperfect error extraction. We use Redundant Syndrome Extraction (RSE), which ensures qubit errors can be identified in this case, though at the cost of redundant extraction operations. A core concept utilized in RSE is Balanced Incomplete Block Designs (BIBD). BIBD divides a set of numbers into subsets, with the numbers and number pairs appearing a fixed number of times. This implies each BIBD corresponds to an effective RSE code. Previous research has already designed a working RSE code for 7 qubits using BIBD. Our goal is to look for other possible RSE codes corresponding to different BIBDs.

INVESTIGATING THE REGULATION OF ERA THROUGH BORTEZOMIB-MEDIATED REPRESSION OF ESR1 LOCUS

Ola Shana, Elaine Alarid (Mentor)

The majority of breast cancers express ER gene (ESR1), grow in response to estrogen, and are treated by drugs that block ER function. Accordingly, the control of ESR1 is essential in cancer treatment. We have previously shown that bortezomib, an alternative cancer drug that inhibits the 26S proteasome, causes attenuation of ESR1 expression after prolonged exposure. Using quantitative-RT-PCR, we find that in addition to ESR1, the expression of neighboring genes (CCDC170, ZBTB2, SYNE1, and ARMT1) in several ER-positive breast cancer cell lines (MCF-7, T47D and ZR-75-1), are similarly decreased after 24-hour bortezomib treatment (30nM). These data indicate that proteasome inhibition co-regulates genes in a 125kb locus surrounding ESR1 and suggests a role for the 26S proteasome in the control of broad genomic regions.

A CLOSER LOOK AT HIGH ENERGY NEUTRINOS IN ICECUBE

Adam Shandonay, Tianlu Yuan (Mentor)

The IceCube neutrino observatory uses digital optical modules (DOMs) embedded in the Antarctic ice to detect neutrinos that help scientists discover more about the universe. For the past several years, IceCube has broadened our understanding of nature by measuring neutrino oscillations, the astrophysical neutrino flux, and high energy cross sections. In order to continue learning more about neutrinos, we need to accurately reconstruct their interactions inside the detector. Furthermore, as neutrinos travel to IceCube through the Earth, their flux can be attenuated. In this report, I analyze the quality of event reconstruction by looking at distance dependence on angular resolution and the behavior of neutrino attenuation as the initial flux varies.

THE IVORY RING AND THE REVOLUTIONARY FRIENDSHIP OF WRITERS SHI PINGMEI, LU JINGQING, AND LU YIN

Alison Sharpless, Rania Huntington (Mentor)

Chinese woman authors Shi Pingmei, Lu Jingqing, and Lu Yin, who were inspired by the nationalist May Fourth Movement of 1919 to involve themselves in their country's modernizing society by writing, came to Beijing to be part of the first generation of college-educated women. The three formed a close bond over their shared ambitions, and were even written into each other's works, the most notable being Lu Yin's *The Ivory Ring*, a novel not yet translated into English about Shi Pingmei's struggles and tragic early death. Little had been previously researched about the unique friendship of the writers; this presentation aims to introduce the authors and novel to English-speaking audiences as well as present the conclusions of the research, which was completed in December 2017.

EVALUATING THE SAND MOTOR AS AN OPTION FOR PROMOTING HEALTHY AND RESILIENT LAKE MICHIGAN BEACHES

Briana Shea, David Hart (Mentor)

In 2011, 20 million cubic meters of sand was deposited off the Netherlands coast. This sand motor was designed to distribute sand naturally to preserve the shore and protect the inland from flooding. In light of sea level rise, this mega-nourishment project was a way to reduce the expense and frequency of traditional beach nourishments. The Lake Michigan coast in Southeastern Wisconsin faces similar challenges due to erosion and recent water level rise. Increasing bluff instability and negative effects of traditional coastal protection structures show a need to explore the possibility of mega nourishments in this area. My presentation will discuss the insights of the Dutch Sand Motor, the history of beach nourishments in Wisconsin, and explore the possibility of a mega-nourishment project here.

TOWARDS A PAN-GROUP ACTIVATOR OF THE QUORUM SENSING SYSTEM IN STAPHYLOCOCCUS EPIDERMIDIS

Wenqi Shen, Helen Blackwell (Mentor)

Staphylococcus epidermidis is one of the leading causes of hospital-acquired infections, and these infections are difficult to eradicate via traditional antibiotic therapy due to increasing antibiotic resistance and the formation of robust biofilms. The accessory gene regulator (*agr*) quorum sensing (QS) system plays a key role in its pathogenesis, and therefore could be an attractive target to attenuate infections. *agr* activation is achieved by binding the autoinducing peptide (AIP) to its cognate receptor. Chemical modulators targeting the *agr* system represent valuable tools for better understanding the role of *agr* QS system during infection. However, only a limited number of compounds currently exist. Herein, we characterized the structure-activity relationships (SARs) of AIP-II/III and discovered the first set of pan-group activators of *agr* system in *S. epidermidis*.

INVESTIGATING THE SPECIFICITY OF HISTONE DEMETHYLASES

Simone Shen, Rupa Sridharan (Mentor)

Induced pluripotent stem cells (iPSCs) can be generated through somatic cell reprogramming. The resulting iPSCs are functionally identical to embryonic stem cells and are characterized by indefinite self-renewal and the ability to differentiate to the three germ layers. Gene expression is regulated through post translational modifications that alter the proteins DNA is wrapped around, called histones. We have found that the repressive modification histone 3 lysine 9 dimethylation (H3K9me2) needs to be removed for reprogramming. Histone demethylase Kdm3b has the ability to specifically remove H3K9me2 and is essential for reprogramming despite the closely related Kdm3a being dispensable. I will investigate the different genomic loci Kdm3a and Kdm3b interact with.

ON THE PHILOSOPHICAL POTENTIALS OF NON-COSMOLOGICAL ASTRONOMY

Tianzhe Shen, Michael Titelbaum (Mentor)

Natural sciences have drawn considerable attention from the philosophy community, but non-cosmological astronomy does not seem to be one of them. In this project, I examine the investigations of two subjects in astronomy--interstellar dust and star formation--and discuss potential philosophical issues raised by their methodologies--in particular, their modeling strategies and usage of limited evidence.

CHARACTERIZATION OF MAJOR HISTOCOMPATIBILITY COMPLEX HAPLOTYPES IN INDONESIAN CYNOMOLGUS MACAQUES

Cecilia Shortreed, David O'Connor (Mentor)

Improvements to anti-rejection therapies in transplantation rely on pre-clinical studies conducted in nonhuman primate models. Cynomolgus macaques (*Macaca fascicularis*) serve as an excellent model because their major histocompatibility complex (MHC) immune genes are homologous to the human leukocyte antigen (HLA) complex, which both contain class I transcripts that encode cell-surface proteins involved in cell recognition, and thus, rejection of non-host tissues. MHC genes require characterization to control disparity between donor and recipient tissues. During phase 1 of my study with a cohort of 210 macaques, I characterized 137 class I allelic variants, increasing the Mafa Immuno Polymorphism Database by over 10%. Completion of this genetic study will significantly improve investigators' ability to use these macaques for transplantation research at institutions across the U.S.

CRANIAL SENSORIMOTOR DEFICITS WITH INCREASED ALPHA-SYNUCLEIN IN PERIPHERAL MUSCLES IN PINK1 -/- RATS

Adileen Sii, Cynthia Spiotta (Mentor)

The overall pathology of Parkinson disease (PD), a progressive neurodegenerative disorder, is complex. Most individuals with PD have early-onset (preclinical) signs, including sensorimotor deficits in speech and swallowing; however, the underlying mechanisms are unknown. We used the Pink1 -/- rat model of early-onset PD (n=8) and compared ultrasonic vocalization parameters and tongue force measures to age-matched wildtype controls (n=8). Western blots were used to analyze the relative densities of alpha-synuclein, a PD related protein, in three cranial muscles in both genotypes. Our preliminary data support our hypothesis that increased alpha-synuclein co-occurs with significant vocalization and tongue force deficits in the Pink1 -/- model. Data from this study provide the first evidence that peripheral alpha-synuclein pathology may be contributing to early-onset cranial sensorimotor deficits.

RELATIONSHIP FLAGS (FOR LEADERS, ADVOCATES, AND GREEK STUDENTS)

Lauren Silber, Maddie Zimmerman, Tracy Schroepfer (Mentor)

1-in-3 college women experience dating violence. Domestic Abuse Intervention Services is an available resource, but they don't actively reach out to UW students to initiate dialogues about dating violence. Can peer-led workshops teach students about the prevalence of dating violence, equip them with tools to recognize warning signs, and prepare them to help friends experiencing dating violence? We will administer a pretest and posttest to workshop participants to measure their changed level of understanding about dating violence. We hypothesize that answers to questions on the posttest, on average, will be significantly more accurate than answers on the pretest. We hope to analyze the effectiveness of peer-led workshops surrounding this issue in order to establish a standard model for educating university students about dating violence.

REDIRECTING CARBON FLUX TO INCREASE DODECANOL PRODUCTION IN E. COLI VIA COMPETING PATHWAY KNOCKOUTS

Trevor Simmons, Brian Pflieger (Mentor)

Renewable sources of heavy fuels as well as high value oleochemicals, are not only environmentally essential, but are also economically attractive to large scale industrial corporations. Previous work from the Pflieger Lab has shown viable production of C12 fatty acid and fatty alcohol, a heavy fuel and high value chemical precursor, through metabolic engineering of *Escherichia coli*. This project proposal focuses on increasing production of C12 fatty acid and fatty alcohol by investigation into redirection of carbon flux within the metabolism of *E. coli*. Production of acetate and lactate remove carbon that could be used in fatty acid and alcohol biosynthesis. Nonessential genes that control lactate and acetate production will be knocked out of previously developed C12 fatty acid and alcohol strains using CRISPR-Cas9 methods.

USING ENVIRONMENTAL VARIABLES TO IMPROVE GENOMIC PREDICTIONS IN OATS

Syedda Simmons, Lucia Gutierrez Chacon (Mentor)

The Cereals Breeding and Quantitative Genetics Laboratory of the Department of Agronomy has a trial network for Elite oat materials along several experimental research farm stations across Wisconsin. We focus on gathering processed and analyzed information on meteorological variables to identify superior cultivars with good adaptation and performance to the production area. By collecting data through the NOAA website and evaluating crucial readings, we will obtain the meteorological information in eight research stations over the last 15 years, define different phenological phases per experiment, and calculate environmental covariates per phase. Finding the best environment possible for these plants is critical. Plant breeding programs are important to the development of new varieties with improved yield and agronomic characteristics and they are beneficial for farmers and consumers.

