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THE SEARCH FOR RESISTANCE TO POTATO VIRUS Y

Chester Abramczak, Ana Fulladolsa Palma (Mentor), Plant Pathology

Potato virus Y (PVY) is the most important disease affecting seed potato certification. PVY resistance has been found in wild relatives of potato (*Solanum tuberosum*). CHC 39–7 (*S. chacoense*) was crossbred with the susceptible US-W4 (*S. tuberosum*). The offspring, XD3, was self-pollinated to create the population used in this study. Our objective is to find the resistance gene. It has been mapped to the end of chromosome IX. My research has been to narrow down the gene region and eventually find the gene itself. Using markers to analyze the target genomic area, we can correlate the phenotype and the genotype of the individuals in our population. These trials will show us how close to the gene we are until we can pinpoint its exact location.

STRATEGIES TO IMPROVE ALLOGENEIC BONE MARROW TRANSPLANT USING IMMUNOCYTOKINE

Madeline Adam, Christian Capitini (Mentor), Pediatrics

Overall survival for high-risk pediatric neuroblastoma is poor despite advances in current treatments. Hu14.18-IL2 is an immunocytokine that recognizes GD2 expressing tumors and has been shown to promote anti-tumor activity. The purpose of these studies was to determine if hu14.18-IL2 can be safely given after allogeneic bone marrow transplant (alloBMT) with T cells and to identify what kind of anti-tumor effect the combination will have on GD2 expressing NXS2 neuroblastoma. For each study, A/J mice were irradiated and injected with isolated bone marrow and T cells from C57BL/6 donors on Day +0. Then mice were challenged with NXS2 on Day +10. The treatment mice were then injected with hu14.18-IL2 on Days +14–16. For the duration of the study the mice were monitored for clinical GVHD scores, weight loss and tumor growth by digital caliper. Results of the study suggest that hu14.18-IL2 can be safely given after alloBMT with low doses of T cells. Although the combination of T cells and immunocytokine cannot prevent tumor growth, they do limit growth of NXS2 as compared to groups not treated with immunocytokine, suggesting biologic activity after alloBMT without lethal toxicity.

EARLY HARAPPAN STEATITE SEALS OF ANCIENT SOUTH ASIA: EXPERIMENTAL REPLICATION AND ANALYSIS

Laura Aiken, Jonathan Kenoyer (Mentor), Anthropology

The production of carved and glazed steatite seals during the Early Harappan Period of the Indus Civilization, circa 2800–2600 BC involved the early use of pyrotechnology to create symbols of power and authority. Using replicas of ancient tools combined with modern scientific documentation of experimental processes, I was able to determine the types of tools and firing technology used to produce these important objects. This research contributes to the larger discussion of how glazing technology may have developed independently in ancient South Asia and the role of pyrotechnology in the production of high status artifacts such as seals and ornaments. This study concludes that the foundations of later Harappan seal making traditions have their roots in the Kot Diji Phase of the Early Harappan Period.

STUDYING BIG DATA

Sarah Alsawaf, Franco Llamas, Amanda Mix, Craig Anderson (Mentor), Wisconsin Institute for Discovery

This project aims to find novel ways in which we can marry heterogeneous data sets. Those data were collected through a game-embedded curriculum that teaches about the mechanisms of viral replication, and allowed for collection of multiple data streams that include discourse on and around the curriculum and game, clickstream data sets from gameplay, pre/post assessments of general science and virology knowledge and attitudes, and physical artifacts created through the curriculum. Together, these data streams give us a multimodal approach to understand how students play and learn in a game-embedded informal learning space.

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

Lindsey Amundson, Anita Bhattacharyya Consigny (Mentor), Waisman Center

Down syndrome (DS) is caused by the trisomy of chromosome 21 (Ts21) which leads to impairment in cortical development. Earlier studies revealed the lack of GABA interneurons, a type of neuron in the central nervous system (CNS). Until recently, it has been difficult to understand cortical development in DS. Induced pluripotent stem cells (iPSCs) allow researchers to see into the window of development of the cortex. Using published protocols, iPSCs can retain Ts21 when they are generated from individuals with DS. These iPSCs can then be differentiated into neurons to study the development of the brain. To test whether fewer GABA interneurons develop from Ts21 iPSCs, explaining fewer GABA neurons in the DS cortex, GABA neurons were differentiated and counted from both euploid and Ts21 iPSCs. The study aims to identify whether GABA neuron differentiation is the stage of neuron development that Ts21-induced cells deviate from typical cells. The results of this research will lead to a better understanding of DS and what can be done to lessen the effects by unraveling the mechanism in which Ts21 changes the structure of the brain.

ILLUMINATING POSSIBLE CAUSES FOR LEPIDOPTERA ATTRACTION TO ARTIFICIAL LIGHTING

Eric Anderson, Walter Goodman (Mentor), Entomology

Our objective was to identify likely motivating factors for the attraction Lepidoptera exhibit for artificial light sources. We investigated temperature differentials created by various lightbulbs and high intensity wavelengths as possible causes for attraction using *Manduca sexta* as our model. Temperature gradients did not appear to have a significant effect on moth flight paths while fluorescent bulbs (short wavelengths) appeared to have a stronger influence on moth behavior than incandescent bulbs (long wavelengths). The influence the motivating factor had on the moths was quantified by measuring light passes and hovering behavior, respectively, over a set time interval and was subjected to statistical tests. The findings from our study may help to determine which outdoor lights sources would have the smallest impact on migrating moth behavior.

BOVINE INTESTINAL ALKALINE PHOSPHATASE INCUBATED IN GLUCOSE INCREASED ACTIVITY

Rachel Andrie, Bethany Lucas (Mentor), Zoology

Alkaline phosphatases are tissue-specific homodimeric enzymes that catalyze the removal of phosphate groups. They have been found to become glycosylated when in the presence of carbohydrates, but it is not clear how these carbohydrate chains affect the enzyme's activity. To determine this, we hypothesized that BIAP incubated in 0.1 M glucose would show increased activity over BIAP incubated without glucose. We incubated two BIAP solutions, one with glucose and one without, at 4°C. An enzyme assay with p-nitrophenylphosphate was used to measure both enzymes' activity at the end of 7 days. Our data supported our hypothesis, with the mean of the glucose BIAP solution 0.047 ± 0.00128 μmol hydrolyzed/min, and no glucose BIAP solution 0.043 ± 0.0030 μmol /min, showing statistical significance ($p < .05$). We have reasonable confidence in our data, but recommend that the experiment be repeated with replicates and verification of methodological assumptions. The results of this experiment may prove useful to increasing BIAP activity/stability (i.e., shelf life), and future studies might focus on the mechanism of this phenomenon.

LA FRONTERA EN WISCONSIN: EXPERIENCES OF MIGRATION FROM THE BORDER TO WISCONSIN

Alexandra Arriaga, Karma Chavez (Mentor), Communication Arts

This project involves getting involved in the migrant communities both on the border between Ambos Nogales and in my local neighborhood of Madison, Wisconsin. As a storytelling project, it involves gathering interviews, images and information about the migrant experience and sharing those narratives in local media, and exploring the responsible methods of reporting on marginalized communities such as undocumented immigrants. As a service-learning project, a significant purpose is to gain relationships and understandings of the day-to-day challenges faced by the undocumented community such as mistrust of law enforcement, fear of deportation and stress about employment. Through interviews and relationship building, the project explores the ways in which the border extends itself miles away from the point of crossing for someone who is undocumented.

SYNTHESIS OF MEDIUM-CHAIN METHYL KETONES IN FREE FATTY ACID OVERPRODUCING ESCHERICHIA COLI

Rottinghaus Austin, Brian Pflieger (Mentor), Chemical and Biological Engineering

Metabolic engineering enables the production of a variety of compounds with capabilities as fuels, pharmaceuticals, polymers, fragrances, and many others. Many of these chemicals can be produced in *Escherichia coli* as derivatives of free fatty acids. One such chemical, methyl ketone, is produced through the hydrolysis of β -ketoacyl-CoA, an intermediate in the β -oxidation pathway, by the thioesterase FadM. Here, I outline the steps taken to optimize the synthesis of 11-carbon methyl ketones through a reengineered β -oxidation pathway. The modifications included overexpressing fadM and the key genes in the β -oxidation pathway up to β -ketoacyl-CoA, replacing and engineering the rate limiting enzyme, and knocking out metabolic pathways that compete with fatty acid biosynthesis. Each of these genetic engineering steps increased the medium-chain methyl ketone yields.

MICROTUBULE DEPENDENT TRAFFICKING OF GLUR2 INTO DENDRITIC SPINES OF RAT HIPPOCAMPAL NEURONS

Adam Awe, Erik Dent (Mentor), Neuroscience

The AMPA receptor subunit (GluR2) inserts into dendritic spines of neurons to regulate fast excitatory transmission in the nervous system. Our lab has shown that the microtubule (MT) cytoskeleton directly polymerizes into the spine head to deliver molecular cargoes. I hypothesize that GluR2 is transported directly into spines on polymerizing MTs. To test this hypothesis, I inhibited both MT polymerization and the motor protein dynein. Levels of GluR2 and kinesin motor proteins (KIF1A/KIF5C), that traffic GluR2-containing AMPA receptors, were measured with fluorescence microscopy. GluR2 levels in spines decreased after inhibition of MT polymerization, but GluR2 and motor protein levels were unchanged after dynein inhibition. Thus, MT polymerization is important for transporting cargo into spines, but dynein may not be transporting these cargoes out of spines.

CLIMATE AND FOREST PRODUCTIVITY AFFECT MICROBIAL COMMUNITIES IN YOUNG CONIFER FORESTS OF YELLOWSTONE

Aisha Ba, Winslow Hansen (Mentor), Zoology

Wildfires occur more frequently with warming in the northern Rocky Mountains, increasing the extent of early-succession conifer forests. Ecosystem processes in young forests are strongly determined by soil microbial community composition. However, the factors structuring microbial communities remain poorly resolved. I asked: In 27 year-old postfire lodgepole pine stands of Yellowstone National Park, how does soil microbial composition vary with lodgepole-pine productivity and climate? I surveyed 20 plots spanning mean daily summer temperature (8.2–9.7°C), mean annual precipitation (675–1230 mm yr⁻¹) and tree productivity (1–52 Mg ha⁻¹ yr⁻¹) gradients. Stand structure and understory percent cover were measured. Soil inorganic N, labile-carbon and microbial community composition were quantified. Microbial communities shifted toward more stress- and drought-tolerant functional groups with increasing tree productivity and warmer-drier climate.

PRESSURE GAPS IN PATIENTS WITH DYSPHAGIA COMPARED TO HEALTHY CONTROL

Emma Backlund, Corinne Jones (Mentor), Surgery

A pressure gap, or an area of reduced pressure, in the hypopharynx can appear in patients with dysphagia. These gaps are identified by high-resolution manometry (HRM), a tool that measures pressure activity within the pharynx. Currently, pressure gaps and their correlation with swallowing function are poorly understood. The purpose of this study is to analyze pressure differences found within the hypopharynx region during swallowing in patients with dysphagia showing a gap and compare them with healthy, age-matched controls. Both groups underwent HRM as well as Videofluoroscopy. Videofluoroscopy enables use of the standardized Modified Barium Swallow Impairment Profile (MBSImP) scoring system to assess components of swallowing. Pressure differences will also be compared to MBSImP scores to determine how physiological components of swallowing relate to pressure gaps.

STEM CELL TRANSPLANTATION THERAPY AS A POTENTIAL THERAPY FOR BLINDING RETINAL DISORDERS

Patrick Barney, David Gamm (Mentor), Ophthalmology and Visual Sciences

Retinal degenerative diseases (RDDs) are among the most prevalent causes of blindness. These diseases target photoreceptors (PRs) and prevent them from functioning or lead to cell death. To counter the effects of these diseases, we are creating PR cells from human induced pluripotent stem cells (hiPSCs) for use in cell-replacement therapy. Our focus is to increase the number and purity of PR cells in our cultures as well as establish a method of isolating these PR cells from other neural retina (NR) cells. With these advancements, we expect improved engraftment when transplanting the hiPSC-PRs in rodent models of RDD. This work is essential for the clinical application of hiPSC-PR cell replacement therapy and achieving the ultimate goal of treating blindness in human patients.

DISTURBANCE EFFECTS ON THE ANT COMMUNITIES OF GRASSLAND PRAIRIES

Savannah Bartel, Tania Kim (Mentor), Entomology

This study examines the impacts of annual harvesting of perennial grasses for bioenergy production on ant communities in native grasslands. Ants were collected in the summer of 2013 in 9 harvested and 9 control sites throughout southern Wisconsin and identified to the species level. We examined the impacts of harvesting on ant community metric and the abundances of individual ant species. Harvesting significantly increased overall ant abundances and decreased species diversity. Individual species responses to harvesting also yielded significant results as harvesting positively impacted the dominant *Lasius neoniger* species and negatively impacted several subordinate species. These results show that disturbance can have a large impact on ant communities and varying species-specific responses, thus potentially altering biotic interactions within the ecosystem and impacting ecosystem health.

PLUMBAGIN, A PLANT-DERIVED NAPHTHOQUINONE, INHIBITS GROWTH OF DOCETAXEL RESISTANT PROSTATE CANCER

Satyamedha Bathula, Ajit Verma (Mentor), Human Oncology

Prostate cancer (PCa) is one of the leading causes of death in men across the world. Despite the initial success of androgen ablation therapy, resistance to anti-androgen therapy manifests by progression to castration resistant prostate cancer (CRPC), which is the end stage that accounts for the majority of PCa patient deaths. Docetaxel (DTX) is an approved drug for the treatment of CRPC. However, development of DTX resistance and toxicity are the major limitations in the use of DTX in the treatment of CRPC. Now we are investigating to determine whether these limitations may be overcome by combining DTX with plumbagin (PL), which inhibits the growth and PCa metastasis. The results will provide preclinical evidence for the control of CRPC.

AUTOMATIC ENCODING OF GENDER BY THREE-YEAR-OLD CHILDREN

Gina Bednarek, Kristin Shutts (Mentor), Psychology

When young children meet people for the first time, what features do they notice and remember about them? In the present research, we tested whether 3-year-old children automatically encode other people's gender. Participants (N=24; 13 girls) were presented with different facts about unfamiliar boys and girls, and were later asked to recall which facts went with which people. We found that participants made more within-category memory errors (e.g., misattributing a fact associated with one girl to another girl) than between-category errors (e.g., misattributing a fact associated with a girl to a boy), $t(23)=1.94$, $p=.03$, one-tailed test. The results show that young children spontaneously encode whether someone is a boy or a girl, and further suggest that gender is a fundamental category for humans.

COEVOLUTION OF THE RNA LIGASE RtcB AND ITS ACTIVATOR ARCHEASE

Amanda Beltrame, Kevin Desai (Mentor), Biochemistry

RtcB is an RNA ligase which joins 3'-phosphate and 5'-hydroxyl termini, and is essential for tRNA splicing. Archease is a protein cofactor of RtcB that accelerates ligation and modifies its NTP cofactor specificity. The *rtcB* gene is widely distributed in all three domains of life; however, the archease gene is not widely found in bacteria. In this study, we explored the differences between Archease-dependent and independent RtcBs. Here we show that Archease is functionally interchangeable between Archease-dependent RtcBs; however, Archease fails to activate Archease-independent RtcBs. Furthermore, we show that Archease promotes multiple-turnover ligation activity of an Archease-dependent RtcB. Our study shows that Archease likely evolved to promote multiple-turnover activity of RtcB and that RtcB and Archease must coevolve to enable a functional interaction.

SCAT ANALYSIS OF URBAN COYOTES (CANIS LATRANS) AND RED FOXES (VULPES VULPES) IN MADISON, WISCONSIN

Bruce Jake Berger, David Drake (Mentor), Forest & Wildlife Ecology

As humans rapidly expand their development into previously unoccupied areas, the wildlife that was accustomed to purely natural surroundings now has the potential to interact with humans. This new habitat represents a modified ecosystem for the plants, animals, and humans that now must share the same environment. This is of particular interest to all of the people and wildlife that inhabit Madison, Wisconsin, where an urban setting is thought to provide a sustainable habitat for populations of coyotes (*Canis latrans*) and red foxes (*Vulpes vulpes*). In order to better understand the similarity of the diets of these two members of the Canidae family in this ecosystem, previously acquired scat samples were analyzed to observe and compare their diets. Each of the 20 coyote and 19 red fox scat samples were dissected, and the contents were classified as mammal, seed, insect, vegetation, bird, or anthropogenic. After comparing the biomass, frequency of occurrences, and volume proportion of all the contents, it was determined that the diet of the local coyote population was 67% animal matter and 34% plant matter, and that the diet of the local fox population was 30–40% animal matter and 60–70% plant matter. Although the distribution of food resources is a critical aspect of interspecific competition, further study on several more variables (namely, competition for space) is necessary to accurately assess the full context of the interactions between coyotes and red foxes in Madison, Wisconsin.

BDNF GENOTYPE MODIFIES THE ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND COGNITION

Michelle Berning, Ozioma Okonkwo (Mentor), Medicine

Increased brain-derived neurotrophic factor (BDNF) protein supports neuronal function in the brain, while decreased levels are associated with aging and Alzheimer's disease. Physical activity is known to enhance BDNF levels and cognitive function. In this study, we investigated whether BDNF genotype modifies the association between physical activity and cognition. 1182 participants from the Wisconsin Registry for Alzheimer's Prevention completed physical activity questionnaires and cognitive assessments. Results indicated an interaction between BDNF genotype and minutes walked per week on tests of cognitive speed and flexibility, such that carriers of the BDNF risk allele benefited most from increased walking time ($p=0.043$). Future studies utilizing objective measures of physical activity will further demonstrate the role of BDNF genotype in relation to physical activity and cognition.

ANALYSIS OF ARABIDOPSIS THALIANA RESPONSE TO ENVIRONMENTAL STIMULI THAT MIMIC SPACE FLIGHT

Natasha Bilkey, Richard Barker (Mentor), Botany

Plants are sessile organisms and have thus become exquisitely sensitive to mechanical stimulation in order to adapt to the constantly changing mechanical environment around them. The purpose of this research is to analyze the genetic, morphological, and physiological responses to environmental stimuli as a result of touch-signaling in Arabidopsis mutants. We generated mutants that are part of a network that is altered in the calcium signaling pathway, *tch-2*. We then assessed their response to thigmotropic, gravitropic, and hypoxic stimuli, in comparison to wild-type plants. Results from these experiments may provide insight to plants' response to space-flight and the role of touch-signaling in the regulation of plant development. This work is funded by NASA.

HIGH SURFACE AREA TIN OXIDE AS A HIGH TEMPERATURE SUPPORT MATERIAL

Faisal Bin Salem, Juan Venegas (Mentor), Chemical and Biological Engineering

The need for sustainable chemical processes has led to the growing interest in heterogeneous catalysis. Supported metal oxides are commonly used heterogeneous catalysts in petrochemical refining, polymer production and exhaust gas treatment. To enhance productivity of these catalysts, high surface area supports maximize the amount of active sites available for reaction. Due to its redox properties, tin oxide is used in oxidation and reduction reactions. The high temperature requirement of these processes, however, causes their surface area to significantly decrease. Thus, the development of high surface area tin oxides that can withstand high temperature treatment would widen their applicability as a support materials. The focus of this work will be to develop a synthesis method for such materials.

EFFECT OF PASSAGE NUMBER ON THE PROTEIN COMPOSITION OF HUMAN FIBROBLAST DERIVED EXTRACELLULAR MATRIX

Madeline Bireley, Eric Schmuck (Mentor), Medicine

Cardiac fibroblasts (CF) are primarily responsible for production and maintenance of native extracellular matrix (ECM) in the heart. When cultured at high density, CFs secrete ECM, which can then be harvested as sheet. CF-ECM is rendered acellular through contact with decellularizing agents and is primarily composed of collagens and fibronectin. CF-ECM has been seeded with a variety of stem cells and has been shown to greatly improve cell retention at the site of injury. This poster will focus on the effects of cell culture passage number on the ratio of collagen and fibronectin in CF-ECM. Understanding the effects of passage number on the protein composition is a critical component of moving this biomaterial into clinical trials.

FABRICATION OF A MICROFLUIDIC ASSAY FOR MEASURING TEMPORAL SECRETION VIA INVERSE DIFFUSION

Aniket Biswas, Layla Barkal (Mentor), Biomedical Engineering

My research project explores the idea of microscale diffusion profiles as historical records. A current issue with microfluidic devices used for cell-based assays is that the extremely low volume makes resampling at various time points almost impossible. The current solution entails using separate devices for each time point, which compromises the biological sensitivity of an experiment. We propose to develop a probe and analysis framework that allows the target cellular/molecular factors to diffuse away from the cell culture, and that can be analyzed at the end of the experiment to give the full historical record of secreted molecules at any time point during the diffusion process, thereby reducing the need for multiple samplings and providing clean data with low levels of noise.

NOVEL TREATMENT FOR DYSPHAGIA IN PATIENTS WITH COGNITIVE IMPAIRMENT

Samantha Blanke, Nicole Pulia (Mentor), Medicine

Dysphagia, or swallowing dysfunction, resulting in entry of food or liquid into the airway, frequently leads to development of pneumonia in patients with Alzheimer's disease; yet there are currently no effective treatments for dysphagia in patients with AD. The purpose of this study was to examine the effects of a novel 8-week lingual strengthening treatment for dysphagia on swallowing-related outcomes in four patients with dysphagia and cognitive impairment (Mini-mental status exam scores < 24). Preliminary results show increases in lingual pressures (3/4 patients), lower ratings of swallowing-related effort (2/4 patients) and improvements in several subscales of the SWAL-QOL. These findings suggest that lingual strengthening therapy may be a feasible treatment option for patients with dementia and supports the need for future research.

ELECTROMAGNETIC SEED DEPOSITION TECHNIQUES FOR AN AUTONOMOUS BRACHYTHERAPY ROBOT

Lindsay Bodart, Bruce Thomadsen (Mentor), Medical Physics

Low Dose Rate (LDR) prostate brachytherapy is the permanent implantation of small radioactive sources, or seeds, into cancerous regions of tissue. Currently the procedure is performed manually by a trained physician, but efforts have been put into the development of an autonomous brachytherapy robot that will replace the physician's role and achieve a higher placement accuracy. Robotic needle insertion into tissue has been studied considerably, and now attention to seed deposition is manifesting. One idea is to adopt the concepts of an electromagnetic propulsion of the seed. The feasibility of charging a seed or making it magnetic is of foremost importance, but other factors—such as how a magnetic seed would impact patient MR imaging—also needs consideration.

HOW CONSUMER SCIENCE CLASSES AFFECT STUDENTS ENVIRONMENTAL KNOWLEDGE AND ATTITUDES

Marcus Bolles, Lydia Zepeda (Mentor), Consumer Science

The purpose of this project is to show whether a consumer science class could increase environmental knowledge and change environmental attitudes. Data was analyzed from questionnaires distributed to students at the beginning and end of the semester to see if there were significant changes in knowledge, attitudes, and behaviors. The questions were standardized and validated scales of environmental knowledge and attitudes. Significant differences were found in some knowledge and attitude questions.

EVIDENCE OF CRANIAL SENSORIMOTOR DEFICITS IN A PINK1 KNOCKOUT MOUSE MODEL OF PARKINSON'S DISEASE

Alexander Brauer, Michelle Ciucci (Mentor), Communication Sciences and Disorders

Parkinson's disease (PD) causes significant deficits in movement and communication. The pathology is not well understood and thus treatment is limited. This study assayed sensorimotor performance and vocal communication in a genetic mouse model of PD based on the loss of function gene Pink1. We hypothesized that Pink1^{-/-} mice would show early and progressive deficits compared to wild type controls. Our results partially supported those hypotheses, as Pink1^{-/-} mice had significantly aberrant intensity and frequency modulation of vocalizations and mild limb deficits, although these effects were less robust than predicted. Future work will delve deeper into the molecular basis of the observed dysfunction with Pink1, and other PD-related genes, to add to our understanding of the complex nature of PD and develop better treatments.

UNDERSTANDING DEMOGRAPHIC DIFFERENCES FOR STUDENTS WITH ASD IN CLINICAL AND COMMUNITY-BASED RESEARCH

Elizabeth Braunreuther, Leann Smith (Mentor), Waisman Center

The purpose of this research is to explore potential differences in demographic characteristics of research participants based on method of recruitment. We will compare individuals recruited through public schools versus those recruited through a clinical study. Our results should indicate whether the different recruitment methods created participant samples comparable with state demographics for adolescents with ASD. This study has implications for how autism research is conducted in order to expand access to disadvantaged groups, narrowing racial and socioeconomic disparities.

WHAT DOES IT TAKE TO BE A CEO?

William Bravo, Maria Triana (Mentor), Management and Human Resources

Most of us think that anyone can be a CEO with the right dedication and leadership skills. The goal of this project is to understand the types of personal backgrounds that S&P 500 CEOs tend to have. We gather as much background and personal information as we can on over 900 CEOs from the S&P 500 over the past decade. My tasks included going through our list of executives and searching online public records for personal information (e.g., if they are married, have children, where their parents are from, socioeconomic status growing up, and whether their mother was employed). With the data that we are collecting we will test for associations between personal history, how they are viewed as leaders, and their business decisions.

NUTRIENT CONCENTRATION AND FOOD WEB STRUCTURE IMPACT BACTERIAL COMMUNITY COMPOSITION IN LAKE MENDOTA

Joshua Breider, Robin Rohwer (Mentor), Bacteriology

High-nutrient runoff into Lake Mendota results in toxic cyanobacterial blooms and reduced water clarity. Understanding how bacterial community composition (BCC) impacts nutrients could inform management strategies. 142 water samples were collected from Lake Mendota during summers 2013–2015 and analyzed for BCC and water chemistry. Correlating nutrients and BCC improves our understanding of their impact. Additionally, the time period sampled spans the invasion of spiny water flea in Lake Mendota. This major disruption to the food web impacted water clarity and likely BCC. Long-term trends in BCC reveal ties between BCC and food web structure. BCC was determined using Automated Ribosomal Intergenic Spacer Analysis (ARISA) on DNA extracted from 0.22 µm filters. A DNA extraction method was chosen to optimize yield and time spent per extraction.

CHARACTERIZATION OF AN APOPTOTIC-LIKE CELL DEATH REGULATOR IN ASPERGILLUS NIDULANS

Mikaela Breunig, Mehdi Kabbage (Mentor), Plant Pathology

Apoptosis is a type of programmed cell death (PCD) that plays an essential role in the biology of many organisms. Increasing evidence suggests that apoptotic-like cell death occurs in widely divergent species, but the molecular components in the case of fungi remain unclear. Interestingly, animal apoptotic regulators function in fungi. Using functional genomics in a yeast cell death screen, I have identified candidates from an *Aspergillus nidulans* cDNA library that may function in PCD regulation in fungi. Here, we phenotypically characterized one of these, AN6337, in *A. nidulans* creating knock-out and over-expression strains. Under stress conditions, the over-expression strain had reduced growth compared to wild-type and knockout. These initial results provide a solid basis to further evaluate AN6337 function in the PCD processes in fungi.

INVESTIGATING THE FUNCTION OF BACULOVIRUS LEF-7

Jaime Brown, Nathaniel Byers (Mentor), Institute for Molecular Virology

Viruses are small infectious agents that have evolved a variety of mechanisms by which they infect and replicate within host cells. They are responsible for many human diseases including HPV, influenza, and certain cancers. Many viruses, such as the insect baculovirus AcMNPV, have evolved ways to manipulate the DNA damage response (DDR) to enhance viral replication within the infected cell. Baculoviruses produce a protein called LEF-7 that is a known manipulator of the DDR. By studying LEF-7 and the proteins it interacts with, we will gain insight on how the DDR is regulated in cells. Knowing the mechanisms facilitated by baculoviruses in altering the DDR of infected cells may have implications for human cancer treatments as well as for better understanding the unknown mechanisms by which other human viruses cause disease. My research project has been focused on studying LEF-7 in human and insect cells and investigating its response to the DDR. Future directions include identifying proteins that interact with LEF-7 via immunoprecipitation.

MODELING LOCAL AND SYSTEMIC CYTOKINE RESPONSES TO C9T11-CLA AND CELECOXIB IN RHEUMATOID ARTHRITIS

Brandon Bruce, Jake Olson (Mentor), Animal Science

Rheumatoid arthritis (RA) is an autoimmune disease that causes the body's immune system to mistake its own collagen as a foreign invader. This leads to the destruction of vital collagen between bones as well as severe inflammation and joint pain in people afflicted with the disease. Celecoxib lessens inflammation caused by RA through inhibition of the COX-2 enzyme in the intracellular arachidonic acid (AA) cascade, but long-term treatment can cause fatal side effects. The cis-9, trans-11 (c9t11) isomer of conjugated linoleic acid (CLA) has also been shown to reduce inflammation similarly to that of Celecoxib by attenuating phospholipases crucial for the start of the inflammatory AA cascade, which is upstream of COX-2 in the AA cascade. This long-term enzyme attenuation caused by c9t11-CLA, as opposed to Celecoxib's enzyme inhibition, may differentially alter local and systemic inflammatory mediators. Because cytokines are key mediators of inflammation, our research compares blood plasma and arthritic paw tissue cytokines of mice treated with Celecoxib or c9t11-CLA at various stages of disease development in an induced RA model. With this information, we can gain a greater understanding of c9t11's mechanism of reducing inflammation in RA locally, through paw tissue cytokines, and systemically, through plasma cytokines, as well as learn more about the consequences of targeting two different enzymes in the AA cascade.

THE ROLE OF CAROTENOIDS IN DEALING WITH OXIDATIVE STRESS

John Bruckbauer, Rachele Lemke (Mentor), Bacteriology

Rhodobacter sphaeroides is a species of bacteria that can produce furan containing fatty acids. This class of fatty acids has several potential industrial uses. In the Donohue lab, the probiotics and biofuel production industries are of particular interest. Carotenoids are an important part of the photosynthetic apparatus within *R. Sphaeroides* and have an impact on the growth of cells. Specifically, carotenoids help the cells deal with oxidative stress. By creating mutations in genes that produce carotenoids, more can be learned about their role in singlet oxygen stress, a condition when furan fatty acids are produced. This project hopes to determine the impact of the *crtI* gene on carotenoid function and whether the phenotypes can be restored through complementation.

EFFECT OF TEMPERATURE AND SALINITY ON SEED GERMINATION RATE IN VARIOUS VARIETIES OF ALFALFA

Marisa Brudny, Johanne Brunet (Mentor), Entomology

Soil salinity influences seed germination in many agricultural crops. It is well known high soil salinities decrease seed germination rate in many crop species, such as *Lactuca sativa* and *Cucumis melo*. Soil salinity is usually higher near the surface and decreases deeper in the soil. Alfalfa (*Medicago sativa*) seeds are generally planted near the soil surface and salt stress is known to decrease germination rate in many varieties. However, it is not known how Roundup®-ready alfalfa, transgenic alfalfa resistant to glyphosate, and coated alfalfa seeds germinate under high salinity conditions compared to conventional alfalfa. Understanding how alfalfa seeds respond to salt stress at varying temperatures could be used to help farmers select alfalfa seed suited for their particular fields. The purpose of this study was to determine the effect of increasing salt stress on germination of alfalfa seeds for different varieties of Roundup®-ready and conventional alfalfa and for coated versus non-coated conventional alfalfa seeds at different temperatures. We hypothesized that increasing levels of salinity will decrease percent germination across types of alfalfa, but we predicted that seeds of non-coated types will have higher germination rates overall. We evaluated the various varieties of Roundup®, conventional, and coated/non-coated alfalfa seeds subjected to various salt concentrations (no salt, 50mM, 100mM, 150mM) incubated at various temperatures (15C, 25C, 34C). Germination rate was calculated as percent germination out of 100 seeds per treatment.

A NEW APPROACH TO THE DESIGN AND MANUFACTURING OF SAXOPHONE MOUTHPIECES FOR UNIQUE TONAL QUALITIES

Alexander Buehler, Krishnan Suresh (Mentor), Mechanical Engineering

The internal design of a saxophone mouthpiece plays a large role in its tonal quality. The internal designs of modern saxophone mouthpieces is rather limited since they rely on traditional means of manufacturing. I propose to use 3D printing (a.k.a. additive manufacturing) to present a new paradigm for the design of saxophone mouthpieces with unlimited geometric complexity. Designing mouthpieces specifically for 3D printing will allow me to create complex internal structures, previously impossible to manufacture. If successful, these designs could potentially produce new and unique tonal qualities. Using spectral analysis to quantify the results, I hope to discover mouthpiece geometries that will give more artistic liberties to saxophone players by allowing them to achieve a wider variety of tonal qualities.

ENGAGING CHILDREN IN SCIENCE—BIOLOGY 375/399

Seah Buttar, Julia Chini, Rachel Sobiesk, Dorothea Ledin (Mentor), WISCIENCE

This course, Biology 375/399, helps student leaders become adult role models in science in the Madison community. A scientific role model is not only someone who can present scientific information to children in an interesting way. It's someone who's there with them over time to cultivate their curiosity and excitement about science, help them think like scientists, and nurture both their desire to learn more and their belief that they can. It's also someone who's a role model to other adults, taking leadership in science education and outreach. ARMS role models make a difference—not just for a day, but for a lifetime. Presenters will be reenacting how we lead an afterschool club or classroom to show our peers how to engage youth in a meaningful way.

FOLIC ACID: ITS IMPLICATION IN ALLEVIATING SPINAL CORD INJURY-INDUCED NEUROPATHIC PAIN

Seah Buttar, Ravinderjit Singh, Gurwattan Miranpuri (Mentor), Neurological Surgery

More than one million individuals in the United States alone suffer from spinal cord injury (SCI). One potential therapy to alleviate neuropathic pain (NP) following SCI with epigenetic and dietary significance is the effect of folic acid. Folic acid is a common dietary supplement that acts as an epigenetic mechanism that controls—silences or expresses—the expression of matrix metalloproteinase (MMPs). To research the mechanisms in play, rat models were used to explore the potential of FA therapy on expressions of MMPs, alleviation of NP, and axonal regeneration. Following the contusion to mimic SCI, assessments were made regarding the animal's locomotor abilities and functional outcomes. To analyze the molecular aspects that measure the epigenetic mechanisms and their effectiveness, western-blots of harvested spines were completed.

EINS, TWEE, THREE: HERITAGE TRILINGUALISM IN WISCONSIN

Calla Buttke, Joseph Salmons (Mentor), German

This project investigates the speech of Wisconsin-born trilinguals. These people speak West Germanic languages like Pommersch as a first language and standard German to varying extents, and use mostly English in daily life. They are important for two reasons. First, generations after immigration often cease to speak the language(s) of their ancestors, but many fourth- and fifth-generation Wisconsinites remain not just bilingual but multilingual. Second, these speakers integrate elements from all three languages in conversation and switch between them. Elements from standard German, Northern German, and English are used in this sentence: 'Then gucken sie draussen.' ('Then they look outside.')

Using interview recordings from the Wisconsin Heritage German Project, both old interviews and new interviews I participated in, this project analyzes such linguistic features.

POLICIES PROMOTING RENTAL ASSISTANCE BENEFICIAL FOR LOW INCOME COMMUNITY HEALTH

Delaney Cairns, Leann Tigges (Mentor), Community and Environmental Sociology

Federal and state policies have ingrained homeownership into the American Dream. I find that policies based on homeowners favors city residents—not predominantly black North Minneapolis residents. Homeownership programs which focus on downpayment and closing cost assistance exclude many in North Minneapolis. Low-income housing complexes create tracts of poverty, while Section 8 rental vouchers are insufficient to meet demand, and income restricted apartments are geographically isolated from the North Minneapolis community. Based on these findings I recommend a policy change to increase rental options. These policies would more efficiently address the housing risks that the most vulnerable households face.

SOIL PARTICLE SIZE ANALYSIS IN MILWAUKEE

Martin Calderon, Carolyn Voter (Mentor), Civil and Environmental Engineering

The composition of soil has an important effect on hydrology yet very little is known about soils in urban areas, which tend to be highly compacted and disturbed. The purpose of my research is to sample soil in different areas of Milwaukee and determine the composition of silt, soil, and clay in a sample. We then compare the current composition of the soil in the different parts of Milwaukee with the composition indicated by historical data. Initial soil analysis shows that soil composition varies substantially even between nearby blocks in Milwaukee. This work will help give a better idea of which green infrastructure to use in which part of the city, since movement of water varies with the composition of soil.

NOVEL DATA COLLECTION SYSTEM FOR TOURNIQUET MASTERY TRAINING (TMT)

Montserrat Calixto, Calvin Kwan (Mentor), Surgery

Junctional and inguinal bleeding is a significant and challenging problem on the battlefield. Inventors have developed new types of tourniquets, including the Abdominal Aortic Tourniquet™ (AAT) and the Combat Ready Clamp™ (CRoC) to address these abdominal and pelvic injuries. While these hemorrhage control technologies have been developed, validated, and approved for use, training systems that teach and refresh skills related to these technologies have not been developed. These training systems are vital because these skills can be difficult to train and are infrequently used. To address these needs, a sensor-enabled manikin was designed. Using the sensor data, the different phases of applying the tourniquet were captured and key performance was measured.

YOGA FOR AUTISM

Mary Callaghan, Gudrun Buhnemann (Mentor), Asian Languages and Cultures

Everyday sounds, smells, and sights are capable of being painful to a child with autism. A child with such sensitivity to their surroundings often struggles to pay attention to the tasks with which they are faced. Therefore, they are in need of some kind of escape from those senses bothering them. Through my research, I found that children with autism can find this therapeutic escape through yoga. I was able to prove that a child constantly struggling to live normally with a frantic and chaotic mind would find peace, solace, and connection in an often disconnected world through the practice of yoga. Practicing yoga is beneficial to children with autism due to yoga techniques that calm the nervous system, relieve anxiety, and teach discipline.

EFFECTS OF CHONDROITIN SULFATE PROTEOGLYCANS IN RECOVERY AFTER FOCAL CEREBRAL INFARCTION

Claire-Marie Canda, Lindsey Jager (Mentor), Neurology

Stroke affects many people worldwide, with no effective treatment beyond clot-busting drugs such as tissue plasminogen activator (tPA). There is evidence that suggests the presence of cerebral molecules that inhibit the regeneration of neurons, crucial to recovery post-injury: chondroitin sulfate proteoglycans (CSPGs). We performed a systematic review that supported the claim that reduction in chondroitin sulfate proteoglycans will improve recovery. We found few studies with cerebral infarction that compare the use of CSPG- lowering chemical treatments and behavioral results. No reports were found with direct comparison of quantitative CSPG levels and behavioral results. In order to further support the claim that CSPGs garner some importance in stroke recovery, future experimentation that contains analysis of chondroitin sulfate proteoglycan levels juxtaposed with behavioral testing post focal infarction is needed.

FUNCTIONAL CHARACTERIZATION OF CANDIDATE GENES INVOLVED IN THE STABILITY OF THE VERNALIZATION RESPONSE

Nahin Cano, Daniel Woods (Mentor), Genetics

Flowering time is a critical determinant of reproductive success in plants. A key adaptation to seasonal variation in temperate climates is the vernalization requirement; the process by which competence to flower is achieved only after prolonged exposure to winter cold. We are using the small temperate grass, *Brachypodium distachyon* as a flowering time model to accelerate gene discovery. Information gained can potentially be used for crop improvement in related crops such as wheat, oats, and rye. Candidate genes were chosen to identify the role, if any, they play in the stability of the vernalization response. Functional characterization of these genes will be done using a combination of gene knock-down and over expression analyses.