AN ASSESSMENT OF MEDICATION-ASSISTED OPIOID TREATMENT PROVIDERS IN WISCONSIN

Rita Simpson, Ryan Westergaard (Mentor)

The purpose of this research is to make evidence-based interventions, which prevent HIV and opioid overdose, more accessible to people with opioid use disorders living in rural Wisconsin. The first phase of this project emphasizes understanding the barriers preventing people who inject drugs from accessing prevention services. Telephone interviews with Medication-Assisted Treatment (MAT) Providers were conducted to better understand provider-associated barriers to care. Patterns emerged revealing the significant geographical barriers that people who use opioids and live in rural counties face in accessing MAT, the inability of many providers to serve all those seeking treatment, and the HMO-related restrictions imposed by state-sponsored insurance. Increased awareness of these barriers can serve as a critical first step in improving access to valuable prevention and treatment resources.

DEVELOPMENT OF ARM-LENGTH MEASUREMENT METHODOLOGY IN CHILDREN IN ANTIGUA, GUATEMALA

Kelly Siverhus, Devika Suri (Mentor)

Guatemala has the fifth highest prevalence of stunting in the world. In stunting, while legs fail to elongate, trunk length and head size remain conserved. These findings stimulate curiosity in the growth rates of the upper versus lower extremities. This study, led by the Center for Studies of Sensory Impairment, Disease, and Metabolism, aimed to develop an official procedure for arm length measurement to be used in this future research. Testing intra-observer and inter-observer replicability of various methods, it was found that measuring from the acromion process to the distal ulna with a meter stick and from the acromion process to the distal radius with flexible tape are the most precise. Using these methods in future research will maintain precision while reducing time-cost and inefficiency.

ROLE OF AUTOPHAGY IN CETUXIMAB RESISTANCE IN HEAD AND NECK CANCERS

Justin Skiba, Randy Kimple (Mentor)

Head and neck cancer (HNC) is the 6th deadliest cancer in the US. Currently, cetuximab (CTX), a monoclonal antibody against the epidermal growth factor receptor (EGFR), remains the only effective targeted therapy for treatment of head and neck cancer. Combining radiation and cetuximab improves 2 year survival rates by 10%, however over 40% of patients do not survive 5 years after diagnosis. The shortcomings of these treatments may be explained by EGFR therapy-induced autophagy. Autophagy is a normal pro-survival cell process that is activated in response to stress. It enables cells to recycle damaged organelles to maintain metabolic activity. It is our goal to investigate the role that autophagy plays in resistance to cetuximab in HNC, as well as to assess whether inhibiting autophagy would improve tumor responses.

DEVELOPING UTILITY-VALUE INTERVENTIONS TO HELP FIRST-GENERATION COLLEGE STUDENTS

Tanja Skiljevic, Judith Harackiewicz (Mentor)

First-generation (FG) college students face a mismatch between their interdependence and the culture of independence in college, especially in STEM fields. Previous research has found that focusing on utility value (UV; the value seen in a task because it is useful for achieving personal goals) through interventions can be beneficial for FG students' motivation and academic performance. In the study, participants watched a lecture on the biology of fungi, wrote about how fungi related to themselves, their family, their community, or society (the UV interventions), and then took a test. The study aimed to determine which intervention would most effectively increase FG students' test performance, interest, and perceived utility value, compared to a control condition.

RAMANUJAN GRAPHS

Rodrigo Smith, Naser Talebizadeh Sardari (Mentor)

The main goal of this research is to develop and understand methods involving certain types of algorithms in group theory. We also study the construction of LPS Ramanujan graphs, and their properties. These graphs are highly connected and have the optimal spectral gap. We study the algorithm that finds a short path between any pairs of vertices in the LPS Ramanujan graphs. The main ingredient in the algorithm is representing an integer n as a sum of 4 squares, subjected to congruence conditions. We shall discuss the nature of how these problems as well as the effort to further extend this algorithm into a sum of 5 square and work with the analogous problems in that domain.

UTILITY VALUE: INCREASING ACADEMIC ACHIEVEMENT IN FIRST GENERATION AND MINORITY STUDENTS

Cynthia Smith, Stacy Priniski (Mentor)

African Americans, LatinX, and Native Americans constitute 26% of the U.S. population and only 9% of STEM professionals (National Science Board, 2012). First-generation students, who make up 20% of U.S. students, have college dropout rates of 28-35% as compared to 17% for continuing generation students (Chen, 2005; Radford et al., 2010). Research suggests that utility-value interventions, where students write about how learning material applies to their lives, promote motivation and performance for these groups in science. For my thesis, I am conducting secondary data analysis of utility-value interventions implemented in introductory science courses at San Francisco State University. I am testing effects on science motivation and self-efficacy and expecting higher scores on these and increased academic performance for first generation and minority students.

PERFECTING THE ART OF TEACHING MATH

Rikin Soni, John McGinty (Mentor)

The aim of this research is to gain a better understanding of the underlying processes of how students learn math and what learning processes they struggle with. The experiment will entail four input methods utilizing enactive, iconic teaching, and symbolic teaching, with various combinations and a post-test where subjects will describe their thought processes of how they recalled an answer. The research question is what combination of input methods or learning mechanism will be described by the participants? My hypothesis, based on Barsalou's theory of grounded cognition, is that the recall mechanism active as recalled from participants will be of iconic input followed by symbolic input. This project will provide us with insight for better strategies for teaching math to 4-12th grade students.

THE GENETIC ARCHITECTURE OF VARIOUS DOMESTICATION TRAITS IN MAIZE-TEOSINTE HYBRID POPULATIONS

Bailey Spiegelberg, Alessandra York (Mentor)

Maize (*Zea mays* ssp. *mays*) was domesticated from teosinte (*Z. mays* ssp. *parviglumis* and ssp. *Mexicana*) about 9,000 years ago in the Balsas River Valley, Mexico. Plants were selected for based on beneficial traits, such as larger fruits, ease of harvest and maturity time. In this study specifically, I examined the genetic architecture of domestication traits such as kernel weight, plant height and culm diameter. Phenotype data was collected from multiple maize-teosinte hybrid populations and analyzed to collect least squared means (LSMs). The LSMs were then used for quantitative trait locus (QTL) mapping with R/qtl. The goal of this QTL study was to see if phenotypic difference occurs because of a few loci with large effects or due to many loci with small effects.

IMPACTS OF CLIMATE CHANGE ON THE GROWTH OF A LIANA (VITIS RIPARIA) AND HOST TREE (QUERCUS ALBA)

Audrey Spiegelhoff, Laura Ladwig (Mentor)

Under climate change, winters have been getting warmer and increasing the potential of warm-adapted species to move north and compete with cold-adapted species. Lianas are woody vines that compete with trees and thrive in warmer environments. Since the climate is warming, lianas may move north. To identify changes in the growth of a common liana (*Vitis riparia*) and host tree (*Quercus alba*), growth rings were collected from 5 sites across the United States. Historical weather data was then used to examine associations with growth. Preliminary results show at one site, liana growth increased as temperature increased, while tree growth decreased. At another site, there was no association between liana growth and increasing temperature. Data from the remaining 3 sites will further clarify these climate-growth relationships.

INVESTIGATING THE EFFECTS OF COTRANSLATIONAL AGGREGATION ON PROTEIN FOLDING VIA FRET

Alexios Staikos, Silvia Cavagnero (Mentor)

The events which govern the balance between protein folding and aggregation in the cell are poorly understood. Prior data suggest nascent proteins are capable of aggregating cotranslationally before the completion of their synthesis and release from the ribosome. The goal of my study is to investigate whether cotranslational protein-protein interactions are deleterious and direct nascent proteins down misfolding and aggregation pathways upon release from the ribosome. This will be accomplished via labeling nascent proteins with N-terminal fluorophores and monitoring non-native N-terminal interactions by FRET. I will probe the degree of aggregation among ribosome released proteins in the presence and absence of molecular chaperones using the single domain apoMb as a model. Obtained findings will provide insight on how the folding fidelity is attenuated in vivo.

FAT-SHAMING INTERNET MEMES AND THEIR INFLUENCE ON PERCEPTIONS OF WORKPLACE HARASSMENT

Sage Staples, William Cox (Mentor)

Weight-based harassment is often perpetuated via joke images (JIs) on social media. We hypothesize that JIs make bias seem normatively acceptable and less serious. We will conduct a media content analysis on fat-shaming JIs to understand their content, prevalence, and popularity. Additionally, we will conduct a randomized-controlled experiment examining how exposure to fat-shaming JIs affect perceptions of workplace harassment. Participants will view either fat-shaming or control JIs. Participants will evaluate human resources complaints, including a fat employee's complaint about a supervisor ridiculing their weight. If JIs perpetuate bias by making it seem more acceptable, then participants will rate the employee complaint as less serious. Understanding the role of humorous social media in perceptions of workplace harassment help us to develop effective efforts to overcome biases.

REFINING CONVECTIVE CLASSIFICATION THRESHOLDS

Tobiah Steckel, Tristan L'ecuyer (Mentor)

Cloudsat data and Geostationary satellite data were coupled from 2007-2010. Cloudsat recorded whether deep convection, stratiform or shallow convection were occurring. These convective flags were then used to train geostationary data that reported Cloud Top Temperature. Further, regional vectors were created to describe deep convection, stratiform convection, shallow convection and non convective pixels specific to 10 x 10 degree boxes over the Atlantic Ocean (between 5-35 N, 0-80 W). With these vectors Quadratic Discriminant Analysis was applied to compare regional vectors with any test vectors. The resulting algorithm provides an area of convection just given Cloud Top Temperature input. This algorithm allows a much more robust way of classifying convection.

NUCLEAR CALCIUM SPIKING IS INVOLVED IN SYMBIOTIC SIGNALING BETWEEN POPLAR AND MYCORRHIZAL FUNGI

Edward Steigerwald, Jean-Michel Ane (Mentor)

Nuclear calcium spiking is central to the common symbiosis pathway (CSP) used by arbuscular mycorrhizal (AM) fungi to colonize the roots of host plants. It is induced by symbiotic signaling molecules released by AM fungi. Recent genomic and experimental data suggest that ectomycorrhizal (ECM) fungi also produce these signaling molecules and use the CSP to colonize plants. To test if ECM fungi could therefore trigger calcium spiking, we transformed poplar with a fluorescent calcium reporter protein called G-GECO and used confocal laser microscopy to observe spiking. AM fungi induced typical spiking in wild-type plants but spiking with reduced frequency and intensity was observed in a transgenic line interrupting the CSP. ECM fungi induced spiking like AM fungi, suggesting that they activate the CSP as well.

REGIONAL DIMENSIONS OF THE BREXIT VOTE

Elm Stephenson, Yoshiko Herrera (Mentor)

In a high-turnout 2016 election, the United Kingdom narrowly voted to leave the European Union by a slim margin. However, the different regions of the UK voted entirely differently, with Scotland and Wales decisively voting to remain. This project seeks to understand the reason for this differing margin. From the outset, it was hypothesized that this regional differentiation was the result of different demographics, different economies, and different cultural attitudes toward immigrants. This hypothesis was tested through research about these individual factors. It was found that the regions' differing economies and cultural attitudes were influential, but the demographics of these regions were not predictive. Therefore, the first element of the hypothesis was rejected, and the two others were supported.

DETERMINING THE EFFICACY OF VARIOUS TEACHING METHODS IN MATHEMATICS

Riley Sterman, John McGinty (Mentor)

Mathematics is an important field used in almost all areas of study, yet many struggle to understand it. Perhaps it is because the content is too abstract or because it is too specific. This study involves participants engaging in a series of three exercises, a pretest, and a posttest designed to gauge the change in their understanding of Euler's theorem. The different exercises vary in their level of realism, or concreteness. Specifically one exercise will involve blocks, another icons, and finally symbols. One specific ordering, blocks to icons to symbols, is representative of concreteness fading. It is hypothesized that this permutation will be particularly potent. However, does this ordering have a statistically significant difference in efficacy, when compared to other permutations of the exercises?

A LOW-COST PLATFORM FOR RESISTIVE MEMORY CHARACTERIZATION

Maxwell Strange, Jane Li (Mentor)

Resistive memory (RRAM) is an emerging technology that shows promise as a replacement for NAND-based memory in applications like SSDs because of its high performance, high density, and low power consumption. Since the RRAM switching mechanism is currently unknown, researchers predominantly gain intuition about its function through nano-second-scale time-domain characterization. Tools from industry are typically prohibitively expensive and lack software-defined interfaces, making them rather inflexible and tailored to verification and not research. To that end, we build a flexible research platform that is capable of highly accurate characterization of RRAM cells. The platform supports an extensible software API to apply pulses as narrow as 30ns while measuring device resistance. This platform can also characterize RRAM arrays and can be extended to many other devices.

WHEN WILL NEW HIRES COLLABORATE?

Vineeth Suresh, Thomas Ngo (Mentor)

The overarching questions of this project are to what extent and under what circumstances new employees collaborate with incumbents in hiring organizations. Specifically, the project studies the impacts of two factors - (1) knowledge relatedness and (2) social networks between hired individuals and hiring organizations - on new post-mobility collaboration. We answer these questions using a unique panel data of management scholars who attended the Academy of Management Annual Meetings between years 2001 and 2014. Technical requirements of data construction include using website crawlers and machine learning techniques in downloading and extracting html files, and mapping personal IDs and affiliation IDs across years. As an URS participant, I have heavily involved in mapping personal IDs across 14 years - a critical task of the project.

IM NOT GAY, I'M FAKING IT

Alice Svetic, Kaitlin Verchimak, Kate Corby (Mentor)

Artistically, this work comes from a place of connection between us, both as friends, fellow movers, and supporters. In terms of bodies inhabiting space and time, a duet inherently creates a relationship. For us, this was the aspect of researching a duet that intrigued us most. From there, we strived to create movement that was gestured, and would also contrast with more virtuosic uses of limbs. This work encompasses conflicted feelings surrounding meaning, femininity, subtlety, and what it means to jam. Upon the premiere of this work, we left our audiences with a simple program note: Meaning, in itself, is subtlety.

HIGH RESOLUTION SPECTROSCOPY DIAGNOSTICS ON THE PLASMA COUETTE EXPERIMENT

Megan Tabbutt, Cary Forest (Mentor)

The Plasma Couette Experiment (PCX) at the Wisconsin Plasma Physics Laboratory (WiPAL) researches weakly magnetized, fast flowing, plasmas in order to study the Magnetorotational Instability (MRI), a Magnetohydrodynamic (MHD) instability which has been theorized to be the source of turbulent angular momentum transport in accretion disks. PCX aims to explore astrophysical phenomena by creating relatively easy to study laboratory plasmas near the same parameter regime. It is necessary to obtain precise measurements of plasma parameters such as the ion temperature, ion velocity, electron temperature, ion density and electron density. In order to do this, we built a Fabry-Perot interferometer. A Fabry-Perot interferometer images light produced by ions in the plasma into an interference pattern that can be used to deduce the ion velocity distribution function.

AFRICAN AMERICAN PROTESTS IN NEWSPAPERS 1994-2010

Jason Tajimaroa-Arroyo, Pamela Oliver (Mentor)

The Civil Rights Movement is one of the most recorded parts of African American history. After the Civil Rights Movement though, many sociologists and historians stopped recording African American movements and protests, leaving a big gap of unrecorded systematic information. This study focuses on evaluating African Americans protests and movements based from news articles between the years of the early 1990s to 2014 so that the gap can lessen. We code, evaluate and analyze the articles. Our work is sent to the researchers so they can compile it into a data set of protests over time. This analysis will include social and historical context. The study also focuses on patterns in news reports, and understanding the differences between the news reports and the event.

EFFECTS OF NITROGEN FERTILIZATION ON TROPICAL FOREST SOIL PH

Diana Tapia, Elliot Vaughan (Mentor)

With human activity on the rise, ecosystems have experienced an increase in nitrogen (N) levels. Studies have shown that increased N can affect soil pH with implications for plant fertility, nutrient and carbon cycling. Using soil from two forests in El Yunque National Forest, Puerto Rico I will determine how long-term N fertilization affects the pH of soil. I measured pH that received 50 kg nitrogen/ha/year soil for 15 years and compared with control plots. I predict that soil pH will decrease due to nitrogen fertilization in both forests. This study will help us better understand the effect of future increases in nitrogen on pH levels in different tropical forest soil.

USE OF SPINAL CHORD STIMULATOR IN PATIENTS WITH LUMBAR BACK AND LOWER EXTREMITY DIABETIC NEUROPATHY

Omar Tarawneh, Alaa Abd-Elseyed (Mentor)

Neuropathies are among the most common of all long-term complications of diabetes, affecting up to 50% of patients. Diabetic peripheral neuropathy can be resistant to conservative therapy including physical therapy, medications and interventions. Spinal cord stimulators (SCSs) demonstrated improved clinical outcome as an option for treating neuropathic pain. A SCS trial, followed by a permanent implant in a patient resulted in less pain at 6 and 12 month follow up. With risk of diabetic neuropathies increasing with age, and more patients presenting a combination of multifactorial chronic pain problems rather than a clear cause, this case lends support towards conducting further trials to elucidate the benefit of SCS on neuropathic pain related to diabetes mellitus.

SPEED OF FKPP WAVE ON INFINITE REGULAR TREES

Grigory Terlov, Wai-Tong Fan (Mentor)

In this study we analyse wave propagation on infinite regular trees induced by reaction-diffusion mechanisms. While FKPP wave was closely studied on the real line, there is not much known about it in different environments. Such processes often appear in biology where diffusion spreads in medium structured as a tree. To model the process as we connect it to the large deviation principle of a generalized skew Brownian Motion.

ON THE PROBABILITY OF IRREDUCIBILITY OF RANDOM POLYNOMIALS WITH INTEGER COEFFICIENTS

Grigory Terlov, Philip Wood (Mentor)

In this article we study asymptotical behavior of the probability that a random monic polynomial with integer coefficients is irreducible over the integers. We consider the cases where the coefficients grow together with the degree of the random polynomials. Our main result is a generalization of a theorem proved by Konyagin in 1999. We also generalize Hilbert's Irreducibility Theorem and present an analog of this result with shifted Binomial distributed coefficients.

B CELL ACTIVATING FACTOR AS A BIOMARKER IN CANINE INFLAMMATORY BOWEL DISEASE

Dahlia Tesfamichael, Jessica Pritchard (Mentor)

Inflammatory bowel disease (IBD), the most common chronic enteropathy in dogs, is diagnosed via invasive and expensive intestinal biopsies. Identifying a blood biomarker for canine IBD would make diagnosis inexpensive and noninvasive. In humans, the cytokine B cell activating factor (BAFF) is increased in the blood and tissue of IBD patients compared with healthy controls. Therefore, we hypothesized that BAFF blood transcription is significantly increased in dogs with IBD compared to healthy controls. In a limited number of dogs, there was no significant difference in blood BAFF transcription between IBD and controls. However, more samples would need to be tested to establish a significant difference between groups. The next step in this study will compare BAFF transcription in duodenal biopsy specimens of the two groups.

THE THERMAL TOLERANCE OF ICE CRAWLER SPECIES

Kelly Thao, Sean Schoville (Mentor)

Grylloblattidae, more commonly known as ice crawlers, inhabit alpine regions where temperatures can range from -12C to 21C yearly; however, they are also found in ice caves, where the temperature is relatively constant, only dropping during the winter. Ice crawlers live in the temperature ranges between -4.0 0.8C to 27.0 0.7C and may react negatively to global warming, so a goal of my study is to assess the thermal tolerance of different species. Ice crawler species may not be able to evolve to changing climate conditions (known as physiological niche conservatism). If they are able to evolve, we expect to see species differ in their thermal tolerance when they inhabit different environments, or when co-occur at sites and compete for resources

POSITIVE EXPERIENCES AMONG PARENTS OF CHILDREN WITH AUTISM SPECTRUM DISORDER

Myxee Thao, Sigan Hartley (Mentor)

Existing literature on autism spectrum disorder (ASD) has primarily focused on developmental deficits and the array of challenges experienced by children with ASD and their families, including behavioral problems and parental stress (Kayfitz et al., 2010). However, little is known about families' positive experiences associated with ASD. Using qualitative data from 120 written self-reports by parents of children with ASD, this study found that parents report feeling proud of and being positively shaped by their child. Specifically, when asked to report on positive experiences regarding their child, parents mentioned life fulfillment, empathy, and gratitude. Findings from this study suggest that parents of children with ASD do, indeed, hold positive beliefs about their child and positive experiences are an important factor in future family resilience research.

ADVANCING SILVOPASTURE IN WISCONSIN

Emily Thierry, Diane Mayerfeld (Mentor)

Silvopasture, the managed integration of trees with pasture, is being researched in Wisconsin to assess potential benefits to farmers and the environment. This research compares four treatments: silvopasture, ungrazed woods, grazed woods, and open pasture. Soil compaction is an environmental indicator of concern. Before grazing began, there were no significant differences in soil compaction between treatments. After two seasons of grazing, a slight but statistically significant difference between treatments has emerged near the soil surface, with the ungrazed woods showing less compaction than the grazed treatments. This research could potentially improve profits and environmental outcomes in midwestern livestock farms.

IDENTIFICATION OF PROTEIN INTERACTIONS INVOLVED IN POSITIVE-STRAND RNA VIRUS REPLICATION

Jessica Thornton, Paul Ahlquist (Mentor)

Positive-strand RNA viruses constitute the largest class of viruses and include important human pathogens, such as poliovirus and Zika virus. Without exception, all positive-strand RNA viruses depend on rearranging host membranes to compartmentalize their RNA genome replication machinery, concentrate replication components, and avoid cellular defense systems. Physical interactions between viral replication proteins drive the formation and function of these compartments. Using a photo-crosslinking technique and model virus systems, we have identified multiple viral protein interactions which we expect to be critical for productive viral infection. Our identification and characterization of molecular interactions should provide an excellent basis to develop broad-spectrum antivirals against positive-strand RNA virus replication.