DATA COLLECTION METHODOLOGY COMPARISON FOR LIFE CYCLE ASSESSMENT ON BELTLINE RECONSTRUCTION

Aaron Canton, Angela Pakes Ahlman (Mentor), Civil and Environmental Engineering

The Recycled Materials Resource Center compared the accuracy between two different data collection methodologies for recycled material use in the Beltline Highway reconstruction in Dane County, Wisconsin. PaLATE, a life-cycle assessment tool, was used to analyze the environmental impact of the data after collection. Data collection Method 1 involved analyzing design plans and estimates for the reconstruction. Method 2 involved detailed material use tracking onsite during construction. The goal of the study is to quantify the level accuracy of Method 1, which is more accessible than Method 2. If the results show a relatively small error, Method 1 would become a viable data collection option for future analyses. If the error is large, the results could indicate the importance of tracking recycled materials during construction.

THE EFFECTS OF TGF-BETA ON THE GROWTH OF THE FTC-238 CELL LINE

Leanna Carey, Ricardo Lloyd (Mentor), Pathology and Laboratory Medicine

Thyroid cancers are the most common of endocrine malignancies and overall, they comprise about 1% of human cancers (Hardin, 2015). TGF-beta is an important protein that influences cell proliferation and differentiation. In a normal cell it would act as a cell growth inhibitor, but in cancer cells it is thought that at some point it turns into a cell growth promoter. Epithelial-Mesenchymal Transition (EMT) occurs during cancer progression and is the process of the cells going from an epithelial state to a mesenchymal state. TGF-beta induces EMT in thyroid cancers (Hardin, 2015) and it is hypothesized that TGF-beta will induce EMT in the follicular thyroid carcinoma cell line FTC-238. Treated and untreated cell culture and standard cell counts were used to determine growth rate. FTC-238 cells were seeded and cultured with or without (control) TGF-beta in a serum-free media for 3 weeks. The cells were harvested, counted and an aliquot of cells were frozen at -80oC on days seven, fourteen, and twenty-one. After running multiple rounds of cell cultures, qPCR was completed using the RNA isolated from the frozen samples. Complementary DNA was made and mRNA, such as E-cadherin, SLUG, and miR-200c were tested for expression to determine if EMT has occurred. When the cell counts were compared over the twenty-one days, the results varied. Some of the experiments verified the hypothesis that there would be more growth in the culture with TGF-beta, while others showed a switch at around day fourteen where the control group had more growth than the TGF-beta group. Further investigation of the expression of EMT components for each experimental group is still ongoing.

THE SOAP PROJECT: WOMEN'S EMPOWERMENT AND SANITATION IN LWEZA

Mackenzie Carlson, James Ntambi (Mentor), Biochemistry

The Soap Project, a Wisconsin Idea Undergraduate Fellowship, was implemented in Lweza, Uganda, in August of 2015. The purpose is to improve sanitation and empower women in the village. Objectives included holding a soap-making demonstration, educating women in the community on using soap for sanitation, and utilizing local and sustainable materials. Our faculty mentors are James Ntambi, Professor of Biochemistry and John Ferrick, and our community partner is Village Health Project- Uganda. Key stakeholders include the Morgridge Center for Public Service, Village Health Project, Village Health Project-Uganda, and the Lweza community. The Soap Project has sparked five groups attempting to make soap, and we continue to work with them to unite the efforts. This initiative showcases the partnership between UW-Madison and Lweza with an innovative and unique approach to addressing poor sanitation, empowering women, stimulating local economy, and promoting youth development.

THE REGULATION OF CHROMOSOMAL DNA REPLICATION BY ORC-ORIGIN BINDING IN THE EUKARYOTIC CELL CYCLE.

Martha Carreno, Catherine Fox (Mentor), Biomolecular Chemistry

The laboratory of Catherine Fox is studying the regulation of eukaryotic chromosomal DNA replication, the process that duplicates the genetic material for cell division. We focus on the first step, the initiation of replication. This event occurs at multiple, precise loci called origins of replication. There is no one essential origin, however an appropriate number of origins and their spacing across a chromosome are critical. A reduced number of origins in several eukaryotic models causes genome instability disorders, including cancer. The Origin Replication Complex (ORC) is a complex of six different conserved protein subunits binds and thus selects chromosomal origins. The binding of ORC to the origin is the first step in chromosomal duplication. We are proposing to study three main types of origins that the lab has shown use different mechanisms for ORC-origin binding in *Saccharomyces cerevisiae*, a useful experimental model organism. This research will tell us about the different mechanisms ORC uses to define chromosomal origins and how these mechanisms influence origin activity and genome stability in eukaryotic cells.

FURTHER CHARACTERIZATION OF AROMATASE EXPRESSING CELLS IN THE MONKEY HYPOTHALAMUS

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

Aromatase is the rate-limiting enzyme for estradiol (E2) synthesis. A previous study in our lab suggests that neuroestradiol in the hypothalamus is necessary for local E2 synthesis and gonadotropin releasing hormone (GnRH) pulsatility in the hypothalamus. In situ hybridization mRNA labeling confirms the presence of aromatase expressing cells in the stalk-median eminence (S-ME) and arcuate nucleus (ARC). Although immunostaining has shown that aromatase expressing cells are not co-localized with GnRH neurons, aromatase expressing cells' phenotypes remain unknown. This study aims to determine whether aromatase synthesizing cells in the hypothalamus are neurons or glia using double fluorescent immunocytochemistry.

CHARACTERIZATION OF PVT1 TRANSCRIPTS IN THE 17 β -ESTRADIOL TREATED ACI RAT MODEL

Aaron Chack, Kirsten Dennison, Quincy Harenda, James Shull (Mentor), Oncology

We use the ACI rat model to identify genetic determinants that increase susceptibility to mammary cancer development. We have identified multiple loci that contain said determinants, and one of these loci was fine mapped to a region on chromosome 7 containing a gene of interest called Plasmacytoma variant translocation 1 (Pvt1). Pvt1 encodes a long non-coding RNA and is a recent candidate oncogene in the development of many cancers. However, its function in cancer development is not known. The goal of my project is to use molecular biology techniques to characterize and annotate Pvt1 transcripts in the rat mammary gland. Ultimately, we hope to use our Pvt1 transcript characterizations to elucidate the role of Pvt1 in cancer development, and to relate this role to human breast cancers.

ANALYZING THE RNA BINDING PROPERTIES OF BIC-C: A REGULATOR OF EMBRYONIC DEVELOPMENT IN VERTEBRATES

Nithin Charlly, Michael Sheets (Mentor), Biomolecular Chemistry

Bicaudal-C (Bic-C) is a regulatory protein that binds and represses translation of specific mRNAs in animal cells. Our work using *Xenopus* embryos has provided evidence for a critical role for Bic-C in vertebrate development, but how this protein selects mRNA targets for repression are unknown. While evidence indicates the N-terminal domain is responsible for binding specific RNAs, the molecular basis of this protein-RNA interface is poorly understood. To address this issue, I expressed variants of the Bic-C N-terminus in *E. coli* and analyzed their RNA binding properties with gel electrophoresis assays. This research defines the regions of Bic-C necessary and sufficient for providing specificity in translational repression. Studying Bic-C has potential in broadening our understanding of embryogenesis and organ-specific diseases, such as polycystic kidney disease.

A COMPARISON OF STRENGTH CHANGES AND CELLULAR RESPONSE USING PRIMED MSCS ON INJURED RAT MCL

Joshua Choe, Connie Chamberlain (Mentor), Orthopedics and Rehabilitation

Once healed, injuries to ligaments display characteristics of inflexible scar tissue, resulting in increased incidence of re-injury. Mesenchymal stem cells (MSC) alter healing by affecting cytokines and cell types in healing tissue, collagen organization, and modulate inflammation, which can improve healing. We examined how priming MSCs pre-implantation impacts rat medial collateral ligament (MCL) healing two weeks post-injury. Cellular response through quantification of cell types and ligament mechanics were analyzed. Results show that MCLs primed with poly(I:C) demonstrated an increased failure load, and reduced number of type I macrophages relative to the control. Additionally, there was an increased number of type I macrophages, present in the LPS-primed group. Based on the improved mechanical properties and cell counts, MSCs primed with poly(I:C) may promote enhanced functional healing.

MINING PERSONAL HABITS ON A SMARTPHONE

Prithvi Chowhan, Keshav Sharma, Xinyu Zhang (Mentor), Electrical and Computer Engineering

The correlation between the user's psychological status such as mood and stress levels and his habits of smartphone usage remain only partially explored. To further evaluate this correlation, the project aims to create an Android Application to record statistical data about the usage of the smartphone. These statistics mainly include app usage (duration of usage of a particular app), browser history, call and message history and activeness of the user, which are then stored into a database for pattern recognition. The collection of the information overtime would result in certain inferred habitual patterns. Consequently, the app will be able to launch specific applications and (or) play music consistent to the way the user is habituated to use the phone and relevant to the user's mood.

SPUTTERING DEPOSITION OF METALLIC THIN FILMS

Malcolm Clark, Paul Voyles (Mentor), Materials Science and Engineering

Sputtering is a method of physical vapor deposition used to deposit thin films. We have reconditioned a used vacuum system for sputtering deposition of metal thin films. This is done by creating a vacuum chamber in which a gas such as argon is pumped in at a steady rate. Sputtering uses an Argon plasma to knock atoms off a target. Those atoms condense on a substrate to make a thin film. Thin films microstructures varies with substrate temperature and pressure in which they are deposited. Our objective is to discover how the substrate temperature effects the structures and properties of thin films in order to create ultra-stable amorphous thin films for wear coatings.

ANGER EXPRESSION IN INFANCY

Lyndsey Clayton, Hill Goldsmith (Mentor), Psychology

We investigated the relationship between neuroimaging measures taken at 1 month of age and infant anger expression at 6 months observed during a distressing laboratory task (arm restraint). Anger in infancy was identified by lowered and drawn together eyebrows, distress vocalizations and bodily struggle. Neuroimaging focused on regions near the amygdala, a region implicated in emotional processing. In exploratory analyses relating infant amygdala volume to infant anger, we found that infants with lower amygdala volume at 1 month of age expressed more anger during the distress task at 6 months. In addition, mother self-reported anger and mother reported infant anger was related to infant anger expression. Continuing analyses will examine maternal parenting practices in relation to these findings.

THE ROLE OF VAB-1/EPH RECEPTOR DURING EPIDERMAL INTERCALATION IN C. ELEGANS

Hunter Cochran, Elise Walck-Shannon (Mentor), Zoology

During *C. elegans* embryogenesis, dorsal intercalation occurs when epidermal cells exchange places with one another. In this study, we describe a role for Eph receptor—a receptor tyrosine kinase, known as VAB-1 in *C. elegans*—during the process of intercalation. The literature suggests that *vab-1* is crucial for proper embryogenesis; however, no one has described *vab-1*'s role in intercalation specifically. Here, I show that VAB-1 is necessary for intercalation and determine which regions of the VAB-1 protein are required for intercalation using a variety of characterized alleles within the *vab-1* gene. Because Eph receptors are highly conserved, this research has implications for vertebrate processes that depend on cell intercalation, such as neural tube closure disorders in humans.

SIBLING DYNAMICS IN CHILDREN WITH AUTISM SPECTRUM DISORDER

Lilyan Cohen, Sigal Hartley (Mentor), Human Development and Family Studies

Autism Spectrum Disorder (ASD) is a developmental disability characterized by atypical development in socialization, communication, and behavior. An increasing number of children are being diagnosed with ASD over the past decade, and thus it is important to understand the family factors that impact the child with ASD's well-being and development. Little research has investigated positive and negative sibling dynamics between typically developing children and their sibling with ASD. We examined the association between birth order, number of children in the family, severity of the child with ASD's symptoms and functioning and quality of the sibling relationship. Analyses were based on a sample of 157 families with two or more children where one child had ASD (aged 5–12 years). Results have important implications for potential family services to improve sibling relationships.

DEVELOPMENT AND VALIDATION OF THE WISCONSIN UPPER RESPIRATORY SYMPTOM SURVEY FOR KIDS (WURSS-K)

Lily Comp, Supriya Hayer (Mentor), Family Medicine

Colds and flu have a very big impact on children's daily lives including how they learn and function. The purpose of this research is to develop an instrument, in the form of a short survey for children, to trace duration and severity of acute respiratory infections (ARI) in children. There are currently no other instruments designed to assess in-depth how children are affected during the cold and flu so the Wisconsin Upper Respiratory Symptom Survey for Kids (WURSS-K) was created. Children ages four to nine were invited to participate in the study. Participation consists of filling out a daily survey during a cold or flu episode. Children are compensated for their participation. The survey is currently in its validation stage.

BUILDING AN ACCESSIBLE DATABASE OF PATIENT EXPERIENCE FOR THE UNITED STATES

Mark Raphael Conti, Nancy Pandhi (Mentor), Family Medicine and Community Health

A third of the medical costs in the United States go towards mental health disorders. Depression, a mood disorder that causes a continuous feeling of sadness and loss of interest that can be found in 16% of the adult population, contributes to these expenses. Young adults (18–29) is one age group that struggles with access to appropriate mental health care. A database of patient experiences is being created in order to establish more information about patient care, through conducting video interviews of people with different health conditions. People who volunteer to tell their experiences are chosen if they maximally vary on different socio-demographic factors across different geographical regions of the U.S.—Midwest, East Coast and West Coast. Through conducting a secondary analysis of transcriptions, common ideas of patient experiences of care inside and outside of the health care system can be found. Each of these themes can be used to create a better overall sense of patient experience and teach health care professionals better techniques to support patients suffering from depression.

CHARACTERIZING SPECIES-SPECIFIC COFACTORS INVOLVED IN INFLUENZA VIRUS REPLICATION

Olivia Cottrell, Steven Baker (Mentor), Medical Microbiology & Immunology

Influenza A viruses primarily infect wild aquatic birds, but certain viral subtypes infect a diverse repertoire of mammalian species. The viral polymerase in avian- versus mammalian-derived viruses often contain characteristic polymorphisms that grant species-specificity. It has been suggested that the host factor ANP32A confers species-specificity, where a 30 amino acid insertion is observed in several avian species, but not in mammals. Our objective is to determine how diverse ANP32A proteins from various viral host species modulates the influenza virus polymerase complex. Using cell-based polymerase activity assays, we will analyze if protein differences, including and independent of the 30 amino acid insert, affect viral polymerase replication. From these studies we can infer the role of ANP32A on species-specific influenza restriction.

UNDERSTANDING MATURATIONAL DIFFERENCES IN CARDIORESPIRATORY FITNESS DEVELOPMENT IN CHILDREN

Carol Coutinho, Andrew Watson (Mentor), Orthopedics and Rehabilitation

Cardiorespiratory fitness (CRF) is a primary determinant of overall health in children. However, changes in cardiac morphology and function in response to exercise training are not well characterized in children. Therefore, the purpose of this study was to evaluate changes in cardiac morphology and function following 20 weeks of exercise training. Female youth soccer athletes underwent resting 2D echocardiography and maximal aerobic testing before and after training. Changes in cardiac morphology included significant increases in left ventricular end-diastolic volume and left ventricular mass, a decrease in ejection fraction, and no change in wall thickness or function. Right ventricular morphology and function were unchanged. These findings suggest that exercise training elicits changes in left ventricular morphology, but not function, in female youth athletes.

PERCEPTIONS OF OBESITY AMONG WISCONSIN COMMUNITY MEMBERS INVOLVED IN HEALTH PROMOTION

Katherine Craemer, Jacqueline Hui, Joan Waukau, Michael Wong, Amy Hilgendorf (Mentor), Center for Community and Nonprofit Studies

Obesity is one of the leading causes of disease and death in the United States and in the world, however people have different perspectives about obesity and how to address it. As one aspect of the Obesity Prevention Initiative (OPI), we seek to understand how community members working in health promotion efforts perceive obesity and what steps can be taken to lower the prevalence of obesity. We conducted interviews and surveys of community members working on obesity prevention and health promotion in two counties in Wisconsin. To understand their opinions and the implications of this for local intervention planning and implementation, we analyzed the quantitative survey and qualitative interview data and present our information in a mixed methods analysis.

FMRI INVESTIGATIONS OF MULTISENSORY INTEGRATION OF NUMBER

Kimberly Crow, Edward Hubbard (Mentor), Educational Psychology

A fundamental question in numerical cognition is how the brain recognizes number across multiple senses. The intraparietal sulcus is responsible for number recognition and activates simultaneously independent of which sense numbers are presented to. Healthy college undergraduates were presented with two intervals containing 7, 8, or 10 flashes and beeps. Participants were asked to compare the stimuli and indicate which interval had a larger numerical quantity. Participants were more accurate when presented with numbers farther apart (e.g., 7 vs. 10 was better than 7 vs. 8). Our team is developing neuroimaging studies to test whether the parietal lobe and frontal lobe contain populations of neurons tuned to specific quantities independent of sense. Our results will allow for improvement in how students understand number in school.

IN VIVO MODELING OF METASTASIS USING A PROSTATE CANCER PROGRESSION CELL LINE

Katelin Cunningham, Dalton McLean (Mentor), Urology

Prostate cancer is one of the most prevalent cancers among men in the United States and accounts for approximately 27,000 deaths annually, most often as a result of metastasis. The model that is used to address this issue of metastasis, was developed in the Ricke Lab and is known as the BPH1 Cancer Progression (BCaP) cell lines. Using this cell line, we will recreate a viable prostate cancer metastasis model in vivo. We used a broad spectrum tumor targeting agent CLR1404 to visualize widespread metastasis in mice. Preliminary results using CLR1404 show significant uptake of the molecule using our most malignant cell line xenografts. The hope of this research is to use an agent to target bone metastasis and to develop a spontaneous metastasis model.

ACADEMIC'S VIEWS OF INEQUALITY AND THE MEDIA

Ross Dahlke, Michael Wagner (Mentor), Journalism and Mass Communication

From President Obama down to municipal legislators, inequality is seen by many to be the defining issue of our time. However, there are a lot of different conversations going on about various inequalities, but little consensus. The purpose of the greater research project is to compare and contrast the ways that academic scholars and journalists talk about economic, healthcare, racial, LGBT and gender inequality. So far we have examined the ways that scholars from a variety of academic fields define inequality and possible causes and solutions. My research focused on economic and gender inequality and the research suggests that scholars have many different ideas on the causes of inequality, mostly pointing to structural problems. However, it is seldom that scholars propose solutions to inequality.

NEURONAL ANTIGEN SPECIFIC T CELLS MITIGATE CNS INFLAMMATION IN THE MOUSE MODEL OF MULTIPLE SCLEROSIS

McKenna Dallmann, Aditya Rayasam (Mentor), Pathology and Laboratory Medicine

Multiple Sclerosis is the most widespread disabling neurological condition of young adults, affecting 2.5 million people worldwide, with over two hundred new cases presented each week. It is an autoimmune, demyelinating disease, where the body's T cells release inflammatory cytokines that damage the myelin sheath covering axons, leading to impaired motor functioning. When studying EAE—the mouse model for MS—previous models immunized to induce an immune response against the MOG35–55 peptide found in the myelin by the CD4 T cells. The problem with this model is that it only allows for single antigen specificity and only immunizes to cause CD4 T cells to respond; however, in patients, there could be multiple antigen specificity, other than just for myelin. Additionally, both CD4 and CD8 T cells could be involved in the immune response. Our model enables us to study both CD4 and CD8 T cell immune response, as well as their specificity outside of myelin. In order to accomplish this, we drive the expression of OVA with a Nestin promoter, which places OVA peptides in the soma of neurons, such that when we transfer in OT-I and OT-II T cells, CD4 and CD8 T cells can form an immune response against the neuronal cell bodies. Thus far, our research has suggested that when CD4 and CD8 T cells can recognize neurons, they reduce the inflammation and motor deficits associated with EAE.

SYNTHESIS AND OPTIMIZATION OF COBALT FERRITE NANOPARTICLES FOR SPECIFIC PHOSPHOPROTEIN ENRICHMENT

Kunal Dani, Leekyoung Hwang (Mentor), Chemistry

Phosphorylated proteins play a vital role in biological processes including signal transduction, cell development, and regulation of cellular pathways of proteins. Analysis of phosphoproteins provides critical insights on understanding many biological/disease mechanisms related to malfunction of phosphorylation. The challenge is phosphoprotein analysis in an isolated environment because they appear in low abundance and co-exists with their abundant non-phosphorylated counterparts. Therefore developing an efficient method for specific phosphoprotein enrichment will be practical and useful in the long run. The aim of this project is to develop a viable enrichment method by synthesizing functionalized cobalt ferrite (CoFe₂O₄) nanoparticles with specialized multivalent ligands that can recognize and bind phosphoproteins. By utilizing the nanoparticles' superparamagnetic nature and binding ability, we can effectively isolate and enrich phosphoproteins for further analysis.

THE DESIGN CHALLENGE: INTERDISCIPLINARY ENGAGEMENT TO IMPROVE SCIENTIFIC VISUALIZATION

Robert Darlington, Tanya Buckingham (Mentor), Geography

The Cartography Lab hosts an 11-hour Design Challenge annually, to bring together interdisciplinary teams that include data scientists/cartographers and domain specialists. This year, the goal was to have students represent fossil data over time. There is a lot of work to do after the event to improve the event next year, and to inspire others. The participant survey has been summarized, and coded to influence next year's event. In addition, a research paper will be published to inspire others to do similar events. I will share my process of helping with research for the paper, overseeing the survey, and interviewing organizers. This will result in adjustments to the format of the annual Design Challenge, and a better understanding of the participant experience.

EVERYDAY RHETORICAL LABOR OF DISABILITY: ARGUING FOR ACCESS

Jamie Dawson, Annika Konrad (Mentor), English

The purpose of this study is to investigate the rhetoric blind and visually-impaired individuals must use in order to gain access to institutional, social and informational structures. Imbalances in rhetoric that happen when blind and visually-impaired individuals attempt to gain access were found through analyzing semi-structured interviews with codes corresponding to either the institutional, social or informational systems. These codes were also classified as either internal or external in nature. Results show that imbalances tend to be at the expense of the disabled individual. In speaking up for the interest of disability, all individuals should be responsible for a more distributed or universal model of communication.

ESTIMATING INTERGENERATIONAL ELASTICITY OF SKILLS

Joseph DeGuire, Steven Durlauf (Mentor), Economics

One focus in the inequality literature has been on how inequality is transmitted across generations. A commonly used measure for the persistence of inequality is the intergenerational elasticity, which measures how variable some quantity, usually income, is from one generation to the next. In this project, I take a different approach by focusing on a worker's multidimensional skills, derived from the occupations they hold, rather than his or her income alone. I show that skills are a good predictor of income, and estimate the intergenerational elasticity of these skills. My findings indicate that skills are relatively inelastic across generations, suggesting one reason for persistent inequality and also suggesting formation and improvement of skills as one way to address inequality.

THE PATH TO PROFESSIONALIZATION IN THE CONTEXT OF CRISIS: AN EXAMINATION OF SOCIAL WORK IN JORDAN

Wilder Deitz, Eric Lock (Mentor), Social Work

My project is an institutional analysis of the nascent social work profession in the country of Jordan. Using a series of interviews with academics, professionals, experts, and politicians conducted in Jordan in August of 2015, I aim to gauge what I am terming the “institutional character” (in essence, the confluence of institutionalization and ideology) of Jordanian social work, and determine prospects for future growth of the profession. The main questions I seek to explore in this research are as follows: 1) How are professionals, academics, and the Jordanian government working towards establishing social work as a profession in Jordan? 2) Are the necessary conditions in place for social work to evolve as a profession that adequately meets Jordan’s needs?

GROUNDWATER-TREE INTERACTIONS IN NORTHERN WISCONSIN: IMPLICATIONS FOR FOREST MANAGEMENT

Yeline Del Carmen, Dominick Ciruzzi (Mentor), Civil and Environmental Engineering

As the climate continues to change, the severity and frequency of droughts will vary, affecting forests worldwide. Typically in dry ecosystems, groundwater can provide a source of water during drought, allowing trees to grow. However the role of groundwater in wet environments, such as Northern Wisconsin, in reducing drought stress is unknown. We show that groundwater may influence tree growth during times of water stress. Tree cores were analyzed to establish tree growth variability among different tree species and were related to groundwater levels. Our results may suggest that shallow groundwater promotes consistent growth during drought in temperate tree species. This study can help forest managers target protection strategies in regions where shallow groundwater promotes drought resistance and adaptive strategies in drought vulnerable areas.

PEN AND PAL: SPLITTING THE BIFUNCTIONALITY OF PSEB, A 4,6-DEHYDRATASE/5-EPIMERASE

Nathan Delvaux, James Thoden (Mentor), Biochemistry

Pathogenic bacteria often utilize flagella as a virulence factor. Recently it has been found that flagella can be post-translationally glycosylated, with the carbohydrate appendages playing important roles in virulence. A particular sugar, known as pseudaminic acid, or Pse, has been found attached to the flagella of Gram-positive *Bacillus thuringiensis*, a relative of *B. anthracis*, the causative agent of anthrax. Contrary to Gram-negative bacteria, which utilize a bifunctional 4,6-dehydratase/5-epimerase, known as PseB, to catalyze the first step in the formation of Pse from UDP-GlcNAc, *B. thuringiensis* appears to use two distinct enzymes (Pen and Pal) for this step. This research focuses on the characterizations of Pen and Pal. The active site architectures of these enzymes provide insight into the divergent nature of this pathway.

THE RELATIONSHIP BETWEEN SLEEP QUALITY AND THE ACCUMULATION OF AMYLOID PROTEIN IN THE BRAIN

Brittany Derynda, Barbara Bendlin (Mentor), Medicine

Sleep dysfunction is a risk factor for Alzheimer’s disease (AD) and the extent to which it contributes to AD pathology is not known. This study works to determine whether sleep dysfunction is associated with the accumulation of amyloid protein (A β). 18 participants (59.8 \pm 4.5 years, 79.2% female, 75% with family history of AD) underwent an overnight sleep study using polysomnography. Objective sleep quality was measured using Wake After Sleep Onset. AD pathology was measured using cerebrospinal fluid samples analyzed for A β 42 and A β 40 levels. Multiple regression was used to test the association between A β 42 levels and sleep measures. Worse sleep quality was significantly associated with lower A β 42 levels ($p < .05$). Poor sleep quality may contribute to amyloid accumulation; or possibly, amyloid accumulation contributes to poor sleep.

ANTIMICROBIAL ACTIVITY OF ACTINOBACTERIA ASSOCIATED WITH THE MONARCH BUTTERFLY (DANAUS PLEXIPPUS)

Daniel Desautels, Cameron Currie (Mentor), Bacteriology

To escape the harsh winters of the Midwest of the United States, Monarch butterflies (*Danaus plexippus*) travel to overwintering forests in Mexico. Here, the Monarchs gather by the millions, providing an opportunity for pathogens to infect and decimate the entire population. One obligate parasite of Monarch butterflies with the potential to infect the Monarch population is *Ophryocystis elektroscirrha*. I propose that the Monarch butterfly has beneficial symbiotic bacteria that protect the host from infection. Other insects are known to associate with beneficial microbial symbionts for protection from pathogens, such as the leaf-cutter ants. To find potential symbiotic candidates, I will examine antimicrobial activities of microbial isolates from Monarch butterflies. This will be done by comparing bioassay data of the isolates based on their phylogenetic relationship.

MATERNAL STRESS AND DEPRESSION IN INFANCY: RELATIONS WITH INFANT EMOTION REGULATION

Alexandra Devine, Hill Goldsmith (Mentor), Psychology

Maternal depression is linked to increased infant negativity; however, we examined the link of maternal stress and depression with infant regulatory abilities. Forty-six 6-month olds were tested using the Still-Face Paradigm, a well-developed task assessing infant response to distress (Mesman et al., 2009). Mothers completed questionnaires assessing stress and depression. Infants of depressed mothers used more regulatory behaviors that did not necessitate mother engagement (i.e., self-soothing; $r = .35$, $p < .05$). In addition, maternal stress was independently related to infant regulatory behaviors ($r = .31$, $p < .05$), indicating that infants of stressed or depressed mothers may not look to their mother as a source of support during distressing situations.

CHARACTERIZATION OF AROGENATE DEHYDROGENASE ENZYMES FOR TYROSINE SENSITIVITY

Aditya Dewanjee, Hiroshi Maeda (Mentor), Botany

Tyrosine (Tyr) is an essential amino acid in protein synthesis and its secondary metabolites are significant in medicine, agriculture, and various fields of science. Therefore, an understanding of Tyr synthesis in plants is crucial. This project focused on the arogenate dehydrogenase (ADH) pathway in plants, specifically in *Spinacia Oleracea*, a member of the Caryophyllales order. Other species of this order had been confirmed to have Tyr insensitive enzymes, and based on phylogenetic evidence we hypothesized that the SoADH2 enzyme would also have relaxed sensitivity to Tyr. The aims of this project were to characterize SoADH1 and SoADH2 for Tyr inhibition, and then perform site-directed mutagenesis in order to determine amino acids necessary for relaxed inhibition. This study has great agricultural and pharmaceutical potential in the establishment of transgenic plant expression systems.

INVESTIGATING THE ROLE OF KDM3B, A HISTONE DEMETHYLASE, IN THE ACQUISITION OF PLURIPOTENCY

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

Induced pluripotent stem cells (iPSCs) are somatic cells that have been reprogrammed to acquire the properties of embryonic stem cells by the overexpression of a small set of proteins. iPSCs have the unique ability to self-renew and maintain pluripotency, allowing them to differentiate into any of the three primary germ layers. This makes them suitable tools for regenerative therapy and disease modeling. Since somatic cells and their corresponding iPSCs share the same genome, iPSCs have acquired pluripotency by modifying their epigenome, the chemical marks on their DNA and histone tails. These epigenetic modifications are performed by various epigenetic enzymes. The goal of my project is to help delineate the molecular mechanism of an important epigenetic enzyme, Kdm3b, during the reprogramming process.

EVALUATING METHODS TO BREAK DORMANCY IN CARROT SEED

Meggie DiPoto, Adam Bolton (Mentor), Horticulture

Wild carrots are found all around the world and provide a wealth of genetic diversity, desirable for breeding programs. However, their seeds often face dormancy, which prohibits the seeds from germinating. The purpose of this research is to determine a method to break seed dormancy in wild carrot seeds, allowing them to germinate. Previous studies reported treatments such as chilling, freezing, freeze thaw cycles, and gibberellic acid to be successful in breaking seed dormancy in other plants. These treatments were reproduced in this experiment to see their effect on dormancy in four varieties of carrot. After each treatment, the seeds were evaluated for the number germinated every seven days. Analyzing the percent germinated will determine whether these treatments help overcome seed dormancy in wild carrots.

CHIP-SEQ REVEALS MIRNA61–250 AS A NOTCH TARGET GENE IN GERMLINE STEM CELLS

Emma Doenier, Erika Sorensen-Kamakian (Mentor), Biochemistry

Notch signaling activates transcription of target genes and, thereby, regulates stem cells and differentiation broadly during animal development. The nematode *C. elegans* employs Notch signaling to maintain germline stem cells (GSCs) (1). Previous work, in this system, identified two Notch targets with a candidate gene approach (2). Here we use chromatin immunoprecipitation followed by high throughput sequencing (ChIP-Seq) to identify GSC Notch targets on a genomic scale. ChIPs of the LAG-1/CSL DNA binding protein identify 384 significant peaks, of which 8 were also identified in parallel ChIPs of the GLP-1/Notch receptor. Two of these 8 common peaks belonged to the targets already known. In addition, one was in the promoter of mir-61 and mir-250, termed collectively mir61–250 (3). In situ hybridization demonstrates that these miRNAs are transcribed in GSCs and that their transcription is Notch-dependent. To ask if mir61–250 affects GSC maintenance, we used CRISPR-Cas9 (4,5) technology to delete the ChIP-Seq peak region flanking mir61–250. The resultant mir61–250 promoter deletion abolishes transcription of the miRNAs and, therefore, provides a loss-of-function mutant. Yet no GSC defect was seen. One explanation is that mir61–250 is functionally redundant with other genes. Another explanation is that mir61–250 affects GSCs under non-standard lab conditions not yet assayed (e.g. starvation, stress). In addition, we are exploring the idea that overexpression of the miRNAs may affect GSCs. Our progress will be reported.

UNDERSTANDING LAKE ECOSYSTEM REGIME SHIFTS THROUGH CHEMICAL AND MICROBIAL SPATIAL VARIABILITY

Patrick Dowd, Robin Rohwer (Mentor), Bacteriology

An ecosystem regime shift of increasing concern is the eutrophication of freshwater ecosystems and subsequent development of harmful algal blooms. Little is understood, however, regarding the phenomena occurring at the most basic level within a lake ecosystem—its biogeochemical and microbial ecology—directly preceding and following a bloom. Current theory suggests that regime shifts are preceded by observable increases in the variability of an ecosystem's components, implying that it's possible to predict an algal bloom. To test this theory, nutrients were added to two hydrologically and geographically similar lakes to experimentally induce algal blooms, while keeping a third as a control. Biogeochemical and physical variability of all three lakes was monitored using a novel sensor apparatus while microbial samples were simultaneously gathered throughout the summer.

VAMPIRE PLAGUES: MEDICAL MISCONCEPTIONS AND POPULAR FOLK BELIEFS

Christina Dudley, Tomislav Longinovic (Mentor), German, Nordic, and Slavic

The goal of my research was to understand how the bubonic plague and other epidemics were attributed to “vampire diseases.” Resulting from the temporal proximity between initial suspicions of vampirism in 17th- and 18th-century Europe and the resurgence of the Black Death throughout the continent, the two are commonly associated, especially in Slavic regions. The plague is relatable to vampires, as they both deform the bodies of their victims and are linked to diseased rats. Some other illnesses linked with these creatures are syphilis, porphyria, rabies, tuberculosis, hemophilia, and anthrax. Using my knowledge of the Serbo-Croatian language, vampire culture, and biological sciences, I performed triple-disciplinary research in Croatia to decipher how bubonic plague epidemics have morphed into a vampire belief system.

SOME BACTERIAL ISOLATES OF LEAFCUTTER ANT FUNGUS GARDENS PROMOTE FUNGAL GARDEN GROWTH

Zach Dumar, Cameron Currie (Mentor), Bacteriology

Leaf-cutter ants utilize a fungal cultivar known as *Leucoagaricus gonglyophorus* as an external stomach to break down plant polysaccharides into simpler monomers. A diverse community of bacteria lives in consortium with this fungus, and the community composition is highly conserved within an ant species in this arrangement. These bacteria have several possible functions, such as nitrogen fixation and processing of plant polysaccharides, but their exact role remains uncertain. A prior experiment that I conducted suggested that the bacterial community has little impact on the ability of the fungal cultivar to maintain its own size. The bacterial community may instead be providing nutrients for active growth of the fungus. Coculture of the fungal cultivar with bacterial isolates showed some cases in which bacteria may facilitate growth.

T-CELL ANTIGEN SPREAD IN INDIVIDUALS WITH RECURRENT PROSTATE CANCER FOLLOWING PAP DNA VACCINATION

Alexander Dwyer, Douglas McNeel (Mentor), Medicine

DNA vaccines encoding PAP have been investigated in our laboratory as treatment for patients with recurrent prostate cancer (CaP). These vaccines can elicit PAP-specific T-cell responses in CaP individuals and recent evidence suggests that additional off-target prostate tissue antigens may trigger immune responses as well (i.e. antigen spread). Possible candidate antigens for off-target T-cell activation would include the CaP-associated proteins PSA, SSX-2, AR and others. The specific aim is to determine whether T-cell cytokine-secreting responses occur to any of these off-target antigens after immunization with a PAP-encoding DNA vaccine. This experiment was conducted using PBMC samples from CaP individuals collected before vaccination and at two time points post-vaccination. Immune responses were assessed by IFN γ ELISPOT to determine vaccine-induced T-cell activation against the experimental antigens.

THE USE OF QUANTITATIVE ULTRASOUND SHEAR WAVE ANALYSIS TO NONINVASIVELY ASSESS TENDON MECHANICS

Alexander Ehlers, Darryl Thelen (Mentor), Mechanical Engineering

Quantitative ultrasound imaging techniques would allow for noninvasive assessment of functional tendon tissue behavior in vivo. Clinical imaging ultrasound provides information on tissue morphology, which clinicians must subjectively interpret in terms of function. My lab has introduced a novel approach of measuring and interpreting wave propagation in tissues, as a means of estimating the tissue stress. My aim is to assess the sensitivity of the quantitative metrics to variations in ultrasound transducer position that could occur clinically. I imaged wave propagation in axially loaded ex vivo porcine tendon undergoing cyclic loading. A translational stage was used to alter the position and orientation of the transducer relative to the tendon. Wave speeds were measured for each condition and statistical analyses were performed to determine potential effects.

HEART RATE VARIABILITY AND RESTING STATE FUNCTIONAL CONNECTIVITY IN MAJOR DEPRESSION

Alissa Ehlers, Heather Abercrombie (Mentor), Psychiatry

Depression is associated with decreased cortical control over limbic regions. Additionally, heart rate variability (HRV), which is associated with mood regulation, is altered in depression. In healthy individuals, cortical-limbic neural connectivity is associated with variation in HRV. This study hypothesizes that decreased connectivity between the ACC (a cortical region) and amygdala (a limbic region) is associated with greater depression severity and altered HRV. We collected cardiac and resting state functional connectivity data during two fMRI scans of 45 depressed and 45 healthy women (90 subjects total). Data analysis is ongoing. If our hypotheses are confirmed, this project will provide evidence for HRV as a valid psychophysical measure of mental health status and a predictor of related functional connectivity patterns.

DNA-HCR FISH: OPTIMIZING A NOVEL MICROSCOPIC DETECTION TOOL FOR MIXED MICROBIAL COMMUNITIES

Elizabeth Erb, Natalie Keene (Mentor), Civil & Environmental Engineering

Hybridization chain reaction—fluorescence in situ hybridization (HCR-FISH) is a method that has recently been designed to increase signal intensity for low ribosomal content in bacterial cells when standard FISH protocols fail to provide detectable signal amplifications. This technique utilizes two hybridizations, one to hybridize the target and initiator sequences to the target microorganism, and the other hybridization to hybridize the labeled amplifier probes to the initiator sequence creating greater fluorescence and detection of what is being targeted. We are optimizing DNA-HCR FISH in order to detect mRNA in target organisms, and to combine it with 16S targeted FISH, in order to identify organisms carrying out precise functions in various microbial communities.

THE RELATIONSHIP BETWEEN SENSORY OVER-RESPONSIVITY AND OBSESSIVE-COMPULSIVE SYMPTOMS

Karyn Esbensen, Hill Goldsmith (Mentor), Psychology

Prior evidence supports a relationship between obsessive-compulsive disorder (OCD) and the sensory over-responsivity (SOR) subset of sensory processing disorder, but a developmental trajectory has yet to be examined thoroughly. To examine the association between OCD and SOR across two developmentally sensitive periods, primary caregivers reported on sensory over-responsivity and OCD symptoms and behaviors at age 7, parents and twins (n=1058) reported on OCD symptoms at age 13. Adolescent twins also self-reported their sensory over-responsivity at age 13. Auditory and tactile sensitivity strongly intercorrelated at both ages and modestly correlated across ages. Within age and across age, auditory and tactile sensitivity moderately correlated with OCD symptom counts. A predictive relationship between sensory processing and obsessive-compulsive tendencies is an initial rationale for early intervention research.

MAPPING TREE COVER GAIN IN THE SAVANNA OF BRAZIL: A CONSERVATION TOOL

Anisa Yasmin Fadhil, Jesse Miller (Mentor), Zoology

Large areas of tropical grassland and savanna ecosystems have been converted to tree plantations in recent years. Because savannas have low tree cover, they are often mistaken for deforested areas, when in fact they are areas that have not historically been forested. In this study, we examined a widely used map of tree cover gain in a diverse tropical savanna region, the Cerrado of Brazil. We analyzed the extent of new woody vegetation cover that represents conversion of native grasslands to plantations versus de facto reforestation in the Cerrado region. Our findings indicate that almost 60% of the tree cover gain map is composed of tree plantations. The results are crucial in guiding policies and management decisions based on accurately mapped afforested areas.