TRACING THE DEVELOPMENT OF THE NERVOUS SYSTEM IN ARACHNIDS WITH FLUORESCENT ANTIBODIES

Paula Thuo, Prashant Sharma (Mentor)

Developmental biology in arthropods aims to understand the processes leading to the functional and structural diversity of organisms throughout their life cycle. The study of these processes in an evolutionary framework allows the discovery of common patterns across lineages of the tree of life. The majority of studies have focused on a few model organisms mostly in the branch of insects. Here, we use an emerging model organism, the house spider *Parasteatoda tepidariorum* (Koch, 1841) to investigate patterns of the organization of the nervous system in different developmental stages. We are coupling fluorescent immunohistochemistry with specific antibody markers to produce a comparative framework for normal development of the nervous system and main sensorial structures in arachnids and other arthropods.

WORKFLOW DISRUPTIONS DURING PEDIATRIC PROCEDURAL SEDATION: A QUANTITATIVE AND QUALITATIVE ASSESSMENT

Cathy Tran, Gregory Hollman (Mentor)

The purpose of this project was to analyze what type of distractions occur during the introduction portion of pediatric sedations. Therefore, the overall goal is to develop interventions that can improve workflow efficiency and decrease medical errors during pediatric sedations. The researcher, Cathy Tran, and a team of 3 nurses analyzed 102 recordings for who is potentially being distracted, the level of disruptions, and the type of disruptions. The data was assessed for any pattern between the levels and the types of disruptions. The most recorded type of disruptions is Interruptions/Distractions. However, the data support that usability errors inversely-impacted the sedation team the most. These results support that a policy that decreases the occurrence of interruptions and usability errors would be the most beneficial.

GENERATING AND CHARACTERIZING RESISTANCE TO IONIZING RADIATION IN POPULATIONS OF ESCHERICHIA COLI

Joseph Trimarco, Michael Cox (Mentor)

Efficient and accurate DNA repair processes are essential to maintaining genomic integrity. While most DNA repair mechanisms are remarkably effective, extreme sources of DNA damage can overwhelm these processes. One such source is ionizing radiation (IR). Using directed evolution, we have generated four populations of IR-resistant *E. coli* using high-energy electron beam IR via a clinical linear accelerator (Linac). Now at 100 rounds of selection, we have generated the most IR-resistant organisms ever produced within a laboratory. Using whole-population genomic sequencing, we have identified candidate mutations for conferring IR resistance in proteins conducting DNA double-strand break repair (RecD, RecJ, RecN, DinI), transcription (RpoB), and anaerobic metabolism (ArcB). Using these mutations and others, we describe genetic modifications necessary for experimentally evolved paths to IR resistance.

THE EFFECTS OF ACCENTED SPEECH ON KNOWLEDGE ACQUISITION

Teresa Turco, Maryellen MacDonald (Mentor)

Accented speech is all around us, but previous research paints a mixed picture of how interactions with accented speakers affect language comprehension. Listeners can adapt to and fully comprehend accented speech; however they process this speech differently than unaccented speech. The additional mental burden of deciphering accented speech could prevent deep understanding and encoding of new material. This study examines the effects of accented speech on learning outcomes from classroom-style spoken text for both native and non-native English speakers.

DNA METHYLATION IN PALATE DEVELOPMENT AND CLEFT PALATE PATHOGENESIS

Caden Ulschmid, Robert Lipinski (Mentor)

Here, we examined the role of DNA methylation in palate morphogenesis and cleft pathogenesis. In vitro assays demonstrated that pharmacologic inhibition of DNA methyltransferase (DNMT) activity by 5-aza-2'-deoxycytidine (AzadC) attenuates proliferation of cranial neural crest cells in a concentration-dependent manner. Administration of 0.5mg/kg AzadC to C57BL/6J mice at GD9.75 resulted in cleft palate with high penetrances. Affected palatal shelves were hypoplastic, suggesting an underlying growth deficiency. Next, we examined the requirement for DNMT1 through its deletion from either the epithelium or mesenchyme of the developing palate. Deletion of *Dnmt1* from the palatal mesenchyme, but not epithelium, resulted in clefts recapitulating the phenotypes resulting from pharmacologic DNMT inhibition. These findings suggest that DNA methylation regulates the proliferation of mesenchymal cell populations required for palatal shelf outgrowth.

INVESTIGATING SOCIAL CATEGORY PREFERENCES AND STEREOTYPES IN EARLY CHILDHOOD

Andrea Vaca, Rachel King (Mentor)

Our research investigates children's intergroup cognition. In this study, we examined 4K students' (ages 4 and 5) use of social categories in guiding their behaviors and expectations about others. In one task, we measured children's social category-based friendship preferences. In a second task, we measured the same group of children's awareness of social category-based stereotypes. Finally, we tested the relationship between children's performance in these two tasks. Our results shed light on early intergroup cognition and have implications for parents and educators.

LONG-LASTING NEUROPLASTICITY IN SPINAL RESPIRATORY MOTOR OUTPUT IS INDUCED BY ADENOSINE 2A RECEPTOR

Ranveer Vasdev, Stephen Johnson (Mentor)

For preterm infants, an immature respiratory control system contributes to respiratory diseases, such as apnea of prematurity. In adult rodents, activation of spinal adenosine 2a receptors induces a long-lasting increase in spinal respiratory motor output, but it is not known whether newborn rodents have the capacity to express a similar form of neuroplasticity. To test this hypothesis, an adenosine 2a receptor agonist (CGS21680) was bath-applied to isolated neonatal rat brainstem-spinal cords while recording spinal respiratory motor output. We found that CGS21680 induced a long-lasting increase in spinal respiratory motor output. Surprisingly, CGS21680 also induced periodic short-term decreases in respiratory motor output which persisted during drug washout. Thus, adenosine 2a receptor activation in neonates may beneficially cause long-lasting increases in breathing amplitude.

A LATE HOLOCENE 10BE BASED GLACIAL CHRONOLOGY FOR THE BEARTOOTH MOUNTAINS, SOUTHWESTERN MONTANA

Claire Vavrus, Shaun Marcott (Mentor)

As climate continues to rapidly change, it becomes increasingly important to understand how glaciers responded to past climate changes to better forecast future responses. Currently, the late Holocene alpine glacial history in the western United States is poorly understood. Here, we precisely date three glacial deposits in a basin in the Beartooth Mountains of southern Montana. Previous studies estimated that these moraines formed during the Neoglaciation (4000-2000 years ago) and the Little Ice Age (LIA-200-500 years ago). The boulder samples collected from the three deposits produced mean ages of 13,360 years, 920 years, and 270 years before present, challenging the previous age interpretations of the moraines. These ages suggest a more complex relationship between alpine glaciers and climate in this area than was originally thought.

INTERACTIONS OF TRANSTHYRETIN AND RETINOL BINDING PROTEIN WITH BETA-AMYLOID

Rahul Venkatesh, Regina Murphy (Mentor)

Alzheimer's Disease (AD) is a neurodegenerative disorder common among individuals over 60 that destroys memory and other important cognitive functions. AD pathology is partially characterized by plaques of aggregated $A\beta$ (A β), a proteolytic cleavage product of the transmembrane amyloid precursor protein, that is shown to be toxic to neurons and thought to contribute to observed cognitive decline. This project explores the interactions of three proteins: Transthyretin (TTR), A β and Retinol binding protein (RBP). To study these interactions, we produced and purified recombinant TTR and RBP. The binding affinities of Retinol to RBP, in the presence and absence of A β , were also measured to understand whether A β might impede the ability of RBP to bind / release retinol at the blood brain barrier.

SPATIAL OR SKILLS MISMATCH? AN INVESTIGATION OF THE BARRIERS TO JOB ACCESSIBILITY IN OMAHA, NE

Mari Verbeten, Gary Green (Mentor)

The purpose of this case study is to investigate the barriers faced by minorities as they access jobs in the Omaha-Council Bluffs metropolitan area, with a focus on how the spatial mismatch hypothesis influences these inequalities. Incorporating this hypothesis and other factors such as residential segregation, transportation, concentration of poverty, and unemployment rates, we are finding that the inequalities are becoming more complex, weaving together all factors mentioned. It was discovered that job growth is (slowly) occurring where minority populations live, but a skills and job readiness mismatch now exists, barring individuals from accessing jobs that are potentially right down the street. We created place-based policy suggestions that would initiate change and better serve all residents, regardless of location, race or skill level.

CERTIFICATION BODIES, COP'S RELATIONSHIP WITH HOSPITAL ORGANIZATIONAL CHANGE AND FOOD PROCUREMENT

Maximilian Vichr, Alfonso Morales (Mentor)

We know little about how hospitals are changing how they source and serve food, historically these often conflict with the very purpose of these institutions: to improve health. However, certification bodies, and community of practices (CoPs), have introduced new perspectives on food by considering community and environmental health. In addition to acknowledging the value of feeding health, hospital food procurement can play a strong role in the economic and sustainable livelihood of the local food system. This project analyzes budgets and interviews from the UW-Health hospital, its participation in CoPs, as well as certification bodies to better understand the process of organizational change. The work demonstrates reciprocal relationships and iterative processes by which institutions (hospitals) and organizations (certification bodies and CoPs) come into alignment.

TCF19: A NOVEL TRANSCRIPTION FACTOR THAT REGULATES DNA REPAIR GENES IN PANCREATIC β -CELLS

Claudia Vilela, Dawn Davis (Mentor)

Diabetes is associated with reduced pancreatic β -cell mass. It was previously found that the novel transcription factor, Tcf19, is a potential causal gene for diabetes. We hypothesized that the loss of Tcf19 will make cells more susceptible to DNA damage by reducing the expression of DNA damage repair genes. To test this hypothesis, cDNA was synthesized from RNA collected from Tcf19 whole body knock out mice islets. Tcf19 depleted cells showed upregulation of Gadd45a, Dtx3l, which are associated with DNA damage, along with apoptosis marker CHOP. The proliferation marker Ki67 was downregulated in KO mice islets. These data suggest the role of Tcf19 as a transcriptional regulator of DNA damage repair genes and in maintaining a functional β -cell mass

EFFECTS OF DIABETES ON PSYCHOPHYSIOLOGICAL MEASURES OF REACTIVITY AND RECOVERY TO NEGATIVE STIMULI

Natalie Villegas, Lauren Gresham (Mentor)

Diabetes can lead to fatal complications and past research has indicated an affective component to the disease. Midlife in the U.S. (MIDUS) is a national longitudinal study following the overall health and wellbeing of participants. The present study examines whether findings of abnormal negative emotional responses in diabetics in the MIDUS Main sample (diabetic = 34, nondiabetic = 243) could be replicated in a second cohort, the MIDUS Refresher sample (diabetic n=14, nondiabetic n=123). Participants' corrugator muscle activity was used to index their emotional responses while they viewed affective stimuli. Although the Refresher sample showed a similar pattern of abnormal negative responses, their results were not significant, possibly due to lack of power given the smaller sample size.