WIRELESS NETWORK PERFORMANCE ASSESSMENT FOR AN INTEGRATED HOME ENERGY SYSTEM PLATFORM

Zeng Fan, Giri Venkataramanan (Mentor), Electrical and Computer Engineering

Residential energy consumption is one of the major forms of energy consumption in the world. In order to allow people to manage energy usage in their homes, our team developed an Integrated Home Energy System Platform, which allows users to remotely monitor and control their household consumption, through the website or smartphone application. In this project, we evaluated the reliability of wireless communication for this platform in various conditions. We also tested the communication efficiency with different parameters of our integrated platform. According to the collected data in the experiments, we determined the final set-up for the integrated platform to provide users a robust control mechanism.

TRANSITION PROBABILITIES OF CO II, WEAK LINES TO THE GROUND AND LOW METASTABLE LEVELS

Thomas Feigenson, James Lawler (Mentor), Physics

New branching fraction measurements based primarily on data from a cross dispersed echelle spectrometer are reported for 80 lines of Co II. The branching fractions are converted to absolute atomic transition probabilities using radiative lifetimes from laser-induced fluorescence measurements for the 19 upper levels of the lines. Twelve of the 80 lines are weak transitions connecting to the ground and low metastable levels of singly ionized cobalt. Such lines, if unblended in stellar spectra, have the potential to yield Co abundance values unaffected by a breakdown of the Local Thermodynamic Equilibrium approximation in stellar photospheres.

ACHIEVING LEARNING OBJECTIVES BY ADDING COMPLEXITY TO OFF-THE-SHELF SIMULATOR MODELS

Rebekah Fiers, Shannon DiMarco (Mentor), Surgery

Simulation allows for practice without patient morbidity. Current market simulators do not account for common variations in patient anatomy, including Benign Prostatic Hypertrophy (BPH), which occurs in 75% of men by age 80. Our goal is to develop and validate a urinary catheterization simulation for a male with BPH to evaluate insertion technique and training for surgical specialties. Nine urology residents completed the simulation with a 16 Fr Coude. We collected pre- and post-survey data to assess the validity of our model. Residents reported little difficulty and very high confidence and rated the simulation realism as adequate. Based on their responses prostatic and urethral resistances must be adjusted before this model can be used for educational and research purposes.

INVESTIGATING THE EFFECTS OF GENERAL ANESTHETICS ON OUTCOMES OF TRAUMATIC BRAIN INJURY IN DROSOPHILA

Julie Fischer, David Wassarman (Mentor), Medical Genetics

Traumatic brain injury (TBI) patients often receive general anesthetics (GA) before undergoing surgery. I have developed a *Drosophila melanogaster* GA-TBI model to investigate the influence of genotype on the effect of GAs in the context of TBI. Previously, in studies of a single fly genotype, I found that different GAs, isoflurane and sevoflurane, had different effects on the probability of death in the GA-TBI model and that isoflurane exposure prior to TBI and after TBI had opposite effects on the probability of death following TBI. I will apply this model to different fly genotypes to identify genes responsible for GA-TBI outcomes. These findings may be applicable to clinical settings, where patients of diverse genotypes are treated with GAs in the context of TBI.

MUTANT H-RAS MEDIATED CETUXIMAB RESISTANCE AND DOWNSTREAM INHIBITION IN HEAD AND NECK CANCER

Michael Fisher, Randy Kimple (Mentor), Human Oncology

Cetuximab remains the only molecular targeted agent approved for treatment of head and neck cancer (HNC). For many HNC patients, concurrent cetuximab and radiation is not successful. Ras alterations are present in 10% of HNCs. Evidence in colorectal cancers suggests that mutant Ras confers resistance to cetuximab mediated radiosensitization; however, the role of Ras mutation in HNC is unclear. Employing wild-type and mutant H-Ras HNC derived cell lines, we examine the role of constitutively active H-Ras in radiosensitization and the efficacy of downstream MEK/ERK and Akt/mTOR inhibition. Clonogenic survival and proliferation assays show mutant H-Ras cells to be resistant to radiosensitization by cetuximab and sensitive to both MEK/ERK and Akt/mTOR inhibition. Future studies will involve a mouse flank xenograft model to test these initial results.

UNDERSTANDING THE ROLE OF TYROSINE 1101 IN THE NUCLEAR TRANSLOCATION OF THE EGFR

Bailey Flanigan, Deric Wheeler (Mentor), Human Oncology

Triple-negative breast cancer (TNBC) is a subclass of breast cancers that do not express estrogen, progesterone, or HER2 receptors. The epidermal growth factor receptor (EGFR) is one of the few membrane-bound signaling receptors commonly overexpressed in TNBC. Antibody therapies directed against the EGFR such as cetuximab have been developed; however, a large majority of patients exhibit resistance to cetuximab, a pattern which presents a significant clinical hurdle in the treatment of TNBC. Previous work has linked cetuximab resistance with increased translocation of EGFR from the cell membrane to the nucleus. EGFR nuclear translocation was then shown to be dependent upon the phosphorylation of Tyrosine 1101 (Y1101), an amino acid residue on the cytoplasmic tail of the EGFR. Although many steps of the signaling pathway leading to Y1101 activation have since been elucidated, the mechanistic role of Y1101 in subsequent EGFR translocation has yet to be identified. In this study, I seek to better understand the role of Y1101 in the nuclear localization of EGFR with the goal of establishing molecular targets that can be used to prevent EGFR nuclear translocation and restore cetuximab sensitivity in TNBC patients.

TREATMENT OF PIK3CA AND APC-MUTATED COLORECTAL CANCERS WITH A DUAL PI3K/MTOR INHIBITOR

Tyler Foley, Dustin Deming (Mentor), Medicine

A significant portion of the colorectal cancer patient population possesses mutations of the PIK3CA gene, which encodes a constitutively active phosphoinositide-3-kinase (PI3K) protein, and the Adenomatous Polyposis Coli (APC) gene. Mice expressing both mutations were generated along with spheroids derived from tumor tissue. Spheroids were treated with NVP-BEZ235 (BEZ), a dual mTOR/PI3K inhibitor, and BYL710 (BYL), a PI3K alpha inhibitor. Mice were treated with BEZ or vehicle control for 14 days. Spheroid cultures treated with BEZ showed a significant decrease in diameter compared to BYL-treated and control spheroids. Mouse tumors treated with BEZ showed significant reductions in size relative to control tumors. Clinical trials are currently being developed to investigate the efficacy of PI3K/mTOR inhibition for patients expressing this mutational profile.

COMBINED ACTIONS OF ETOMIDATE AND MIDAZOLAM ON GABAA RECEPTOR KINETICS

Connor Ford, Robert Pearce (Mentor), Anesthesiology

GABAA receptors are the target of many clinically important drugs that are used for a variety of purposes. This research aims to characterize the simultaneous modulation of GABAA receptors by midazolam and etomidate. Electrophysiological recordings are being conducted to measure the GABA-triggered activation of these channels in the presence of each drug individually and in combination. A kinetic model will be developed that represents what is occurring at the molecular level as the drugs influence GABA binding and unbinding and channel opening and closing. We hypothesize that etomidate and midazolam will exhibit a synergistic interaction, meaning that lower concentrations of each drug can be used to achieve a desired effect. Ultimately, this study will attempt to explain how synergy can occur at the molecular level.

SIFTING & WINNOWING: UW-MADISON JOURNAL OF LAW, POLITICAL SCIENCE, AND PUBLIC POLICY

Kyra Fox, Kelsey Beuning, Jake Schwid (Mentor), Political Science

Sifting & Winnowing is an undergraduate academic journal of law, public policy and political science at the University of Wisconsin-Madison. We aim to increase campus discussion and academic achievement among undergraduates by offering opportunities for publication and editing experience. We will discuss the relationship between academic opportunity and publication opportunities, explain our current opportunities and answer questions regarding the undergraduate publication process.

FAMILIAL AND CULTURAL PATTERNS RELATED TO A TRANSGENDER YOUTH'S TRANSITION PROCESS

Callie Frautschi, Stephanie Budge (Mentor), Counseling Psychology

There continues to be a lack of psychological and medical research out on transgender youth, let alone the complex dynamics of family relationships among the youth and their caregivers. Our research focuses on the coping mechanisms and relationships of transgender youth and their caregivers. The research is derived from qualitative interviews given to twenty families from Kentucky, Massachusetts, and Wisconsin. For my presentation, I am conducting an in-depth case study using triadic analysis to compare the differing multicultural factors within the family and how these factors impact familial relationships, the youth's transgender identity, and the coping processes of the family members. My results will provide valuable insight into the pertinent roles that culture plays in the coping of families with transgender children and the relationships that they possess.

OS79 ENZYME COMBATS FUSARIUM HEAD BLIGHT

Kaitlyn Gabardi, Ivan Rayment (Mentor), Biochemistry

Fusarium head blight (FHB) affects yields and quality of wheat and barley all over the world and is caused by fungi in the genus *Fusarium*. In the United States, FHB is caused by *Fusarium graminearum*, which produces the mycotoxin and virulence factor deoxynivalenol (DON). The toxicity of DON and its effectiveness as a virulence factor can be reduced through glycosylation by UDP-glucosyltransferases such as Os79, which is enzyme found in rice. In Europe, FHB is caused primarily by *Fusarium sporotrichioides* where it produces T2-toxin as its virulence factor. This research will focus on changing the specificity of Os79 to allow it to inactivate T-2 toxin through glycosylation and hence increase the utility of Os79 to control FHB worldwide.

BUILDING PATHWAYS FOR FULLY ENGAGED STUDENTS: YOUTH VOICE AND STUDENT-TEACHER RELATIONSHIPS

Angela Gableman, Mariah Kornbluh (Mentor), Civil Society and Community Studies

Students are most successful in school when they are content and engaged. Establishing this environment can be difficult, as students frequently struggle to see the relevance of what they are learning. One way to combat these obstacles is to increase students' school engagement and connectedness by increasing youth voice. This means the students will have more say in the decisions at the school. In order to do this, it's important that students have access to supportive adults. We conducted a longitudinal study of a nearby high school and examined changes in the students' perception of their voice and the availability of adult support over time. I will present results indicating growth in some key domains of student voice and potential explanations.

GENDER SPECIFIC ATTRIBUTES OF GROUND REACTION PRESSURES DURING THE SNATCH

Annie Gallagher, Kristen Pickett (Mentor), Kinesiology

Purpose: The purpose of this study was to describe the ground reaction forces and plantar pressure distribution characteristics during the first 5 phases of the snatch maneuver and identify gender specific differences therein. **Methods:** Each participant attempted a total of 5 snatches based on percentages of their current tournament record. During the first 5 phases of the pull ground reaction pressure data was collected from the inside of the individual's shoe using a Novel Pedar insole sensor system. The data was compared in each phase for differences between the genders. **Significance:** Weightlifting is a complex and explosive sport that could greatly benefit from a better understanding of the forces being applied to the foot to maintain balance. An analysis of ground reaction forces and plantar pressure distribution characteristics has never been done in the sport of weightlifting for either male or female athletes; however, the manner in which female athletes are coached to complete the lift could be greatly affected by this measure. This research will benefit both athletes and coaches in the field of weightlifting and could address biomechanical factors affecting recreational female weightlifters.

FCGR3A VARIABILITY: COPY NUMBER, SINGLE NUCLEOTIDE POLYMORPHISMS, AND EFFICACY OF IMMUNOTHERAPY

Mikayla Gallenberger, Amy Gurel (Mentor), Human Oncology

Immunotherapeutic treatment options for cancer continue to rise, but not everyone will benefit from these therapies. To improve the efficacy of immunotherapy, personalized treatment strategies based on one's genotype can be determined. My project focused on genotypic differences in the Fc gamma receptor (FCGR) gene, FCGR3A (expressed on NK cells). FCGR3A is subject to genetic variability in both copy number variation (CNV) and in single nucleotide polymorphisms (SNP), both of which affect the ability of the FCGR3A protein to interact with immunotherapies. We adapted the reference-query pyrosequencing (RQPS) assay to simultaneously genotype the SNP and CNV of FCGR3A. We utilized RQPS to genotype metastatic renal cell carcinoma patients to delineate the relationship between patient response to immunotherapy and their FCGR3A CNV/SNP genotypes.

THE EFFECTIVENESS OF OLFACTORY STIMULATION AS A FORM OF SENSORY ENRICHMENT FOR RHESUS MACAQUES

Mia Gambucci, Stephanie Hoker, Peter Pierre (Mentor), Psychology

Enrichment is an important component of captive animal husbandry that increases wellbeing by facilitating species-specific behavior, which in turn makes animals better models for study. We aim to gain a better understanding of the role that olfactory stimulation plays in the environmental enrichment of Rhesus Macaques at the WNPRC, and compare this domain to other types of enrichment as part of a larger cost-benefit analysis of different strategies. In this study we investigate the extent of interaction and preference for olfactory enrichment delivered via a novel PVC device through 5 phases: (1) A baseline to acclimate the subjects to the novel device. (2) A counterbalanced scent vs. blank preference test to determine extent of engagement. (3) A second baseline. (4) A counterbalanced comparison of two different scents to measure individual variation in scent preference. (5) A counterbalanced comparison of scent vs. a familiar enrichment device. Preliminary analysis suggests relatively low levels of engagement with the scented device and a possible increase in pacing behavior.

EPIGENETIC MODIFYING AGENTS ENHANCE IMMUNOGENICITY OF PROSTATE CANCER CELLS

McKaylin Gamel, Joshua Lang (Mentor), Medicine

Epigenetic defects accumulate in the cancer genome, which is partially responsible for turning off tumor suppressor mechanisms and activate oncogenes. Deficiency of antigen expression inhibits tumor recognition and facilitates immune evasion. In tumorigenic cells, genes responsible for immune recognition tend to be hypermethylated, leading to epigenetic silencing. Enzymes such as DNA methyltransferases (DNMTs) transfer methyl groups onto DNA and hypomethylating agents inhibit these enzymes. Epigenetic modifying agents (EMAs) have been shown to increase tumor antigen expression. In our studies we tested the effect of Zebularine (ZEB), a novel hypomethylating agent in combination with LBH589, a histone deacetylase (HDAC) inhibitor on gene expression of MHC I elements in the MHC I-deficient 22rv1 PC cell line. First, we established our in vitro model and defined optimal dosage for ZEB by testing a concentration gradient and monitoring toxicity. Then we tested ZEB with or without LBH589. At 72 hours, cells were harvested, total mRNA was extracted and expression of MHC I elements beta-2 microglobulin (B2M) and HLA-A were measured by quantitative PCR. We used RPLP0 as a housekeeping gene. Our studies suggest that ZEB induces HLA-A and B2M expression on the MHC I deficient 22rv1 cell line. In conclusion, EMAs may provide a potential tool to reverse antigen presentation deficiencies, which may potentially enhance antitumor immune responses. By improving immunity against cancer, EMAs may be good candidates to improve cancer outcomes when used in combination with other therapies.

DO RESIDENT'S OPERATIVE LEADERSHIP SKILLS CORRELATE WITH SELF-ASSESSMENTS OF TECHNICAL SKILL?

Samantha Gannon, Shannon Dimarco (Mentor), General Surgery

This aim of this study was to compare research residents' perceptions of skill decay, task difficulty, and confidence with their observed leadership skills during a simulated bowel repair. Leadership was defined as the participant's ability to direct their assistant. Participants were given 15 minutes to perform a simulated bowel repair. Prior to the procedure, participants were asked to rate their skills decay, task difficulty, and confidence in addressing the small bowel injury. Interactions were coded to identify the number of instructions given to the assistant. Thirty-six residents participated in the study. Results showed that number of directional instructions had a significant negative relationship between participant's ratings of both skill decay and difficulty in the small bowel repair procedure and steps. Evaluating resident's directional instructions may provide an additional intra-operative assessment metric. Further evaluation relating to operative performance outcomes is warranted.

PRAGMATIC EFFECTS ON THE INTONATION OF HERITAGE SPEAKERS OF SPANISH

Karen Garcia-Olmos, Rajiv Rao (Mentor), Spanish and Portuguese

A heritage speaker of Spanish (HSS) is someone who grew up in a household where Spanish was spoken to some degree outside Spanish-speaking countries. Our study focuses on pragmatics, or how the meaning of speech is changed based on the context of communication, specifically through intonation. To demonstrate this, HSS participants produced fifteen prewritten sentences either sarcastically or sincerely. These sentences were saved as files that will be analyzed for pitch range, average pitch, and speech rate. Then the sincere data will be compared to their sarcastic counterparts, and finally, all HSS data will be compared to those of native Spanish speakers. This will help determine how the complex integration of English and Spanish in HSS has an effect on their expression of pragmatic meaning.

ANATOMICAL ACCURACY OF COMMERCIAL FEMALE URINARY CATHETER TRAINING SIMULATORS

Jordan Gates, Tori Carter-Story, Shannon DiMarco (Mentor), Surgery

The purpose of this study is to determine how accurately female urinary catheterization simulators model the actual anatomy and realism of the female urinary system. As training simulators become more and more common and relied upon in medical education, it is of vital importance that these simulators be designed with the utmost integrity and accuracy. Failure to do so defeats the purpose of realistic medical simulation and could potentially lead to harmful results for the practitioner and the patient. This study examined anatomical accuracy of two different commercially available female urinary catheter medical simulators as compared to known benchmark measurements of female urinary system anatomy. After conducting statistical analysis, the results showed that the measurements taken from the catheter simulators varied significantly from the benchmark measurements. These results expose the fact that some commercial urinary catheter simulators may not be as anatomically accurate as expected, and thus may not be of high enough standards to be used to train medical practitioners.

MACHINE LEARNING PREDICTIVE MODELS FOR PROTEIN-PROTEIN INTERACTION

Jack Gellerman, Julie Mitchell (Mentor), Biochemistry and Mathematics

In an era of data science and informatics, the use of machine learning for its prescient capabilities is becoming increasingly prevalent in health care. The etiology of a biochemical disease can often be traced to mutations altering a protein's surface. Thus, predicting areas of protein binding and potential mutagenesis effects is useful in understanding the mechanisms of biochemical dysfunction. Protein interface residues known as hot spots fulfill crucial roles in the binding process. Using data mining techniques of support vector machines (SVM's) and deep learning neural networks, we are in the process of extracting applicable information related to protein-protein association. Prediction of this phenomenon through the computational methods outlined below will be achieved by training an SVM on a radial basis kernel function. In developing our model, we will first optimize several key parameters before using it to predict hot spot occurrence in a test set of amino acid residues. A relatively novel technique of machine learning, deep learning neural networking will be applied by our data mining project. This also generates a hierarchy of features' usefulness in hot spot prediction, but in an unsupervised/semi-supervised manner.

ARABIDOPSIS MUTANT RESPONSE ON CADAVERINE MEDIA UNDER VARYING LIGHT INTENSITY AND WAVELENGTH

William Genthe, Amy Jancewicz (Mentor), Genetics

While a sizable amount of research has investigated the effects of other polyamines on plant growth, a lack of literature exists on the role of the diamine, cadaverine. A mutant with a light-dependent cadaverine resistant phenotype was studied. Preliminary data have suggested that light intensity was inversely correlated with primary root elongation in the mutant compared to wildtype. To determine if cadaverine effects light response in Arabidopsis, our current experiments are testing whether wavelength contributes to the observed difference in growth under low light conditions, again by analyzing Arabidopsis primary root growth. This work will help characterize a gene involved in cadaverine response, and potentially suggest a role for cadaverine in the process of photosynthesis.

UW-MADISON RECYCLING AND TRASH BIN INVENTORY

Brenna George, Sabrina Bradshaw (Mentor), Civil and Environmental Engineering

A waste collection bin inventory was conducted to understand how individuals interact with the campus multi-stream waste collection infrastructure utilized in academic buildings. Twelve buildings were selected to document the location, type, and label associated with each waste bin found in the facility. Formal interviews and surveys were also conducted with building managers and occupants to understand current practices. Results from the inventory and surveys pointed to several key issues preventing proper recycling, including: inconsistency in bin types and signage across campus, and a lack of knowledge of what can be recycled where. The information gained from this study will be used to develop a consistent, easy-to-use waste collection system.

INVESTIGATIONS INTO THE NEURAL BASIS OF EFFECTIVE MATH TEACHING

Grace George, Edward Hubbard (Mentor), Educational Psychology

Although there has been an explosion of neuroscientific studies regarding how the brain learns, there have been almost no neuroscientific investigations of how the brain teaches. Skillful teaching is difficult, especially for subjects like math. Effective teachers must have solid math content knowledge, but also high pedagogical knowledge to identify and help learners overcome misconceptions. Previous brain imaging studies have found that when social networks are activated, mathematical networks are suppressed and vice versa, suggesting a neural source of difficulties in thinking about math content and pedagogy simultaneously. In this study, teachers will answer questions related to math pedagogy and math content while undergoing brain imaging use fMRI, to provide insights into how effective teaching is executed in the brain.

CENTRAL NERVOUS SYSTEM TUBERCULOSIS IMMUNITY

Christian Gerhart, Zsuzsanna Fabry (Mentor), Pathology and Laboratory Medicine

In 1993, the World Health Organization (WHO) declared tuberculosis (TB) a global health emergency. It is estimated that today 1/3 of the world's population, or approximately 2 billion people, is infected with latent TB. The most dangerous form of Mycobacterium tuberculosis (Mtb) infection is central nervous system (CNS) tuberculosis (CNSTB). While pulmonary TB has become one of the primary interests in infectious disease research and a major focus of vaccine development, current understanding about the pathogenesis of CNSTB, is very limited. As part of our study, we introduce novel murine models for identifying the mechanism behind Mtb dissemination as well as the host immune response following Mtb infection of the CNS.

METHODS OF FINE MOTOR SKILL ASSESSMENT IN RATS: A COMPARISON

Megan Gilbertson, Lindsey Jager (Mentor), Neurology

Rodent fine motor behavioral tests provide crucial information regarding the effects of brain injury and treatment in rodent models, particularly in fine motor ability changes pre- and post- treatment experimental groups. Behavioral assessments currently widely used include the Reaching Test, the Staircase Test, and the Pasta Handling Test; all of which involve the rodent grasping. We found studies using the aforementioned assessments and looked to compare the tests in their ability to detect treatment effects across brain injury types and other factors such as time and resources necessary. A systematic review of peer reviewed journal articles available on PubMed involving brain injury in rodent models and assessments of fine motor skills was performed and compared based on their efficacy in providing sensitive and specific data.

THE RELATIONSHIP BETWEEN ANOREXIA NERVOSA, SELF-OBJECTIFICATION, AND YOGA

Noah Gill, Gudrun Buhnemann (Mentor), Asian Languages and Cultures

While anorexia's deadly nature has been the focus of research in the fields of mental and physical health for a long time, the causes of anorexia are complex and remain highly debatable. Despite this ongoing debate, self-objectification is known to be a major contributing factor to the formation and persistence of anorexia. Further, practicing yoga has been shown to have an impact on the amount of self-objectification one experiences. This paper examines the relationship between anorexia, self-objectification, and yoga to determine if yoga is an effective form of prevention and treatment of anorexia. It discusses findings from several research studies and interviews, and it identifies the benefits and risks of yoga as a form of treatment.

SYNTHESIS OF MULTIPURPOSE VECTOR FOR OPTIMAL TRANSGENE EXPRESSION IN HUMAN PLURIPOTENT STEM CELLS

Richard Giza, Jennifer Umhoefer, William Murphy (Mentor), Orthopedics and Rehabilitation

Modifying genetic expression via exogenous transgene delivery may improve tissue development using human pluripotent stem cells (hPSCs), but low non-viral transfection rates inhibit progress. Development of an optimal multipurpose vector, based on Epstein Barr nuclear antigen-1 (EBNA-1) technology with the following sequences is ideal for hPSCs: a constitutive eukaryotic promoter, multiple cloning sites, a cistronic spacer, and a nuclear green fluorescent protein reporter. EBNA-1 technology is expected to increase transfection rates and transgene expression longevity by enhancing nuclear import, episomal replication, and episomal retention. Preliminary 293 cellular studies suggests transfection with EBNA-1 mRNA increased transfection efficiency of mini-oriP plasmids, EBNA-1 nuclear localization, and decreased EBNA-1 expression after 48 hours. Transfection of our vector + EBNA-1 construct could be used to manipulate transgene expression in hPSCs.

PSUEDOKNOTS: EFFECTS OF TRANSLATION IN TRITIUM MOSAIC VIRUS

Andrew Goethel, Aurelie Rakotondrafara (Mentor), Plant Pathology

The aim of this research is to analyze what Triticum mosaic virus (TriMV) needs for its translation. Most mRNAs utilize a 5' cap structure to recruit the translation machinery. TriMV however, does not have a cap. It relies on its 739 nucleotide long 5' untranslated region for translation. Within that region, we predicted a structure at nts 42–69 that resembled a pseudoknot found in another plant virus. Our goal is to test whether this pseudoknot structure is needed for TriMV translation. Our approach is to disrupt the pseudoknot sequence and structure, and measure translation activity of the mutant RNAs. By comparing the altered sequence translation activity to the original sequence, we are able to test whether this predicted pseudoknot in TriMV aids in translation.

RECOVERY FROM INJURY IN AND OUT OF THE PRACTICE ROOM

Cody Goetz, Ian Tomaz, Jessica Johnson (Mentor), Music

The purpose of this poster session is to inform, by means of anecdotal evidence, and to educate current pianists and piano teachers about the injury and recovery experience of two collegiate pianists. Cody Goetz and Ian Tomaz, two undergraduate pianists at the University of Wisconsin–Madison, both sustained and recovered from serious physical injuries as a result of both pianistic and non-pianistic issues. The poster will outline and celebrate their personal stories related to their injuries and their process to full recovery through the specific technical changes, physical therapy exercises and stretches, Alexander technique, and lifestyle changes that allowed them to return to being professional pianists. In addition to radically changing their performance practice, the experience gave the presenters new insights into teaching optimal biomechanics and ergonomic movement at the keyboard as well as diagnosing potential physical issues at the piano. It is their hope that this poster session will help collegiate pianists and piano teachers better understand the needs—personal, physical, and professional—of injured pianists at the collegiate level by sharing their personal stories and providing a short bibliography of relevant resources.

DEFINITIONS OF HEALTH BY ATHLETES AND CAREGIVERS IN SPECIAL OLYMPICS

Rachel Gold, Karla Ausderau (Mentor), Kinesiology

Individuals with intellectual disabilities face alarming disparities in quality of and access to health care services. After the deinstitutionalization movement of the 1950's, health care for individuals with intellectual disabilities became a diffusion of responsibility within communities. Few health care providers were equipped to provide the necessary specialized service, which has led to poorer health outcomes and higher risk for chronic conditions within this population. Special Olympics Healthy Athletes program provides health screenings and educational sessions to athletes and their families. Literature suggests, that the lack of access to quality health care results in a poorer understanding of health for people with Intellectual Disabilities. The objective of this study was to examine how athletes with intellectual disabilities and their caregivers define health for individuals with intellectual disabilities. Four athletes with intellectual disabilities and four non-related caregivers participated in individual and small group semi-structured interviews as part of a larger qualitative evaluation of the Special Olympics Healthy Athletes program. Thematic analysis was used to examine the data and identify meaningful categories within and across interviews. Caregivers' and athletes' definitions and understanding of health differed, however, there was consensus on the importance of Special Olympics programming in impacting the health of individuals with intellectual disabilities. With a greater understanding of what health means to individuals with intellectual disabilities and their families, it will be possible to decrease the existing health disparities by creating and promoting more inclusive widespread health education and services.

CROWDFUNDING ASTHMA RESEARCH: AUDIENCE ENGAGEMENT THROUGH SOCIAL MEDIA

Sarah Gorall, Lawrence Hanrahan (Mentor), Family Medicine and Community Health

Studies show promising results when treating asthma as a bacterial infection with macrolide antibiotics. These studies are not recognized because results have been inconclusive. Thus, obtaining funding is not prioritized, and crowdfunding is the solution. I have been reviewing literature and gathering expert opinions on information including: reaching out to target audiences, developing key consumer insights and gauging the effectiveness of our content to our target audiences. With this information, I have been strategically planning a social media campaign to communicate the goals of our scientific research to the public. If successful, trials can be funded to gather further evidence in pursuit of constructing new guidelines for treating asthma. A blueprint could also be created showing an alternative way of engaging the public with researchers.

ARCHITECTURE, ZONING, AND THE SEGREGATION OF WOMEN'S PUBLIC AND PRIVATE SPHERES IN MADISON, WI

Sela Gordon, William Gartner (Mentor), Geography

Notions of surveillance, boundary, and distance are codified in zoning and architectural plans that maintain public and private divisions in modern American life. I conducted a visual analysis of architectural plans and zoning maps for several Madison neighborhoods. I visited homes to observe kitchen designs and other gendered spaces, and also documented neighborhood amenities. The configuration of public and private spaces has a differential effect on women; sometimes displaying a women's work and other times relegating women to dark corners. While freedom of architectural choice is class dependent, the layouts of middle- and lower-class homes often imitate selected gendered spaces from upper-class homes. Finally, the configuration of neighborhoods around public spaces enables a form of surveillance that may reinforce social norms.

BIOCORE OUTREACH AMBASSADORS

Sara Grange, Evan Heiderscheit, Mathias Hibbard, Meghna Kurup, David Marshall, Alina Zdechlik, Michelle Harris (Mentor), Interdisciplinary Instruction Program

We will be presenting the work of the Biocore Outreach Ambassadors, the volunteer organization associated with the Biology Core Curriculum program. Our overarching mission is to encourage inquiry-based learning and improve science education in elementary-age children at rural communities around the Madison area. At our rural sites, we provide family Science Nights, an annual weeklong Summer Science Camp at Wisconsin Heights, and a long-standing After School Science Club program in Mazomanie. On campus, we run booths at many of the science events (i.e. Science Festival, Science Expeditions, Expanding Your Horizons, etc.) and conduct our own inquiry-based learning/teaching workshops during our bi-weekly organizational meetings. The outreach we provide strongly aligns with the theme of 'progressing together' as our volunteers both teach and learn alongside the people we serve. With this, we spread knowledge to various communities and help excite the next generation of scientists.

CHILDREN'S USE OF MUTUAL EXCLUSIVITY PROMOTES IMMEDIATE, BUT NOT LONG-TERM, WORD LEARNING

Elizabeth Grant, Kayla Hui, Haley Vlach (Mentor), Educational Psychology

The mutual exclusivity bias (MEB) describes children's assumption that an object can have only one label and, therefore, that unfamiliar words apply to novel objects. We sought to identify whether MEB promotes children's long-term retention of words. Experiment I involved a word-mapping task and a delayed test for retention. Children used MEB during word mapping, but after a delay, they did not have higher retention for words that were mapped via MEB. In Experiment II, we replicated Experiment I and added two conditions to examine whether interference from learning multiple new words affects retention. The results revealed that interference did not affect children's retention in this task. We conclude that MEB supports initial word mapping, but it does not support long-term retention of words.

THE RELATIONSHIP BETWEEN POSITIVE MEMORIES AND BEHAVIOR PROBLEMS IN CHILDREN WITH ASD

Megan Gray, Sigan Hartley (Mentor), Human Development and Family Studies

Child behavior problems are a source of stress for parents of children with autism spectrum disorder (ASD). In part, child behavior problems may lead parents to perceive their son/daughter with ASD in a negative way, contributing to parenting stress. However, parents who perceive their son/daughter with ASD in a positive way, even in the face of a high level of child behavior problems, may experience a lower parenting stress. The current study explores the relation between parental perceptions of children with ASD rated from a Five Minute Speech Sample and the severity of child behavior problems and level of parenting stress. Analyses are based on 128 mothers and fathers of children with ASD (aged 5–12 years) from Wisconsin. Results have implications for supporting families of children with ASD.

BROWNIAN ROTATION OF ANISOTROPIC PARTICLES SUBJECT TO A NONHOMOGENEOUS MAGNETIC FIELD

Sean Greene, Wai-tong Fan (Mentor), Mathematics

Brownian motion is how particles diffuse randomly in a fluid, e.g. when you add food dye to a glass of water. The randomness arises because of collisions between the fast moving molecules that make up the fluid and the particles. We study what happens if you make these particles anisotropic (nonspherical) and subject them to a magnetic field that causes the particles to rotate. We describe how the distribution of orientations evolves over time, both if we ignore and account for the random motion.

INFLUENCE OF TEMPERATURE ON FIBER OPTIC CABLES

Noah Gueron, Francis Halzen (Mentor), Physics

The purpose of this project is to determine the influence of temperature on the transmittance of signal in a fiber optic cable. Originally when the devices deployed for use in Antarctica (known as DOM's) were tested a fiber optic cable was used that did not have temperature protection, meaning that the jacket shrunk and possibly influenced the sensitive measurements. The measurements showed that the DOM's and fiber cables were not temperature dependent, however other studies have demonstrated that there is a specific dependence that varies at certain temperatures. The aim is to investigate these claims through various tests using light and fiber cables while varying temperature.

THE EFFECTS OF PRAGMATIC MEANING ON INTONATION IN HERITAGE SPEAKERS OF SPANISH

Miriam Guevara, Rajiv Rao (Mentor), Spanish and Portuguese

The main purpose of this research is to study similarities and differences in pragmatic meaning between native speakers and heritage speakers of Spanish through their intonational patterns. Heritage speakers were recorded using the speech analyzing software, Praat, saying sentences that had either a clear sincere meaning or sarcastic meaning based on the context of the sentence. The three variables we will be analyzing are pitch range, mean pitch range, and speech rate. This data will then be compared to native speaker data in order to see how pragmatic meaning is affected between native and heritage speakers. This research will demonstrate in turn how the Spanish language is affected in heritage speakers after years of speaking and hearing two or more languages simultaneously.

THE ROLE OF MKRN3 IN PUBERTY: USE OF A HIGH MOLECULAR CUT OFF MICRODIALYSIS PROBE

wanjia guo, Ei Terasawa-Grilley (Mentor), Pediatrics

Inactivation of MKRN3 causes precocious puberty (Abreu et al., 2013). As the first step to understand the role of MKRN3 in the pubertal increase in GnRH release, it is important to measure MKRN3 levels in the stalk median eminence, where pubertal increases in GnRH release occur. However, due to the large size of the MKRN3 protein (55 kDa), it will not pass through our standard microdialysis probe (cut off 20 kDa). We, therefore, conducted an in vitro test utilizing a new 100 kDa cut off probe by infusing MKRN3 standard through the new probe in vitro. Results indicate that MKRN3 was detectable in perfusate samples demonstrating that microdialysis experiments with the new probe is a viable approach for measuring MKRN3 in in vivo experiments.

DISTRIBUTED MEMORY FLUID-SOLID INTERACTION SIMULATIONS

Felipe Gutierrez, Dan Negrut (Mentor), Mechanical Engineering

We present a distributed memory framework for large-scale fluid-solid interaction simulations called Chrono::HPC. In this simulation environment, the method of Smoothed Particle Hydrodynamics (SPH) is employed to simulate the dynamics of a fluid interacting with 3D rigid bodies. The implementation relies on Charm++, an asynchronous message passing parallel programming framework able to run in a distributed-memory/supercomputer setup. We leverage Charm++ object-based programming paradigm to employ a hybrid parallelization strategy based on domain and force decomposition. The framework is demonstrated via a simulation of a dam-break problem containing buoyant rigid bodies and scaled to systems with tens of millions of degrees of freedom.

ASSOCIATIONS BETWEEN MATERNAL IQ, PARENTING QUALITY, AND ACADEMIC READINESS

Britta Gutschenritter, Stephanie Gross, Janean Dilworth-Bart (Mentor), Human Development and Family Studies

Previous research studies, in the field of Human Development, have found significant effects of the home environment on children's cognitive skills. The purpose of this study is to examine associations between maternal intelligence and children's academic readiness. Our study included data from 49 preschool-aged children and their mothers. There were two components to our study involving a lab visit and a participant home visit. In the lab setting, children were administered the Woodcock-Johnson test of cognitive abilities and the Wechsler Abbreviated Scale of Intelligence (WASI) to measure maternal IQ. The Home Observation for Measurement of the Environment (HOME) test was used to assess parenting quality. We hypothesize there will be a significant association between maternal IQ and child math and reading readiness that is mediated by parenting quality. We will also explore the extent to which specific aspects of the home environment such as learning materials, language stimulation, physical environment, responsivity, academic stimulation, modeling, variety, and acceptance may have the strongest associations with math and reading readiness scores. We expect that our findings will inform future research about the roles that maternal IQ and home environment play in understanding discrepancies in child academic readiness.

IMMIGRANT FAMILIES: LITERACY AND IDENTITY DEVELOPMENT OVER TIME AND SPACE

Enrique Guzman, Catherine Lilly (Mentor), Curriculum and Instruction

When coming to the United States, not only do immigrant children have to adapt to a new environment, but often times they are faced with language and economic barriers. This often leads to them falling behind academically and creating a negative self-image. By following ten children over ten years, this study seeks to understand how children make sense of their relocation to the United States and how these experiences affect their identity construction and literacy and language development over time. Each year these children complete similar tasks, and observations, spoken data, and "artifacts" are collected in an attempt to see if any changes have occurred. By doing so, this study seeks to understand how immigrant children define themselves across time.

WONEWOC FORMATION AND TUNNEL CITY GROUP ROCKS: POTENTIAL NATURAL SOURCES OF GROUNDWATER CONTAMINANTS

Lisa Haas, Jay Zambito (Mentor), Geoscience

Wisconsin faces a variety of groundwater quality issues that include both natural contaminants, such as arsenic from sulfide minerals, and human-induced contaminants, such as nitrate from agricultural land-use practices. Although some Cambrian-age sandstone-dominated rock units have been suggested to be potential natural sources of groundwater contaminants, little detailed rock geochemical data exists for these units. At the WGNHS, we are midway through a project to characterize the elemental composition of rocks of the Cambrian Wonewoc Formation and Tunnel City Group across western and south-central Wisconsin. Geochemical data has been collected using a handheld x-ray fluorescence (XRF) analyzer from drill cores, outcrops, and well cuttings. This dataset indicates that the elemental composition of rocks from the Wonewoc Formation and Tunnel City Group include a variety of elements for which groundwater quality standards and advisory levels exist, including aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, vanadium, and zinc. Furthermore, the presence and abundance of these elements varies spatially across the state, through stratigraphic successions, and even within individual rock beds at the centimeter-scale. Our preliminary data confirms that a regional geochemical and mineralogical dataset for the Wonewoc-Tunnel City interval is critical for determining the potential for these rock units to serve as natural source of groundwater contaminants.

CROWDFUNDING ASTHMA RESEARCH: MOTIVATING DONORS WITH THE POWER OF STORY

Kelsey Hackett, Sarah Gorall, Philip Rudnitzky, Erica Terry, Lawrence Hanrahan (Mentor), Family Medicine and Community Health

A bacterial infection may be responsible for some cases of asthma and treated with a macrolide antibiotic. However, this is an uncommon view because conclusive studies are lacking. Communicating scientific concepts and why we should care about them is challenging because medical research is not always based on quantitative data, but qualitative data, including measure of quality of life, as well. My project role is to develop compelling, human interest stories that will engage target audiences and motivate them to donate. Methods include developing compelling stories of individuals struggling with uncontrolled asthma, and who then overcame it. This work will create a call for action. If successful, this effort will document the best practices for engaging the public in funding scientific research.

FASHIONING BUDDHA: A COMPARATIVE ANALYSIS OF BUDDHA-BRANDED CLOTHING

Morgan Haefner, Corrie Norman (Mentor), Religious Studies

My research will show the use of Buddhist symbols by brands such as the Neon Buddha, Phat Buddha Wear, Buddha Wear and the Funky Buddha is strategically deployed in contrasting ways to socially differentiate these brands in the fashion world. Once the symbol is deployed, the clothing is consecrated as fashion through the dissemination of the item and its messages through society. Finally, this presentation will strive to answer how contrasting uses of Buddhist symbols, in context of social dissemination, affect the message received.

DESIGN OF A TISSUE—ENGINEERED RETINAL MODEL FOR AGE-RELATED MACULAR DEGENERATION

Kiersten Haffey, Kristyn Masters (Mentor), Biomedical Engineering

Age-related macular degeneration (AMD) affects more people in the U.S. than all cancers combined. Late stage AMD is characterized by the formation of blood capillaries in the retina. These blood vessels leak and damage the retina causing blindness. Treatment of AMD is also costly, involving multiple injections of drug directly into the eye and serious complications. Unfortunately, the mechanism of neovascularization in macular degeneration is not well characterized, providing an obstacle to the development of new treatment strategies. Here I propose the development of a tissue-engineered retinal environment to more closely simulate in vivo conditions of cell-cell communication, signal transport, and neovessel formation. This tissue-engineered environment will include the sclera, choroid, Bruch's membrane and retinal pigment epithelial cells, and will use microfluidic techniques to form microengineered blood vessels that can more closely simulate in vivo conditions. Currently, no other complex 3D retinal models exist to mimic AMD neovascularization. This device would ultimately be used to better understanding the process of AMD and identify and screen treatments for this disease.

ROADMAP TO VITAMIN A: FINDING THE GENETIC REGION CONTROLLING β -CAROTENE ACCUMULATION IN CARROT

Shanovich Hailey, Shelby Ellison (Mentor), Horticulture

Orange carrots have their characteristically vibrant coloration made possible by a substantial level of carotenoids in their root tissue; particularly β -carotene. β -carotene is a precursor for vitamin A production in the body and consumption of this provitamin is critical for maintaining human health. Despite the importance of β -carotene little is known about the genetic regulation of this trait in carrots. Taking advantage of the recent carrot genome assembly and Genotyping-by-Sequencing (GBS), previous research has uncovered a localized region on Chromosome 7 (~1Mb) that appears to be significantly associated with β -carotene. Fine-mapping in this region of interest has resulted in a 600kb window that will be useful for narrowing down candidate genes controlling β -carotene accumulation. Further, co-dominant markers will be created to utilize for marker-assisted selection in the USDA carrot breeding program.

URBAN CANID PROJECT PUBLIC SURVEY

Crystal Hall, David Drake (Mentor), Forest and Wildlife Ecology

One of the goals of the UW Urban Canid Project is to increase the knowledge, awareness and tolerance of the public toward coyotes and red foxes. We created a 12-question survey to gauge the publics' opinion, knowledge and attitude towards these animals. We administered this in-person survey to randomly select individuals over 18 years of age on State Street in Madison and Picnic Point on the UW-Madison campus. Our results will help us better understand, among other factors, the public's attitudes, knowledge, and opinions toward red fox and coyotes based on demographics of survey respondents, respondents' experiences with red fox and coyotes, and differences in perspective toward red fox and coyotes. We can use this information to better educate the public on these animals.

EXPERIMENTAL STUDY COMPARING METHODS OF QUANTIFYING CEREBRAL INFARCTION VOLUME

Crystal Hall, Lindsey Jager (Mentor), Waisman Center

Reliably knowing the infarct volume allows researchers to determine if their studies are accurately treating the stroke. Measuring cerebral infarction volume with a histological method has proven to be problematic due to the subjectivity of each operator. We conducted a systematic review to find the best histological method to quantify cerebral infarction volume. The review compared various stains and various methods of measuring. That study came to no conclusive answer due to a lack in comparative studies so we developed our own. We created a study comparing cresyl violet and immunohistochemistry (looking at CD11b and GFAP) imaging with manual tracing and thresholding. Our comparative study used the average infarct volume across all observers and looked at which method had the smallest range of standard deviation.

DISPARITIES IN HEALTHCARE AS PERCEIVED BY INDIVIDUALS IDENTIFYING AS TRANSGENDER

Katie Hall, Alexa Callahan, Jay Klamer, Lindsay Morris, Lisa Pine, Carleigh Sher, Elisa Torres, Regina Vanderlinden, Brittany Wright, Elisa Torres (Mentor), Nursing

Healthcare's current understanding of gender, which separates individuals within populations based on taxonomies, has created a harmful lack of knowledge that causes individuals identifying as transgender to be misrepresented or simply unrecognized in healthcare. This systematic literature review determined that factors such as stigma and lack of provider knowledge are contributing to negative healthcare experiences for the individuals within the transgender community. The authors recommend eliminating the use of dichotomous terms that are commonly used to define gender and promoting awareness of the entire gender continuum. Addressing stigma, lack of provider knowledge, and eliminating use of dichotomous terms may establish trust, effective communication, and culturally congruent care between providers and their patients, ultimately reducing future healthcare disparities faced by the transgender community.

INVESTIGATING THE MECHANISTIC AND FUNCTIONAL ROLE OF S31 PHOSPHORYLATION IN THE H3.3 HISTONE VARIANT

Daniel Hanna, Peter Lewis (Mentor), Biomolecular Chemistry

The incorporation of histone variants into chromatin can have a range of critical effects on gene regulation. Replication-independent histone H3 variant-H3.3 is deposited in actively transcribed gene bodies, transcription start sites, transcription factor binding sites, and heterochromatic regions of the genome such as telomeres. The role of H3.3 at these loci remains poorly understood. In the N-terminal tail, variant H3.3 contains Ser31 and differs from canonical histones H3.1/H3.2 (Ala31). Ser31 can be post-translationally modified via phosphorylation. I utilize a combination of cell based and biochemical assays to investigate how phosphorylation at Ser31 contributes to H3.3 function.

SPINAL CORD STIMULATOR FOR TREATING CHEMOTHERAPY INDUCED PERIPHERAL NEUROPATHY

Rewais Hanna, Alaa Abd-Elsayed (Mentor), Anesthesiology

A 47-year-old man presented with severe bilateral chemotherapy-induced peripheral neuropathy in both hands. The patient failed conservative management, which included physical therapy, neuropathic agents and opioids. Patient was on increasing doses of opioids to manage his pain however this high dose regimen did not alleviate his severe pain. Furthermore, pain prevented the patient from using his hands during simple activities. After exhausting all other options, the patient agreed to have a spinal cord stimulator trial, which was performed. This decreased patient pain by about 80 % and improved his ability in both hands. We then performed the permanent implant by placing 2 Octad leads in the cervical spine region with good coverage for both hands. Patient continued to do well after the implant with a similar reduction in pain level. He is now able to use both hands and perform activities he could not perform prior. Patient also reported improvement in hand strength.

OPTIMIZATION OF TONGUE MUSCLE FIBER CROSS-SECTIONAL AREA ANALYSIS

Allison Hare, Heidi Kletzien (Mentor), Surgery

Age-induced decline in muscle function of the tongue may contribute to oral dysphagia in the elderly population. One possible contributing factor to this dysfunction is atrophy of muscle fibers in the tongue. A common method used to study such atrophy is analysis of fiber cross-sectional area (CSA), since it is directly related the amount of force a muscle fiber can produce in defining the number of sarcomeres that can operate laterally across the fiber. This project's objective was to optimize methods of CSA analysis used to investigate the effect of age in muscles of the extrinsic tongue; particularly, the genioglossus (GG), styloglossus (SG), and hyoglossus (HG).

REACTIONS TO FEEDBACK IN RACE-RELATED SITUATIONS

Brennan Harris, Patricia Devine (Mentor), Psychology

How do White people respond when a Black person thinks they are prejudiced? White participants believed they were having a live Skype conversation with a Black fellow student (actually a pre-recorded actor). Participants were randomly assigned to one of four experimental conditions in which the Black discussion partner told them that they do understand racial issues, do not understand racial issues, do not understand racial issues and seem prejudiced, or received no feedback. After the interaction, we assessed participants' acceptance of the feedback, reaction to the Black discussion partner, and interest in reading race-related articles. We predicted that White people's source(s) of motivation for responding without prejudice (internal and/or external) would predict whether they responded to negative feedback in a receptive or defensive way.

SOUTH AFRICAN YOUTH EXPERIENCES OF SOCIAL COHESION THROUGH SCHOOLING

Erika Hartzheim, Christina Cappy (Mentor), Educational Policy Studies

This project researches how schooling shapes young South Africans' sense of morality and social belonging, as well as their future aspirations. Through ethnographic research, we examine how students attending low-income, rural and township high schools in KwaZulu-Natal, South Africa, interpret and enact values taught through schooling. While in Africa, Cappy conducted daily classroom observations, surveys, focus groups and interviews that we now code to support our hypothesis. Through this research we propose that youth frame a large portion of how they view social cohesion and division in moral terms. Schooling plays a transformative role in shaping young South Africans' moral views of the world. As youth reflect upon and participate in educational practices, including morning assemblies, cultural activities, and classes, they rework social belonging and future life goals.

NEURAL MECHANISMS SUPPORTING MULTISENSORY INTEGRATION OF NUMBER

Jennifer Hathaway, Grace George, Cooper Siepmann, Edward Hubbard (Mentor), Educational Psychology

A fundamental question in understanding quantities is how the brain is able to recognize number independent of a particular modality: that is, how does the brain recognize that four beeps and four flashes are both four? Previous studies have demonstrated that the human brain can process numerical information with increased accuracy and ease when presented in multiple senses, but the neural mechanisms supporting this ability have not been clearly defined. We are using fMRI to investigate how the parietal and frontal brain regions process numbers when presented as auditory beeps and as visual flashes and how number is integrated across sensory modalities. This research will provide insight into the brain's ability to integrate information from multiple senses and could lead to improvements in teaching techniques.

THE ROLE OF CENTROSOMES IN THE DNA DAMAGE RESPONSE

Jaide Hawn, Ryan Denu (Mentor), Medicine

Centrosomes are cellular microtubule-organizing centers required for proper chromosome segregation. Centrosomes have been implicated in the DNA damage response, but their role has not been adequately addressed. We hypothesize that centrosomes are a signaling center for the DNA damage response. To assess this, we genetically engineered a cell's polo-like kinase 4 (PLK4), an enzyme required for centrosome duplication, to be chemically inhibited by bulky ATP analogs; this allows us to make cells without centrosomes. Cells without centrosomes were challenged with the DNA damaging agent doxorubicin to assess the presence of an adequate response. Secondly, we assessed recovery from DNA damage after washout of doxorubicin. Preliminary results suggest that centrosomes are not required for the DNA damage response but do increase the efficiency of this response.

PRIMARY CARE AND PUBLIC HEALTH COLLABORATION

Hannah Hayes, Susan Zahner (Mentor), Nursing

Public Health (PH) and Primary Care (PC) sectors have significant impact on the well-being of society. However, despite complementary goals, the two sectors have historically operated separately. The concept of promoting collaboration between PC and PH has gained new momentum and was addressed by the Institute of Medicine, highlighting the importance of greater integration. This study focuses specifically on how collaboration at the local level is perceived by health-care leaders via qualitative secondary analysis of a multi-state study applied to a published ecological framework detailing what successful collaboration entails. The analysis will document areas of alignment between the framework and the actual Wisconsin experience of PH and PC collaboration. Utilization of the findings may guide researchers and practitioners in future endeavors to increase collaboration.

FEEL THE BURN: A 10,000-YEAR RECORD OF THE FIRE REGIME OF BONNET LAKE, OHIO

Katherine Hayes, Jack Williams (Mentor), Geography

Fire, an integral process in ecosystem dynamics, can be influenced in size, strength and frequency by changes in climate, vegetation or anthropogenic activity. Fire events produce charcoal, which is deposited in lakes locally within watersheds. We sampled 10 meters of a lake sediment core from Bonnet Lake, Ohio, and performed macroscopic charcoal analysis to count and identify charcoal fragments throughout the core. These counts were used to establish background and peak rates of charcoal accumulation, which illuminate fire frequency at a local level. Through the comparison of multiple charcoal records, we will establish a fire history of the lower Midwest and determine how that history has been influenced by climate change and anthropogenic forces.

NOVEL GENE IDENTIFICATION AND ANALYSIS USING RNAI KNOCKDOWN AND CRISPR-CAS9 SCREEN TECHNIQUES

Grace Heglund-Lohman, Kate O'Connor-Giles (Mentor), Genetics/Molecular Biology

We performed a targeted RNAi screen of 61 candidate genes identified through genome-scale bioinformatics datasets. Using, transgenic RNAi lines, we screened for morphological and behavioral abnormalities to identify novel regulators of synapse growth and development. We identified 12 genes whose knockdown results in ectopic synapse formation and nine whose knockdown yields locomotor deficits. CG4587, which exhibits significantly reduced locomotor activity, is especially interesting because it encodes a calcium channel subunit that is not fully understood, but has been linked to disease in humans. I am proposing to generate a classical CG4587 allele using CRISPR-Cas9-based genome engineering to confirm the locomotor phenotype and to further analyze the molecular function of this gene.

USING ARTIFICIAL TRANSCRIPTION FACTORS TO INDUCE DIFFERENTIATION INTO CARDIOMYOCYTES

Evan Heiderscheit, Asuka Eguchi (Mentor), Biochemistry

Differentiation of pluripotent cells has become an effective way to study diseases and engineer tissues. However, the discovery of transcriptional regulators is challenging, expensive, and labor-intensive. Instead of taking the conventional approach of testing transcriptional regulators by trial and error, artificial transcription factors (ATFs) can provide a way to study relevant transcriptional networks. Using a library of ATFs designed to target an array of nine base pair sequences in the genome, thousands of genes can be tested in parallel. In this study, a library of ATFs was tested in the differentiation of stem cells to cardiomyocytes. ATFs, which are capable of specifying mesodermal progenitor cells to cardiomyocytes, were discovered in this gain-of-function screen. This strategy can enable the identification of cell fate-defining regulators in an unbiased manner.

TEACHOLOGY: DESIGNING BLENDED PROFESSIONAL LEARNING FOR TEACHING WITH TECHNOLOGIES

Nallely Hernandez, Lauren Fugh, Mark Hollendyke, Anna Irmiter, Kelly Zimmermann, Lindsay Stoetzel (Mentor),
Education Outreach and Partnerships

Our poster details the work of our team of School of Education undergraduate students who have collaboratively researched, designed, and implemented a Peer Mentorship Framework to allow teachers to engage in facilitated reflective discussion about their lesson designs. The goal of the framework is to help teachers redesign lessons to integrate technology into their teaching in more meaningful ways. This academic year we are converting our workshop model for using the framework into a standalone website with digital resources to support teachers over greater time and distance.

SELECTIVE ADVANTAGES PROVIDED BY EPSTEIN-BARR VIRUS IN PRIMARY EFFUSION LYMPHOMAS

Nora Herzog, William Sugden (Mentor), Oncology

We sought to determine which genes encoded by Epstein-Barr Virus (EBV) provide selective advantages to primary effusion lymphomas (PELs) so that these tumors retain EBV. Possible candidate genes include the EBERs that can inhibit apoptosis and the BART miRNAs that have been shown to sustain Burkitt's Lymphoma cells. We expressed these genes on plasmids and introduced them into four cells lines. Fluorescent microscopy coupled to nucleic acid hybridization was used to detect and measure the number of EBV genomes over time. In cells that lost EBV genomes, the plasmids would provide the selective advantages normally provided by EBV. In cells that did not lose EBV genomes, the plasmids we introduced could not provide the cells the needed selective advantages that EBV provides.

HISTOLOGICAL ANALYSIS OF ESTROGEN-INDUCED MAMMARY CANCER IN ACI AND EMCA4A5A RATS

Conor Hillert, James Shull (Mentor), Oncology

We are using the ACI rat model for estrogen-induced mammary cancer in order to define genetic variants that determine mammary cancer susceptibility. The Emca4a5a, subcongenic strain generated during the fine mapping of the Emca4 locus, has BN alleles introgressed onto the background of an ACI at the distal part of the Emca4 locus. Emca4a5a rats had similar tumor numbers in comparison to ACI rats but got their tumors earlier and a large portion of the treated population had to be sacrificed before the end of treatment due to tumor burden. Based off of this data we hypothesized that the Emca4a5a tumors grew faster and were more aggressive than ACI tumors. The object of this study is to characterize and compare the histology of rat mammary tumors from ACI and Emca4a5a subcongenic rats with respect to gross histological differences and proliferative rate. We are also examining histological characteristics of proliferation rate (S phase fraction of cells) and nuclear size in these tumors. We hope to discover any underlying cellular phenotypes associated with the seemingly differing progression profiles of Emca4a5a and ACI rat tumors.

GIANT MOLECULAR CLOUD FORMATION WITHIN SELF-PERPETUATING SPIRAL ARMS OF DISK GALAXIES

Nathaniel Hilliard, Elena Donghia (Mentor), Astronomy

Simulations of galaxy dynamics are widely used in order to explain and motivate observed galactic phenomena, such as spiral arms in our own Milky Way. It has been shown through these simulations that giant molecular clouds (GMCs), dense, star-forming regions in galaxies, can explain the spiral structure commonly seen in disk-type galaxies. If we accept a causal relation between GMCs and spiral arms, then since the spiral structure is long-lived compared to the GMCs, there must be GMC-forming regions in the disk. Using high-resolution stellar N-body simulations, we show that high density disk regions can, in principle, collapse by gravity to form GMCs. Adding gas particles into a new high-resolution hydrodynamical simulation, we seek to definitively show GMC formation within high density spiral arm regions.

EVALUATION OF THE EFFICACY OF TELEVISION AS ENRICHMENT IN RHESUS MACAQUES (MACACA MULATTA)

Stephanie Hoker, Mia Gambucci, Peter Pierre (Mentor), Primate Research Center

This study evaluates the efficacy of television as environmental enrichment. Video stimuli, in the form of television, were presented in 1 hour sessions to 50 rhesus macaques (*Macaca mulatta*). Snapshots of animals looking at the video were taken every two minutes. The study presented two types of content. First subjects were shown an animated feature (familiar content) and second a video of conspecifics (novel content). Looking percentage was determined by taking the total number of “looks” of each subject and dividing it by the total possible observations for the session. Subjects watched for an average of 30% of the hour (18 minutes). Animals preferred conspecific content (35.5% or 21.3 minutes) to animated content (22.6% or 13.5 minutes).

INVESTIGATIONS OF TET1 IN FOLATE-ENHANCED SPINAL CORD REGENERATION

Felissa Hong, Bermans Iskandar (Mentor), Neurological Surgery

Folate pathways have been shown to mediate partial axonal regeneration in the injured adult CNS via methylation, the optimal folic acid dose of 80 $\mu\text{g}/\text{kg}$ with the effects being biphasic and dose dependent. Preliminary immunocytochemistry experiments show that the decline in axon regeneration at higher folate doses is related in part to the demethylating enzyme TET1. In this study, we will confirm these findings by studying in detail, TET1 protein levels in the spinal cord at escalating doses of folic acid. Confirmation of this hypothesis may suggest that TET1 inhibition could enhance the therapeutic effects of folic acid at doses higher than 80 $\mu\text{g}/\text{kg}$, promoting the use of combinatorial therapy to heal the injured CNS.

MODELING VIRUS SPREAD AND ANTIVIRAL RESPONSE AS A NONLINEAR DYNAMICAL SYSTEM

Nicholas Hoppe, Gheorghe Craciun (Mentor), Mathematics

Agent-based modeling has broad applications in biology spanning evolution, vegetation ecology, language dynamics, cancer morphogenesis, and immunology. Efforts for modeling multi-agent systems in immunology have been focused on intracellular kinetics of viral growth. Consequently, relatively few models exist for the spatial and temporal spread of viruses and their associated antiviral host response, and these models vary widely in complexity. Therefore, it is desired to establish a model that captures the most salient characteristics seen in experimental data, with the minimum number of parameters. This is currently being done by examining experimental data of vesicular stomatitis virus (VSV) through monolayers of baby hamster kidney (BHK) cells from Yin et al. Results will be presented at the University of Wisconsin–Madison’s Undergraduate Symposium.

COMMUNICATION AND CAREGIVER BURDEN IN ALZHEIMER’S DISEASE

Emily Hosokawa, Lyn Turkstra (Mentor), Communication Sciences and Disorders

Caregivers of individuals with Alzheimer’s disease and related dementias (ADRD) experience high levels of stress and burden because of the communication decline associated with ADRD. The aim of our study is to measure caregivers’ knowledge about communication in ADRD and relate this to their reported levels of burden. Past research suggests that caregivers with more knowledge of effective communication strategies report less stress, yet studies also suggest that teaching communication partners new strategies can be a source of additional stress. We administered a Knowledge of Communication questionnaire and burden interview to 30 caregivers of adults with ADRD. Results will have implications for information we provide to caregivers when a family member is diagnosed, and development of effective interventions to reduce burden.

THE EFFECTS OF EARLY LIFE STRESS ON CORTISOL AND HEART RATE IN RESPONSE TO ACUTE STRESS

Nishat Hossain, Brian Leitzke (Mentor), Waisman Center

Early life stress, such as child maltreatment, is associated with atypical hypothalamic-pituitary-adrenal (HPA) axis and autonomic nervous system (ANS) reactivity to acute stress. When in a stressful event, most individuals exhibit elevations in cortisol and heart rate, markers of HPA and ANS activity. Children who have experienced early life stress, however, have been found to show a blunted salivary cortisol response. Research investigating stress reactivity typically uses the Trier Social Stress Test, an in-person interpersonal encounter to elicit a stress response. While this has shown to be effective, it is quite labor-intensive. The purpose of this study is to assess the impact of early life stress on HPA and ANS reactivity to a novel, virtual psychosocial stressor. To determine whether this virtual stressor has any impact on cortisol and heart rate reactivity relative to the in person stressor, we plan to test a sample of adolescents between the ages of 11–16. They will be taken through this virtual psychosocial stressor, which includes an impromptu speech and math task in front of a video feed of pre-recorded judges on a computer screen. We will collect salivary cortisol samples before and after the stressor and heart rate throughout the task using a heart rate monitor. We will administer the Life Stress Interview to assess the amount of life stress each participant has experienced. We expect that children who have experienced less life stress will exhibit greater elevations in cortisol relative to children with lower levels of early life stress though we anticipate no relationship between early life stress and heart rate reactivity. This research will lead to a greater understanding about the biological and psychological aspects of the effects of early life stress on adolescents. Further, this research may inform prevention and intervention strategies to ameliorate the negative health and behavior outcomes associated with high levels of early life stress.

CLARIFYING LTM FORMATION BY INTEGRATING THE INFLUENCES OF THE NOTCH AND WINGLESS SIGNALING PATHWAYS

Alyssa Hotz, Katherine Scheuer (Mentor), Genetics

Long-term memory (LTM) formation in *Drosophila melanogaster* is controlled by several different proteins that have an effect on neurons in the mushroom body region of the brain. These proteins, cAMP response element binding protein (CREB) and Armadillo (arm), have different effects on LTM formation depending on their abundance, location in the cytoplasm or nucleus, and (in the case of CREB) their isoform. CREB and arm are controlled by two different signaling pathways, Notch and Wingless (Wnt) respectively. These pathways control the abundance and location of CREB and arm in the cell, which leads to the formation of LTM. This study looks at the cascade of events in the Notch and Wnt pathways, which lead to effects in CREB and arm to determine which factors may impact LTM formation. A better understanding of the mechanics of LTM formation and potential defects in LTM formation hold implications for memory-related disorders.

NEUTROPHIL RESPONSE TO ANTIFUNGAL-TREATED BIOFILMS OF CANDIDA ALBICANS

Matt Hoyer, Jeniel Nett (Mentor), Medicine

Candida species are one of the most common fungal pathogens in humans. Although usually eliminated by neutrophils or antifungal drugs, growth as a biofilm (cells within an extracellular matrix of polysaccharides and proteins) by these species leads to resistance to both methods of elimination. This study examined the combined effect of neutrophils and antifungals by treating biofilms with sub-inhibitory concentrations of common antifungals and examining the neutrophil response by monitoring their production of reactive oxygen species (ROS), release of neutrophil extracellular traps (NETs), and chemotaxis. We found that antifungal treatment did not significantly affect neutrophil production of NETs or chemotaxis. However, treatment of biofilms with fluconazole led to decreased production of ROS. This trend was not seen when neutrophils were in the presence of fluconazole-treated planktonic *Candida* cells, nor when neutrophils in isolation were treated with fluconazole, suggesting that the fluconazole-biofilm interaction was a necessary component leading to decreased neutrophil ROS production.

MODERATION EFFECTS OF EARLY TEMPERAMENT ON ADOLESCENT CALLOUS/UNEMOTIONAL TRAITS

Diane Hsieh, Hill Goldsmith (Mentor), Psychology

We examined early temperament as a moderator for the association between low socioeconomic status (SES) and adolescent callous/unemotional traits (CU). Temperament is widely studied in predicting behavioral tendencies; however, few studies have examined the relation between individual temperament constructs (e.g., anger, inhibitory control) and CU in community samples. Participants are 702 healthy twins, whose temperament and CU were measured at age 7 and 12 years respectively. We hypothesize that higher anger and lower inhibitory control in middle childhood would strengthen the predictive power of low SES on CU. Exploratory methodological analyses will examine agreement between self-reported and cotwin-reported CU. Gender differences will also be tested.

GENDER DIFFERENCES IN THE LINK BETWEEN PEER SEXUAL HARASSMENT VICTIMIZATION AND MATH ENGAGEMENT

Ta yang Hsieh, Janet Hyde (Mentor), Psychology

Despite recent advocacy for gender equality in STEM, females are still underrepresented in mathematics-intensive subjects such as engineering and physics. We utilized a longitudinal design to examine Wisconsin adolescents' 12th grade math course taking and career aspirations as predicted by their 9th grade math self-concept, which is predicted by their 7th grade peer sexual harassment victimization (PSHV) and objectified body consciousness (OBC). Results show that PSHV was associated with higher OBC. Gender interacted with OBC in predicting math self-concept, such that OBC predicted lower math self-concept in 9th grade for girls, but not boys. Math self-concept significantly predicted both girls' and boys' math course taking, and boys' (but not girls') career aspirations. Our study is relevant in understanding the gendered trajectory in STEM fields.

AN ANALYSIS OF FACTORS PREDICTING MEMORY LOSS IN ALZHEIMER'S DISEASE PREVENTION

Mingzhao Hu, Yifei Zhang, Amir Assadi (Mentor), Mathematics

Recently, data-driven approaches are used in prediction and diagnostic of Alzheimer's Disease (AD.) Our goal is to identify the most prominent factors associated with memory loss in AD through analysis of data from ADNI (Alzheimer's Disease Neuro-imaging Initiative,) and to develop a predictive model for the onset of AD. To this end, we used principal component analysis for data visualization and exploration. Linear regression model under backward elimination reveals that the degree of memory loss is significantly and positively correlated to education, while negatively correlated to gender, age, and the biomarkers APOE4 (allele existence) and TAUAB420 (cerebrospinal fluid). Furthermore, we propose a novel data-driven approach to evaluate the data and the results for stability and reproducibility using differential geometry/topology and statistics.

COLOR AND PATTERN VARIATION WITHIN THE BUTTERFLY PARNASSIUS CLODIUS

Mryia Hubert, Sean Schoville (Mentor), Entomology

The Clodius Parnassian butterfly (*Parnassius clodius*) shows variety in the pattern and coloration of the wings within the species. This variation spans across different parts of the U.S, including different elevations. It is unclear why multiple color patterns are maintained across the distribution of this species. Over 600 wing samples were analyzed using scientific image software to measure the extent of red, black, and white pigmentation. These measurements were compared among locations using statistical methods. If genetic drift were causing these patterns, it is expected that distance alone would account for variation. Results support the hypothesis that pattern and coloration are due to climate differences and predation, and not by geographical distance. These findings increase the understanding of evolutionary mechanisms maintaining variation in species.

TRIACYLGLYCEROL SYNTHESIS AND SYSTEMIC ENERGY BALANCE: IS MGAT2 REQUIRED IN THE FAT CELLS?

Matthew Hupy, Eric Yen (Mentor), Nutritional Sciences

Acyl-CoA:monoacylglycerol acyltransferase-2 (MGAT2) is an important enzyme in the efficient resynthesis of triacylglycerol (TAG) in the enterocytes, a step required for the absorption of dietary fat. The enzyme plays a crucial role in regulating energy balance, as suggested by the observations that mice lacking MGAT2 absorb normal amounts of fat but exhibit increased energy expenditure. As a result, mice lacking MGAT2 are protected from diet-induced obesity. Mice lacking MGAT2 only in the intestine exhibit a lesser degree of increased energy expenditure. These previous data suggest that the intestine is not the only location from which MGAT2 regulates systemic energy balance. MGAT2 is expressed in the adipose tissue, a tissue shown to regulate systemic energy balance. Accordingly, it is of interest to determine if MGAT2 is required in adipose tissue for regulating systemic energy balance. During this project, I will generate and characterize the phenotypes of mice lacking MGAT2 specifically in adipose tissue when they are fed diets with different fat contents. The results of these experiments will provide insight as to where MGAT2 could be targeted for obesity prevention and treatment.

INTERRELATIONS BETWEEN EMPATHY, THE ANTERIOR CINGULATE CORTEX, AND EMOTIONAL RESPONSES

Ben Hushek, Stacey Schaefer (Mentor), Waisman Center

Emotional empathy, or feeling what another feels, facilitates cooperation and behavior intended to benefit others. Evidence suggests the anterior cingulate cortex (ACC) may play a role in empathy-related processes. 112 healthy adults, aged 26–85, from the MIDUS refresher sample (www.midus.wisc.edu) completed a self-report measure of empathy, viewed emotional pictures while their facial electromyography (EMG) was measured, and underwent a structural MRI scan. We found that greater left caudal ACC (lcACC) volume is associated with greater emotional empathy ($r=.21$, $p=.04$), more frowning (corrugator supercillii activation) to negative pictures ($r=.26$, $p=.01$), less frowning and more smiling (zygomaticus major activation) to positive pictures ($r=-.29$, $p=.007$; $r=.24$, $p=.03$, respectively), and a greater emotional range of frowning responses to negative compared to positive pictures ($r=.23$, $p=.03$).

WHAT IS THE BEST SCAFFOLD FOR IN VITRO NEURAL CELL CULTURE?

Joann Huynh, Lindsey Jager (Mentor), Waisman Center

Human-induced pluripotent stem cells demonstrate promise in their ability to differentiate into neural cells and ultimately replace the cell types, and thereby brain tissue, damaged by stroke. This review may provide insight on stem cell therapy as a form of post-stroke recovery, to diminish cognitive impairment, for future research. Prior to transplantation, an appropriate scaffold must be determined to allow for heightened accuracy by facilitating proper adhesion, differentiation, and proliferation, increasing the likelihood of success. We present here a review of available biocompatible scaffolds and their efficacy. We conducted a systematic review of scaffolds outlined in full-text, peer-reviewed articles with unique experimental data, available on PubMed, to determine an ideal scaffold, based on article and scaffold selection criteria best suited for the transplantation of hiPSCs.

RENTING LUXURY FASHION

Talaidh Isaacs, Shannon Younger (Mentor), Management and Human Resources

This project focuses on the effect Rent the Runway (RTR) has on how we view ourselves and others in US society. RTR is a website where people rent designer dresses for a significantly lower cost than buying them, a relatively new phenomenon called access based consumerism where people are able to access cultural capital that is usually not available because of economic capital. The majority of the data for this study consists of interviews with RTR customers that are coded and analyzed using grounded theory techniques. A strong correlation between people willing to take risks and people who use RTR has been noticed. This research on consumerism will examine the ways access-based consumerism has the potential to flatten the social classes in US culture.

EFFECTS OF PHYSICAL FITNESS ON CEREBROVASCULAR REACTIVITY IN PRE-CLINICAL ALZHEIMER'S DISEASE

Joseph Janz, Ozioma Okonkwo (Mentor), Medicine

Persons with Alzheimer's disease (AD) dementia exhibit decreased cerebrovascular reactivity (CVR), the ability of cerebral vasculature to dilate in response to local neural activity. It remains unclear whether abnormal CVR is present in pre-clinical AD. This study's objective is to determine whether pre-clinical AD participants from the Wisconsin Registry for Alzheimer's Prevention versus control participants exhibit decreased CVR. We will use resting state fluctuation amplitude (RSFA) as a proxy for CVR. We also aim to determine whether physical fitness modifies CVR decline. We expect to observe lower RSFA in the pre-clinical AD cohort than controls and for fit individuals among the pre-clinical cohort to show less CVR impairment relative to less fit individuals. Results will help articulate the nature of CVR decline in AD.

STANDARDIZING ELISA PROTOCOLS IN THE EVALUATION OF NEUROBLASTOMA CLINICAL TRIALS

Amal Javaid, Jacquelyn Hank (Mentor), Human Oncology

High-risk neuroblastoma remains a major problem in pediatric oncology. The Humanized 14.18K322A(Hu.14.18K322A) antibody is a monoclonal antibody that targets GD2 expressed on the surface of tumor cells. It has been administered in conjunction with chemotherapy, surgery or natural killer cells in the treatment of high-risk patients in the GD2NK safety and feasibility clinical trial. The Sondel lab was involved in evaluating the efficacy of this treatment in the GD2NK trial in patient samples by using ELISA assays to (1) determine the amount of therapeutic antibody present at different time points during the course of treatment; (2) detecting the generation of an immune response to treatment; (3) quantify the amount of immune response generated. In order to obtain the most accurate and comparable data, the protocols for these assays needed to be standardized. The updated protocols will be used to evaluate patient samples in future trials to give more reliable, accurate results to obtain a better understanding of the effectiveness of the treatment, response to therapy, and kinetics in the bloodstream. This will potentially improve future efficacy of the treatment.

AGE AT PUBERTAL ONSET AND SELF-REPORTED LEVELS OF SOCIAL ANHEDONIA: WHAT IS THE CONNECTION?

Bevlin Jennings, Diane Gooding (Mentor), Psychology

The present study will compare individuals who differ in terms of self-reported levels of social anhedonia with regard to their ages at onset of puberty and their digit ratios. The age at onset of puberty is an indirect measure of brain development. Abnormally large or small ratios of the 2nd to 4th finger (2D:4D digit ratio) serve as an indirect measure of neurodevelopmental deviance. This data was collected using personality scales, a medical history questionnaire, and by obtaining scans of participants' left and right hands and performing off-line measurements. We were particularly interested in social anhedonia, a decrease in interest in and/or pleasure experienced from social relationships, because this symptom has been associated with risk for the later development of various psychological disorders. Additional findings relating social anhedonia, late maturation, and abnormal digit ratios would provide the basis and rationale for future research.

CHANGES TO THE NITROGEN CYCLE IN WISCONSIN PRAIRIES OVER THE PAST 60 YEARS

Lauren Jensen, Laura Ladwig (Mentor), Zoology

The Wisconsin landscape has changed greatly as prairies have been converted into agriculture, and human activity and management techniques have altered those that remain. Increased nitrogen deposition and varying fire management practices have changed prairie functioning drastically since John Curtis first surveyed Wisconsin prairies in the 1950s. A recent resurvey of these sites in 2015 has shown a vast change in species composition, as well as an increased abundance in the average leaf nitrogen content over the past 60 years. This increase in leaf nitrogen could increase rates of nitrogen cycling, which affect not only these prairie communities, but also surrounding ecosystems.

DEVELOPMENT OF A NOVEL HIGH-THROUGHPUT ASSAY TO CHARACTERIZE ORIGINS OF DNA REPLICATION IN YEAST

Katherine Jiang, Catherine Fox (Mentor), Biomolecular Chemistry

Life requires the copying, or replication, of chromosomal DNA. This process starts at chromosomal locations called origins of replication. Altering origins is tied to cancer and developmental defects. Origins are necessarily formed by binding of a protein which, in eukaryotic cells such as ours, is called the Origin Recognition Complex (ORC). In essence, ORC binding is key to forming origins of replication and thus the origins of life. Thus, to understand how life starts, we must understand how ORC interacts with origins. To study ORC-origin interactions, our lab proposes studying the sequence structure of the origin. To this end, I helped develop a novel assay to characterize the sequence structure of all of the origins within the model organism yeast (*Saccharomyces cerevisiae*). This assay is called the high-throughput competition (HTC), for its ability to characterize sequence structures of > 3000 sequence variants of > 100 yeast origins in a single experiment, as contrasted to a historically-important but time-intensive assay. From the HTC, I have found that origin sequence structure differs among yeast origins, which supports a model of ORC-origin interaction variation. Importantly, these structural differences are linked to differences in ORC-origin binding previously characterized by the lab. I have defined these differences as molecular targets that will be tested for ORC-origin interactions in future directions within the lab.

EXPERIMENTS IN ACRYLIC RESIST AQUATINT FOR SAFER USE IN INTAGLIO PRINTMAKING

Luke Johnson, Emily Arthur (Mentor), Art

The technique of aquatint has long been the standard for adding tonal values to an intaglio printed image. The process involves depositing an acid resist, on the plate, but not as a solid coating. When exposed to acid, the metal between particles of resist is etched, resulting in areas of 'tooth' that will hold ink. Currently rosin aquatint is the prevailing method of achieving tone in intaglio printmaking. The danger in this method is that rosin can lead to contact dermatitis and asthma. Recent work has been done using acrylic based materials sprayed with an airbrush to achieve the look of traditional aquatint. Emily Arthur and I worked during the 2015–16 academic year to test the acrylic resist method in comparison to traditional techniques.

YOUNG CHILDREN'S VISITS WITH THEIR JAILED PARENTS

Nicole Johnson, Julie Poehlmann-Tynan (Mentor), Human Development and Family Studies

The present study examined thirty young children, their jailed parents, and current caregivers, who participated in both a home and jail visit. We assessed the initial validity of a new measure used to rate the children's attachment-related behaviors during visits in a corrections setting. The children's behaviors were evaluated through qualitative and quantitative attachment measures, observations in both the jail and home, in addition to caregiver interviews. We found preliminary evidence for the validity of our new measure; children's behaviors during the jail visit correlated with their attachment security observed in the home. Our observations indicate that, in certain contexts, non-contact visits with incarcerated parents can be stressful for children and caregivers can ameliorate the outcome of visits.

THE EFFECT OF ASPECT RATIO ON MOLECULAR ORIENTATION IN VAPOR-DEPOSITED ORGANIC SEMICONDUCTORS

Noah Johnson, Mark Ediger (Mentor), Chemistry

Vapor-deposited glasses are commonly used in organic electronic devices, which are used in many phone displays and newly commercialized OLED TVs. The light output of an OLED could be improved by a factor of 1.5 by controlling molecular orientation. To better understand what governs molecular orientation I studied the effect of aspect-ratio on molecular orientation by using a high-throughput characterization of glasses of two linear organic semiconductors, p-TTP and DPAVBi. Ellipsometric measurements indicate that both of the molecules display tunable molecular orientation based on the substrate temperature during deposition. Compared to the previously studied linear systems, the larger aspect-ratio molecule DPAVBi exhibits similar behavior, while the more compact p-TTP exhibits significantly less molecular orientation, and thus represents an intermediate between linear- and disc-shaped molecules.