ACCELERATING ACCURATE BANDGAP PREDICTION USING MACHINE LEARNING

Sam Wagner, Josh Bernson, Aditya Sharma, Donglin Wang, Dane Morgan (Mentor)

Band gap refers to the energy difference between the valence and conduction electron orbitals in materials. By predicting these band gaps more efficiently, we can improve the functionality of many electronics, such as solar panels. By using machine learning, it is possible to predict the band gaps of materials with perovskite structures more efficiently than before. The two conventional methods for predicting band gaps, both of which use Density Functional Theory (DFT), are generalized gradient approximation (GGA), which is fast but inaccurate, and the Heyd-Scuseria-Ernzerhof (HSE) method, which is accurate yet time-consuming. Using machine learning models, we hope to use values generated by GGA, along with other properties, as variables to predict band gaps with the accuracy of the HSE method, yet faster than ever.

DECLINE IN MOVEMENT DURING ADULTHOOD: CAN IT BE A BIOMARKER OF IMPENDING ILLNESS OR DISEASE?

Lindsey Waite, Joseph Kemnitz (Mentor)

A previous longitudinal study of rhesus monkeys revealed that voluntary movement, on average, slowly decreased with advancing age. Furthermore, moderate calorie restriction slowed the rate of decline in movement. This study extends the earlier analysis to test the hypothesis movement is predictive of impending ill-health or nascent chronic disease. Ultrasound motion detectors (U) and accelerometers (A) were used to measure movement of male and female rhesus monkeys undergoing moderate calorie restriction (R) or eating ad libitum (C). Health records for the animals were evaluated for time of onset of illness or diagnosis of disease. A predictive relationship between voluntary movement and poor health would suggest that activity monitors could be a valuable adjunct to standard physical exams in assessing health and a biomarker for intervention.

PRENATAL MATERNAL MENTAL HEALTH AND EARLY CHILDHOOD TEMPERAMENT

Zachary Wallace, Julia Porter, William Wooten (Mentor)

The Baby Brain and Behavior study seeks to investigate how early-childhood experiences influence children's development and wellbeing. The purpose of this project is to identify predictive relationships between prenatal maternal psychopathology and longitudinal temperamental development in young children. Prenatal predictors were evaluated during the third trimester of pregnancy using the Edinburgh Postnatal Depression Scale, the State Trait Anxiety Inventory, and an Essex Stress Composite Score. Child temperament was assessed at 6, 12, and 18 months postpartum according to the Infant Behavior Questionnaire to quantify emotional regulation, negative affect, and surgency/extraversion. A regression analysis will be conducted to evaluate the predictive character of prenatal maternal psychopathology towards children's developing temperament.

WRITING AND REBELLING: THE YOUNG POETS OF MEXICO CITY AND THE LEGACY OF MARIO SANTIAGO PAPANASQUIARO

Daniel Walzer, Ruben Medina (Mentor)

In the infrarrealista neo-avant-garde movement, artistic expression is inextricably linked to life. Two infrarrealistas have gained significant attention: Roberto Bolaño, whose works have been translated into many languages, and Mario Santiago Papanasquiario, who wrote poetry outside of literary establishments. From this marginal position, Papanasquiario expanded upon his ethics and aesthetics, seeking to defy the dominant literary institutions of Mexico City between the 1970s and 1990s. Today, his works are admired by young writers throughout Latin America, but remain an active area of study. Therefore, I traveled to Mexico City to interview Luna Itaj Inan, Frizia Guerrero, Rojo Cárdoval, and Joana Medellín Herrero, four poets influenced by the infrarrealista movement. Ultimately, I will explore how Papanasquiario's poetics continues to be adapted, performed, and shaped by gender.

AMBIENT FORMALDEHYDE OVER THE UNITED STATES FROM GROUND-BASED AND SATELLITE OBSERVATIONS

Peidong Wang, Tracey Holloway (Mentor)

Formaldehyde (HCHO) is a carcinogen that affects public health in ambient air. This study analyzes HCHO diurnal, seasonal, and interannual trends over the U.S. from 2006 to 2015 both from ground monitors and satellite observations. HCHO has greater diurnal amplitudes where there are more biogenic emissions and larger temperature changes. However, diurnal HCHO peaks 2-4 hours earlier than temperature does. Even though satellite observations indicate less strength in observing winter time HCHO, we find a consistent spatial distribution of the summer to winter ratios, with lower ratios in the West U.S. and higher in other regions. Observed yearly average HCHO has increased in most regions in U.S. from 2006 to 2015, but has decreased in the Southeast especially in summer time.

PREDICTING THE ANTIFUNGAL ACTIVITY OF ALPHA/BETA-PEPTIDES AGAINST C. ALBICANS USING SVM REGRESSION

Nathan Wang, Sean Palecek (Mentor)

Helical alpha/beta-peptides are a promising candidate for developing antifungal drugs because they display higher antifungal activity and selectivity towards fungal cells than naturally occurring antimicrobial peptides, and can impede the development of drug resistance by inducing membrane lysis through non-receptor mediated interactions. Previous studies have found a broad correlation between the helicity and hydrophobicity of helical alpha/beta-peptides with how active they are against fungus. I used an SVM regression model with a training set of 70 helical alpha/beta-peptides we had previously assayed to successfully predict the minimum inhibitory concentrations (MICs) against planktonic *C. albicans* for 10 newly synthesized peptides with a wide range of overall hydrophobicities. This model will be helpful to guide the design of better antifungal drugs in the future.

WHICH MAJORS FOSTER THE MOST ENTREPRENEURSHIP?

Junting Wang, Bekhzod Khoshimov, Jon Eckhardt (Mentor)

Policy makers often assume that student entrepreneurship is most prevalent amongst students pursuing degrees in Science, Technology, Engineering, and Mathematics (STEM) programs. This study examines the validity of this assumption. Using survey and administrative data collected at the University of Wisconsin-Madison, this project will (1) build a multi-year panel database for analysis from a larger project underway that is examining student entrepreneurship (2) report on the prevalence of student entrepreneurship by major and, time permitting, (3) examine potential causes for the distribution of entrepreneurship by major. With these findings, scholars will have a basic understanding of the distribution of academic entrepreneurship by majors. Moreover, this understanding will provide a foundation for future research on academic entrepreneurship and facilitate the management of University based entrepreneurship programs.

THE IMPACT OF BACKGROUND TELEVISION ON CHILDREN'S PLAYING BEHAVIOR

Claire Wang, Daisy Mejia, Heather Kirkorian (Mentor)

The purpose of our study is to examine how Background TV (BTV) affects children's behavior at solitary toy playing. Each child participant (12-24 months of age, n=50) is accompanied by an adult, in the purposely created home-like environment. The child is expected to present playing behaviors they would normally have at home. The entire playing session lasts for thirty minutes and is recorded. The children are exposed to three 10-minute conditions: game show, talk show, and no TV playing. Their attentions and engagements will then be coded. While we are still in the stage of coding data, based on the preliminary results we hypothesize that TV playing can be distracting for children, which keeps them from engaging in toy playing.

USING TRANSFER LEARNING TO CLASSIFY BREAST CANCER CELLS WITH FLUORESCENCE IMAGING

Zijie (Jay) Wang, Tiffany Heaster, Yin Quan, Melissa Skala, Alexandra Walsh, Anthony Gitter (Mentor)

Studying tumor heterogeneity by analyzing protein or gene expression levels over thousands of cells is very challenging. In this project, we instead use a transfer learning approach to classify cancer cell types solely based on fluorescence imaging. We used images of two types of breast cancer cell lines - MDA-MB-231 and SKBr3 - to partially retrain a deep convolutional neural network Inception v3, which was pre-trained on 10 million natural images with over 400 categories. We hypothesize features extracted from general pictures by a deep neural network are portable to classify breast cancer cell types. The ability to recognize distinct cell types within tumors would provide a powerful tool for analyzing clinical samples.

COMPARTMENTALIZED REGULATION OF SUBCELLULAR CALCIUM SIGNALING AND ITS IMPACT ON ATRIAL ARRHYTHMOGENE

Aleah Warden, Alexey Glukhov (Mentor)

During contraction of the heart, a small influx of calcium ions (Ca^{2+}) through voltage-gated L-type Ca^{2+} channels (LTCCs) enables a massive release of Ca^{2+} from the sarcoplasmic reticulum (SR) into the cytoplasm to activate myofilaments. Atrial myocytes lack structures that position LTCCs close to the SR and ensure synchronous cell contraction, instead they have the scaffolding protein caveolin-3 (Cav3) on the surface membrane. In pathophysiological conditions, disruption of Cav3 may affect the surface distribution of LTCCs, leading to desynchronized subcellular Ca^{2+} release, abnormal contraction and arrhythmogenesis. I applied fluorescent confocal imaging in the live atrial myocyte to characterize Ca^{2+} handling in wild type and genetically engineered Cav3 knockout mice. The results of this project will potentially improve therapeutic approaches that combat atrial remodeling and arrhythmias.

HOW STUDENTS' PERCEIVED ARTISTIC SKILLS RELATE TO THEIR UNDERSTANDING OF HOW TO DRAW AN ATOM

Krista Washechek, Sally Wu (Mentor)

This research looks at how students perceived artistic ability may affect how they learn chemistry through drawings. More specifically, I examined whether a student's artistic ability correlates with their confusion when asked to draw atoms. In an experiment, participants were asked to think out loud while engaging with prompts asking to draw an atom. After the analysis of these students' words and survey answers related to their personal artistic ability, I anticipate to find that the better students feel about their own artistic ability, the less confused they will be when asked to draw. Drawing is a common strategy in chemistry and understanding the relationships between perceived artistic skills and drawing can help instructors better support their students in drawing.

SEEING THE FOREST FOR THE TREES: HOW CANOPY TREE SPECIES GRADIENTS AFFECT TREE SEEDLING RECRUITMENT

Kyle Watter, Laura Ladwig (Mentor)

Scientists are concerned over the loss of tree biodiversity in Wisconsin forests. They have proposed many processes to explain this trend, including climate change. However, the relationship between forest canopy and understory tree seedling structures has received far less attention. My study asks: What relationship does canopy basal area, canopy species richness, and the percent abundance of common Wisconsin tree canopy species have with the understory tree species richness, stem density, and percent abundance of common tree species seedlings? Results show relationships between canopy basal area and abundance of certain species in the understory. This result suggests more logging may be used to improve forests.

TESTING EFFECT: DO CHILDREN BENEFIT FROM RETRIEVAL TESTING IN STORYBOOKS?