CHRONIC GRAFT-VERSUS-HOST DISEASE AND PSYCHOLOGICAL WELL-BEING

Sam Johnson, Erin Costanzo (Mentor), Psychiatry

Individuals who receive hematopoietic stem cell transplants (HSCT) to treat hematologic cancer are at risk for a long-term complication called chronic graft-versus-host disease (cGVHD), which can be debilitating and impair quality of life. We investigated whether the severity of cGVHD symptoms predicted psychological well-being (PWB). Participants (N=59) completed self-report questionnaires assessing PWB and cGVHD symptoms. Results of an ANOVA revealed that patients with severe cGVHD reported having a greater purpose in life than those with moderate or no cGVHD ($F(2,55)=3.735$, $p=0.016$). An examination of specific cGVHD symptoms showed that those who reported fewer problems with eating/digestion, muscles/joints, and mental/emotional health reported greater PWB (all $p<.05$). Results suggest that severity of cGVHD and corresponding symptoms may affect HSCT survivors' psychological well-being.

ANALYSIS OF THE HUMAN GUT MICROBIOTA USING C-TYPE LECTIN PROBES

Sheila Johnson, Gavin Dillavou-Brown, Chariesse Ellis, Sheila Johnson, Laura Kiessling (Mentor), Chemistry

Understanding the relationship between microbes and their host is essential to understanding how to maintain a healthy microbiome. Fluctuations in the bacterial composition can have adverse effects on the host's immune cell development, food digestion, metabolism, and overall homeostasis. C-Type Lectins are calcium-dependent carbohydrate binding proteins that bind sugars in the highly conserved carbohydrate recognition domain (CRD). The three C-type lectins that we have chosen to study are Langerin, Dendritic cell-specific intercellular adhesion molecule-3 (ICAM-3) grabbing non-integrin (DC-SIGN), and Dectin-2. An assay to rapidly compare ligand specificity is important in the field to understand the function of C-type lectins in microbe binding. Through development of ForteBio and Flow Cytometry assays, we will be able to determine C-type lectin binding specificity to the human gut microbiota.

PRODUCT BUNDLING AS A BEHAVIORAL NUDGE TO INCREASE CONSUMER FRUIT AND VEGETABLE SELECTION

Madeleine Jones, Kathryn Carroll (Mentor), School of Business

In the U.S., many adults under-consume fruits and vegetables relative to levels recommended by the Center for Disease Control (CDC). This is a significant public health concern because adequate consumption of fruits and vegetables has been associated with reduced risk of certain chronic diseases. The purpose of this study is to test whether product bundling can serve as a behavioral intervention to increase selection of healthful fruit and vegetable (F&V). A laboratory experiment was performed using a mock grocery store to emulate a realistic shopping environment. Results suggest that product bundles (consisting primarily of F&V items) could increase retail F&V sales. They also indicate that bundles need not necessarily offer a price discount, as consumers may perceive greater value from the convenience of bundled products.

INFLUENCE OF LIPOSOME COMPOSITION AND PH ON LIPOSOME-WATER PARTITIONING OF LAMOTRIGINE

Brian Jun, Joel Pedersen (Mentor), Soil Science

Concentrations of pharmaceuticals have been detected in crops irrigated with contaminated water at levels exceeding recommended daily consumption levels. It is, therefore, important to predict the uptake and bioaccumulation of such compounds. However, the most common predictor of bioaccumulation via partitioning to biological lipids, the n-octanol-water partitioning coefficient (K_{ow}), is inaccurate for ionizable organic molecules, including many pharmaceuticals, because bulk n-octanol cannot accommodate charged compounds in the manner lipid bilayers can. To more accurately predict such partitioning, we determine the liposome-water partitioning coefficient (K_{lipw}) of lamotrigine, an anticonvulsant chosen due to its toxicity and ionization at environmentally relevant pH values. We used varying liposome compositions of zwitterionic phosphatidylcholine, anionic phosphatidic acid, and cholesterol to simulate plant membranes, and observed K_{lipw} at varying pH's to study all ionization states of lamotrigine.

IMMEDIATE LAKE INFORMATION IOS APP FOR NTL LTER PROJECT

Xu Junjie, Corinna Gries (Mentor), Limnology

The North Temperate Lakes Long-Term Ecological Research site (NTL LTER) maintains instrumented buoys on several lakes in Wisconsin. The measurements of weather and water conditions during the ice free season are useful to sailors, fishermen and the general public and have been available on the NTL website. To further facilitate the distribution of these data now, I developed a iOS App iPhone. The data is transferred to the iOS App by a web service implemented by PHP. The function of this App not only includes the display of the lake information, but also helps users create their own graph based on variables they choose. This iOS App supports iPhone 4 or any modal after that and it is available through Apple Store for free.

ACQUISITION OF GENDER-ALIGNED SPEECH: /Aɪ/ IN AFRICAN AMERICAN ENGLISH

Misty Kabasa, Calvin Kosmatka, Joseph Salmons (Mentor), German, Nordic and Slavic

The emergence and influence of gender differentiated speech patterns remain understudied. It has been established that women and men use different speech patterns, that parents' speech to children may differ according to the child's gender, and that women tend to lead in sound change over time. Our research adds to a nascent body of work, suggesting that early language learning subsumes the encoding of gendered social information in phonetic variation prior to the changes that occur after children begin school. We focus on productions of the diphthong /aɪ/ in African American English by six speakers at 4 and 5 years of age, before starting first grade. We interpret these findings based on available data and propose a model for more comprehensive future research.

DIFFERENTIAL DIAGNOSIS OF PSYCHOPATHOLOGY: ADOLESCENT AND PARENT PERSPECTIVES

Finola Kane-Grade, Hill Goldsmith (Mentor), Psychology

Adolescence is a time of profound physical and psychological changes, and adolescents can experience depressive and anxiety symptoms at a high rate. We studied current symptomology in 957 adolescents using a standardized structured clinical interview, the DISC-IV. Mothers also reported on their child's symptoms. Adolescents reported twice as many internalizing symptoms, such as depressive symptoms, than mothers ($t(956) = 22.18, p < .001$), whereas, mothers reported significantly more externalizing symptoms, such as conduct problems ($t(939) = 3.46, p = .001$). The results point to the importance of self-report when trying to understand adolescent psychopathology, particularly for internalizing disorders.

EFFECT OF INCOME ON WEALTH TRANSFERS: EVIDENCE FROM THE SOCIAL SECURITY NOTCH

Malcolm Kang, Kegen Tan (Mentor), Economics

The Social Security Notch was a policy change that reduced retirement income of people. Previous literature examined the effects of this exogenous income shock on a variety of socioeconomic indicators like mortality and elderly labor supply. Using empirical data from the Wisconsin Longitudinal Study, I investigate the repercussions of the Notch on intergenerational wealth transfer. I uncover a significant causal relationship between the Notch and the resultant change in parental bequest behavior. Preliminary results suggest a statistically significant reduction in bequest levels when parents were affected by the Notch. Late-life income indeed serves as a policy lever for parental bequests. My findings will serve to inform lawmakers when they consider future reforms to retirement schemes and social pensions.

MINDFULNESS AND SELF-CARE AS A PATH TO BETTER LEARNING

Ina Kansariwala, Supriya Hayer (Mentor), Family Medicine

Pre-medical and medical students are constantly burdened by a high stress environment, which often times affects their performance as healthcare learners and subsequently as providers. Students tend to adopt poor health habits and experience a decline in overall well-being. The role of self-care in medical students has not been well emphasized and preliminary studies show that there is a great need to incorporate mindfulness and wellness strategies into the educational model. Studies utilizing Mindfulness Based Stress Reduction (MBSR) programs have shown an increase in overall self-awareness of students including greater stress relief, increased self-compassion, decreased anxiety, and increased empathy. Incorporation of MBSR strategies into health-education curriculums leads to better learners, which translates to better patient care.

“PROPS” DURING MEALTIME FOR CHILDREN WITH AUTISM: REWARD AND SELF-REGULATION

Shannon Kant, Jessica Muesbeck, Karla Ausderau (Mentor), Kinesiologist

Mealtime, an important family routine, is significantly affected in families with children with ASD as they report significant mealtime behaviors, increased focus on the child with ASD and overall difficulty constructing a family mealtime. Families use a number of strategies to support engagement in mealtime, specifically to support their child with ASD, but these strategies have not been clearly identified in the literature. Families with typical children have been shown to use props as positive reinforcement in family's routines, including mealtime. The purpose of this study was to characterize if and how families with young children with ASD are using props (i.e. toys, blankets, books) to support mealtime participation for children with ASD. Fourteen families with a child between the ages of 2 and 7 years with ASD participated in one to two videotaped mealtime observations. Videos were reviewed to determine if the family used any type of prop during mealtime and identify the potential purpose of the prop for that child during the mealtime experience. Just over half of the families used a prop during the mealtime to support their child's mealtime participation. Props were common child objects such as toys, pacifiers, blankets, balls, and books. The intended use of the prop fell into two categories. Props were used as a positive reinforcement, which would be similar to the current typical literature. However, more commonly they were used as a self-regulation tool to support the mealtime routine. Props were not an active part of the social engagement or mealtime experience, but rather a tool to help the child regulate for mealtime participation.

INVESTIGATION OF DISEASE RESISTANCE IN POTATO PLANTS

Maryatt Karstensen, Ana Fulladolsa Palma (Mentor), Plant Pathology

Potato virus Y (PVY) affects susceptible potato (*Solanum tuberosum* L.) plants, causing foliar symptoms and potato tuber necrotic ringspot disease. Current breeding efforts at UW-Madison utilize *S. chacoense* plant M6 and *S. chacoense*-*S. tuberosum* hybrid XD3 to breed virus resistant varieties. The objective of this study is to determine the susceptibility of M6 and the range of resistance of XD3. Our experiments consist of inoculating ten M6 plants with strain PVYO, and three groups of three XD3 plants with different PVY strains. The plants will be tested for infection using serological assays after three weeks. This will be repeated twice. We expect that XD3 will not be infected with any PVY strain and that all M6 plants will be infected after the first inoculation.

ARE THEY PAYING ATTENTION? RELATIONS BETWEEN THE SPACING EFFECT AND CHILDREN'S ATTENTION ABILITIES

Emily Katz, Amanda Babler, Emily Utic, Haley Vlach (Mentor), Educational Psychology

The “spacing effect” describes the phenomenon that distributing learning events over time on a spaced schedule promotes memory to a greater degree than presenting learning in immediate succession on a massed schedule. The current study examined the relationship between children’s attention abilities and the magnitude of the spacing effect. Children were presented with four cognitive tasks that measured their attention abilities, their working and long-term memory, and their memory of information presented on massed or spaced schedules. Preliminary results show that children with lower attention abilities had greater success when the information was presented on a massed schedule. These findings suggest that although spaced learning might be best for most children, there may be some children that benefit more from other learning schedules.

HOW ARE COLLEGE STUDENTS BALANCING ACADEMIC AND SOCIAL DEMANDS AT UW–MADISON?

Taylor Keaton, Bradford Brown (Mentor), Educational Psychology

A challenge exists for many undergraduates as they enter a residential university in balancing the academic and social demands of the institution. UW-Madison exacerbates this challenge because it is regarded as an academically rigorous institution with a “party school” social atmosphere. Intensive interviews with a diverse sample of 33 first-year students in the early fall and late spring of their freshman year reveal the variety of ways in which students negotiate this balancing act. Findings point to factors that affect students’ decisions to favor one or the other of these demands and the implications of this decision for their adjustment to college.

DESIGNING AND TESTING BIOMATERIALS THAT REGULATE TRANSFORMING GROWTH FACTOR-BETA 1

Anna Kellner, William Murphy (Mentor), Biomedical Engineering

The protein, transforming growth factor-beta 1 (TGF β 1), initiates cellular processes such as apoptosis and proliferation via binding to cell surface receptors. These receptors include TGF Receptor I (TGFRI) and TGF Receptor II (TGFRII). Unregulated transforming growth factor-beta (TGF β 1) signaling has been implicated in cutaneous scarring, pulmonary fibrosis, and liver cirrhosis. Regulation of TGF β 1 using receptor-derived biomaterials may lead to advances in regenerative medicine by reducing scar tissue formation and allowing for healthy tissue regeneration. Previously we utilized a biomimetic approach to design synthetic peptides derived from TGFRI and TGFRII that we hypothesized could bind to and sequester TGF β 1. We have shown that a peptide derived from TGFRI significantly inhibits TGF β 1 in a HUVEC expansion assay. Here we propose to further study the ability of the engineered peptides to bind TGF β 1 in a series of cell-based and biochemical assays.

CREATING VIRTUAL ENVIRONMENTS: MODELING CHANGE IN 3D

Conlain Kelly, Yi Xian Soo, Patrice Tandifor, Kongmeng Xiong, Kevin Ponto (Mentor), School of Human Ecology

A projected one billion consumers will own Virtual Reality products within the next ten years. Our research is intended to enhance the VR experience by creating 3D models of objects and representing how they change over time. A standard time-lapse captures an object’s growth in 2D from a fixed angle; this research takes the next step forward by representing the time-lapse as a 3D model that can be viewed from all angles. The models are generated from photos we take which we align and process using specialized software. Time-lapses are then formed from the data and used to write code that depicts real-time events in Virtual Reality. These models can be used in a variety of fields, including educational, entertainment, and medical environments.

MBD1 REGULATION OF NEURONAL MATURATION AND SYNAPTIC INTEGRATION

Laurel Kelnhofer, Xinyu Zhao (Mentor), Waisman Center

Methyl-CpG binding domain protein 1 (MBD1) is a known reader of DNA methylation. By binding to methylated DNA, MBD1 mediates gene repression and has been shown to play an important role in adult neurogenesis. Previous studies in our lab indicate that MBD1 deficiency leads to reduced proliferation of adult neural stem cells and impaired neuronal differentiation. However, the role of MBD1 in regulating neuronal maturation is unclear. The goal of my project is to (1) determine if the deletion of MBD1 affects neuronal maturation and (2) determine whether the presence of MBD1 affects the synaptic integration of maturing neurons. To determine whether MBD1 plays a role in maturation we have used a mouse line generated by our lab to conditionally knock out MBD1 in immature neurons by infection with a retrovirus coding for the Cre protein. Functional integration has been investigated using pseudotyped rabies virus that allows for monosynaptic retrograde tracking for neuronal presynaptic connections.

INDEPENDENTLY ACQUIRED PRESSURE AND VOLUME OF PATIENTS WITH PULMONARY ARTERIAL HYPERTENSION

Jack Kemnitz, Eric Dinges (Mentor), Biomedical Engineering

Pulmonary arterial hypertension (PAH) is a disease in which the mean pulmonary arterial pressure rises above 25 mmHg. In patients with PAH, the main cause of death is right ventricle (RV) failure. Pressure acquired from right heart catheterization (RHC) is used to monitor and diagnose the disease clinically, but does not provide a complete explanation of the mechanical characteristics of the condition. In order to better evaluate this, pressure-volume loops can be generated. RV pressure and volume can be acquired simultaneously, or via independent procedures where magnetic resonance imaging (MRI) provides the volume over time. While both procedures require a RHC, an advantage of independent procedures is that volume acquired via MRI is manually analyzed, allowing for more control and reduced technical error.

EXPANDING ENTOMOPHAGY: INVESTIGATING POTENTIAL BARRIERS TO MEALWORM AND CRICKET CONSUMPTION

Marjorie Kersten, Susan Paskewitz (Mentor), Entomology

The purpose of this research was to assess consumer perceptions of edible insects in Madison and Zambia and to determine what influences these perceptions. Consumer perceptions are a potential barrier to developing insect micro-livestock farms and promoting entomophagy, the consumption of insects, as a sustainable solution to food insecurity. Entomophagy is common in Africa but often stigmatized in the United States. Through assessing consumer perceptions via surveys, informal focus groups, taste tests, and field notes in Zambia and at the University of Wisconsin-Madison, strategies can be developed and implemented to destigmatize entomophagy and promote the consumption of farmable insects. The research results serve as baseline data for my community partners in Madison and Zambia who are working to implement insect micro-livestock farms and increase entomophagy.

YOUNG ADULTS' EXPERIENCES MANAGING DEPRESSION

Huda Khokhar, Nancy Pandhi (Mentor), Family Medicine

E-health and internet usage are increasingly influencing how patients gather health information. Young adults (YA), compared to other age groups, have the greatest gap between use of mental health assistance and receiving care. Many avoid treatment due to factors such as perceived stigma or unfamiliarity with treatment options. This study will investigate self-management strategies for depression outside of the healthcare system, specifically focusing on how YA may self-medicate or cope through substance abuse and self-harm. A secondary analysis will be conducted using transcribed video interviews with diverse YA with depression from three regions (Midwest, East Coast, West Coast). Interviews will be analyzed using content analysis and common themes will be derived. This project's implications include addressing a sensitive topic that vastly affects the population.

EXPLORING DIFFERENTIAL GENETIC REQUIREMENTS FOR ESS SECRETION IN PY79 AND 3610 OF BACILLUS SUBTILIS

Jia Hui Khoo, Briana Burton (Mentor), Bacteriology

The Ess or Type VII secretion systems are essential for mediating the pathogenicity of some Gram-positive human pathogens. In *Bacillus subtilis*, the Ess secretion system is encoded by the yuk operon and the main secretion substrate is Yuke. Preliminary data suggests that the yuk operon is not required for Yuke secretion in the undomesticated strain NCIB3610, but is required in the domesticated laboratory strain PY79. Our aim is to understand how the genetic variation between the domesticated and undomesticated *B. subtilis* strains could impact Yuke secretion. To detect the differential secretion of Yuke, a secretion assay allowing for blue/white screening combined with reciprocal transformation and genome sequencing, will be developed. The results of this study could provide insights on additional genetic requirements of Ess secretion.

THE MOLECULAR BASIS OF MYOSIN RELATED CARDIAC MYOPATHIES

Daniel Kieffer, Michael Andreas (Mentor), Biochemistry

Myosin is the protein in muscle responsible for muscular contraction. Myosin is a dimer consisting of a catalytic head domain responsible for contraction, and a coil-coiled domain known as the myosin rod is responsible for myosin filament assembly. Mutations throughout the rod have been associated with skeletal and cardiac myopathies. The focus of this research is the region surrounding the R1500 amino acid of the myosin rod. Mutations at the R1500 residue are associated with cardiac myopathies and presently, there is no published structure for this region. These mutations are thought to disrupt the coil-coil of the myosin rod and affect interactions in the thick filament. The goal of the research is to determine the structure around the R1500 region using X-ray crystallography.

ANALYZING BINDING PROPERTIES OF BICAUDAL-C AND MRNA

Ian Kies, Michael Sheets (Mentor), Biomolecular Chemistry

Translation is how proteins are made from mRNA, and it can be regulated by other proteins, such as Bicaudal-C (Bic-C). Previous work by the Sheets lab demonstrated that Bic-C is important for embryonic development and other work has demonstrated that Bic-C also controls the formation of organs, such as the kidneys. However, knowledge about how Bic-C selects which mRNAs to regulate is unknown. The Sheets lab is studying this mechanism by producing variants of the N-terminus region of Bic-C in *E. Coli* and performing biochemical assays to define the binding properties of Bic-C to mRNA. These experiments could provide new information about how Bic-C's activities are perturbed and lead to abnormal organ functions and illnesses, such as kidney disease.

TOPOLOGICAL APPROACH TO THE DATA MINING OF THE INFLUENZA VIRUSES

Mansu Kim, Amir Assadi (Mentor), Mathematics

Modern approaches to a predictive modeling in the biological sciences and medicine take the advantage of learning theory and depend on the large sets of data. Although the data-driving machine learning and data mining strategies have been enjoying a huge success in the biological research and advancing our understanding of the biological complexity, they are still subjected to the major limitations due to the challenges encountered in the data analytics. This research explores a combination of topology, linear algebra, and statistics to develop the efficient data mining algorithms and methodology to organize the large data sets and reduce the limitations. They are applied to the influenza-virus data sets to study the evolution of virus.

ASSESSING 160 YEAR CHANGES IN OVERSTORY COMPOSITION OF THE GREAT LAKES NATIONAL PARKS

Scout Kirby, Donald Waller (Mentor), Botany

Throughout the 1800s, the Public Land Survey (PLS) was implemented in the United States to divide territory for later settlement. While dividing the land, surveyors observed and recorded natural features, including overstory characteristics such as tree species and diameter. To assess changes in overstory composition over the past 160 years, we compared PLS tree data with modern National Park Service tree surveys for nine Great Lakes national parks. From this analysis, we found declines in fire-tolerant species and those favored by the timber industry during European settlement. We also found that the current dominant species groups across the landscape are Aspen and Maple. This analysis has increased our understanding of the stability and functioning of forest ecosystems during a time of rapidly changing disturbance patterns.

ECOLOGY AND PERFORMANCE OF PHOSPHORUS REMOVAL IN A MICROBIAL COMMUNITY USING GLYCINE AS A SUBSTRATE

Matthew Kizaric, Francisco Moya Flores (Mentor), Environmental Engineering

Enhanced biological phosphorus removal (EBPR) using the uncultured microorganism *Candidatus Accumulibacter phosphatis* and lab-scale bioreactors has been extensively studied using volatile fatty acids, such as acetate, as the primary carbon source. However, a recent metatranscriptomic analysis of *Accumulibacter* has shown glycine as another potential carbon source. There is little information about the effect of glycine on the performance of the EBPR cycle, but could hold the key to improved EBPR functioning, *Accumulibacter* isolation, or reactor community stability. By maintaining *Accumulibacter*-enriched bioreactors for a series of cycles and using glycine as a sole carbon source, kinetic profiles, organismal interactions, and overall stability in the bioreactors was investigated. The applications could help determine new metabolic pathways within *Accumulibacter* and develop optimization procedures for this biotechnological process.

STATIC FREEZING EXPERIMENT

Nicholas Kizewski, Louis Chapdelaine (Mentor), Engineering Physics

As the earth's population grows ever larger, so does its need for energy. Since it has been proven that traditional methods of power production have had negative effects on our planet and its inhabitants, safer and more efficient replacements have been on the rise; including Fluoride-salt-cooled High-temperature Nuclear Reactors (FHR's). The objective of our research is to determine the thermophysical properties of fluoride salts and observe the process they undergo during freezing. We plan to submerge and melt a flask of fluoride salt in a boiling salt bath and then record data from temperature probes and visual observations as the sample cools. The collected data will be used to develop a scalable computer model to run safety analysis tests on a simulated nuclear reactor.

APPLICATION OF METAGENOMIC TECHNIQUES TO MASTITIS CONTROL

Anna Kleinhans, Stephanie Metzger, Laura Hernandez (Mentor), Dairy Science

Mastitis continues to be the most prevalent and economically significant disease affecting dairy cattle. Quarters of the udder are affected and chronically inflamed leading to poor health and production. The most common milk microbiome genera differs between healthy quarters and quarters with clinical mastitis. In this study, milk samples have been collected at 3 time points based on microbiological status and somatic cell count, that is immediately prior to final milking before dryoff, prior to morning milking on days 4–7 of next lactation, and days 11–14. The overall goal of this project is to identify and determine the biological significance of microbial communities that are associated with inflammation of bovine mammary glands across the dry period and the first 150 days of the next lactation.

EXPLORING THE ONCOGENIC ROLE OF E7 IN THE DEVELOPMENT OF ANAL CARCINOGENESIS

Darcy Knaack, Louise Meske, Evie Carchman (Mentor), Surgery

Anal cancer in the United States is associated with the human papilloma virus (HPV). Little research has been done to determine what affect HPV oncoprotein E7 alone has on anal tumorigenesis versus the combined effects of E6 and E7. Transgenic K14E7 mice and bigenic K14E6/E7 mice were treated with 7,12-Dimethylbenz[a]anthracene (DMBA), a carcinogen, over a period of 5, 10, 15, or 20 weeks. Mice not given DMBA represented controls. Mice were observed weekly for anal tumor growth. Results suggested that E7 alone is capable of inducing anal tumors. However, the combination of E6 and E7 expressed in the epithelium is more effective than E7 alone; 100% of K14E6/E7 and 84% of K14E7 mice had anal tumor growth by 20 weeks.

THE EFFECTS OF VARROA DESTRUCTOR MITES ON HONEYBEE POPULATIONS

Heide Knoppke-Wetzel, Diane Nhieu, Sainath Suryanarayanan (Mentor), Community and Environmental Sociology

Beekeepers in the United States have been suffering annual losses of 30%-90% of honeybee colonies over the past decade, a level significantly higher than prior years' losses. The parasitic mite *Varroa destructor* and agricultural practices such as pesticide usage and monocropping are considered to be part of the mix of factors contributing to the decline of honey bee health. Our research examines the connection between intensity of agricultural development and *Varroa* levels in honey bee colonies. In this project, we analyze parasitic mite levels in honeybee bodies gathered from 16 beehives that were equally distributed across 8 field sites in central Wisconsin representing high and low intensities of agricultural development.

DETECTING ORIGIN OF EXPANSION IN THE BIASED VOTER MODEL

Craig Knuth, Xiaoyi Yang, Wai-Tong Fan (Mentor), Mathematics

Range expansion is a ubiquitous phenomenon in biological systems, in which a species successfully spreads to new areas. An important question in these systems concerns detecting the origin of expansion. In this work, following Hallatschek and Nelson in 2007, we model the population dynamics by a biased voter model on a lattice. Computer simulations are performed, which (i) visualize two interacting propagating waves and (ii) verify the rigorous result by Durrett and Fan 2016 about a coupled stochastic partial differential equation. To detect the origin of the expanding wave, we employ and explore a statistics introduced by Peter and Slatkin in 2013 called the directionality index.

U.S. DOMESTIC POLITICS OF CLIMATE ENGINEERING

Kendl Kobbervig, Kyra Fox, Devin Judge-Lord (Mentor), Political Science

With advances in technology, government agencies and serious players in public policy have begun to talk about proposals to engineer Earth's climate in order to counteract climate change. Scholarship on the politics of climate engineering, like early political science scholarship on climate change, has focused on international governance. This paper complements this scholarship by mapping the political terrain of climate engineering politics in the United States. Leveraging an original database of popular and academic publications on the topic and advances in text analysis methods, we assess which actors and arguments have most influenced U.S. policymakers as they begin to take positions on climate engineering research or regulation. Specifically, we examine the influence of both mass media portrayals and scientific literature on the policymaking debate. Through comparison of these two information outlets, we assess which has a stronger influence on policymakers and how this influence will affect U.S. domestic climate engineering policy in the near future.

WILD BEE VISITATION RATES TO PLANTED WILDFLOWERS AND WEEDS IN CONSERVATION BORDERS

Jade Kochanski, Tania Kim (Mentor), Entomology

Wild bee communities provide valuable ecosystem services, especially in agricultural contexts. Establishing pollinator conservation borders around agricultural lands is an important conservation strategy to negate human-driven land use changes. To understand how wild bees use floral resources in conservation borders, we examined the visitation rates of wild bees to intended (i.e., planted) floral resources and unintended (i.e., weeds) floral resources. Bee visitation rates were estimated using visitation observations in two treatments: high diversity floral strips and controls (untreated strips). We hypothesized that in high diversity strips, weeds will have similar visitation rates to those of intended resources and in control treatments, bees utilized weeds. This study will help explain wild bee foraging preferences, aiding in determining the effectiveness of conservation borders and future conservation strategies.

THE ROLE OF NEUROESTRADIOL IN THE PEOVULATORY LH SURGE

Lucille Kohlenberg, Ei Terasawa-Grilley (Mentor), Pediatrics

Ovarian estradiol (E2) induces negative and positive feedback effects on the release of gonadotropin releasing hormone (GnRH) and anterior pituitary LH and FSH. A series of studies in this lab indicates that E2 (henceforth called neuroestradiol) is also synthesized in the hypothalamus and participates in the control of GnRH release. This study tests the hypothesis that neuroestradiol release from the hypothalamus is integral to the preovulatory LH surge. Accordingly, we examined the effects of the aromatase inhibitor letrozole on the estradiol benzoate (EB)-induced LH surge in ovariectomized female monkeys. Aromatase is the rate-limiting enzyme for E2 synthesis. Preliminary results indicate that letrozole attenuates the EB-induced LH surge, suggesting involvement of a non-ovarian source of E2, presumably neuroestradiol, in the preovulatory LH surge.

POLLEN PREFERENCES OF BOMBUS IMPATIENS ON A COLONY LEVEL OVER THE COURSE OF THE FORAGING SEASON

Alexandra Kois, Danny Minahan (Mentor), Entomology

As the habitat of the common eastern bumble bee (*Bombus impatiens*) continues to be altered by urbanization, the insect faces the challenge of survival while being exposed to increasingly limited sources of nutrition. This experiment serves to identify possible evidence for how the pollen preferences of *B. impatiens* change over time, specifically, over the course of the foraging season. Pollen samples were collected from *B. impatiens* individuals over three days during each of five periods throughout the foraging season. Pollen is being identified to determine if the pollen resources collected change within this time frame. Literature and our previous observations reveal that individual bumble bees will collect pollen from one source in a single foraging bout. We are testing the hypothesis that between individual bees in a single hive, pollen collection will be from multiple sources at any given time.

AN ALGEBRAIC APPROACH TO MODELING VISUAL PERCEPTION OF MOTION USING QUATERNIONS

Eli Krenzke, Julia Lindberg, Amir Assadi (Mentor), Mathematics

The brain is capable of grouping signals together in complicated ways that merge spatial and temporal information. Billions of neurons, with thousands of connections, are responsible for generating information from the dynamics of their activation. Despite great strides in modeling human vision, little is known about the aforementioned integration of space and time in the brain. Our research proposes a novel algebraic layer to enhance the available algorithms for modeling vision, and to unify spatial and temporal aspects of neural signals. To test the abstract theory, we propose a detailed time-lapse analysis of data, collected in a research collaboration on the visual perception of movement. The rich theory of quaternions allows for the union of three-dimensional space and time, into a single variable $q = (t, x, y, z)$, analogous to the construction of a single complex variable defined by two real parameters. Due to the well-developed theory of quaternions, mathematical methods such as the Fourier Transform and advanced signal processing theory may become amenable to a hypercomplex adaptation that is relevant to our model.

RAISING LITTLE ALDOS

Sarah Krier, Bret Shaw (Mentor), Life Sciences Communication

The Little Aldos nature education program implemented at YMCA Camp DayCroix provided a more focused nature curriculum and supported projects that exposed campers to concepts from the writings of Aldo Leopold. These include: The Land Ethic; human interaction with the environmental community; environmental stewardship; the risks and benefits of hunting on a community; and Aldo Leopold's ideas of ecological integrity, stability, and beauty. Research suggests that children who actively engage with the natural world form lasting personal connections with the environment. My goal was to help campers form these connections by encouraging awareness of the impacts of their actions and empowering them to be environmental stewards within their schools and communities.

A POTENTIAL MECHANISM FOR ATMOSPHERE-OCEAN COUPLING IN THE MADDEN-JULIAN OSCILLATION

Kaitlyn Krzyzaniak, Larissa Back (Mentor), Atmospheric and Oceanic Sciences

The Madden-Julian Oscillation (MJO) is a convective, intraseasonal weather disturbance that propagates eastward from the Indian Ocean and across the tropical Pacific. Atmosphere/ocean coupled models do a better job predicting this phenomenon than non-coupled models, but the mechanism behind the improved performance remains unclear. In this analysis, we use a linear mixed layer model to develop and test a hypothesis for why coupled models simulate enhanced MJO activity. We investigated the total surface convergence in order to determine the contributions from boundary layer temperature gradients and the free troposphere. A possible conclusion, supported by this analysis, suggests that the winds converge towards the convection, causing oceanic upwelling, lowering surface temperatures, and resulting in SST gradient-driven convergence north of the equator. These interactions provide a potential mechanism by which using coupled models may improve MJO simulation skill.

DOES THE TRANSGENERATIONAL RESPONSE TO FOLIC ACID FOLLOW A SEX-LINKED INHERITANCE PATTERN?

Tenzin Kunsel, Bermans Iskandar (Mentor), Neurological Surgery

Folic acid is a dietary supplement commonly taken by pregnant women because of its effectiveness in preventing neural tube defects. Recent studies from our lab have shown that taking 80 µg/kg of folic acid improves axon regeneration after spinal cord injury, the effect is mediated by DNA methylation, and is inherited by multiple generations. The purpose of this research is to determine the gender of inheritance of the transgenerational response. In one group, we will treat the male of a breeding pair with 80 µg/kg of folic acid, and in another group, we will treat only the female. The 2 groups are bred, and the offspring receive a spinal cord injury and axon regeneration assessed. Preliminary data show that both groups show improvement in the regeneration phenotype in the F1 offspring, but to a lesser extent than when both the male and female are treated. If these results are confirmed in subsequent generations (F2–4), the implications on our understanding of inheritance would be significant.

ALPHA-SYNUCLEIN PATHOLOGY IN GASTROINTESTINAL TRACT IN A RAT MODEL OF PARKINSON'S DISEASE

Meghna Kurup, Michelle Ciucci (Mentor), Surgery

Parkinson's disease (PD) is a neurodegenerative disorder characterized by sensorimotor impairment that stems from widespread pathological alpha-synuclein (a-syn) aggregation and cell death in the central nervous system (CNS). Recent evidence has shown that pathological spread of these aggregates between the enteric nervous system and the CNS occurs, with some proposing that PD begins in the gut and is a gateway to CNS impairment. This study assessed a-syn pathology in gastrointestinal (GI) tissue sections from PINK1 knockout rats, a genetic model of PD, using immunohistochemistry for a-syn aggregation in GI muscle and mucosa, as well as the neuronal complexes controlling them. These data will be the first to demonstrate pathological aggregation of a-syn in the GI tract of the PINK1 knockout rat model.

ENGINEERING GUIDANCE GRADIENTS IN HYDROGEL SCAFFOLDS TO FACILITATE AXONAL GROWTH POST-STROKE

Susanna Kwok, Lindsey Jager (Mentor), Neurology

Following stroke and traumatic brain injury, neuronal death occurs in areas of the brain, primarily the cerebral cortex. Neuronal cell death can result in cognitive and motor deficits that are typically permanent and affect an individual's quality of life. Numerous research studies have shown that neurons and their axons can be guided in vitro by concentration gradients of chemical signaling molecules contained atop or within hydrogel scaffolds. Hydrogel scaffolds administered to infarction sites within the brain have also been shown to improve cell migration into the areas of damage. However, very few studies have been conducted on the combined effects of hydrogels and concentration gradients of chemical signaling molecules in improving the migration and growth of neurons and their axons in vivo. The goal of this study was to conduct a systematic review to analyze current methods in engineering gradient containing hydrogels that may be easily translated from in vitro usage to in vivo use.

PLACE-BASED LEARNING TO PROMOTE STEWARDSHIP

Halle Lambeau, David Hart (Mentor), UW–Extension

This project is centered on the idea of place-based learning, which is the concept of education through interaction with one's environment. Place-based learning is characterized by using nature and the outdoors to teach fundamental information; It is about getting children and young adults out of the classroom to promote a respect for nature. Through the incorporation of the key components of place-based learning, the goal of this research is to develop an interactive activity made available to the public in order to generate an appreciation of the Great Lakes region. This is done by the creation of a project that provides people a look at the unique wildlife inhabiting the ecosystems surrounding the Great Lakes.

EARLY LIFE ADVERSITY, DEPRESSION, AND NEGATIVE MEMORY BIAS

Amy Lang, Heather Abercrombie (Mentor), Psychiatry

Early life adversity (ELA) is associated with depression in adulthood. Negative memory bias is a core feature of depression. This study investigated whether ELA is directly associated with negative memory bias, or if ELA indirectly leads to negative memory bias, as a consequence of the association between ELA and depression. We hypothesized that, in depressed subjects, severity of ELA would be associated with negative memory bias, even after adjusting for depression severity. To date, we have tested negative memory bias in 73 women with varying degrees of ELA and depression severity. Our eventual sample will include 80 women. Upon completion of data collection, we will test whether ELA accounts for variance in negative memory bias, over and above the variance accounted for by depression severity.

OPTIMIZATION OF CATM, A TRANSMEMBRANE PROTEIN STRUCTURAL PREDICTION PROGRAM

Evan Lange, Alessandro Senes (Mentor), Biochemistry

Transmembrane proteins are a class of cellular proteins that span the cell membrane. Due to the difficulties inherent in working with transmembrane proteins in the laboratory, there is a very limited amount of structural information available for these proteins. CATM is a computational tool developed in the Senes lab that predicts the structure and homoassociation energy of single-pass transmembrane helices. It is difficult to test the accuracy of CATM because of the lack of structural data available for transmembrane proteins. To address this, we generated a large library of transmembrane helices using a mass-cloning strategy, measured their propensity for homoassociation, and used the resulting data set to assess and improve the ability of CATM to correctly predict homoassociation levels of transmembrane helices.

MINDFULNESS PREDICTS PSYCHOLOGICAL AND PHYSICAL FUNCTIONING AFTER STEM CELL TRANSPLANTATION

Anna Larson, Erin Costanzo (Mentor), Psychiatry

We examined the extent to which mindfulness predicted psychological and physical functioning following hematopoietic stem cell transplantation (HSCT). Participants (N=111) completed a mindfulness measure pre-HSCT and measures of psychological and physical functioning pre-HSCT and 1, 3, and 6 months post-HSCT. Participants with a better ability to focus on the present moment reported less depression ($z = -5.04, p < .001$), anxiety ($z = -4.32, p < .001$), pain ($z = -2.16, p = .031$), and fatigue ($z = -2.61, p = .009$) following HSCT as compared to less mindful patients. Similar results were found for those who were better able to describe internal experiences. Participants who were nonjudgmental toward internal experiences and those who accepted internal experiences without reacting also had less depression and anxiety. Findings indicate that mindfulness may be a protective factor for psychological and physical functioning post-HSCT.

A TOPOLOGICAL STUDY OF BRANCHED STRUCTURES IN BIOLOGY

Christopher Larsson, Amir Assadi (Mentor), Mathematics

This research is motivated by current problems in biology relating to the patterning of nervous and vascular systems. These systems have exquisitely branched structures with underlying complex dynamics that are coupled at the molecular scale for proper guidance of nerves and vessels. In addition to the mentioned systems in animals, branched structures occur in the root systems of plants and growth patterns of trees. Variation in patterns and growth dynamics of these structures are influenced by the molecular biology of the organisms, inspiring research to discover the common principles underlying their pattern formation.

THE USE OF A NATIONAL SURVEY TO UNDERSTAND PARENTS' PERSPECTIVES OF COMMUNITY SERVICES AND PROGRAMMING FOR THEIR CHILDREN DIAGNOSED WITH FRAGILE X SYNDROME AND/OR AUTISM SPECTRUM DISORDER

Sarah Laudon, Audra Sterling (Mentor), Communication Sciences and Disorders

Autism Spectrum Disorder (ASD), now found in 1 out of every 68 children, is characterized by lack of social reciprocity, communicative difficulties, and repetitive behaviors. Fragile X Syndrome (FXS) is the most common known cause of inherited intellectual disability; children diagnosed with FXS can present with learning disabilities and social and behavioral challenges. These diagnoses can occur together. This study will examine parent perspectives in the services provided to their child with ASD and/or FXS. This will include medical care, Birth to Three services, speech pathology services, as well as literacy benchmarks and goals, IEP planning by their school, and level of independence. Past research has indicated that no large-scale survey covering a variety of treatment services and developmental milestones has been completed.

ANALYZING THE INTERACTION BETWEEN MOLECULAR CHAPERONE SIS1 AND PROTEIN SORTING FACTORS CUR1 AND BTN2

Adam Lauko, Elizabeth Craig (Mentor), Biochemistry

Cellular proteins are inherently dynamic molecules whose misfolding is implicated in serious neurodegenerative disorders, including Alzheimer's and Huntington's. Because of the negative effects of protein misfolding, eukaryotic cells have evolved an elaborate system of Protein Quality Control to remove and recycle damaged proteins. In stressed *S. cerevisiae* cells, the J-protein Sis1 gradually redistributes from the cytosol to the nucleus, a major site of protein degradation. In vivo evidence suggests that Cur1 and Btn2, putative protein sorting factors, are responsible for the redistribution of Sis1. We report here a hydrophobic region on Sis1's C-Terminal Domain-1 that plays a significant role in mediating Sis1's interaction with these sorting factors. This advancement will be helpful in uncovering the complexities of the compartmentalization of misfolded proteins upon acute stress.

PHARAOH'S FABULOUS WEAVE: ARTIFICIAL HAIR IN ANCIENT EGYPTIAN ART

Erin Lawrence, Jeremy Hutton (Mentor), Classical and Near-Eastern Studies

From the Great Sphinx and the golden mask of King Tut, all the way to statues of Cleopatra, ancient Egyptian art is filled with images of royals and elites wearing false beards and wigs. In many cases, the artists clearly denote the artificiality of hair on both men and women. But if a wig is meant to provide an illusion of a sumptuous head of hair, why would the representation of the wig owner clearly betray their secret? By examining art, mummies, and surviving examples of wigs, this presentation will seek to answer this and other questions regarding hair, false hair, and baldness within Ancient Egyptian fashion and its artistic tradition.

ANALYSIS OF DEFECTS IN CRYSTALLINE SILICON-GERMANIUM NANOMEMBRANES

Maja Lazarevic, Max Lagally (Mentor), Materials Science and Engineering

Silicon-Germanium ($\text{Si}_{1-x}\text{Ge}_x$) semiconductor alloys play an essential role in the strain engineering of multilayer thin films for microelectronic devices. However, it is not possible to produce high quality, single-crystalline, bulk SiGe because of the physical limits of crystal growth. SiGe thin films can be epitaxially grown on Si substrates, but the lattice mismatch between the two materials results in a compressive strain in the SiGe film. When grown thick enough, the SiGe releases the strain through the formation of crystalline defects. These defects degrade the material's electronic transport properties. Our research focuses on the analysis of defect concentrations in SiGe made by two growth methods: strain-graded thick films and nanomembranes of varying thicknesses and compositions grown on silicon-on-insulator (SOI). We find that strain-graded SiGe films have defect concentration values high enough to cause poor device performance. This fact motivates the use of SiGe obtained through nanomembrane fabrication. Nanomembranes are thin enough to prevent the formation of defects while providing the necessary lattice parameter for single-crystalline, high-quality, epitaxially grown SiGe thin films. This research works towards the discovery of a new substrate material for flexible, faster, and thinner microelectronic devices.

PROFILING E3 LIGASES: ELUCIDATING UBIQUITIN BRANCHING

Jee Hyeon Lee, Eric Strieter (Mentor), Chemistry

The post-translational modification of ubiquitin, called ubiquitination, controls cellular processes in cells. Ubiquitin can be attached to substrate proteins in form of linked ubiquitin chains. The objective of the project is to understand the extent of branching that can occur with poly-ubiquitin chains and their biological importance in cellular signaling. Human E3 ligases of UBE3C and ARL1 assemble poly-ubiquitin chains. The results lead how signaling pathways are regulated by specific ubiquitin chain formation. Middle-down mass spectroscopy is used to characterize branched ubiquitin chains. The E3 ligases from branched ubiquitin chain have a variety of neurological diseases such as genetic (Angelman Syndrome) and degenerative (Parkinson's) diseases. Thus, uncovering which ubiquitin chains these E3's synthesize is critical towards developing a cellular understanding of the disease and therapeutics.

ASSESSING THE PRENURSING UNDERGRADUATE STUDENT PIPELINE

Pa Zao Lee, Mel Freitag (Mentor), Nursing

The purpose of this research is to identify the unique barriers and challenges of Pre-Nursing students of color as a predominantly White, large Midwestern university. The support the School of Nursing provides are also analyzed to improve pre-nursing students of color experiences. By identifying the challenges that Pre-Nursing students may face, we can connect it to the larger psycho-social factors Pre-Nursing students of color face. Data collected will be from transcriptions of monthly talking focus groups within Pre-Nursing and Nursing students of color and the College Student Inventory Survey that assesses the sense of belonging students feel within the University of Wisconsin Madison community. Pre-Nursing students of color are defined as African American, Latinos, American Indian/Pacific Islander, and Southeast Asian.

PRAGMATIC EFFECTS ON THE INTONATION OF HERITAGE SPEAKERS OF SPANISH

Jay Lema, Rajiv Rao (Mentor), Spanish and Portuguese

The topic of heritage speakers of a language remains a relatively unstudied aspect in the field of linguistics. A heritage speaker is someone who speaks a minority language growing up but transitions to being more dominant in the majority language as they get older. The goal of this research study is to analyze the pragmatics of voicing sarcasm, specifically, how changing intonational patterns affects pragmatic meaning of sarcastic and sincere utterances in heritage speakers of Spanish. To gather data, heritage speakers were recorded saying a set of 15 pre-written responses, created to evoke either a sarcastic or sincere response. These recordings will be analyzed for the pitch range, mean pitch, and speech rate; the findings will then be compared to measurements from native speakers.

CHARACTERIZATION OF COLLAGEN IN BPH

Stephanie Lemancik, Will Ricke (Mentor), Urology

The purpose of this study is to determine potential statistical differences in collagen qualities between two groups of mice. One group was induced with Benign Prostatic Hyperplasia (BPH) and Bladder Outlet Obstruction (BOO) with testosterone (T) and 17-estradiol (E2), and the other group was untreated to act as a control group. The urogenital tracts (UGT) of each group were sectioned and stained with Picrosirius Red to analyze collagen. The programs CT-Fire and CurveAlign were used in order to quantify collagen fiber length, width, straightness, and angle relative to the lumen of the urethra. The preliminary findings are a statistical difference in angle and straightness, which suggests a difference in collagen between the BPH and control groups.

NON-SYMBOLIC SNARC EFFECT

Kimberly Lense, Percival Matthews (Mentor), Educational Psychology

Prior research has revealed the SNARC effect (spatial-numerical association of response codes), whereby humans automatically map numbers to space. We searched for an analog to this effect using non-symbolic fractions (e.g., ratios composed of dot, line, or circle pairs). Participants compared a series of non-symbolic fractions, indicating whether each was larger or smaller than a standard by pressing a response key on the left or the right side of space. Larger stimuli were associated with the right side of space, as indicated by faster reaction times, when they were presented on the right, and smaller magnitudes were associated with the left. These results demonstrate mapping between fraction magnitudes and space, even for these unique displays, extending knowledge on the nature of human number sense.

THE BIOLOGICAL FUNCTION OF THE CGG REPEAT SEQUENCE ASSOCIATED WITH FRAGILE-X SYNDROME

Brad LeVesque, Anita Bhattacharyya Consigny (Mentor), Waisman Center

Fragile-X syndrome is the most common inherited form of intellectual disability. Fragile-X causes mental and physical retardation, as well as developmental delay and autism-like behaviors. It is an X-linked gene; however, it does not follow a typical pattern of inheritance for an X-linked genetic disorder. Fragile-X syndrome is caused by the silencing of the FMR1 gene, due to the expansion of the CGG trinucleotide repeat sequence in its promoter region. The silencing of this gene stops the production of a protein called FMRP, which plays a significant role in healthy neuron development. The biological function of this CGG repeat sequence other than the effect on silencing of the FMR1 gene is unknown. Until very recently, there was not an efficient way to study the function of this trinucleotide repeat sequence. However, new advancements such as the development of neuronal differentiation methods for human embryonic stem cells and new genome editing technology has allowed us to create experimental cell lines with a deleted CGG repeat sequence and compare their expression of the FMR1 gene to human control lines. Our results from qPCR analysis showed statistically insignificant differences in the expression of the FMR1 gene in the experimental CGG deletion lines when compared to the human control lines in the stem cell, neural progenitor, and mature neuron stages. These results lead us to conclude that the CGG repeat sequence does not have a biological function related the FMR1 gene other than its effect on silencing. However, more extensive analysis would be needed to conclude a complete lack of function of the CGG repeat sequence because this sequence, like many other exon sequences, could play a role as a transcription factor of other genes.

CALCIUM SIGNALING: THE INTERFACE BETWEEN MECHANICAL AND PATHOGEN RESPONSE NETWORKS

Gabrielle Li, Simon Gilroy (Mentor), Botany

For many years, scientists have known that plants respond to the environment. If a predator were to attack a plant, unfortunately, the plant cannot simply escape from danger like animals do. Cytosolic Ca²⁺ acts as a mobile signal to transmit information from one cell to another in both the plant's immune and mechanical responses. Calmodulins and CaM-like proteins detect calcium signals. Ca²⁺ signaling in plants is important as it has been shown to regulate responses to a large number of environmental stimuli and control many developmental processes. We hypothesize that there is significant overlap between how plants sense and respond to mechanical and pathogen stimuli. In this lab, we utilize qPCR, microscopy, and pathogenesis assays to study the interface between these response networks.

EMPATHY AND HARM AVERSION IN MORAL DECISION MAKING

Shiying Li, Paula Niedenthal (Mentor), Psychology

To investigate the sources of emotional response in moral dilemmas and how naming affects people's moral decision making, in this proposed research, participants rated their empathetic concerns towards individuals in personal and impersonal moral dilemmas with or without videos when the agent, the saved people, the sacrificed people or no people are named. Participants also rated the permissibility of utilitarian choices given moral dilemmas when the agent, the sacrificed, the saved or no people are named.

APPLICATIONS OF MATHEMATICAL MODELING IN DANCE

Julia Lindberg, Eli Krenzke, Amir Assadi (Mentor), Mathematics

Great advances have been made in modeling mundane human activities from walking to performing simple chores, but modeling finer human movements, such as dance, remains highly challenging research. Furthermore, aesthetics and affective dimensions of dance enhance difficult theoretical and modeling challenges. The objective of this project is to develop novel computational and mathematical tools to investigate ballet movements in the context of Statistical Learning Theory. This objective will be achieved by: (A) Pattern recognition and feature extraction from the analysis of dance (ballet) video data, in order to evaluate accuracy of dance steps. Methods from graph theory, statistical learning theory and topology are used to achieve model reduction, which then relies on Gestalt theory to retain the most significant pieces of information needed for pattern recognition. (B) For correctly executed dance steps, modeling the possible variations of performance by dancers as a mathematical space, which is determined by an information-preserving estimation, the number of statistically independent parameters that determine the space of possible variations of embeddings of certain graphs from (A). Thus, the range of esthetics and artistic dimensions of dance would be approximated by a quantifiable collection of parameters. Furthermore, subjective preferences of individual dance experts could be compared as configuration of points in such an aesthetic parameter (moduli) space. **Conclusions & Significance**—The results of this research contribute to understanding the capabilities and limitations of intelligent systems in learning dance as an art form.

IMPACT OF THE WASTE PRODUCT ACID WHEY ON AGGREGATE STABILITY OF AN AGRICULTURAL SOIL

Daniel Linton, Edward Boswell (Mentor), Biological Systems Engineering

Acid whey (AW) is waste byproduct from cheese production that is currently directed to waste water treatment plants. The principal objective of this study was to investigate the potential for land application of AW in agricultural systems; land application can be a way to return nutrients to the agroecosystems. A major concern with applying this is the impact it would have on soil aggregate stability since AW contains salt and may act as a deflocculating agent disrupting soil structure. In this study, an agricultural soil was treated with varying concentrations of AW ranging from 0% to 318% to determine the impact on soil wet-aggregate stability. Additionally, AW from different cheese varieties was tested. Preliminary results suggest applied concentration rate and type of AW yield different wet aggregate stability measures and the application of digested AW creates measurably more stable aggregates.

TROUBLING RACIAL DISCOURSE: YOUTH, RACE, AND OPPORTUNITY IN MADISON

Tashiana Lipscomb, Amina Iro, Bianca Baldrige (Mentor), Educational Policy Studies

The project seeks to understand the historical and contemporary discourse used to describe Black youth and educational opportunity in Madison, Wisconsin. Although Madison is often lauded as one of the top cities to live and raise a family, the growing discourse on the racial and economic disparities facing Black youth and families creates a contradictory narrative. An examination of the rhetoric and language used in media outlets, as well as the experiences and stories from Black community members and youth, shows that the discourse on race and opportunity is multi-dimensional. The focus of the presentation will highlight data collected from Madison-based newspapers, magazines and other published material as well as various community events.

ARE THERE UNEXPECTED PARALLELS BETWEEN ABSTRACT ALGEBRA STRUCTURES AND BIOLOGY BUILDING BLOCKS?

Sonya Loberger, Laurence Loewe (Mentor), Genetics

While seemingly very different, mathematics and biology share unexpected similarities: a small number of building blocks, a vast complexity, and principles that construct the latter from the former. In biology a few types of atoms, 4 DNA bases, 20 amino acids, etc., combine into the incredible diversity of life. In mathematics a few operations and special elements combine into sequences that can create endless sets and algebraic structures. In biology the viability of a sequence is determined by death; the mathematical equivalent is proof of contradiction. Such proofs could rule out otherwise plausible biological hypotheses and could help design more promising experiments and thus expand the thinking capabilities of biologists, a key goal of the Evolvix language. Here we review the hierarchy of structures from abstract algebra, their axioms, special elements, and operators to explore how they might help model biological diversity.

MUDDIED WATERS: WATER MANAGEMENT IN MMANGWENI VILLAGE, SOUTH AFRICA

Theoren Loo, Michael Bell (Mentor), Community & Environmental Sociology

20 million people in South Africa face a problem of water insecurity where they lack access to clean water and are crippled by waterborne diseases. Lack of infrastructure to deliver and protect potable water to rural villages result in widespread prevalence and transmission of waterborne diseases. This results in an unfair health and economic burden to those who contract infections in rural settings. In this case study of Mmangweni village, surveys were conducted to assess water practices and accessibility in response to the complaints of the prevalence of waterborne diseases voiced in 2013. Additionally, photographs of springs were geotagged and tested for fecal coliforms and a map was created of the village. All primary springs used for drinking water tested positive for fecal contamination and it was found that the majority of community members do not treat water before consumption. This study is the first to investigate the water situation in Mmangweni and provides the community's stakeholders and the South African government data to install water systems to improve quality and accessibility for those living in rural areas on the Eastern Cape.

UNDERSTANDING THE EXPERIENCES OF OLDER ADULTS WITH FREQUENT HOSPITALIZATIONS: A QUALITATIVE STUDY

Julia Loosen, Melissa Dattalo (Mentor), Medicine

Five percent of Americans account for almost half of all health care spending, yet patients with “high-utilization” patterns are underrepresented in research studies. Understanding the goals, values, and perceptions of patients with “high-utilization” patterns is critical to designing effective interventions. The purpose of this grounded theory study was to develop a theoretical model of factors contributing to frequent hospitalizations, grounded in lived experiences of patients and their families. We conducted in-depth interviews with frequently hospitalized patients and any caregivers they identified as important in their health care. Management strategies of patients and caregivers fell into “late reactive”, “early reactive”, and “proactive” categories. Use of these strategies depended on personal thresholds for accessing health care and on expectations of “being listened to” by health care providers.

SRC-FAMILY KINASE FYN IN EPITHELIAL-MESENCHYMAL TRANSITION

Meng Lou, Davalyn Powell (Mentor), Medical Microbiology and Immunology

In recent years, epithelial-mesenchymal transition (EMT) has been increasingly studied in order to understand the role it plays in one of the many hallmarks of cancer: invasion and metastasis. Src-family kinases, including Src and Fyn, are non-receptor tyrosine kinases that participate in many cellular transduction pathways and have been shown to be overexpressed in several epithelial cancers. When expressed in a constitutively active form, Src-family kinases have also been demonstrated to induce malignant transformation in several models including the larval zebrafish. Overexpression of constitutively active Fyn in zebrafish keratinocytes results in abnormal cell shape changes and protrusions reminiscent of malignant transformation. Here we amplify the phenotype in zebrafish epithelial cells through the utilization of p53 tissue-specific mutants generated by driving expression of a CRISPR guide targeting the p53 gene known to be essential for tumor suppression under the keratinocyte-specific krt4 promoter. Mutations in p53 are common within tumors and this tissue-specific disruption of p53 along with expression of constitutively active Fyn will provide a better model for human disease.

INVESTIGATION OF ALLOSTERIC COMMUNICATION ACROSS PROTEINS VIA MUTAGENESIS

Wanying Lou, Megan Leander (Mentor), Biochemistry

Characterization of mechanisms involving allostery offers a novel aspect to protein structure and function at the molecular level. Allostery explains the process by which a binding event at one site leads to activation of activity at a distal site within the same protein; a change in quaternary structure is elicited. Site-to-site allosteric communication plays a key role in signal transduction pathways, transcription regulation as well as metabolism. The mechanistic foundation behind allosteric communication is poorly understood and should be further explored to reveal its phenomenal behaviors and functional capabilities. Our goal is to develop and explicate an allosteric network to provide further insight to fundamental principles of allostery. Our proposed method to study and dissect allostery communication includes performance of deep mutational scanning, also known as mutagenesis. This approach integrates massive systematic protein mutations with high throughput DNA sequencing to establish an extensive map of allosteric residues. By using mutagenesis, we will identify intrinsic properties, behaviors of protein, and characterize its function. The development of this novel allosteric network and characterization of its regulatory mechanisms via mutagenesis can greatly contribute to drug design, influence protein engineering, and advance medical biotechnology.

EFFECTS OF MATERNAL STRESS ON NEONATE HIPPOCAMPAL VOLUME

Megan Lucas, Andrew Alexander (Mentor), Medical Physics and Psychiatry

Parental stress is an important aspect of early brain development, however, few studies have examined the effects of parental stress on the infant brain. This research project aims to investigate how maternal stress influences the early maturation of the brain, in particular the hippocampus. Utilizing magnetic resonance imaging (MRI) and atlas-based segmentation, measurements of left and right hippocampal volumes were obtained from one-month-old infants. Maternal stress measures were derived from the Parental Stress Index (PSI) questionnaire. We expect to see a negative correlation between maternal stress scores and hippocampal volume in the infants. Considering that the hippocampus is integral in memory and learning, understanding the relationships between maternal stress and hippocampal volume is critical to advancing knowledge about how stress influences early child development.

EFFECTS OF MEDIA ON EMBRYONIC STEM CELL GROWTH AND DIFFERENTIATION

William Lundeen, Ei Terasawa-Grilley (Mentor), Pediatrics

Gonadotropin Releasing Hormone (GnRH) is essential for reproductive function. The ultimate goal of this study is to generate GnRH neurons from human embryonic stem cells. Growth of embryonic stem (ES) cells requires a specific medium condition. As the first step toward my goal, the effects of three media on ES cell proliferation and differentiation will be compared. ES cells will be exposed to three media, TESR, in house E8, and E8 provided by WiCell, for several weeks and the health of ES cells growth rate (reaching confluence) and differentiation rate will be compared. Preliminary data indicates that TESR and WiCell E8 media appear to be better than in house E8. The findings of this study will provide a solid base for the ultimate goal.

STUDYING THE EFFECTS OF MDS MUTATIONS IN HSH155 AND PRP21 ON THE SPLICING OF INTRONS

George Luo, Aaron Hoskins (Mentor), Biochemistry

Recently, studies have shown mutations in genes associated with the spliceosome are linked with certain types of Myelodysplastic Syndromes (MDS). Specifically, mutations in SF3B1 and SF3A1, U2 snRNP associated splicing factors, have been found in a number of MDS cases. SF3B1 is thought to bind pre-mRNA along with Prp21 and to help link U2snRNP to the intron. In our research, we investigated the corresponding mutations in the *S. cerevisiae* homologs, Hsh155p (homolog of SF3B1) and Prp21 (homolog of SF3A1), which are well-conserved between humans and yeast. We have introduced MDS-related mutations into *S. cerevisiae* HSH155 and Prp21 and carried out Reverse-Transcription Polymerase Chain Reaction to look at splicing efficiency of certain pre-mRNA in wild type and mutant *S. cerevisiae*. Determining how these mutations affect splicing in yeast will help us not only better understand the essential roles of the Hsh155p and Prp21p proteins but also provide clues to how these mutations may lead to MDS in humans.

SHIFTS IN WINTERTIME PROCESSES AND INDUCED CHANGES TO SOIL AGGREGATION AND MICROBIAL CARBON

Madalyn Lupinek, Edward Boswell, Nicholas Balster (Mentor), Soil Science

Understanding the effect of anthropogenic changes on the earth's carbon cycle requires investigating the role of soil to sequester carbon. Climate change models predict shifts in wintertime processes, such as the amount of snow cover, which are likely to affect soil carbon dynamics. The relationship between soil aggregation and microbial processes is a primary component of carbon cycling in soil. This study will investigate the biophysical role of microbes in soil aggregation relative to changes in freeze-thaw cycles by quantifying microbial biomass carbon. I'll be presenting microbial biomass C data from soil samples collected in fall 2015 and spring 2016. These data will improve our understanding of the impact of wintertime processes on the interaction between soil microbes and soil aggregate dynamics.

STUDY OF THE EFFECTS OF HYPEROXIA ON MITOCHONDRIAL FISSION AND FUSION

Gina Luu, Kara Goss (Mentor), Pulmonary Medical Clinic

The research aims to understand how postnatal hyperoxia exposure alters fusion or fission in right ventricle tissue of animals exposed to hyperoxia conditions. Fission and fusion are crucial in preserving mitochondria when cells experience stress. Fusion mixes partially damaged mitochondria as a form of complementation. Fission makes new mitochondria, but also enables removal of damaged mitochondria and facilitates apoptosis during high levels of stress. The method is using protein estimations to prepare samples. These samples are run through gel electrophoresis to determine which proteins are up or down regulated in correlation to mitochondria. The expected result is an increase in fission, creating new healthy mitochondria, attempting to repair damage from hyperoxia. Postnatal hyperoxia exposure affects normal mitochondrial development and may result in cardiovascular disease.

DE NOVO SYNTHESIS OF ALL STEREOISOMERS OF 2,3,6-TRIDEOXYHEXOPYRANOSIDES AND THEIR OLIGOMERS

John Lynch, Weiping Tang (Mentor), Pharmaceutical Science

All possible stereoisomers of 2,3,6-trideoxyhexopyranosides are prepared from readily available furan derivatives. This approach gives quick access to over 4000 possible stereoisomers of four unit pyranosides in 11 steps and narbosine B derivatives in 7 steps.

DECONSTRUCTING CONSTRUCTIONS OF DOMESTICITY: AN EXAMINATION OF THE LADIES' HOME JOURNAL IN THE 1950S

Anna Lynn, James Baughman (Mentor), Journalism & Mass Communication

This research examines a segment of the Ladies' Home Journal called "How America Lives" in the 1950s. This research focuses on this segment in order to explore how the magazine constructed ideas about domesticity in America during middle of the century. This research was conducted through a random sampling of "How America Lives" in the Ladies' Home Journal from 1950–1960, in addition to an in-depth examination of several secondary sources. This examination of "How America Lives" revealed a complex definition of domesticity that emphasized a heightened sense of duty to one's family while offering insights intended to empower women in the home. This research sheds light upon the Ladies' Home Journal's construction of domesticity as well as potential economic motivations for this construction.

AN EXAMINATION OF HEALTH EQUITY AND SOCIAL INCLUSION IN THE NATIONAL SCHOOL LUNCH PROGRAM

Julia Machgan, Toni Castro, Elizabeth Schnee, Kelly Weldon, Maddie Wilinski, Jennifer Gaddis (Mentor), Civil Society and Community Studies

The National School Lunch Program (NSLP) represents America's standpoint on child nutrition, which largely ignores health disparities and chemical additives. We conducted a literature review of the NSLP, and compared it to leading programs worldwide, finding that additives in American 'heat-and-serve' foods disrupt the endocrine system and pose health risks. Additionally, our analysis of the NSLP's free and reduced-price meal qualifications indicates a history of institutional racism. Given that over 31 million children rely on the NSLP, it is incumbent on the government, private sector, and local communities to provide healthful school meals. By inducing changes to the sourcing, structure, and goals of the NSLP, we argue that community activism can reduce social exclusion and spark a transition to culturally appropriate and biochemically safe ingredients.

DERIVATION OF BRAIN MICROVASCULAR ENDOTHELIAL CELLS FROM PLURIPOTENT STEM CELLS IN A DEFINED SYSTEM

Shaenah Maguire, Eric Shusta (Mentor), Chemical and Biological Engineering

Brain microvascular endothelial cells (BMECs) play an important role in maintaining the blood brain barrier (BBB). Tight junctions and specific transport systems that characterize BMECs prevent most molecules from being able to cross this barrier into the brain. A defined differentiation protocol to generate BMECs from pluripotent stem cells would allow a powerful platform for high-throughput pharmaceutical screening, the study of BMEC transport mechanisms, and diseases that have been associated with a loss of BBB integrity, such as Alzheimer's and Parkinson's disease. Small molecule treatment was used to drive differentiation through a mesodermal lineage, reflective of in-vivo development. Extensive characterization of intermediate markers and mature BMECs suggests that this protocol can be used to produce BMECs and has the potential to revolutionize their study.

DETECTION AND CHARACTERIZATION OF LISTERIA MONOCYTOGENES MUTANTS WITH CYTOSOLIC GROWTH DEFECTS

D'Antonio Marc, JD Sauer (Mentor), Medical Microbiology & Immunology

Intracellular pathogens have a remarkable ability to live inside mammalian cells, but what is required for pathogens to colonize the intracellular environment of host cells is poorly understood. *Listeria monocytogenes* is an intracellular pathogen specifically adapted to replicate in the host cytosol. To better understand the genetic and metabolic factors essential for *L. monocytogenes*' cytosolic survival, we performed a genetic screen to identify novel virulence genes in *L. monocytogenes*. *L. monocytogenes* mutants with intracellular replication defects were isolated using a classical methicillin selection assay designed to eliminate actively growing bacteria. Of approximately 300 mutants identified in the primary screen, I was able to confirm intracellular methicillin resistance of 12 mutants and have since full-genome sequenced and identified 2 causative mutations. The goal of this proposal is to further characterize these intracellular replication defects in order to better understand the genes that facilitate virulence adaptations of *L. monocytogenes* and other intracellular pathogens

PERIOD EVOLUTION OF DOUBLE WHITE DWARF BINARIES UNDER THE INFLUENCE OF GRAVITATIONAL RADIATION

Kylee Martens, Snezana Stanimirovic (Mentor), Astronomy

Compact objects, such as Double White Dwarf (DWD) binaries, are the most populous producers of gravitational waves (GW) at low frequencies. The gravitational radiation (GR) emitted from the Galactic DWD binary population will create an unresolvable signal known as the confusion noise-limit in the space-based evolved Laser Interferometer Space Antenna. We have created an evolutionary code that continues the period evolution of the DWD binaries under the effects of GR in order to determine the signal amplitudes we expect to see in the space-based detector as a result of the many thousands of resolvable DWD binary signals. Current period evolution models often extrapolate data based on smaller binary populations, however our model will utilize ~ 61 million unique binary systems in order to avoid inaccuracies.

ROLE OF AF9 IN THE REPROGRAMMING OF MOUSE EMBRYONIC FIBROBLASTS

César E. Martinez, Rupa Sridharan (Mentor), Cell and Regenerative Biology

There are over 200 cell types in the human body, all with identical genomes, that behave and function very differently due to their unique epigenetic code. Differentiated cells can now be reprogrammed to become induced pluripotent stem cells (iPSCs), which are highly similar to embryonic stem cells, when exposed to a specific set of transcription factors. iPSCs can be used as tools for disease modeling, drug screening, and cell transplantation therapies. However, reprogramming is an inefficient process: pluripotent stem cells have considerably different epigenetic codes when compared with differentiated cells. Our goal is to overcome epigenetic barriers to reprogramming. Disruptor of telomeric silencing-like protein 1 (DOT1L) is an enzyme that methylates histone 3 at lysine 79 (H3K79me). Knocking down DOT1L has been shown to increase reprogramming efficiency, suggesting that H3K79me is an epigenetic mark that prevents a cell from becoming pluripotent. AF9 interacts with DOT1L, facilitating its ability to methylate. For this reason, I will study how disruption of endogenous AF9 expression affects DOT1L activity in the reprogramming process.

TECHNOLOGIES OF PARTICIPATORY GOVERNANCE IN PUTIN'S RUSSIA

Kevin Mason, Hannah Chapman (Mentor), Political Science

How do non-democracies remain in power? Many scholars have analyzed non-democratic tactics to remain in power through cooptation and coercion. This project focuses on non-democracies use of participatory technology to maintain legitimacy. Participatory technology is defined by as, 'Communication technologies that promote increased interaction, not passivity, between the public and individuals in power—in order to selectively engage its citizens in the political process,' (Chapman 2016). I have written a literature review titled: Media and Information Manipulation in Non-Democracies. I will conduct a case study on the forms of participatory technology in China, and how it affects the citizens and government. Additionally, I will conduct content/discourse analysis of "The Direct Line with Vladimir Putin," to ultimately analyze the effect of the participatory-technology on the citizens/regime.

VISUAL ATTENTION AND LEXICAL PROCESSING IN INFANTS

Janine Mathee, Jenny Saffran (Mentor), Psychology

Previous research has shown that infants are highly susceptible to visual salience when learning new words, and that this influence diminishes as children develop. This study aims to determine whether infants are similarly affected by visual salience when processing familiar words. Learning and recognizing words requires infants to integrate both auditory and visual stimuli. This study employs the Looking While Listening method to examine the relationship between infants' visual attention and their processing of auditory input. In addition, we are investigating the potential effects of vocabulary size and age on the degree to which infants' language processing is affected when their visual attention is disrupted.

DRAWING ACROSS MEDIA

Mary Matoba, Ashley Haut, Chrystal Lee, Mary Matoba, John Millerhagen, Porter Pavalko, Danielle Peters, Kailey Sabel, Heather Kirkorian (Mentor), Human Development and Family Studies

The purpose of this study was to examine how different mediums affects the processes and outcomes of drawings. We recruited children ages 2–7 yrs (N = 82) with an adult comparison group (N=24). All participants drew once with a marker and paper, once with a stylus and tablet, and once with their finger on a tablet. In each condition, they were asked to copy 4 familiar shapes and 2 novel shapes. We observed a reduction in children's drawing quality when drawing novel shapes on tablets using a finger compared to drawing them with either a marker or a stylus, suggesting that the type of medium may influence children's drawing, especially when drawing unfamiliar shapes that require more planning.

EFFECTS OF QDA SOFTWARE CONSULTING ON UW EXTENSION EDUCATORS' USE OF QUALITATIVE DATASETS

Ezad Mazlan, Christian Schmieder (Mentor), UW-Cooperative Extension

The purpose of this project is to determine how educators in the UW-Cooperative Extension respond to software consulting pertaining to MAXQDA, a professional software for qualitative and mixed methods data analysis. Specifically, our goal is to identify effective software teaching practices in changing the analytic habits and self-confidence of educators. The first phase of the project focuses on designing survey questions for developing an online tool, a questionnaire produced using the Qualtrics software to aid in evaluating educators. The final phase involves in revising questions from preliminary findings, to improve the online tool and better evaluate the educators' progress. The creation of the online tool seeks to improve analysis on educators when it comes to using qualitative data for decision-making, program evaluation and organizational learning.

THE MODERATION OF PARENTAL MONITORING ON ANGER AND AGGRESSION

Cassidy McBee, Hill Goldsmith (Mentor), Psychology

Anger and aggression are related, and variables such as hostile attributional style, low self-esteem, and rumination moderate this relationship (Runions & Keating, 2010; Turner & White, 2015; Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005). Pederson and Fite (2014) found that poor parental monitoring (i.e., little awareness of child's whereabouts and who they are with) is associated with an increase in oppositional defiant disorder (ODD) symptoms in adolescents. However, whether parental monitoring moderates the link between anger and aggression remains unknown. We study this possibility using a combination of self-reported anger and aggression, as well as parent reported anger, aggression, and parental monitoring from a sample of 994 twins at ages 7 and 14 years. We will use linear regression analyses to test the hypothesis that increased parental monitoring weakens the link between anger and aggression.

INVESTIGATING THE PHYLOGENY OF FIBROBACTER ISOLATES FROM VARIOUS HERBIVORES

Caroline McCormick, Anthony Neumann (Mentor), Bacteriology

Herbivorous animals rely on a symbiotic microbiota to assist in their digestion of plant material. Molecular evidence of bacteria in the genus *Fibrobacter* is consistently observed in these microbial communities, but cultured representatives are rare. With intentions of gaining insight into this poorly understood genus, we have isolated 35 distinct strains of *Fibrobacter* from eight different herbivorous hosts. Phylotyping of these isolates was done using a multi-locus sequence typing (MLST) approach consisting of DNA sequencing targeted to conserved regions of the prokaryotic genome. Our results show that there is genetic host association present in our *Fibrobacter* isolates, particularly concerning the isolates recovered from horse feces and the cow rumen. These data provide insight into species-specific host-microbe relationships important for nutrition and health in herbivores.

ENJOYABLE CONVERSATION TOPICS OF YOUNG ADULT DATING VS. MIDLIFE EMPTY NEST COUPLES

Katherine McGrath, Amanda Ali, Lauren Papp (Mentor), Human Development & Family Studies

We are interested in looking at which topics of enjoyable conversation are highest rated by young adult dating couples, ages 18–25 (n=100), and midlife couples in the “empty nest,” ages 43–57 (n=110), whose children have left the home. Our project draws from two larger research projects conducted in the UW-Madison Couples Lab. A lab-based survey, Lowell Krokoff’s self-report inventory of Enjoyable Conversations (Coan & Allen, 2007) will be analyzed to find average ratings of each enjoyable topic. We expect plans for the future will be rated highly by young adult dating couples relative to other enjoyable topics, while the topic of children will be rated highly by midlife empty nest couples (Fingerman et al., 2015).

HEROS AND KINGS: THRACIAN-GREEK CROSS CULTURAL INTERACTIONS

Margaret McLaughlin, Nick Cahill (Mentor), Art History

In the 5th century BCE, the ancient Greek historian Herodotus claimed that “the population of Thrace is greater than that of any country in the world except India. If the Thracians could be united under a single ruler, or combine their purpose, they would be the most powerful nation on earth, and no one could cope with them. Since, however, there is no way to bring this about, they are weak” (5.3). Throughout the 5th century, a number of Thracian nomadic tribes did unite, forming the Odrysian kingdom, which lasted until the 1st century CE. Although the entirety of Thrace was never united under one king, the Odrysians gained more power and wealth than did any single Thracian tribe. Through my research I hope to elucidate the role of art in expressing Thracian identity during their transition from nomadic tribes to a kingdom. Tombs produced during the Odrysian’s reign combine artistic traditions from several different cultures—most noticeably Greek—while still retaining the Thracians’ traditional funerary practices. For example, the painted coffers of the 4th c. BCE Ostrusha tomb including depictions of Bellerophon and Thetis draw on Greek artistic motifs and mythological iconography, while the presence of a horse burial with silver and gold armor preserves Thracian rituals. A close examination of these interactions can lead to a better understanding of the complexities of cultural exchange and reception throughout history.

EFFECTIVENESS OF ALTERNATIVE HOUSEKEEPING GENES IN PROSTATE CANCER PROGRESSION

Sean McSweeney, Jordan Vellky (Mentor), Surgery and Urology

Studying gene expression changes through prostate cancer (PrCa) progression is an important tool for identifying biomarkers and developing therapies; however, direct comparisons between PrCa cell line models have not been possible due to the disparity between the sources of current cell lines. Using a novel progression cell line (BCaP) derived from a single cell, we can investigate these differences through progression. Glyceraldehyde-3-phosphate dehydrogenase (GAPDH) has long been used as a housekeeping gene for PrCa research. Data from BCaP cell line suggests variable GAPDH expression. We have identified possible alternatives to GAPDH as better housekeeping genes including: RPLP0, YWHAZ, GUSB, B-ACT, and TBP. Using Q-PCR, Western blotting, and meta-analysis, we are investigating the effectiveness of these alternative housekeeping genes through PrCa progression.

EXPOSURE TO GERMAN AS A SECOND LANGUAGE AFFECTS LANGUAGE PROCESSING IN NATIVE ENGLISH SPEAKERS

Emily Mech, Margarita Kaushanskaya (Mentor), Communication Sciences and Disorders

Proficient bilinguals simultaneously activate each of their languages, even when immersed in a single language. To investigate if second language (L2) speakers of varying proficiency also process their languages in parallel, an auditory lexical decision task using English-German homophones (words that share sounds across languages) was administered to German L2 speakers and English-only speakers. Preliminary analyses indicated that German L2 speakers were slower and less accurate in response to homophones as compared to control words, indicating cross-linguistic activation. Additionally, the degree of cross-linguistic activation varied with German proficiency, with more proficient participants showing the highest level of cross-linguistic activation. These trends show that the L2 may influence auditory lexical processing in the L1, suggesting that experience with a second language may alter people's language representations.

FREQUENCY DEPENDENCE OF BINAURAL INTERACTION IN THREE AUDITORY EVOKED POTENTIALS

Noah Meester, Cynthia Fowler (Mentor), Communication Sciences and Disorders

The binaural interaction components (BIC) of the Auditory Brainstem Response, Middle Latency Response, and Late Latency Response are representations of binaural processing in areas of the brain. Binaural processing enables the brain to interpret speech in noisy backgrounds and locate sounds, and advances in binaural research are conducive to diagnosing auditory communication disorders. Using 500 and 2000hz tone pips and a nonsense syllable as the stimuli, this study aims to investigate the normal BIC response in the three auditory evoked potentials. Amplitudes and latencies of the waves will be the significant sources of analysis for each participant and the study as a whole. Further research is necessary to support the existence of a potential difference in binaural hearing ability between normal, infant, and aging participants.

PREVALENCE OF CULTURABLE ACETOIN-PRODUCING RHIZOBACTERIA IN AN ORGANIC NO-TILL VEGETABLE FIELD

Colton Meinecke, Amy Charkowski (Mentor), Plant Pathology

Acetoin, a product of the 2,3-butanediol pathway in bacteria, acts as a signalling molecule, contributing to growth and induced systemic resistance in plants and to pathogenesis in soft rot pathogens *Pectobacterium carotovorum* and *Dickeya dadantii*. To understand the abundance of acetoin-producing rhizobacteria in the bulk soil and rhizosphere, bacteria were isolated from the rhizosphere, rhizoplane and as root endophytes of peppers and beans grown in untilled rye-covered or tilled bare ground plots. Acetoin production was identified in 18% of isolates and 65% of samples, most commonly in rhizosphere isolates. Locational variance was not observed in most other measured phenotypes. Soft rot bacteria were identified by 16S rDNA sequence. Our findings demonstrate that acetoin-producing bacteria are abundant in agricultural soil within the rhizosphere.

A DIFFUSION APPROACH TO THE COALESCENCE TIME IN EXPANDING POPULATION

Zicheng Men, Wai-Tong Fan (Mentor), Mathematics

The motivation of this research is to find a spatially correlated approach to model the genealogies in expanding population. We focus on studying the coalescence of the lineages of randomly picked samples near the wavefront of the expanding population. Specifically, when and where did the coalescence occur? By Hallatschek and Nelson (2008), the lineage dynamics can be approximated by diffusions under fairly general conditions on population dynamics. Therefore, we model the lineage dynamics of two individuals sampled near the wavefront by two-dimensional Brownian motions. Under this approach, coalescence time and position are calculated using the hitting distribution of the two-dimensional Brownian motion. We study asymptotes of the hitting distribution to gain insight into the relation between the shape of the wavefront and the lineage coalescence.