Sarah Weber, Haley Vlach (Mentor)

The testing effect integrates retrieval practice into learning in order to benefit long-term retention and has consistently been observed in adults' learning. However, it is unclear if children also benefit from learning materials that incorporate testing. This ongoing study involved preschool children (N=50; Mage=47.9 months) learning novel word-object associations during repeated storybook readings. The results showed that children who performed well throughout the storybook reading were more likely to be successful during their final, delayed post-test. Also, regression modeling showed that children's success in storybook reading better predicted retention than the child's age. The results show that if a child is successful throughout the challenge of testing, long-term learning is possible regardless of age.

THE BENEFIT OF THE SPACING EFFECT IN CHILDREN'S SCIENCE LEARNING

Ellen Weber, Sophia Africano, Megan Kaul, Jenna Langmeir, Haley Vlach (Mentor)

Previous research has demonstrated that simultaneous and spaced presentations are beneficial to children's learning. Simultaneous presentation guides visual attention and promotes short-term memory learning, whereas spaced presentation supports long-term retention of concepts. In this study, preschool-aged children (N = 158) were presented with science concept pictures simultaneously, massed, or spaced to determine which presentation style was most effective in teaching children these concepts. There was no difference in learning ability at immediate test, but children displayed stronger performance with spaced learning during the delayed test. These results could indicate that spaced presentation aids performance in long-term memory due to an increase in children's ability to retrieve science concept information after an extended period of time.

KEEPING ON TASK: COMPARING THE INFLUENCE OF REAL AND QUASI-REWARDS ON SUSTAINED ATTENTION

Holly Wegener, Emily Ward (Mentor)

How does receiving a reward affect the ability to stay on task, and what type of reward is most effective at influencing performance? While concrete rewards (e.g. monetary rewards) motivate people and can improve outcomes on a variety of tasks, it is not known how rewards facilitate continuous behavior, such as sustaining attention. For example, does one need to receive a concrete reward to stay on task, or does a progress marker achieve the same results? Here, we test this specifically: during a task requiring sustained attention, participants will receive either a concrete reward, a progress marker 'quasi-reward', or no reward. The results will show how reward - concrete or otherwise - may improve our ability to keep on task for longer periods of time.

THAT DAMN DAM: EVALUATING THE LA FARGE DAM CONTROVERSY

David Weinberg, Caroline Druschke (Mentor)

After decades of flooding in the Kickapoo Valley, citizens urged construction of a dam in La Farge, Wisconsin beginning in 1935. For some - whose farmland was seized beginning in 1970 by the U.S. Army Corps of Engineers under eminent domain policies - the venture symbolized the destruction of their livelihoods. For others, the plan emblemized economic prosperity and social development. Despite the dam being more than half-completed, construction halted in 1975 following cost overruns and environmental concerns. Today, the Kickapoo Valley Reserve resides in the dam's footprint. This paper, rooted in primary and secondary source analysis, considers the project's historical context, legislative policies influencing its development, the relationship between Kickapoo Valley residents and elected officials, and the dam project's ongoing effects.

LEAD RESISTANCE TESTING OF MULTIDRUG RESISTANT ORGANISMS (MDROS) IN THE HUMAN GASTROINTESTINAL TRACT

Jacqueline Welke, Nasia Safdar (Mentor)

Minimizing infection by multidrug resistant organisms (MDROs) is a global health priority; imbalance of human gut microbiota may increase risk of infection by MDROs. Factors affecting susceptibility to infection are genetic and environmental. Evidence shows environmental lead (Pb) could play a role in the imbalance of bacteria in the GI tract, in addition to reducing immune function and selecting for bacterial resistance to antibiotics. We used a broth microdilution assay to assess Pb resistance in isolated MDROs from the study population. Preliminary results show an inverse relationship between MDRO colonization and urine Pb concentration; these results will be further examined in collaboration with urine and blood Pb levels. This study will lay the groundwork for further investigation of environmental contaminants within a large study population.

BEHAVIORAL TESTING OF REWARD DISRUPTION IN THE PINK1 -/- RAT MODEL OF PARKINSON DISEASE

Jacob Welsch, Cynthia Spiotta (Mentor)

Dysfunction within the mesolimbic reward pathway is found in over 40% of individuals with Parkinson Disease (PD); however, the appearance of reward-related signs in the disease progression is unknown. This study uses the Pink1 -/- rat model of PD to replicate the manifestation of early-stage PD and understand PD-related reward disruption. A Sucrose Preference Test was administered to behaviorally test motivation and reward circuitry. We hypothesized that the Pink1 -/- male rats would consume less sucrose compared to wildtype controls suggesting the onset of anhedonia in this model. However, our preliminary data showed Pink1 -/- rats drank significantly more water and sucrose compared to controls. These data are the first to suggest that Pink1 -/- rats exhibit early-onset behavioral differences related to reward mechanisms.

IMPROVEMENTS TO THE WEBMADS DATA QUALITY MONITORING SYSTEM FOR ATMOSPHERIC REMOTE SENSING

Matthew Westphall, Jonathan Gero (Mentor)

WebMADS 2.0 is a web service developed by the UW-Madison Space Science and Engineering Center to support the Center's worldwide network of Atmospheric Emitted Radiance Interferometers (AERIs), scientific instruments which observe a variety of useful meteorological variables in the atmosphere via infrared remote sensing. WebMADS aggregates and displays numerous instrument functionality metrics from each AERI in real-time, allowing researchers and field technicians to identify problems quickly and remotely. Several diagnostic features have been added to WebMADS, including the integration of a new set of quality control metrics, a simultaneous data quality display for all active AERIs, and daily logs of instrument functionality metrics. These additions allow faster diagnosis of instrument problems, leading to higher uptime and better data collection.

THE REDUCTION OF CATHETER ASSOCIATED URINARY TRACT INFECTIONS THROUGH A MULTIDISCIPLINARY APPROACH

Hannah Wildermuth, Thomas Leffler (Mentor)

Catheter-associated urinary tract infections (CAUTIs) are the most prevalent healthcare-linked infection and can increase death rates, morbidity, and healthcare costs, especially in pediatric patients. Studies by physicians and staff at various hospitals encompass combative methods for this epidemic, including bladder scanners and monitorization, education on catheter use, and a multidisciplinary approach combining technology and zero-tolerance policies. Clinicians and researchers at the University of Wisconsin-Madison Pediatric Urology Division implemented a protocol that included these means for CAUTI prevention. Included was the education of medical personnel, policy reformation, product standardization, and a best practice advisory. They led to a 94% decrease in CAUTI cases over 36 months. Other institutions could benefit from this program based on the needs of pediatric patients and the widespread instances of CAUTIs.

HYPOTHALAMIC ESTROGEN RECEPTOR ALPHA GENE SILENCING INDUCES OBESITY IN FEMALE RHESUS MONKEYS

Molly Willging, David Abbott (Mentor)

In this study, we sought to determine the role of hypothalamic estrogen receptor alpha (ERa) in regulating body weight in adult female rhesus monkeys by utilizing RNAi technology to assess the effects of ERa gene silencing (n=4) compared to age and weight matched controls (n=4). Mouse models with ERa gene knockout in the ventromedial nucleus (VMN) of the hypothalamus display weight gain and impaired energy expenditure compared with the controls, yet a nonhuman primate model has not been explored. Increased weekly assessed body weights in VMN ERa silenced female monkeys significantly diverged from those of controls at 12 months. Novel therapeutics targeting the hypothalamus, alone, may provide effective weight regulation. Future studies will address differences in energy expenditure and lipid accumulation.

CHARACTERIZATION OF BURKHOLDERIA STRAINS FROM FUNGUS GARDENS OF FUNGUS FARMING ANTS

Laura Williams, Charlotte Francoeur (Mentor)

Microbial interactions play a large role in the gardens of fungus farming ants. The growth rates of Burkholderia strains isolated from fungal gardens were tested at different temperatures and pHs and compared with those of non-ant associated Burkholderia strains. The strains had the highest growth rate at 35 C and at a pH of 6.0. Additionally, the strains were tested for antibiotic resistance. We will also test their growth on different carbon sources. We used Traitair, a program that predicts phenotypes based on the genomes of organisms, on seven Burkholderia genomes. This characterization of the Burkholderia strains from fungal gardens will provide further insight into the role these bacteria play in the fungal garden

A CASE STUDY OF THE MEDIA TRUST INITIATIVE: THE CORAL PROJECT

Michael Williams, Susan Robinson (Mentor)

In the past 25 years, there has been a large number of projects in journalism focusing on the lack of trust between the media and citizens, especially in western nations. One of these projects is The Coral Project. The Coral Project is a journalistic movement set out to encourage better conversations through comments with three different applications/databases. It also includes various events to stimulate ideas and deliberation about different ways to improve comments and the online journalist community. This study, which performs close analysis on related texts, condenses this project into a working model of concepts to help future trust initiatives build strong communities and engage with those communities effectively.

EXPLORING THE SUPRISING MULTIFACETED NATURE OF A PROTEIN NATIVE STATE

Andrew Wittman, Silvia Cavagnero (Mentor)

The ability to fold into precise and consistent conformations is what allows proteins to perform specialized and complex functions within the cell. The properly folded conformation of a protein is referred to as the native state. This research aims at exploring the possibility that proteins have structures, denoted here as alternative native states, that are significantly different from typical native states. To test this hypothesis, the apomyoglobin protein was heat-treated to untwist its helical backbone. Preliminary refolding experiments suggest that untwisted apomyoglobin refolds into a non-alpha-helical alternative native state. Circular dichroism in the far-UV region and dynamic light scattering will be employed in this project. Future work will utilize gel filtration chromatography and NMR to determine the three-dimensional structure of the putative alternative native state.

THE TOOLS OF QUANTITATIVE ETHNOGRAPHY

Roman Woodward, Brad Rogers, Brendan Eagan (Mentor)

In the past two years, humans have generated 90% of all the data that currently exists, due in part to the rapid growth of information technologies. Identifying meaningful patterns among many statistically significant ones has been challenging for researchers. Due to the sheer size of many datasets, researchers need better tools to draw relevant observations. Quantitative Ethnography provides novel methods to combine qualitative and quantitative analysis. Using Epistemic Network Analysis (ENA) and rho, researchers can finally model complex relationships in large data sets well enough to extract meaningful information. Rho allows users to ensure agreement between two raters, as measured by inter-rater reliability, generalizes to an entire dataset of interest, while ENA allows them to visualize and compare informative connections within the data.

TEXT MINING UNCONSCIOUS BIAS IN SCIENTIFIC PEER REVIEW

Skylyn Worzalla, Anna Kaatz (Mentor)

Academic peer review is the gateway to continued funding and institutional support for every research laboratory featured at the symposium today. However, this process allows unconscious bias to influence decision-making at the highest levels, preventing women and underrepresented minorities from excelling in their fields. We look at an analysis of critiques from scientific peer review processes, including grant and manuscript peer review. Using natural language processing, we train neural networks to identify reviewer's sentiment and lexical structure in critiques to compare them with funding outcomes. Ultimately, we attempt to develop robust metrics to generate a more effective and equitable peer review process.