REPRESENTATIONAL RICHNESS AND LEARNING ABOUT BIOLOGICAL CHANGE

David Menendez, Karl Rosengren (Mentor), Psychology

Life cycle diagrams are commonly used to teach children about metamorphosis. However, the amount of details in these graphs may distract children from the the relevant information. We tested first graders and undergraduates on their endorsement of different types of change (growth, color change, metamorphosis, and species change). Following this, participants were randomly assigned to receive a lesson with either a perceptually bland or rich diagram of a ladybug, an organism that many people do not know undergoes metamorphosis. Finally, we tested children's ability to endorse different types of changes. The overall goal of the study was to see if different types of representation promoted greater generalization of knowledge. We hypothesize that children that received the lesson using the bland diagram will show more learning and transfer.

SHADES OF GRACE

Tiffany Merritt-Brown, Marlene Skog (Mentor), Dance

"Shades of Grace" explores grace in regards to racial relations within the context of contemporary choreography using movement, music, and discussion. My overall approach was to create an aesthetically pleasing work that brought awareness about the need for grace in navigating race relations for both performers and audience. The final product is a work that creates a personal experience for the performers onstage and dialogue for the viewers in the audience.

PURL TYPEFACE

Grace Meurer, Dennis Miller (Mentor), Art

This project is inspired by my love for knitting. I aimed to create a typeface that would function both as a knitting pattern and a legible typeface. My typeface includes an ornamental weight, a display weight, six text weights, and a set of dingbats, which are decorative characters. The typeface started out as sketches on graph paper, which were brought into a digital environment to be refined. The drawings were imported into a program called Fontographer, which was used to format the letters and symbols to their respective keystrokes. The most successful portion of this project is the set of dingbats, as they can be used to create an unlimited number of playful patterns.

ASSESSING COMMUNICATION IN THE DELIVERY OF QUALITY PRENATAL CARE IN DANE COUNTY

Glennie Mihalovic, Sheryl Coley (Mentor), Obstetrics and Gynecology

Improving delivery of prenatal care services has become increasingly important for achieving health equity and reducing birth outcome disparities. To address this concern, we are assessing prenatal communication as one component of a larger qualitative study on prenatal care. By analyzing a diverse sample of mothers, we can determine the role of communication in mothers' standards of quality care. The narratives of mothers' perspectives on quality care were acquired by conducting semi-structured interviews with mothers of varying socioeconomic status who gave birth in 2015 in Dane County (n= 20). These narratives were then analyzed by extracting sections and searching for common themes of prenatal communication, positive and negative interactions with providers, and suggestions for future improvements. Common themes include having providers who gain mothers' trust, patiently listen, fully answer questions and address concerns. These commonalities suggest that Dane County mothers' value provider communication that empowers patients in their decision-making processes during pregnancy and respect mother's choice to forego undesired interventions. By improving communicative practices during prenatal care, productive steps can be made toward enhancing the overall quality of care for all.

CHILDREN OF INCARCERATED PARENTS: EXAMINING FAMILY REPRESENTATIONS THROUGH CHILDREN'S DRAWINGS

Zoe Milavetz, Lexi Frerks, Julie Poehlmann-Tynan (Mentor), Human Development and Family Studies

Following decades of mass incarceration, 5 million U.S. children now have a coresident parent who has spent time incarcerated (Murphey & Cooper, 2015). The present report, which is part of a larger study of families affected by parental incarceration, included 69 children, 3 to 6 years of age. The child was asked to draw a picture of his or her family. Children's drawings were coded with the Family Drawing Code Manual (Fury et al., 1997). Variables coded include: vitality and creativity, family pride and happiness, vulnerability, emotional distance and isolation, tension and anger, role reversal, bizarreness and dissociation, and global pathology. Knowing more about these relationship processes during parental incarceration may inform intervention programs designed to help children and families cope with this challenge.

ALLEN'S RULE AND THE IMPACT OF WARMING WINTERS ON NORTHERN CARDINAL MORPHOLOGY

Colleen Miller, Benjamin Zuckerberg (Mentor), Forest and Wildlife Ecology

Allen's rule predicts which species have larger appendages relative to body size in warmer climates to control thermoregulation. While studies demonstrating larger bird bill size in southerly latitudes generally support Allen's rule, little evidence remains for temporal changes. Over the past 75 years, winter temperatures have increased steadily in much of the United States. The resident Northern Cardinal (*Cardinalis cardinalis*) has responded to climate change through a northward range expansion, yet little information exists on evolutionary morphological changes. I hypothesize Northern Cardinal bill size has increased in warming regions over the past 75 years. By measuring museum specimens' bill size across this period, I found bill surface area has increased significantly over time. These preliminary findings suggest the warming climate may promote such morphological changes.

FMRP REGULATION OF ADULT NEURAL STEM CELLS, NEURONAL PRODUCTION AND COGNITIVE ABILITIES

Jessica Miller, Xinyu Zhao (Mentor), Neuroscience

Fragile X syndrome (FXS), the most common form of inherited intellectual disability, is caused by the lack of fragile X mental retardation protein (FMRP). FMRP loss leads to reduced neurogenesis in the adult hippocampus. Our lab has previously shown that this impaired neurogenesis is associated with learning deficits. However, how FMRP regulates adult neural stem cells (aNSCs) remain unknown. In this project, we discovered that FMRP deficiency resulted in over-activation of aNSCs, which subsequently leads to reduction in neuronal production, and cognitive deficits in mice. We found that impaired neurogenesis becomes more profound in older *Fmr1* mutant animals. We are investigating the underlying mechanism and potential treatment scheme for fragile X syndrome using these mouse models.

THE EFFECT OF INTEGRATED MENTAL HEALTH AND PRIMARY CARE FOR WI PATIENTS WITH SEVERE MENTAL ILLNESS

Chelsey Minten, Nancy Pandhi (Mentor), Family Medicine and Community Health

Mental health disorders are the third most costly medical condition in the United States, and those with severe mental illness (SMI; bipolar and psychotic illnesses) suffer from disproportionate medical burdens, such as decreased life expectancies. One approach to managing SMI is integrating behavioral health care into primary care. The objective of this study is to investigate how integrated care affects health care use, cancer screening, and diabetes preventive care. Electronic health record data will be used to compare these outcomes in one health system delivering usual primary care and another system using integrated primary care. Statistical analyses will be performed in Stata. The long-term goal of this research is to improve the delivery of mental health care in Wisconsin for patients with SMI.

PARTICLE SIZE ANALYSIS: A COMPARISON OF METHODS

Sanober Mirza, Erika Marin-Spiotta (Mentor), Geography

The distribution of soil particle sizes, or soil texture, can help predict soil physical and chemical properties, including water holding capacity and organic matter content, which influence nutrient cycling and the biosphere. Soils with greater proportions of clay and silt-sized particles often contain more organic matter than sandy soils. Measuring soil texture is done through three methods: the pipette method, the hydrometer method, and laser diffraction. In this study, we compared the traditional pipette method with the newly-accepted laser diffraction technique. We compared clay, silt, and sand content measurements in nine tropical soils developed from different parent materials under various climates. We tested for correlations between texture and organic carbon to build a predictive model for estimating soil carbon content.

APPLICATIONS OF PERCEPTUAL GEOMETRY AND GESTALT THEORY OF MOTION IN MODELING VISUAL PERCEPTION

Bhawesh Mishra, Hamid Eghbalnia, Amir Assadi (Mentor), Mathematics

Reconstruction of 3-dimensional (3D) representations from partial views belongs to the class of Inverse Problems in Computational Sciences and Mathematics. The method of solution has major applications in computer graphics, robot vision and medical imaging. The 2D reconstruction, which is at the heart of 3D reconstruction, already encounters challenges in estimation of texture, shading and other surface properties. This project proposes a novel approach to the reconstruction of surfaces by posing it as a learning theory problem from the viewpoint of the observer's sensory experiences. We propose that the solution to surface reconstruction is relative to the individual's frame of reference and sensory experiences. Our model employs perceptual geometry, Gestalt theory and statistical learning theory to design the observer's adaptive response to perception of space, surfaces and their motion. The observer learns by establishing correlation, causal relationships and optimal statistics between the stimuli and their effect on the physical world. We have a realistic chance of achieving a new method for reconstruction because Gestalt theory is accessible, both experimentally and computationally.

MGAT2 DEFICIENCY AND BILE ACID SIGNALING

Jackson Moran, Chi-Liang Yen (Mentor), Nutritional Sciences

Acyl CoA: monoacylglycerol acyltransferase 2 (MGAT2) is a potential intervention target for obesity treatment and prevention. Genetically engineered MGAT2 deficient (Mogat2^{-/-}) mice exhibit protection from diet-induced obesity due to increased energy expenditure, but the basis for this phenomenon has not been elucidated. Bile acid (BA) signaling has recently been linked with modulation of systemic energy expenditure. This study found that Mogat2^{-/-} mice have elevated plasma BA concentrations, but no difference in liver, ileum or fecal BA concentrations. Mogat2^{-/-} mice also exhibit altered mRNA expression of genes involved in BA signaling and transport in the liver and ileum. These findings raise interest in altered BA signaling as a mechanism for the increased energy expenditure observed in MGAT2 deficient mice.

DO SEED TRAITS MEDIATE PLANT COMMUNITY CHANGES IN WISCONSIN'S UNBURNED PRAIRIES?

Christopher Morgan, Jesse Miller (Mentor), Zoology

Historically, both natural and man-made fires have burned their way across North American prairies, providing a necessary disturbance that grassland systems are adapted to. With human activity fragmenting these prairies at an accelerated rate since the 1950s, the few prairies that do remain are often fire suppressed, and woody plant species with larger seeds may have a competitive advantage under contemporary conditions. This study seeks to quantify the mechanisms underpinning biodiversity loss from invading woody plants in order to better understand prairie alteration and disappearance. To do so, we investigated the effects of functional seed traits, fire history, and surrounding land use, ultimately providing valuable information on best management practices for prairies and solid evidence on the effects of landscape conversion on our natural ecosystems.

FOOD SELECTIVITY IN CHILDREN WITH AUTISM SPECTRUM DISORDER: CAREGIVER PERSPECTIVE

Jessica Muesbeck, Karla Ausderau (Mentor), Kinesiology

Children with autism spectrum disorders (ASD) are commonly characterized as having feeding challenges with the most common difficulty described as food selectivity. In the literature, food selectivity is poorly defined due to its array of meanings and resulting impact on the child. The objective of this study was to review current selective eating definitions in the literature as well as interview caregivers to work toward constructing a clear and applicable definition of food selectivity in children with ASD. Eleven families with children diagnosed with ASD and feeding problems between 2–7 years of age participated in 2 to 3 semi-structured interviews in their homes. Using thematic analysis, five primary themes were noted: limited number of foods in diet, food jaggging, sensory aversion properties, nutrition, and mealtime rigidity. The multiple themes reflecting the literature and parent interviews suggest food selectivity is a more complicated phenomenon when embedded in family contexts than a simple quantitative number of foods in a child's diet. By recognizing multiple dimensions of food selectivity, related child feeding behaviors may be better characterized and addressed through family-centered interventions that encourage mealtime participation and health promoting diets. Keywords: Autism, food selectivity, definition

UNDERSTANDING THE PATHOLOGY OF COGNITIVE DEFICITS IN PARKINSON'S DISEASE USING A PINK1 -/- RAT MODEL

Haleigh Mulholland, Michelle Ciucci (Mentor), Surgery

Parkinson's disease (PD) is a neurodegenerative disorder characterized by progressive deficits in motor function over time. PD also has a preclinical period during which patients experience deficits in mood, arousal, learning and memory. The underlying pathology of these deficits is unknown; however, there is evidence that aggregation of alpha-synuclein protein in the brain regions associated with arousal/memory (the amygdala, locus coeruleus, hippocampus, and dorsal raphe nuclei) may be associated with these deficits. In order to characterize the pathology in an animal model of PD, the PINK1 -/- rat, 10-month-old tissue was stained for alpha-synuclein aggregation in the regions of interest. This research will lead to a better understanding of cognitive decline in PD patients and potentially serve as a biomarker for early diagnosis.

MICROSTRUCTURAL AND GEOCHEMICAL ANALYSES OF MANGANESE-BEARING SAND INJECTITES IN NEW MEXICO

Salsabila Nazari, Laurel Goodwin (Mentor), Geoscience

The Loma Blanca fault zone of the Socorro Basin, New Mexico, records both deformation and associated (syntectonic) fluid flux. Initial deformation was accommodated by particulate flow in poorly lithified sands, producing a foliation defined by elongate sand grains. Subsequent precipitation of calcite cement from syntectonic fluid changed sand to sandstone, reducing permeability and increasing the mechanical strength of the fault zone. Subsequent formation of (1) sand injectites (a record of earthquake) and (2) crack-seal veins provides a record of episodic hydraulic fracturing and fluid migration. Field, microstructural, stable isotope, and quantitative x-ray diffraction (XRD) analyses of calcite and manganese-bearing cements in sand injectites indicate a changing source of fault-zone fluids in space and time within the fault zone.

EXAMINING THE FUNCTIONAL ROLE OF FRAGILE X RELATED PROTEIN 1 (FXR1P) IN ADULT NEUROGENESIS

Kelsey Nemec, Xinyu Zhao (Mentor), Neuroscience

FXR1P is a member of the fragile X family of RNA binding proteins, which includes FMRP and FXR2P. Both FMRP and FXR2P regulate adult neural stem cells (aNSCs) and neurogenesis, a process affected in a number of neurological and neuropsychiatric disorders, including Fragile X syndrome. Although FXR1P has been implicated in diverse developmental processes and neuropsychiatric diseases, its role in neurodevelopment is not well understood. The goal of this study is to elucidate the function of FXR1P in adult neurogenesis. We used an inducible triple transgenic mouse model (Fxr1-cKO; Nestin-CreERT2; Ai14::tdTomato) that allows us to investigate how FXR1P deficiency in aNSCs affects proliferation and fate specification. Deletion of FXR1 in aNSCs resulted in fewer adult-born cells and reduced populations of radial glia-like cells, neuroblasts, immature neurons, neurons, and astrocytes. We hypothesize that this reduction in new cell numbers resulted from impaired proliferation, which we confirmed in vitro using primary aNSCs. In addition, we found that mRNAs related to cell cycle progression were downregulated in vitro. Ongoing work includes identification of mRNAs regulated by FXR1P in aNSCs. These results indicate that FXR1P plays an important role in regulating aNSC self-renewal and maintenance in the adult brain.

PROPERTIES OF INTERSTELLAR TURBULENCE SHAPING LARGE NEUTRAL HYDROGEN CLOUDS IN THE MILKY WAY

David Nestingen-Palm, Snezana Stanimirovic (Mentor), Astronomy

A spacial power spectrum of neutral hydrogen in a galaxy allows us to better understand the methods that form structures within large conglomerations of the gas which we define as clouds. These clouds range in size from 0.05 parsecs to over 1 kiloparsec and their structure formation is thought to be dominated by large forces, such as supernovae, creating turbulence in the interstellar medium. Applying a spacial power spectrum to previously obtained neutral hydrogen cloud data of our own Milky Way galaxy will allow us to place constraints upon the turbulent forces shaping them as well as give us quantitative data in which to compare our own Milky Way galaxy to other nearby systems.

JAILED PARENTS WITH YOUNG CHILDREN: SUBSTANCE USE, CO-PARENTING, AND VISITS

Anthony Nestler, Luke Muentner, Julie Poehlmann-Tynan (Mentor), Human Development & Family Studies

Parental incarceration is an important human rights issue facing U.S. families, and 1 in 28 U.S. children have a parent behind bars (Pew, 2010). The vast majority of US incarceration occurs at the jail level; there were approximately 11.4 million admissions to US jails in 2014, with 744,600 jail inmates housed in jails at midyear 2014, compared to 1.5 million individuals housed in state or federal prisons at year end 2014 (Carson, 2015; Minton & Zeng, 2015). The current study included 165 jailed parents with children aged 2 to 6 years of age. We examined jailed parents' reports of substance abuse, co-parenting, and contact with children, hypothesizing that jailed parents with a history of substance abuse would report less optimal co-parenting, and that lower co-parenting with children's caregivers would relate to less jailed parent-child contact during the incarceration.

VARIATION IN COLD TOLERANCE OF SOLIDAGO RIGIDA AND SILPHIUM INTEGRIFOLIUM ROOT TISSUE

Emily Nettesheim, Ellen Damschen (Mentor), Zoology

The seasons in Wisconsin vary widely, with temperatures as low as -34°C in the winter. This often leads to the formation of ice crystals that burst cell walls, ultimately plant death. In order to prevent cell damage, plants are able to induce cold tolerance in their roots. This project monitors the cold tolerance of two common prairie plants, measuring their ability to adapt their root tissue to seasonal changes in temperature. I hypothesize that cold tolerance will slowly increase throughout winter, and rapidly decrease in the early spring, as frost risk lessens. Results from fall 2015 show that the cold tolerance of *Solidago rigida* decreased through fall, supporting the hypothesis, while *Silphium integrifolium* was more variable. There will be continued sampling through spring 2016.

GESTATIONAL ALCOHOL EXPOSURE IN MICE AND MAMMARY GLAND STRUCTURAL CHANGES DURING LACTATION

Emma Nettesheim, Robyn Amos-Kroohs (Mentor), Nutritional Sciences

My project investigates the effects of moderate ethanol exposure on mammary gland development during pregnancy. Pregnant C57/B16J females were exposed to 3 g/kg alcohol (EtOH) from gestational day (GD) 12.5 to 17.5 in two half doses, two hours apart using isocaloric maltodextrin (MD) as controls. Some EtOH litters did not have milkspots at lactation day two (L2), but 0.01g peanut butter (PB) supplement reversed this. Mammary tissue from these three groups (EtOH-NOPB, EtOH-PB, MD-PB) was compared. I used histological methods to look at lipid deposition and structural changes after treatment. I also used Western blotting to quantify proteins (STAT3/STAT5) involved in mammary gland maturation mechanisms. I find that EtOH decreases lipid stores and impairs development during pregnancy, and PB reverses this to a degree.

NORMAL ARTERIAL BLOOD PRESSURE IN YOUNG DOMESTIC CATS (FELIS CATUS)

Sarah Neufcourt, Gillian McLellan (Mentor), Surgical Sciences

Glaucoma is a leading cause of blindness in humans and animals due to reduced ocular perfusion pressure (OPP), most often associated with elevated intraocular pressure (IOP). However, OPP is also influenced by blood pressure (BP) which is an important consideration when evaluating new treatments. Our overall goal is to establish the safety and effectiveness of a new glaucoma treatment for cats and kittens that could adversely reduce OPP by lowering BP. The objective of this study was to determine normal, baseline BP in kittens. After training to accept a BP cuff, 3 consistent non-invasive, oscillometric measurements of systolic, diastolic and mean arterial BP were obtained and averaged, 3x/week in 20 kittens from 10 weeks to 6 months of age. Results will be presented.

IMPROVING WATER DESALINATION THROUGH SPIRAL WOUND CAPACITIVE DEIONIZATION

Joshua Newman, John Koller, Jesse Wouters (Mentor), Civil and Environmental Engineering

Shortage of potable water is a global problem. A technology for solving this problem is capacitive deionization (CDI). CDI research often focuses on material improvement as opposed to structural improvements in the device. This project explores efficiency differences between spiral wound and standard plate and frame CDI systems. Efficiencies of each system were tested by monitoring salt removal and energy use. Preliminary results indicate spiral systems operate more efficiently than plate and frame structures. Additional improvements are being made to the spiral wound system and further testing will be performed to verify our preliminary data. We hope to show that differences of salt removal can be based solely on structural changes, as well as demonstrate the commercial viability of this spiral wound CDI technology.

MULTIPLE REPRESENTATIONS IN CHEMISTRY PROJECT

Daniel Ng, Ilkyu Ju, Tatiana Sta Maria, Martina Rau (Mentor), Educational Psychology

The Multiple Representations in Chemistry Project investigates how best to help students learn college level chemistry. This project builds on prior work showing that students need to learn chemistry content through visual representations. To this end, they need to conceptually understand the visual representations and become perceptually fluent in “seeing” what the visual representations show. We hypothesized that supporting undergraduate students in gaining conceptual understanding of connections and perceptual fluency in connection making will enhance their learning of chemistry knowledge. We conducted an experiment in which students worked with different versions of the intelligent tutoring system that provided different combinations of support for conceptual understanding and perceptual fluency. We also helped gather data by observing and interviewing the students who worked with the intelligent tutoring system. Results from this experiment will yield insights into how best to tailor connection-making support to the students’ needs.

VALIDATING THE LIFETIME TOTAL PHYSICAL ACTIVITY QUESTIONNAIRE

Pauline Ngo, Elisa Torres (Mentor), Nursing

The purpose of this study was to determine the validity of the Lifetime Total Physical Activity Questionnaire (LTPAQ) in mid-life (age 50–64) and older adults (age 65+). The LTPAQ was administered to 7 mid-life and 6 older adults (age range=53–76, M=64.0, STD=6.7) and estimates the average metabolic equivalent hours per week per year spent in occupational, transportation, household, and recreational physical activity (PA). Descriptive statistics were used to test the hypotheses that men report more PA than women, mid-life adults report more PA than older adults, and adults with at least a bachelor’s degree report more PA than those with less than a bachelor’s degree. Results supported these hypotheses and provide preliminary evidence for the validity of the LTPAQ in mid-life and older adults.

THE EFFECTS OF NOSEMA CERANAE ON BEES

Diane Nhieu, Heide Knoppke-Wetzel, Sainath Suryanarayanan (Mentor), Community & Environmental Sociology

Honey bees, an important organismal component of cross-pollination, are depended on by many beekeepers and farmers to commercially help them pollinate their crops, but unfortunately, there has been an annual loss of 30%-90% of beekeeper colonies around the world due to many factors. This research project is one that digs deeper into understanding how agriculturally intensive landscapes affect levels of the fungal pathogen *Nosema ceranae* in honey bee colonies, which is known to negatively affect honey bee health. We analyze *N. ceranae* levels in honey bee bodies gathered from the inside of 16 beehives, which were equally distributed across 8 field sites across Central Wisconsin representing high and low intensities of agricultural development.

A PROPOSED ROLE FOR MELATONIN: CIRCADIAN REGULATION IN DROSOPHILA MELANOGASTER

Erik Nolan, Katherine Scheuer (Mentor), Genetics

Melatonin is a hormone which is highly conserved in a variety of organisms, suggesting an ancient origin. In mammals, one well-characterized role of melatonin is regulation of circadian rhythmicity. Melatonin has been shown to influence the transcription of several circadian clock genes in murine models and is suggested to be both a master peripheral synchronizer and a feedback regulator. The fruit fly *Drosophila melanogaster* shares a highly conserved circadian system with mammals, and has served as an effective model organism for studying circadian rhythmicity. However, the role of melatonin in the fly circadian system remains unknown. This proposal suggests a novel role for melatonin in regulating the circadian rhythmicity of *D. melanogaster*. Melatonin is hypothesized to fill the conserved role as a feedback regulator by acting on a subset of melatonin-receptors in the blood-brain barrier, and influencing the transcription of clock genes via a cAMP response element-binding protein (CREB) pathway.

THE CONSUMER EXPERIENCE—A SURVEY OF DANE COUNTY FARMERS’ MARKET ATTENDEES

Tayler Nowak, Kathryn Carroll (Mentor), Consumer Science

The Dane County Farmers’ Market (DCFM) is the largest producer-only farmers’ market in the United States (DCFM, 2016). The weekly event draws huge crowds, yet vendors report lackluster sales. To explore why individuals are not purchasing more products, we surveyed 395 market attendees throughout the 2015 market season (April—October). Results of the consumer survey yield several important findings. We identify potential reasons why attendees are not spending more. Potential barriers to sales include: lack of widespread credit card acceptance, customer desire for expanded product offerings, and an overly crowded shopping area. We provide the DCFM board with several suggestions to improve the overall consumer experience.

EFFECTS OF DVMAT EXPRESSION ON DEPRESSION AND THE CIRCADIAN CLOCK IN DROSOPHILA MELANOGASTER

Claire Nusbaum, Laurence Loewe (Mentor), Genetics

The vesicular monoamine transporter in *Drosophila melanogaster* (dVmat) is directly related to neurotransmitter disorders such as psychological disorders and Parkinson’s disease. dVmat expression has been shown to affect mood (Lawal et al. 2014). Inhibition of dVmat is congruent with depression, while overexpression of dVmat mimics a state of mania and produces effects similar to those from psychostimulants. Depression and mania are both sides of bipolar disorder, and previous research has suggested that bipolar disorder is related to the circadian clock. Hypotheses regarding mania and the clock usually point to a shortened circadian period. However, there is little known or hypothesized about depression and period length. Researching the connection between dVmat inhibition or overexpression and the circadian clock in *D. melanogaster* will provide a greater understanding of depression.

HIGH THROUGHPUT URINARY FUNCTION ANALYSIS

Steven Oakes, Chad Vezina (Mentor), Comparative Biosciences

The Void Spot Assay (VSA) is a tool for quantifying urinary function in mice. Urinary dysfunction is a common problem in people 50 years and older. Current treatments for urinary dysfunction are inadequate and further research is needed. The VSA is used in urology research, but the VSA has limitations that undermine its effectiveness as a research tool. The aim of this project is to address these limitations, and provide analysis software to increase the effectiveness of the VSA.

CONNECTING OLDER ADULTS AND HEALTHCARE PROVIDERS THROUGH A SOCIAL NETWORKING WEBSITE.

Junho Oh, Adam Maus (Mentor), Industrial Engineering

Elder Tree is a free website developed by the Center for Health Enhancement Systems Studies for older adults who are 65 and over in Wisconsin. One feature of this website is the Clinician Report which aims to connect healthcare providers with their patients. Our goal is to improve the usability of the Clinician Report by employing User-Centered Design (UCD). We have gathered information about users’ needs through contextual inquiry, created a series of paper prototypes, and have evaluated our prototypes through usability testing methods such as task analysis and think-aloud interviews. We will continue conducting interviews with our users and use quantitative analysis to determine ways to further enhance the efficiency, convenience, and accessibility of the Clinician Report.

LINKING ECUADORIAN TEACHERS TO THE LATINO EARTH PARTNERSHIP ENVIRONMENTAL EDUCATION PROGRAM

Brenna O'Halloran, Lauren Feierstein, Catherine Woodward (Mentor), Botany

Protection of biodiversity is successful when local communities understand their environment and the impact of their actions upon it. Our partner, the Ceiba Foundation, is implementing a forest restoration program in coastal communities and seeks to include environmental education. With the Wisconsin Idea fellowship, we assessed environmental education needs with teachers in three rural Ecuadorian communities. We selected parts of the Latino Earth Partnership (LEP) curriculum, adapted them to fit the local environment, conducted a 3-day workshop, and piloted activities with teachers in their classrooms. To further our efforts, we received additional funding this Fall to send Maria Moreno, LEP outreach specialist, this year to follow-up with past participants and train them to lead LEP workshops for other Ecuadorian teachers on a regular basis.

PURIFICATION AND CHARACTERIZATION OF SARO_2595 FROM *N. AROMATICIVORANS* AND *YGHU* FROM *E. COLI*

Charles Olmsted, Wayne Kontur (Mentor), Bacteriology

Lignin is a major factor which limits the viability of using biomass as a fuel source for bioenergy. Guaiacylglycerol- γ -guaiacyl ether (GGE), a model compound similar to compounds resulting from the partial degradation of lignin, and its chiral metabolic intermediates are generally metabolized by stereospecific enzymes. *Sphingobium* sp. SYK-6 and *Novosphingobium aromaticivorans* both are bacteria capable of metabolizing GGE which requires glutathione lyase activity on two stereoisomers of the same intermediate. Previous studies have not determined the SYK-6 enzyme acting on one stereoisomer and neither enzyme acting in *N. aromaticivorans*. I have identified, purified, and determined the biological function of the enzyme, Saro_2595, which performs both reactions non-stereospecifically which has analogous proteins of unknown biological function in both SYK-6 and *Escherichia coli*.

A MYSTERIOUS SHELL IN THE OUTSKIRTS OF THE MILKY WAY

Connor Olson, Snezana Stanimirovic (Mentor), Astronomy

At the edge of the Milky Way lies a region known as the Galactic Anti-center, which contains neutral hydrogen (HI) gas at unusually high velocities. This gas appears as a shell-like structure (the Anti-center shell) and its origin is currently unknown. The goal of this project is to characterize properties of the Anti-center shell and understand what events were likely key in its inception. Using new HI data from the GALFA-HI survey, we are investigating the velocity structure of HI spectra for different regions of the Anti-center shell. We are also measuring the mass of Hydrogen in this region. These measurements will allow us to test the prevailing hypothesis that the shell was created when an external high-velocity cloud collided with the Milky Way disk.

ANALYSIS OF 19TH CENTURY CONGRESSIONAL DISTRICTS

Guy Olson, Jack Edelson (Mentor), Political Science

The purpose of this research is to evaluate the progression of gerrymandering in the United States. Gerrymandering is understood as the practice of manipulating boundaries of a congressional district to favor one party over another. This study evaluates gerrymandering through compiling presidential election data for split congressional districts within the 19th century. Evaluation of the election data compared to districts over time can yield patterns of how gerrymandering affected the United States. The election data in this research project is gathered through searching old newspaper articles databases on the UW Library website. The compilation of data into one source allows for analysis of how gerrymandering impacted the levels of influence held by political parties.

BENEFITS OF MATERNAL CONTACT AND BREAST MILK FOR GUT MICROBIOME MATURATION OF INFANT RHEBUS MONKEYS

Emily Orals, Christopher Coe (Mentor), Psychology

The maturation and composition of the intestinal microbiome plays a major role in physiological, immunological, and neuro-emotional development, and is largely determined by maternal transfer of microbiota through physical contact and breastfeeding. High levels of beneficial bacterial taxa, including Lactobacilli and Bifidobacteria, are indicative of a healthy gut microbiome, which also helps to promote immune competence. The present study assessed infant rhesus monkeys (*Macaca mulatta*) to compare the gut microbiota composition of breast-fed infants to monkeys that were human-reared and fed formula. We investigated how the mother affects the infant's acquisition of beneficial bacteria species. These findings broaden our understanding of the influence that the maternal microbiome has on infant health and may also address the importance of the constituent components of infant formula if young infants are not breastfed.

THE COOPERATION BETWEEN N TO π^* AND HYDROGEN BOND INTERACTIONS: IMPLICATIONS FOR PROTEIN STABILITY

Samuel Orke, Robert Newberry (Mentor), Biochemistry

The structure and folding of proteins primarily depends on the sequence of the peptide chains, and how the bonded atoms interact through space. Interactions that bias a complex protein towards its equilibrium structure have been well characterized and include hydrogen bonding, the hydrophobic effect, and electrostatic interactions. Recently, a new interaction in protein folding has been identified, called the n to π^* interaction. This interaction functions when a p-type lone pair (n) of a carbonyl oxygen overlaps with the antibonding π^* orbital of the carbonyl group on an adjacent residue. The delocalization of electrons through this interaction is stabilizing, and likely contributes to the folding of the protein. Here, we investigate how hydrogen bonding and n to π^* interact with one another. That is, if the lone pair on a carbonyl oxygen can engage in both an n to π^* interaction and a hydrogen bond, we investigate the possibility that increasing the strength of the n to π^* interaction causes a weaker hydrogen bonding interaction. We address this hypothesis by synthesizing four compounds that selectively modulate the n to π^* interaction, which were examined using 2-D NMR experiments. Finally, we investigate the strength of the n to π^* interaction using density functional theory (DFT) calculations with natural bond orbital (NBO) analysis.

GERRYMANDERING IN THE 19TH CENTURY

Dakota Osborn, Jack Edelson (Mentor), Political Science

This research looks at the election data from mid to late 19th century presidential elections. The 19th century was a time filled with civil unrest and social revolutions in the United States. Many congressional districts around the country were gerrymandered to secure vote totals for specific candidates. This research looks at how the presidential election results were affected by gerrymandering. Through the UW databases, we search through historical newspapers to find the results in gerrymandered districts. The data collected will reveal the common trends of thinking at the time and provide a more in depth look at society in the 19th century.

UNVEILING THE JOURNEY OF UW-MADISON'S WASTE

Anna Ostermeier, Jill Sakai (Mentor), Office of Sustainability

For most people, waste becomes invisible as soon as it leaves their hands. The purpose of this project is to reveal waste pathways and processes that occur after hours and behind the scenes and are, therefore, not visible to most campus community members. In two infographics, I distill information from multiple campus and community resources into a comprehensive and visual guide to the journey of UW-Madison's recycling and garbage. I worked with other members of the Office of Sustainability and a consultant from Design Lab to assess the expected audience, intended message, and visual flow. The infographics aim to inform sustainable choices by revealing the implications of where we put our waste.

COLLABORATIVE LEARNING IN ADVANCED GENERAL CHEMISTRY

Lucas Oxtoby, Mark Bollom, Kristopher Kennedy, Sally Wu, John Moore (Mentor), Chemistry

We worked to develop collaborative-learning exercises for four of 16 discussion sections in Professor Moore's Chem 109 course. These exercises promote student-student and student-instructor interaction with the goal being to create a more engaging and effective learning environment. With the help of Professor Martina Rau and graduate student Sally Wu (Department of Educational Psychology), the effectiveness of the exercises we have developed were evaluated using statistical analysis to compare pretest, midterm, and final exam scores of four collaborative learning discussions with twelve control group discussions. Results from our study seem to indicate collaborative learning helps students answer open-ended exam questions where students must explain the reasoning behind their answers. Student interviews suggest they prefer collaborative discussion sections to traditional discussion sections.

EFFECT OF LCOS ON ECTOMYCORRHIZAL SYMBIOSIS BETWEEN HEBELOMA CYLINDROSPORUM AND PINUS TAEDA

Paxton Paine, Kevin Garcia (Mentor), Agronomy

Ectomycorrhizae (ECM) are a type of mutual association formed between plant roots and fungi in the soil. To date, little is known about the events that occur leading up to the formation of ECM, and how these associations are maintained over the long-term. The primary goal of this study was to identify the signaling and growth effects that lipochitooligosaccharides (LCOs) exhibit in ECM between the *Pinus taeda* host tree and the *Hebeloma cylindrosporum* fungus. Two groups of *Pinus taeda* seedlings were formed, and were either inoculated with the *H. cylindrosporum* fungus, or no fungi at all. Plants within each group were treated with an H₂O/ethanol control, sulfated LCOs, or non-sulfated LCOs. Data on root architecture and degree of mycorrhizal association was collected. Sulfated LCOs stimulated greater root development in the non-fungal group when compared with the H₂O/ethanol control and non-sulfated LCOs. The role of LCOs on the formation of ECM still remains unclear, as no mycorrhizae were observed in the fungal group due to experimental error and contamination.

THE IMPACT OF ACCENT ON BILINGUAL AND MONOLINGUAL CHILDREN'S NOVEL WORD LEARNING

Neha Paranjpe, Margarita Kaushanskaya (Mentor), Communication Sciences and Disorders

Current research findings demonstrate that children and adults experience processing costs when processing accented speech. In the present study, we assessed whether accented speech would impact children's ability to learn new linguistic information. We recruited monolingual English-speaking and bilingual Spanish-English speaking children between age 7 and 11. To assess learning, we designed a novel word-learning task with familiar objects paired with novel names and presented by an unaccented speaker in one condition and an accented speaker in another. Preliminary results suggest that it is more difficult for monolingual children, but not for bilingual children, to learn novel words in the context of an accented speaker than an unaccented speaker. These differences may be attributed to the bilingual children's increased likelihood of exposure to accented English. [Funded by NIH grant R01 DC011750]

THE ROLE AND MECHANISM OF NOVEL COMPOUND IN EXPRESSION OF IL-17

Sagar Patel, Judith Smith (Mentor), Pediatrics

IL-17 is a cytokine that controls cells and activates inflammation. It plays an essential role in regulating autoimmune disease. In recent years, studies have shown that IL-17 seems to be overexpressed in arthritis patients. New treatment methods need to be researched because antibody therapy for autoimmune disease is expensive and invasive to administer. Preliminary studies have shown that novel compound WT-91053 and WT-77819 can be utilized to reduce IL-17 expression. However, the potency, specificity, and the mechanism of the compounds are still unknown. Initial studies examining IL-17 mRNA suggest that the compound inhibits at the level of transcription. Future studies will utilize ELISA, luminex, and western blots to further observe mechanism of action. Complete knowledge of how the compounds work and the far-reaching effect could lead to potential treatments.

ROOMMATE RELATIONSHIPS AND COLLEGE ADJUSTMENT

Unmesha Pentakota, Bradford Brown (Mentor), Educational Psychology

This research study is conducted in the Educational Psychology department by the Peer Relationships Study Group on roommate relationships and college adjustment. It focuses on two main areas: learning what factors of the roommates' relationship affect the students, and how the relationship in general affects the students academically, socially, and mentally. This study will be more concentrated on intercultural roommate pairs to analyze in depth on how cultural differences play a role in the connection between roommates. To achieve this, we have conducted interviews and surveys with undergraduate students living in on-campus residence halls. These will then be analyzed to make conclusions and relevant data will be shared with the housing department which may help them in making better roommate arrangement strategies in the future.

ROLE OF AUTOLYSINS IN VIRULENCE AND BIOFILM FORMATION OF THE PLANT PATHOGEN RALSTONIA SOLANACEARUM

Matthew Pereyra, Caitilyn Allen (Mentor), Plant Pathology

Bacteria recycle their cell wall by cleaving the glycosidic bonds in peptidoglycan with autolysin proteins in the process known as autolysis. In the plant pathogenic bacteria *Ralstonia solanacearum*, it has been previously shown that mutation of the putative autolysin gene *ampD* led to attenuated virulence, however the underlying mechanism associated with this phenotype is not well-defined. *R. solanacearum* causes bacterial wilt disease on over 250 species of plants by growing to extremely high cell density and blocking the flow of water and nutrients. *R. solanacearum* thrives in the xylem vessels of susceptible hosts by forming biofilms, a process shown to require extracellular DNA release. We hypothesize that autolysin proteins contribute to virulence by releasing extracellular DNA for biofilm formation.

REGRESSION ANALYSIS OF NEUTRON EMBRITTLEMENT IN REACTOR PRESSURE VESSEL STEELS

Josh Perry, Jerit George, Tom Vandenburg, Dane Morgan (Mentor), Materials Science and Engineering

Many nuclear power plants in the US will need to renew their licenses to operate within the decade. Knowing how long reactors can safely operate for requires predicting how steel becomes more brittle as it is exposed to neutron radiation, and existing models do not reliably extrapolate to very long-term radiation exposures. We have used Gaussian kernel ridge regression to create a model of the neutron embrittlement of alloys commonly used in pressurized water reactors. The model has been able to capture nonlinear dependence of yield stress on nine different parameters. It is competitive with existing models in predicting embrittlement at well-documented low fluences, which may suggest that this method could be useful for licensing of power reactors into the next few decades.

DEVELOPMENT OF A BORONIC ACID BASED ANTIOXIDANT

Alexander Peterson, Thomas Smith (Mentor), Chemistry

Generation of reactive oxygen species resulting in oxidative damage has been linked to different types of disease states such as Alzheimer's, diabetes, and cancer. Currently, small molecule antioxidants have not been explored as potential therapeutics due to their high rate of metabolism and excretion. We propose a general strategy to allow small molecule antioxidants to be both selectively activated in the presence of reactive oxygen species (ROS) while also limiting the mechanisms of drug metabolism. Our objective is to synthesize a variety of boronic acid derivatized antioxidants and observe their antioxidant behavior against hydrogen peroxide induced oxidative stress in vitro and in cellulo. This project highlights boronic acids as a potential step-stone for future pro-and soft-based drug design.