CROSS-SPECIES TRANSMISSION: CHRONIC WASTING DISEASE OF ELK AND WHITE-TAILED DEER INTO DEER MICE

Danielle Writz, Laura Monahan (Mentor)

Chronic Wasting Disease (CWD) is a highly contagious, untreatable, and fatal neurodegenerative disease transmitted among cervids (deer, elk, and moose species). Drastically expanding geographic distributions of CWD in North America coupled with opportunistic scavenging behaviors observed in rodent species generate growing concerns for potential cross-species transmission. This project analyzes biochemical, histopathological, and survival data from deer mice (*Peromyscus maniculatus*) brain tissues acquired from previous elk and white-tailed deer CWD challenge bioassays. One goal of this study is to ascertain whether *Peromyscus maniculatus* is susceptible to and can become infected with cervid CWD. The resultant data will improve our understanding of rodents' possible role(s) in environmental CWD transmission and determine whether *Peromyscus maniculatus* can serve as an important model species for future CWD experimental research.

AWAY FROM HOME: CHINESE INTERNATIONAL STUDENTS AT UW-MADISON

Yuqing Wu, Alice Goffman (Mentor)

In the emotions minorities feel toward the dominant groups, there is forever a tension between admiring, positively learning from, or being assimilated and figuring out ways to deal with prejudice, hostility, or even exploitation that may come from it. Through examining the experience of Chinese international students as they progress through their undergraduate life at UW-Madison, this ethnography shows how they decide between assimilation and isolation, use language techniques to perform boundary works with deep implications for their identities, and face differential treatment at both an institutional, macro level and an interpersonal, micro level.

ZEBRAFISH RFX4 CONTROLS DORSAL MIDLINE FORMATION IN THE NEURAL TUBE

Carol Xu, Yevgenya Grinblat (Mentor)

Mammalian Rfx winged-helix transcription factors are key regulators of neural tube formation and ciliogenesis. Research has shown loss of rfx4 in mammals leads to dorsal midline and primary cilia defects. To investigate the conserved function of rfx4 in vertebrates, we have generated both rfx4 mutants via CRISPR/Cas9 mutagenesis, and rfx4 morphants. We have identified a role for rfx4 in dorsal hindbrain midline and roof plate formation, potentially through transcriptional regulation of zic2 gene.

THE EFFECT OF BACKGROUND NOISE ON SPEECH INTELLIGIBILITY IN SPONTANEOUS PARKINSONIAN SPEECH

Amara Yaeger, Carrie Rountrey (Mentor)

Purpose: This study centered on the effect of background noise intensity (BNSPL) on spontaneous speech intelligibility (SISPON) in individuals with Parkinson's disease (PD). Previous research revealed a weak relationship between increased BNSPL and SISPON. Literature details communication breakdown in PD SISPON in the home and this study aims to investigate BNSPL and its effect on PD SISPON at home. Participants: 13 individuals with PD, aged 55-75, and 12 controls, aged 53-70, participated. Method: Participants wore recording device for 15 hours. Ten sentences were randomly selected and transcribed for SISPON. Noise before/after speech was measured for BNSPL. Results: Correlation analysis showed no relationship and no group effect ($R^2 < .004$). Individual differences emerged in the PD group, ranging $R^2 = (-.43-.44)$. Further investigation of individual differences will be presented.

CONVERGENCE OF PROTEIN NET CHARGE AND NONPOLAR CONTENT AT HIGH MOLECULAR MASS

Susanna Yaeger-Weiss, Silvia Cavagnero (Mentor)

Protein hydrophobicity and mean net charge play a dominant role in protein folding. We performed calculations based on a quantitative analysis of protein hydrophobicity and mean net charge and generated an algorithm that classifies proteins as folded or intrinsically disordered under physiologically relevant conditions with accuracy above 90%. This algorithm is particularly advantageous because it only requires information on amino acid sequence, and no structural information is necessary. Importantly, the prediction accuracy for folded proteins with chain length greater than 140 residues reaches 100%. Surprisingly, we found that, across the E. coli proteome, net charge and hydrophobicity converge to a specific value at high molecular weight.

THE INFLUENCE OF PARENT SCAFFOLDING ON CHILD SELF REGULATION SKILLS

Nan Inmong Yang, Robert Nix (Mentor)

Early self regulation skills develop at a young age and are predictive of healthy eating habits, behavioral problems, and academic success later on in life. Parent scaffolding is vital in the promotion of children's self regulation. This study has implemented an intervention plan with a sample of 74 families from Early Head Starts. Home visits are made where parents are taught how to sensitively scaffold their child's learning through 12 scripted healthy snack preparation lessons aimed at reducing child obesity. Parent and child were videotaped participating in semi-structured interactions. We have been coding the parents' technical, motivational, and emotional scaffolding. Results from the pilot study show that parents in the intervention group score higher on these observer ratings than parents in the control group.

QUALITY IMPROVEMENT: CULTURALLY CONGRUENT NURSING CARE FOR TRANSGENDER PATIENTS

Yaning Yang, Anne Ersig (Mentor)

The disparities seen in healthcare services provided to transgender patients and the general population are quite salient. Integration of elementary educational material on healthcare needs of transgender patients in the early curricula of any healthcare profession has shown to be beneficial. The purpose of this project is to initiate an introductory level education session on transgender patient care to first year nursing students of UW-Madison School of Nursing. A forty-five minute interactive session was developed and delivered to three clinical groups of nursing students. A positive shift in the student nurses' attitude, knowledge, and competency on transgender patient care was observed after the intervention. Thus, undergraduate nursing programs and hospitals can benefit from investing in structured and systematic educational tools and quality improvement modules.

CULTIVATION OF PYROLYZED ORGANIC MATTERS (PYOM) DEGRADING SOIL BACTERIA

MZ Yang, Thea Whitman (Mentor)

Forest fires are increasing in frequency across the world, generating an abundance of PyOM (pyrogenic organic matter, the charred remnants of plant biomass) which has an unclear impact on the carbon cycle in soil. As a part of a larger investigation of the microbial community involved in post-fire carbon cycling, we seek to cultivate bacterial isolations capable of utilizing PyOM as their primary carbon source. Microbes were extracted from fire-affected soils collected at the Stanislaus national forest and were maintained on defined minimal media with a range of concentrations and supplemented with finely ground PyOM. Isolates were characterized by microscopy and sequencing of the 16s RNA genes. Isolates are predominantly Gram-positive with an over-representation of bacteria from phylum actinobacteria, particularly those of the genus *Streptomyces*.

THE EFFECTS OF SHORT-TERM METHIONINE DEPRIVATION ON METABOLIC HEALTH IN MICE

Shany Yang, Dudley Lamming (Mentor)

The global epidemic of obesity has driven an increase in the prevalence of type 2 diabetes, which affects more than 30 million Americans. There is an urgent need for interventions that promote weight loss; however, long-term adherence to calorie-restricted diets is low. In this study, we developed a short-term methionine deprivation (MD) regimen and examined its effects on the metabolic health of young and aged mice of both sexes raised on a chow diet or preconditioned with a high-fat high-sucrose diet. The results show that MD reduces fat mass and restores normal bodyweight and glycemic control in these mice. These findings provide new options for dietary interventions aimed at promoting rapid weight loss to treat obesity and type 2 diabetes.

EULER'S FORMULA AND THE EFFICACY OF DIFFERENT LEARNING CONDITIONS

Pachia Yang, John McGinty (Mentor)

Learning abstract math has proven over time to be a difficult concept for students to grasp. In response to this issue, this study seeks to evaluate the efficacy of four different conditions: symbols and icons, symbols and objects, symbols alone, or a combination of all three. Which sequence of approaches between the enactive, iconic, and symbolic stages is most effective for learning math? I hypothesize that the most effective condition is when students are exposed to all three stages, stimulating motor and sensory skills, perceptual cognition, and experiencing instruction with symbolic representations. If this theorized condition is concluded as the most effective, further experimentation should be conducted to measure accuracy and specify the efficiency of various combinations of stages in hopes of improving future curricula.

TOOLKIT TO INCREASE ACCESSIBILITY AND INCLUSION FOR CHILDREN WITH AUTISM IN PUBLIC INSTITUTIONS

Ougayour Yasmeena, Molly Hussey, Nicole Nelson, Karla Ausderau (Mentor)

Accessibility in cultural institutions can be innately difficult to negotiate for families with children with autism spectrum disorder (ASD). A diverse stakeholder group (self-advocates, therapists, non-profit leaders, and researchers) collaborated on evaluating a local children's museum. The purpose of this evaluation was to assess the current institutional strengths and weaknesses for supporting families with children with ASD or sensory processing differences. In collaboration with museum stakeholders a comprehensive toolkit was developed to provide strategies to improve staff competency, sensory environments, online resources, and overall visitor experience. A pilot evaluation at five cultural institutions was completed. The purpose of this presentation will be to present findings on the effectiveness regarding the evaluation toolkit feedback from the evaluation.

QUANTIFYING SILENCING OF ESTROGEN RECEPTOR ALPHA EXPRESSION IN THE HYPOTHALAMUS OF FEMALE MARMOSETS

Hannah Yohnk, David Abbott (Mentor)

This study was designed to quantify estrogen receptor alpha (ER α) gene silencing in the hypothalamus of adult female marmoset monkeys. The monkeys were part of a study determining the ER responsible for engaging estradiol regulation of metabolism, ovarian function and sexual behavior. This specific study defined a rostral-caudal order of marmoset brain sections obtained postmortem from females that were neurally infused with a virus to silence ER α expression (n=4) or to have no silencing action (controls, n=4) in the hypothalamus. By identifying key brain landmarks, we determined the order of the brain sections, and then quantified the accuracy and effectiveness of ER α silencing. This methodology will assist in analyzing ER α silenced adult female rhesus monkeys and implicate ER α in specific neuroregulation in female primates.

FÖRSTER RESONANCE ENERGY TRANSFER FOR CHEMICAL ECOSYSTEM SELECTION EXPERIMENTS ON THE ORIGIN OF LIFE

Jacob Yourich, David Baum (Mentor)

How can life emerge from non-life? We propose that chemical ensembles capable of collective propagation and adaptive evolution spontaneously arise when provided with chemical building blocks, a source of energy, and a catalytic mineral surface onto which they can adsorb. To test this, we are attempting to generate life-like chemical systems capable of adaptive evolution in the lab using a chemical ecosystem selection approach. However, a major challenge in these experiments is to detect relevant chemical changes in real time. Therefore, we are working to develop a method using the artificial amino acids PheCN and 7AZW to utilize Förster Resonance Energy Transfer as a way to detect condensation reactions between particular, modified amino acids in chemical ecosystem selection experiments.

SAVE THE WORLD BY DISCOVERING NEW ASTEROIDS

Mikihisa Yuasa, Ralf Kotulla (Mentor)

Observation of near-Earth objects, asteroids, and comets enables the improvement in the early-warning system to detect potentially hazardous objects on a collision course with the earth. This project aims to discover new asteroids using an existing software code developed at the University of Wisconsin-Madison. We analyzed archival data from the 480-Mega Pixel One Degree Imager camera installed on the 3.5-m WIYN telescope to detect new asteroids, improved the orbits of already know solar objects, and found cases where our code either misses real asteroids or finds features that just resemble asteroids but are nothing relevant per se. The work done in this project thus improves our reliability to detect and to study these objects and will positively impact the scientific productivity of the WIYN telescope.

SAFEGUARDING CHILDREN: MEASURING THE IMPACT OF WITNESSING PARENTAL ARREST

Anisa Yudawanti, Julie Poehlmann-Tynan (Mentor)

An increase in parental arrest and incarceration has led to varying efforts to reduce emotional trauma in children. Currently, there are over 5 million children in the US who have an incarcerated parent and about 22-41% have witnessed their parent's arrest. This study analyzes data on 35 children, who are 2-6 years of age, from Dane county who witnessed the arrest of a parent. Demographics were collected for each of the children as well as their emotional response to witnessing the parent's arrest, as reported by the jailed parent and the caregiver. The current study will offer insight into the impact that witnessing parental arrest has on children with the hopes of providing recommendations for safeguarding children during a parental arrest to reduce potential trauma.

DIALOGUE BASED REAL TIME AUTHORIZING OF HUMAN ROBOT INTERACTION

Ali Zaidi, Mayank Mali, Linda Wu, Bilge Mutlu (Mentor)

The objective of this project was to create and evaluate the effectiveness a real time robot behavior authoring system. This dialogue based authoring tool would allow the author to edit the behavior of a robot similar to how a parent would teach their child, by first telling what them to do, then having them do it. Each subject will be assigned to have the robot perform a simple task, such as talking or gesturing, using either our real time tool, or traditional non real time behavior authoring. By comparing the speed and accuracy of each subject's implementation, as well as results from various usability questionnaires, we see if a real time robot behavior authoring tool is more effective and usable than traditional, coding dependent methods.

USER-CENTERED DESIGN IN THE DEVELOPMENT OF CONSUMER HEALTH INFORMATION TECHNOLOGY

Rachel Zenker, Connor Pardell, Nicole Werner (Mentor)

Informal caregivers of persons with dementia are highly burdened. The temporal and resource demands put on informal caregivers surpass their capacities. Many universities and institutions have responded to this imperative by developing consumer health information technologies (CHIT) specifically intended to reduce the burden associated with dementia caregiving. While these technologies have shown promise as supplemental informal caregiving technologies, it is important to understand their limitations as they often fail to recruit user-centered design development methodologies. HelpCare Connect, a recently developed CHIT aimed at connecting the informal caregiving network, builds on existing efforts to create highly usable websites for the resource-limited population of informal caregivers. In the present study, we describe the process of extracting user-centered design requirements to be incorporated into the development of CHIT.

THE STUDY OF NEUROSURGERY OPERATING ROOM TRAFFIC IN AN EFFORT TO REDUCE SURGICAL SITE INFECTIONS

Rachel Zenker, Maren Anderson, John Sandgren, Oguzhan Alagoz (Mentor)

A preliminary analysis showed 200 traffic instances in a UW Hospital Neurosurgery OR during a single surgery, which presented distractions for the surgical team and an increased risk of surgical site infections (SSIs). To provide a baseline of how SSIs and traffic are being managed within other health institutions, we conducted an informal literature review that aimed at deriving what influence door openings have on SSIs. In an effort to understand the purpose and frequency of these movements, our team conducted observations weekly in 3 different ORs across various shifts and neurosurgery types. To contextualize these observations, we interviewed members of the surgical team. We are currently in the process of constructing an intervention that aims to reduce unnecessary traffic.

CASTRATION REDUCES DURATION AND INCREASES FREQUENCY OF URINATION

Helen Zhang, Hannah Ruetten (Mentor)

Lower urinary tract symptoms (LUTS) are common in men and are typically attributed to an enlarged prostate. Current LUTS-related research relies on mouse models to replicate enlarged prostates. However, given disparities in anatomy, it is unclear whether mouse prostate size directly impacts urination. This study tests the hypothesis that surgical castration of male mice reduces prostate size and alters urinary physiology. We found that castration reduced prostate size and supplementing castrated mice with testosterone triggered prostate regrowth. Using cystometry, we observed that castration reduced the duration and increased the frequency of urination events. Prostate regeneration restored duration to that of uncastrated mice, but failed to restore frequency. These results provide valuable insight into how mice can be best used to model human LUTS.

THE ESTIMATION OF CLADE-SPLITTING PROBABILITIES TO IMPROVE IMPORTANCE SAMPLING OF PHYLOGENETIC TREE

Xuan Zhang, Bret Larget (Mentor)

A phylogenetic tree is a part of the Tree of Life showing relationships of some living species that is estimated by molecular sequence data from these species. A clade is a group of species that includes an ancestor and all its descendants. A clade-splitting probability is the probability that the clade evolves into smaller branches. The objective of this project is to improve the computational efficiency of a new method to sample trees using importance sampling by finding a better clade-splitting probability distribution. Independent clade-splitting probabilities form the probability for a single tree, which is the proposal distribution in importance sampling. The project computes approximate numerical integrals of posterior probabilities, implemented in software. The expected result is a more efficient sampler than an existing method.

SIMULATIONS FOR THE MINICLEAN DARK MATTER DETECTOR

Hanshu Zhang, Nicholas Decheine, Kimberly Palladino (Mentor)

MiniCLEAN is a direct dark matter detection experiment located in SNOLAB, 2km underground near Sudbury Ontario Canada. It is a technology demonstrator for the detection of nuclear recoils from Weakly Interacting Massive Particles (WIMPs), a likely candidate particle for dark matter. For this experiment, Reactor Analysis Tool (RAT), a Monte Carlo simulation tool for liquid scintillator detectors that relies on particle interactions in Geant4 software, is used to simulate the detector environment. We primarily study signal recoil calibrations and background events. I studied the effect of upgrading Geant4 from version 9 to 10 to help decide whether the MiniCLEAN version of RAT should upgrade. The output of the two versions are consistent and the newer Geant4 version exhibits better performance.

RESCUE OF NEUROGENIC AND COGNITIVE DEFICITS OF FRAGILE X MICE THROUGH GENETIC REDUCTION OF MDM2

Yinghua Zhao, Xinyu Zhao (Mentor)

Fragile X Syndrome is an inherited intellectual disability commonly caused by absence of FMRP, encoded by FMR1 on the X chromosome and essential for neuronal development and cognitive functions. Our lab previously published FMRP loss increased MDM2 levels, over-activated NSCs, and reduced neurogenesis, causing learning deficits in mature adult Fmr1-KO mice. Nutlin-3, currently tested for cancer treatment, effectively rescues these deficits. However, whether systemic Nutlin-3 treatment rescues the symptoms by targeting only MDM2 and via correcting adult neurogenesis is unknown yet directly concern effective therapeutic development. Therefore, I aim to induce conditional MDM2 genetic reduction specifically in NESTIN-expressing NSCs and their differentiated neurons and I hypothesize NSC and adult new neurons-specific MDM2 genetic reduction can rescue neurogenic and cognitive deficits in mature adult Fmr1-KO mice.

FROM YORUBA TRADITIONS TO CONTEMPORARY NIGERIAN PLAYS

Zhiyun Zhao, Aparna Dharwadker (Mentor)

This research explores the significance of using indigenous traditions in postcolonial theatre. Some leading Nigerian playwrights draw their inspiration from Yoruba myth, ritual, and music. Therefore, this paper analyzes the Yoruba traditions in Duro Ladipo's *Oba Ko So* (1964), Wole Soyinka's *Death and the King's Horseman* (1975) and Femi Osofisan's *Morountodun* (1982). The analysis shows that using indigenous traditions in theatre helps to preserve that cultural matter, and makes it available to audiences worldwide. It also helps to create a contemporary Nigerian theatre that is different from Western or Nigerian traditional theatre. Significantly, Yoruba traditions serve as weapons to fight back against the oppressors of Nigerian people. This project highlights the impact of using tradition in drama on the traditions themselves and sociopolitical realities.

THE HIDDEN CONNECTIONS AND THE CAUSES OF ALZHEIMER DISEASE

Jiaxuan Zhao, Boyang Tang, Zhengjun Zhang (Mentor)

Every year huge amount of people become infected with Alzheimer, making the causes of Alzheimer disease one of the top topics to study. In this research, we attempt to find brain regions that may (in)directly associate with Alzheimer. To locate these regions, we preprocessed resting state fMRI from healthy, Alzheimer, and memory disorder groups from ADNI and transformed them into matrices. The Generalized Measures of Correlation (GMC) abled us to find regions to regions explained variabilities from these matrices. By filtering and comparing healthy and unhealthy group GMCs, we located some similarities and differences between brain regions. With the identified regions, researchers may conduct further experiments to confirm whether these regions play a central role in the cause of Alzheimer, and then design differentiated treatments.

MISTUDIO - A GUI SOFTWARE FOR THE ANALYSIS AND VISUALIZATION OF MICROBIOME DATA

Weipeng Zhou, Zhengzheng Tang (Mentor)

In the area of microbiome research, high-throughput DNA sequencing technologies have recently enabled scientists to obtain billions of reads. To interpret these massive data, many analysis and visualization tools are developed. However, even though they are undoubtedly useful for researchers, they are not particularly accessible. The reason is largely due to the fact that they mostly rely on command-line usages, are written in different languages or do not support universal computer platforms. Hence, our lab envisioned miStudio, a web-based GUI application that runs on all computers that installed R. It will provide data filter, analysis and visualization functions for microbiome research. miStudio currently supports association tests analysis and the result is visualized on a circular phylogenetic tree. More features will be added in the future.

LOOKING FOR PROTECTIVE FACTORS IN PRETERM INFANTS

Yan Zhu, Julie Poehlmann-Tynan (Mentor)

Premature birth is a common concern and preterm infants are at greater risk for deleterious developmental outcomes in childhood and adolescence. Looking at the influence of family income on preterm infants, depending on the parenting experiences they receive, is important for knowing if positive parenting is protective for preterm infants. The hypothesis is preterm infants who receive positive parenting will be protected from the effects of low family income. 171 preterm infants were recruited and tracked from birth through 6 years old. The parents were interviewed and observed playing with their infants as well as completing behavior checklists on the child. Correlation patterns will be examined. The results can be used to highlight the importance of parenting quality for parents of preterm infants.