PAD4 IS DISPENSABLE FOR B CELL RECRUITMENT INTO INFLAMED LUNGS IN TNF-ALPHA OVEREXPRESSING MICE

Chloe Peyton, Miriam Shelef (Mentor), Medicine

Peptidylarginine deiminase 4 (PAD4) is a citrullinating enzyme that contributes to lung and joint inflammation in tumor necrosis factor alpha (TNF α) overexpressing mice. PAD4 is also important for antibody production. Since antibodies can be produced by B cells which have migrated into inflamed tissue, we hypothesized that PAD4 may contribute to the recruitment of B cells into inflamed lung tissue. To test this hypothesis, immunohistochemistry to detect B cells was performed on lung sections from TNF+PAD4 $^{+/+}$ and TNF+PAD4 $^{-/-}$ mice. B cell presence was compared in TNF+PAD4 $^{+/+}$ versus TNF+PAD4 $^{-/-}$ lungs. There was no difference in the infiltration of B cells into the lungs of TNF+PAD4 $^{+/+}$ versus TNF+PAD4 $^{-/-}$ mice, suggesting that B cell influx into inflamed lung tissue is not dependent on PAD4 in TNF α overexpressing mice.

THE SYNTHESIS OF FE-GE BINARY AND FE-GE-O TERNARY NANOWIRES FOR SPINTRONIC APPLICATIONS

Brandon Phillips, Matthew Stolt (Mentor), Chemistry

Skyrmions are small, magnetic spin particles with applications in future, spintronic storage devices, and they have been observed in bulk, cubic FeGe. As the stability of skyrmions has been shown to increase in nanowire systems, my research is focused upon the synthesis and characterization of binary FeGe and ternary FeGeO nanowires via CVD and CVT (chemical-vapor deposition and transport, respectively) methods. CVD/CVT synthesis grows nanoparticles by flowing volatile precursor molecules, either gases or powders, over substrates under controlled temperature and pressure conditions. After carrying out various reaction schemes, the synthesized nanowires were identified using electron microscopy, X-ray diffraction, and optical/IR absorption. Future work will consist of the exploration of the skyrmion's phase diagram and electrostatics within the nanowire using nano-scale devices fabricated via electron-beam lithography.

IMPOSTER SYNDROME IN FEMALE WRITING FELLOWS

Audrey Piehl, Emily Hall (Mentor), English

This project looked to determine if Impostor Syndrome—the struggle to internalize external achievement—is present in first semester, female Writing Fellows. The research sought a better understanding of undergraduate women's reactions to heightened authority and responsibility, which is inherent to the Writing Fellows program, a prestigious peer-editing tutorship. Eight respondents completed a three-part, in-depth survey that asked about existing insecurities and anxieties before and during the Writing Fellows program. The results suggest that symptoms associated with Impostor Syndrome, such as doubting one's competence or authority, are prevalent within these Fellows. The findings not only indicate negative self-perception that could affect one's ability to engage in valuable, academic discourse, but ask how these sentiments develop and are perceived by others.

COLLABORATIVE DESIGN: CREATING A RUBRIC TO EVALUATE INCLUSIVE BEHAVIORS IN 4-H CLUBS

Janiece Piolet, Mariah Kornbluh (Mentor), Civil Society and Community Studies

Collaborative Design: Creating a Rubric to Evaluate Inclusive Behaviors in 4-H Clubs is an operation to develop more inclusive spaces within 4-H clubs in Washington County, Wisconsin. This project works to create evaluation rubrics for 4-H club youth and staff to give and receive feedback on levels of inclusivity in their clubs. This presentation will describe the several qualitative methods used to gather data from members regarding how 4-H can be improved, as well as explain how this feedback was then incorporated into dimensional rubrics. These rubrics have been tested and are undergoing editing to ensure they can be properly utilized during a typical 4-H meeting. Once successful within Washington County, these rubrics will be made accessible to the state-wide 4-H office.

SURGICAL RESIDENT OPERATIVE PREPARATION AND INTRAOPERATIVE LEARNING

Kennedy Pipers, Sarah Sullivan (Mentor), Surgery

The operating room must increasingly become a place of active learning. The goal of this study is to investigate pre-operative communication between attendings and residents before and after the implementation of an online tool designed to facilitate residents' case preparation and communication with attendings before procedures. We are going to assess this by interviewing the residents before the procedure and after the procedure to better understand their preparation processes and perceptions of the teaching interactions during the procedure. The interviews will be transcribed and analyzed for themes, using a qualitative approach. Our goal is to determine whether there is a change in preparation, communication, and intra-operative teaching patterns after the institution of the online tool.

WOMEN'S SPATIAL NEGOTIATIONS: ALCOHOL, SEXUAL VIOLENCE, AND GEOGRAPHY ON THE UW CAMPUS

Camille Plaisance, Emma Gunderson, Emily Rose, William Gartner (Mentor), Geography

This project explores women student's negotiation of space on the UW-Madison campus in response to fears of sexual misconduct and violence. Surveys, interviews, and heat maps show that some places along Langdon Street, State Street, and the Southeast Residence Halls evoke heightened senses of fear of sexual misconduct and violence. Results show that gender plays an important role in determining the way space is utilized, and how women use certain avoidance strategies to navigate site-specific fears. Respondents highlight the multi-faceted and complex role of alcohol, as well as other social geographies, in the shaping of women's socio-spatial experiences on the UW-Madison campus.

CULTURING OF NEURAL TUBE ORGANOIDs IN AN ENCLOSED CAVITY OF AN ALGINATE HYDROGEL

Joshua Plantz, Randolph Ashton (Mentor), Biomedical Engineering

Currently, models for the central nervous system are limited to in-vivo animal models and in-vitro cell culture systems. In-vitro, neural stem cells are cultured in 2D or 3D as neurospheres. 2D cultures lack the relevant morphology of in-vivo spinal tissue. Neurospheres are limited to a 500um sphere in order to prevent necrotic core formation. Both culture systems have limitations to the size and shape needed to model spinal tissue. By injecting neural stem cells into a 500um diameter, 5mm long cavity contained within an alginate hydrogel we can control their morphology and eventually differentiate them into a specific spinal domain (cervical, thoracic, or lumbar). This will provide a novel in-vitro spinal cord tissue model with disease modeling applications.

NORMOXIA & HYPEROXIA EFFECTS ON THE HEART IN YEAR OLD RATS

Elizabeth Ploumidis, Kara Goss (Mentor), Medicine

Infants born prematurely frequently develop respiratory failure and oxygen rich gas is required to save lives, but also promotes long-term heart and lung injury. To mimic prematurity, rats were exposed to neonatal hyperoxia or room air, then allowed to age one year, at which time they develop heart failure. Capillaries carry blood away from the body and exchange nutrients, waste, and oxygen with tissues at the cellular level, and a reduction in capillary number has been linked with heart failure. Using heart histology slides, the total capillary count will determine if decreased capillary density contributes to heart failure in this model. In the animals exposed to postnatal hyperoxia, we expect to find fewer capillaries in the heart because of the excess oxygen damaging the tissue.

ESTROGEN RECEPTOR A GENE SILENCING IN FEMALE MARMOSET EXPECTED TO DECREASE SEXUAL SOLICITATION

Anna Pollard, David Abbott (Mentor), Obstetrics and Gynecology

The hormone estradiol stimulates female sexual behavior across mammalian species. Estrogen receptor alpha has been implicated in sexual behavior through virus-delivered gene silencing in mice, however, no receptor determination has been made in primates. The purpose of this study is to determine if in females the ER α signaling that stimulates sexual behavior in mice is involved in sexual behavior in marmosets. Eight ovariectomized female marmosets received infusions into the hypothalamic ventromedial nucleus, four with ineffective (controls) and four with effective gene silencing viral agent. For behavioral testing, male-female bonded pairs lived separately for four weeks before being reunited for 30 minutes, during which time female sexual solicitations were recorded. The data suggest that ER α silencing does not diminish female receptivity towards male sexual advances, however, it may disrupt female sexual solicitation.

IMPLEMENTATION OF POWASSAN VIRUS ASSAY VIA CONCURRENT EXTRACTION OF IXODES SCAPULARIS DNA AND RNA

Sydney Potts, Susan Paskewitz (Mentor), Entomology

The blacklegged tick, *I. scapularis*, is known to transmit *Borrelia burgdorferi* and *Anaplasma phagocytophilum* to humans, which in turn cause Lyme disease and human anaplasmosis, respectively. Powassan virus is an RNA virus, also transmitted by *I. scapularis*, which can cause encephalitis and meningitis. The purpose of this research is to concurrently extract DNA and RNA from *I. scapularis* ticks and analyze these samples for the presence of bacterial DNA and viral RNA. This procedure will allow us to determine if there is an interaction between these pathogens that might facilitate tick infection or co-infection. Furthermore, this work will enable implementation of a Powassan virus assay that could be used to document and combat the spread of the virus in Wisconsin.

WISCONSERVATION, REDUCING WASTE THROUGH EDUCATION IN THE RESIDENCE HALLS

Kyle Powers, Jill Sakai (Mentor), Office of Sustainability

Wisconservation is a month-long education initiative to foster resource stewardship in University Housing residents and prepare students to live sustainably both on- and off-campus. The initiative, now in its second year, is the result of a strong partnership between the Office of Sustainability and University Housing. Wisconservation 2016 is focused on waste reduction, with a poster campaign in the residence halls to address specific commonly trashed items and how to dispose of them properly or avoid using them. We are measuring poster effectiveness through resident surveys and trash audits before and after the initiative. Our presentation will focus on developing the project with University Housing, early results from the 2016 initiative, and future plans for expanding Wisconservation to engage students in campus sustainability.

THE EFFECTS OF MEDITATION INTERVENTION ON CAREGIVERS OF DEMENTIA PATIENTS

Michael Prairie, Gudrun Buhemann (Mentor), Asian Languages and Cultures

Caregivers of individuals with dementia often suffer from a variety of psychological and health related conditions due to their role as caregivers. While there are currently a few options for support for caregivers, meditation has been shown to be an effective means for improving mental health and may offer a new approach to caregiver support. In this presentation, I will assess the results of a variety of studies conducted analyzing the effects of meditation intervention on dementia patients. The studies included show an overall trend towards reduction in depression and caregiver burden of the caregivers, though the research designs utilized may obfuscate the true impact of meditation. These results encourage further refined research into the effects of meditation intervention on caregivers.

VITAMIN D INHIBITION OF A T CELL PRO-INFLAMMATORY CYTOKINE BY AN EPIGENETIC MECHANISM

Corinne Praska, Colleen Hayes (Mentor), Biochemistry

Vitamin D reduces autoimmune-mediated pathology by inhibiting T cell production of interferon-gamma (IFN γ), a pro-inflammatory cytokine, through an unknown mechanism. I hypothesize that the vitamin D hormone, calcitriol, promotes methylation of the Ifng gene promoter to silence gene transcription in T cells. I will test this hypothesis by activating myelin-specific T cells in vitro in the presence and absence of calcitriol and quantifying IFN γ secretion by ELISA and Ifng gene promoter methylation using the methylation-sensitive restriction enzyme SnaBI. If the calcitriol samples show less IFN γ promoter fragmentation by SnaBI and reduced IFN γ secretion compared to the placebo samples, the data would support an epigenetic mechanism. Understanding calcitriol mechanisms of IFN γ regulation will facilitate prevention and therapeutic control of autoimmune disease.

ENGINEERING THE CELLULAR MICROENVIRONMENT TO REVEAL MECHANISMS OF HUMAN DEVELOPMENT

Ryan Prestil, Krishanu Saha (Mentor), Biomedical Engineering

Human pluripotent stem cells can differentiate into any adult cell type, and somatic cells are now routinely reprogrammed to pluripotency via ectopic expression of OSKM factors (Oct4/Sox2/Klf4/c-Myc). During both processes, dramatic changes occur to both gene expression and the physical shape, size, and organization of the nucleus and the cell as a whole. We have developed high-content microcontact-printed biomaterial platforms to control cell patterning to 10 μ m resolution and create a stable gradient of soluble molecules, and we have derived a new multi-transgenic line of human induced pluripotent stem cells to combine doxycycline-inducible OSKM reprogramming factors with live, dynamic fluorescent labels on histones and actin filaments. Combining these capabilities has permitted unprecedented profiling of the processes underlying differentiation and reprogramming and characterization of intermediate cell states.

NURSES' ATTITUDES AND COMPLIANCE WITH THE CAM

Michelle Prihoda, Lisa Bratzke (Mentor), Nursing

The Confusion Assessment Method (CAM) is a sensitive measure of delirium however nurses do not routinely use the CAM. Current literature related to reasons for CAM non-use is limited. The purpose of this project is to evaluate nursing attitudes and adherence rates for use of the CAM to assess delirium in postoperative patients at UW Hospital. Nurses from units participating in the NeuroVision study of post-operative delirium and covert stroke will be asked to participate in this study. Methods include a survey that will be completed by nurses and a review of medical records via HealthLink to assess attitudes towards the CAM and nursing adherence rates. Outcomes of interest include rationale for non-compliance and identification of potential areas for quality improvement projects related to CAM use.

EARLY ADOLESCENTS' PEER RELATIONS AND PARENTAL INVOLVEMENT WITH SOCIAL MEDIA

Ashley Prudhom, Bradford Brown (Mentor), Educational Psychology

Psychologists often wonder what the most current information regarding children and social media is. How, and what, early-adolescents are actually engaging in on social media is ever-changing. Unlike prior studies, our focus is on ten- to thirteen-year-olds. The purpose is to discover how early adolescents become adept at incorporating social media into their peer interactions with the most current social mediums, such as but not limited to, Instagram and Snapchat. We will also explore, through individual interviews, to what extent do parents monitor their child's social media use. Although the study is not conclusive yet, we anticipate discovering how early adolescents are connecting with each other online, and how they discern the peer norms governing usage of social media.

CHALLENGE AND IMPLICATION OF ANTHOCYANIN-BASED POLYMERIC COLORANTS USE FOR FOOD ADDITIVE

Yiming Qin, Bradley Bolling (Mentor), Food Science

Anthocyanins are a class of pigmented plant polyphenols that are used as natural color additives in foods or beverages. However, it is challenging to maintain anthocyanin stability in many food applications, as their chemical structures can be dramatically affected by high pH environment. We hypothesized that anthocyanins can form intermolecular polymers with other phenols that stabilize pigmentation. We found that the addition of acetaldehyde to anthocyanin-rich aronia berry juice led to the formation of more polymeric colors than polyphenol-pH shifting alone. HPLC analysis revealed new pigmented compounds with spectra similar to native anthocyanins. Over time, acetaldehyde led to the formation of a pigmented precipitate with increased stability. Further work is needed to obtain polymerized anthocyanins with favorable solubility and to characterize their structural features.

EFFECT OF ENSO ON PRECIPITATION DISTRIBUTIONS

Junior Quintero, Brian Zimmerman (Mentor), Water Resource Engineering

This research explores the impact particular phases of El Nino Southern Oscillation (ENSO) have on seasonal distributions of daily precipitation. Past studies have relied on composite analysis which simply average hydroclimatic variable averages within individual phases. However, Larkin and Harrison (2005) have already shown that the accuracy of composite analysis is limited. This research relies on the Nino Index Phase Analysis (NIPA, Zimmerman et al. 2016). By developing additional Python modules designed to integrate with the NIPA methodology, within-phase variations of hydroclimatic variables can be observed, focusing here on daily precipitation. Initial results indicate the developed tools can illuminate precipitation anomalies that are ignored by composite analysis and can provide additional predictability of the impact of the El Nino Southern Oscillation on our climate.

QUANTIFICATION OF ENDOGENOUS SIRT3 IN MAMMLIAN LIVER MITOCHONDRIA

Nicole Rademacher, John Denu (Mentor), Biomolecular Chemistry

SIRT3 is the prominent mitochondrial deacetylase that is linked to age-related maladies as well as metabolic dysfunction. Here we develop a method to quantify SIRT3 levels in mouse liver mitochondria in response to caloric restriction. Our method involves isolation of liver mitochondria from mice on calorie restricted and control diets, and comparison of SIRT3 levels within the proteomes to an isotopically labeled standard using mass spectrometry. We expect the levels of SIRT3 in liver to be higher in mice under caloric restriction which will support the role of SIRT3 as an acetylome modulator in response to diet. Such a method is more quantitative than traditional Western blotting and can be used to effectively quantify the levels of SIRT3 in any tissue under experimental perturbations.

EXPLORING EDUCATION POLICY IN AFRICAN COUNTRIES: A CLOSER LOOK AT THE EARLY GRADE READING ASSESSMENT

Vedika Ramesh, Lesley Bartlett (Mentor), Educational Policy Studies

This research considers the impact and issues of the Early Grade Reading Assessment Project (EGRA) conducted in various African countries over recent years. Created by USAID, EGRA is a wave of oral reading assessments measuring foundational literacy skills at early ages. Focusing on the implementation of EGRA in Nigeria, Malawi, and Tanzania, this project collected information by interviewing people involved in the assessment through a variety of roles to analyze EGRA's effectiveness. Preliminary results from Nigeria suggest that despite poor results, EGRA has helped identify issues in the education system and ways to improve. Overall, this research comments how EGRA has impacted education policy—namely the reading curriculum, teacher training, and school characteristics, and it stresses the importance of providing quality fundamental education for all.

ASSOCIATION OF SINGLE NUCLEOTIDE POLYMORPHISMS (SNP) ON TLR1 AND PREMATURE BIRTHS

Tarjani Ranade, De-Ann Pillers (Mentor), Pediatrics

This study focused on the TLR, which is a protein receptor expressed on many cell types that help with the function of the inflammatory system in our innate immune system. By eliminating this protective mechanism, it could cause the ability to drive bacteria to lead to PTB (preterm birth). We hypothesized that one contributor to preterm birth due to infection might be related to the malfunction of specific aspects of the immune system. SNP (single nucleotide polymorphism) testing, that measures the genetic variations of single nucleotide on the DNA strand, was done by PCR to locate what percent of the infant samples we used had the SNP T/T genotype in substitute for the normal A/A genotype. This research also looked at how race affected the ratio of genotype T/T and A/A, showing us that premature birthing correlated with an increased expression of the SNP T/T allele as the number of weeks the baby was in the mother decreased. Looking at the ancestral background of the infants in this study, the mutation was found to be the most prevalent amongst the self-identified Black infants and the least in the Asian infants.

IMPACT OF EVOLUTIONARY PRESSURE ON X. NEMATOPHILA HOST INTERACTION PHENOTYPES

Helena Randle, Angel Casanova-Torres (Mentor), Bacteriology

The bacterium *Xenorhabdus nematophila* establishes a mutualistic association with *Steinernema carpocapsae* nematodes. The nematodes provide access to susceptible insect hosts and, once inside the insect body cavity, the nematodes release the bacteria into the blood where they successfully overcome the insect's immune response and kill it. Here we aimed to further understand the impact of evolutionary pressure to maintain two different host interactions (pathogenic versus mutualistic) on the virulence, immunosuppressive and mutualistic phenotype of *X. nematophila*. To do this, we have used experimentally evolved strains selected for increased virulence in the presence or absence of the nematode host. Our data shows that co-evolution with the nematode host has the greatest impact on pathogenic phenotypes. Bacteria evolved in the absence of the nematode kill more insects than an ancestral strain, while selection for increased virulence had no significant impact on virulence. Similarly, bacteria selected for virulence or not and evolved in the absence of the nematode showed the greatest variation in pathogenic phenotypes (toxicity, immune suppression and bacterial motility). In contrast, our preliminary data suggests that selection for virulence has the greatest impact on mutualistic phenotypes. Overall, our data indicate that the evolutionary pressure to maintain one host has the greatest impact on the phenotypes involved in the interaction with the second host.

DETECTION OF ANTIBODIES IN THE DIAGNOSIS OF PLAGUE AND HANTAVIRUS IN WILD RODENT SPECIES

Kelsey Rayment, Bienenke Bron (Mentor), Pathobiological Sciences

Rodents are a very diverse and abundant group of mammals. In addition, they are important disease vectors of potentially fatal diseases like plague and Hantavirus Pulmonary Syndrome. It is vital to detect the infections in their wild hosts to prevent outbreaks and to inform the public. Infection is detected by screening for antibodies against the pathogen. Previous research has looked at the detection of antibodies in laboratory mice and deer mice (*Peromyscus* spp), but information is lacking in other wild rodent species. Therefore, this study examined the detection of antibodies in these species using Protein G and Protein A/G, which are often used in antibody detection. Blood samples used in this study were collected from several rodent species, including deer mice, Northern grasshopper mice (*Onychomys leucogaster*) and Ord's kangaroo rats (*Dipodomys Ordii*), from study sites in the western United States with a history of plague and Sin Nombre hantavirus. We screened a subset of blood samples for both of these diseases, using standard Protein G and Protein A/G assays. These results will be very important for understanding the limits and applicability of these tests to adequately inform research and public health policy.

PAD2 INCREASES OVERALL CITRULLINATION IN INFLAMED JOINTS OF TNF-ALPHA OVEREXPRESSING MICE

Ryan Rebernick, Miriam Shelef (Mentor), Medicine

Rheumatoid arthritis (RA) is an autoimmune disease characterized by joint and lung inflammation, anti-citrullinated protein antibodies, and high TNF α levels. Since peptidyl arginine deiminase (PAD) 2 and 4 catalyze protein citrullination and are present in inflamed joints, one or both may generate citrullinated targets for autoantibodies exacerbating inflammation. I hypothesized that knocking out PAD2 or PAD4 would reduce overall citrullination in inflamed tissues. To test this hypothesis, inflamed lung and ankle lysates from 5-month old TNF α -overexpressing PAD4 or PAD2 deficient mice were analyzed for protein citrullination via western blot using an anti-peptidyl citrulline antibody. PAD2 $^{-/-}$ tissues showed reduced citrullination while PAD4 $^{-/-}$ tissues showed no change relative to controls. These findings suggest that PAD2 contributes more to the generation of citrullinated antigens in RA than PAD4.

COMPLEMENTARY HEALTH APPROACHES TO PAIN MANAGEMENT IN PEDIATRIC PATIENTS

Chelsi Reilly, Chelsi Reilly, Peggy Riley, Elisa Torres, Benjamin Walker, Elisa Torres (Mentor), Nursing

Pain is a common symptom of hospitalized patients and is typically under-treated in pediatric patients. However, the majority of pain is treatable when recognized. This project aims to assess complementary health approaches to pain management in pediatric inpatients receiving medical and surgical services at the American Family Children's Hospital (AFCH). Interviews were conducted with 75 pediatric inpatients between 24–48 hours of admission or surgical procedure. Descriptive statistics were used to describe complementary health approaches to pain management. Ninety-three (93%) reported using some form of complementary health approach. A doctor or nurse encouraged complementary health approaches never (28%), sometimes (42%), and often (30%). Findings from this project will be used to evaluate the effectiveness of complementary health approaches to pain management outcomes at the AFCH.

MEASURING MITOCHONDRIAL NONENZYMATIC LYSINE ACETYLATION

Keighley Reisenauer, John Denu (Mentor), Biomolecular Chemistry

Protein acetylation is a regulatory modification affecting numerous biochemical and cellular processes. Over half of the proteins in mitochondria have been identified as acetylated, however mechanism of acetylation has not been elucidated. This project focuses on understanding the mechanism of mitochondrial protein acetylation, hypothesizing that non-enzymatic acetylation is responsible for the majority of observed acetylation. To understand non-enzymatic acetylation, we are quantifying the rates of the reaction as a function of acetyl-CoA concentrations, and calculating the second order rate constant for individual lysine reactivity in native proteins. This study will focus on the acetylation mechanism for the following mitochondrial proteins: ACAT, PDH, HMGCS2, HMGCL1, and α KGDH, which are reported in scientific literature to be highly acetylated in mouse tissues.

KERNZA INTERMEDIATE WHEATGRASS—LEGUME MIXTURES COMPATIBILITY AND PRODUCTIVITY AT THE FIELD SCALE

Kyle Rentmeester, Carly Smetana, Valentin Picasso Risso (Mentor), Agronomy

Annual crops have many negative environmental impacts. Intermediate wheatgrass, a perennial crop, can reduce those impacts. Intermediate wheatgrass is being bred to develop a higher grain yielding strain called Kernza. Our goal is determining the effects of crop mixture on Kernza's grain yields and forage quality by growing it in combination with legumes. Seeds were seeded in the field last fall, and legumes will be sown this spring. Over the summer, species composition will be monitored, biomass and quality of the forage measured, the Kernza grains harvested, cleaned and weighed, and the data analyzed by Analysis of Variance and comparison of treatments means. We expect an increase in grain yield, biomass and forage quality when Kernza is grown in mixture with legumes.

PREVALENCE OF VIRULENT GENOTYPES OF BORRELIA BURGdorFERI IN TICKS AND SMALL MAMMALS IN WISCONSIN

Thomas Richards, Susan Paskewitz (Mentor), Entomology

Borrelia burgdorferi, the causative agent for Lyme disease, is spread by blacklegged ticks (*Ixodes scapularis*) and vertebrate reservoirs. Using PCR and RFLP, *B. burgdorferi* can be classified into three ribosomal RNA intergenic spacer types (RSTs). Human infection with RST1 leads to more severe and persistent cases of Lyme disease. RST frequency has been associated with geographically-specific phenology in blacklegged tick populations. When larvae quest synchronously with nymphs (the “Midwest phenology”), a low relative frequency of RST1 is present. Frequency of RST1 is greater where the peak questing periods of the immature stages are temporally distinct (the “Northeast phenology”). This study investigates whether the RST frequency in South Central Wisconsin differs from other parts of the state, reflecting less synchronous questing phenology of local blacklegged ticks.

COMPARISON OF METHODS FOR QUANTIFYING INFLAMMATORY RESPONSE AFTER FOCAL CEREBRAL INFARCTION

Jacob Richie, Lindsey Jager (Mentor), Waisman Center

Inflammation after focal cerebral infarction promotes recovery, but it can also be a cause of secondary injury. Because of this, it is important to be able to quantify the presence of macrophages and microglia post-injury to assess efficacy of treatments. Therefore, a variety of methods exist for both labeling inflammatory cells via immunohistochemistry, as well as quantification of the labeled cells. This study focuses on a comparison of these methods of inflammatory quantification. Antibody stains for the immune cell markers CD11b, CD68, and Iba1 were compared by using them to stain rat brains with an endothelin-1 induced focal cerebral infarction. Stained brain sections were then imaged and analyzed using both cell counting and thresholding techniques.

FDG-GYPSUM EFFECTIVE IN REDUCING PHOSPHORUS LEVELS IN URBAN WATER SAMPLES

Beau Rigstad, Megan Christensen, Jacob Matulle, Margaret Milford, Ellen Damschen (Mentor), Zoology

Eutrophication due to high phosphorus (P) in runoff is a growing issue in Madison-area water bodies, and recent studies have shown that gypsum can be effective in sequestering P from water. We decided to test this using FDG-gypsum, a waste product from power plants, by testing P levels before and after running lake water through a gypsum-filled plug. Our study showed that FDG-gypsum is significantly effective in sequestering P from lake water. Our follow-up study is testing the biological impacts of this P reduction using duckweed as a model organism for eutrophication. We are also testing calcium sulfite, a similar byproduct, for its efficacy in sequestering P from water samples. This research has implications for the water quality and ecological stability of our water bodies.

FORMING BRIDGES THROUGH CARTONERA: A CULTURAL EXCHANGE BETWEEN LATIN AMERICA AND SPAIN

Edel Roach, Ksenija Bilbija (Mentor), Spanish and Portuguese

Eloísa Cartonera of Buenos Aires created cartonera alternative publishing in 2003 in response to a devastating economic crisis in Argentina. This crisis had created cardboard pickers (*cartoneros*) in Spanish, who made their living by searching garbage for cardboard to sell recycling plants. Eloísa Cartonera brought the cardboard at a higher price and used it to inscribe their literature. Many other countries adapted this idea over the next decade to include Spain in 2009. Because Spain does not have *cartoneros* since searching the garbage is illegal there, it has altered the concept of cartonera to fit its own societal needs, while still retaining its roots in Latin American cartonera.

PEACE ON EARTH: THE MILITARY EXPERIENCE OF MARY'S HEALING POWER AT LOURDES

Lauren Roach, Corrie Norman (Mentor), Religious Studies

Every May since 1957, soldiers from various nations have converged in Lourdes, France to participate in official military pilgrimage festivities. The International Military Pilgrimage allows individual soldiers the opportunity to experience the healing of Lourdes, all the while praying for and making relationships to forward peace among nations. The pilgrimage began unofficially as a way for the French to honor American and British victors in WWII. After exploring the country, soldier pilgrims ended their journey in Lourdes where the representatives from these nations spent time before Our Lady of Lourdes to pray for the world following the devastation and destruction of that war. The pilgrimage of military personnel has morphed from a small group to thousands of participants. Today, forty nations participate in the official pilgrimage; some, former enemies now corroborating in a mission of peace through pilgrimage. This paper seeks to further understand the dynamics of this pilgrimage, at the individual, communal, and international level. The origins of this event and the development of a militarily orchestrated pilgrimage can be understood by considering the idea of liminal space and *communitas*, as articulated by anthropologist Victor Turner. Ultimately, the multi-dimensionality of the pilgrimage, as both a religious and military event with corresponding hierarchies and ceremonies, demonstrates the importance and complexity of healing and community fostered through pilgrimage.

PHYSICAL ACTIVITY IMPACTS BIOMARKERS OF ALZHEIMER'S DISEASE IN COGNITIVELY NORMAL MIDDLE-AGED ADULTS

Rachael Rol, Ozioma Okonkwo (Mentor), Medicine

The objective of this study was to determine the effect of physical activity (PA) on biomarkers of Alzheimer's disease (AD) in cognitively normal individuals. Evidence suggests PA is associated with an improved AD biological marker profile, including reduced amyloid- β ($A\beta$) burden and lowered intracellular tau protein. Changes in these proteins are some of the earliest observed changes in AD. For this study, collection of cerebrospinal fluid (CSF) via lumbar puncture provided levels of $A\beta$ and tau, while accelerometry objectively measured participants' PA in Metabolic Equivalents of a Task (METs). Results revealed a positive association ($p=0.008$) between percent total daily activity and CSF $A\beta$, indicating PA may decrease the rate of deposition of $A\beta$ plaques in the brain and could possibly slow the progression of AD.

AGING EFFECTS ON ACOUSTIC CHARACTERISTICS OF ADULT SPEECH

Elaine Romenesko, Hourii Vorperian (Mentor), Communication Sciences and Disorders

Studies of speech and voice in healthy aging are important to establish baselines for clinical assessments given possible changes in anatomy, physiology and motor control. Published reports are inconclusive. This study reports data on vocal fundamental frequency (F0) and the first four resonances of the vocal tract, formant frequencies (F1-F4), in three age cohorts of healthy adults: young (20–35 years), middle (40–55 years) and older (70–92 years). The data were obtained from recordings of monosyllabic words spoken by 94 individuals (52 women, 38 men). The results show significant changes in speech acoustics for women only in F0, F1 and F2. These changes were significant from young to middle age cohorts and young to older age cohorts, but not from middle to older age cohorts.

INTER-AMERICAN COURT AND NATIONAL PROSECUTIONS

Roberto Romero, Alexandra Huneeus (Mentor), Law

This project focuses on the influence of the Inter-American Court of Human Rights in the countries of Colombia and Peru. A trip to Colombia, Peru, and Costa Rica was done to interview people that are heavily involved in the legal proceedings. Coding of court documents related to cases will also be conducted to see common trends. A research assistant will transcribe the interviews and collect media coverage of cases. This project is aimed to understand how and when international courts are effective and can possibly impact the policy of international courts.

THE ASSOCIATION OF MINERAL METABOLISM WITH VASCULAR ACCESS PATENCY

Joel Rosenberg, Alexander Yevzlin (Mentor), Medicine

In patients with End-Stage Renal Disease (ESRD), declining kidney function leads to progressively dysregulated mineral homeostasis and contributes to vascular calcification and a pro-inflammatory milieu. Vascular calcification and inflammation play a role in loss of dialysis vascular access patency. Little is known, however, how mineral markers and treatment options for mineral dysregulation may influence vascular access outcomes in hemodialysis patients. We designed this study to examine the relationship between markers of bone and mineral metabolism, vitamin D replacement medications, and vascular access outcomes. We hypothesized elevated levels of calcium, phosphorous, PTH, and albumin are independently associated with vascular access patency and that vitamin D supplementation decreases risk of access failure. Our findings show a relationship between vitamin D3 usage and greater vascular access patency.

CROWDFUNDING ASTHMA RESEARCH: MEDICAL PROBLEM AND TREATMENT OPPORTUNITY

Philip Rudnitzky, Sarah Gorall, Kelsey Hackett, Erica Terry, Lawrence Hanrahan (Mentor), Family Medicine and Community Health

Asthma has been traditionally diagnosed as an inflammatory response that cannot be cured, only treated through steroid inhalers. However, several small studies point to the possibility that severe asthmatics may be suffering from a bacterial infection, treatable with antibiotics. In order to fund a larger study to provide stronger evidence for our theory, our team has started a crowd sourcing project to raise the funds. My tasks were to explain to people interested in donating to our cause what exactly our methods are, and how it differs from current treatments. If successful, a tailored trial would be created based on the funds received to test antibiotics on severe asthmatics. A positive trial will result in new guidelines for treating asthma.

USE AND EFFICACY OF COGNITIVE-BEHAVIORAL STRATEGIES FOR SLEEP DISTURBANCE IN ADVANCED HEART FAILURE

Alexandra Rushmer, Kristine Kwekkeboom (Mentor), Nursing

Sleep disturbance is a common symptom in patients with heart failure (HF). Cognitive-behavioral (CB) strategies offer promise to improve sleep in persons with chronic illness. This study examined feasibility and initial efficacy of a CB intervention for symptoms in HF patients. Twenty adults with advanced HF and co-occurring pain, fatigue, and sleep disturbance were recruited from a HF clinic. Participants received training and recommendations for daily use of 13 audio-recorded CB strategies (e.g., relaxation, guided imagery). They documented use of the techniques for 6 weeks, and reported symptom severity at 2, 4, 6 and 12 weeks. Results will summarize participants' use of CB strategies, steps taken to improve sleep, and pre-post changes in sleep disturbance severity. Implications for practice and research will be discussed.

BIOREVERSIBLE PROTEIN TRANSDUCTION

Lucas Ryan, Kalie Mix (Mentor), Biochemistry

Our research aims to employ arginine-based protein tags to exploit the heparin sulfate endocytotic pathway to promote cellular uptake of therapeutic proteins. Once inside the cell, the tags will be removed by natural esterase activity to give rise to unmodified protein. This method avoids direct mutation of the protein that would likely hinder stability and functionality. We explore this route using Green Fluorescent Protein, enabling us to easily determine relative uptake between tagged and untagged protein.

INVESTIGATING THE SPECIFICITY BETWEEN MBTH-LIKE PROTEINS AND NONRIBOSOMAL PEPTIDE SYNTHETASES

Jane Ryu, Michael Thomas (Mentor), Bacteriology

Many antibiotics are produced by enzymes called nonribosomal peptide synthetases (NRPSs). Many NRPSs require accessory proteins called MbtH-like proteins (MLPs) for proper catalysis. We are using enterobactin (ENT) biosynthesis from the bacterium *Escherichia coli* as a model system to study NRPS/MLP interactions. YbdZ, the MLP involved in ENT biosynthesis, is required for the function of the NRPS EntF. In the absence of EntF/YbdZ interaction, growth of the bacterium in iron-limited conditions is eliminated. Interestingly, MLPs from other bacteria complement for the loss of YbdZ to various extents, suggesting that there is a level of specificity involved in proper NRPS/MLP interactions. Understanding the specificity in these interactions will allow us to further understand the role MLPs play in NRPS enzymology.

GIT VERSION CONTROL FOR MANAGING SHARED SIMULATION MODELS

Yazeed Sabri, Laurence Loewe (Mentor), Genetics

Modeling is becoming increasingly important for biology and can benefit much from professional version control that provides a safety net for enabling faster testing of model variants. Knowing that it is easy to go back to a working version is universally appreciated, even by users who have little programming expertise. Building upon and keeping track of previous work is part of science, but often complicated by questions of distributed version control: if it only was easy to archive, share, build upon, and restore old versions. Too often unnecessary clutter or no longer needed versions get in the way—among other problems. Here explore approaches to make the powerful Version Control System Git easier to use. Git does almost everything most scientists need for modeling use, but allows for some flexibility that regularly gets non-Git-experts into trouble. We aim to design a simplified layer above Git that makes it easier to track the many changes to models that are inevitably created during modeling by abstracting professional Git expertise and providing scientists with the few essential steps that are extremely helpful to them.

DETERMINING WHETHER MEMORY IS RELATED TO SLEEP IN PEOPLE AT RISK FOR ALZHEIMER'S

Torie Sailer, Kate Sprecher (Mentor), Psychiatry

Alzheimer's disease (AD) is an increasingly prevalent neurodegenerative disease characterized by impaired memory. In healthy adults, memory improves after sleep and recent studies have shown a strong correlation between the development of AD and sleep. The aim of our study was to determine whether memory is related to sleep in people at risk for AD. Sleep was measured with polysomnography in the sleep laboratory in 17 asymptomatic middle-aged participants at risk for developing AD. A word pair task was conducted in the evening as well as in the morning in order to determine how accurately people can recall correct word pairs after a night of sleep. Mood and sleepiness were measured with the Positive and Negative Affect Scale (PANAS) and the Stanford Sleepiness Scale (SSS) prior to the memory test. There was a significant decrease in participants' Recall scores from evening ($M=79.92$, $SD=8.67$) to morning ($M=75.42$, $SD=9.74$) conditions; $t(17)=3.75$, $p<.002$. There was not a significant difference in sleepiness scores from evening ($M=2.72$, $SD=1.18$) to morning ($M=2.67$, $SD=.84$) conditions; $t(17)=.236$, $p<.816$. The PANAS positive scores did not change significantly from evening ($M=31.44$, $SD=7.91$) to morning ($M=29.39$, $SD=7.33$) conditions; $t(17)=1.71$, $p<.105$. There was not a significant difference in PANAS negative scores from evening ($M=11.06$, $SD=2.24$) to morning ($M=10.61$, $SD=1.09$) conditions; $t(17)=1.193$, $p<.249$. These preliminary results suggest that, in people at risk for AD, memory deteriorates significantly overnight. This was not related to mood or level of sleepiness during testing. These findings, provide further evidence that sleep plays an important role in cognitive function and should be further researched to determine how sleep treatments may prevent neurodegenerative diseases such as AD.

INFLUENCE OF LANDSCAPE ON BUMBLEBEE POLLEN DIVERSITY

Robin Sandner, Juan Zalapa (Mentor), Horticulture

Bumblebees forage continuously through the season to obtain nutritional resources, but if colonies cannot collect enough pollen they may fail to reproduce, and the population could decline. Investigation of their foraging behavior may help determine if landscape structure affects the ability of bees to collect pollen. This study seeks to understand if bumblebees forage on different plant assemblages, in different types of landscapes. To do this, bumblebees from agricultural and forested cranberry marshes were caught, and their pollen was sampled to investigate pollen diversity. If agricultural landscapes negatively affect the diversity of bumblebee food resources, we would expect to see a decline in the types of pollen collected which supports the idea that landscape structure can limit bumblebee foraging success.

HOW DO GENOTYPES OF BORRELIA BURGENDORFERI VARY IN TIME AND SPACE IN WISCONSIN TICKS?

Erik Sanson, Susan Paskewitz (Mentor), Entomology

Over the last decade, human infections by *Borrelia burgdorferi* from *Ixodes scapularis* have increased in Wisconsin. Studies have suggested that more severe human illness may occur in the Eastern US compared to Wisconsin due to different patterns of tick seasonal behavior that affect *Borrelia* genotypes. However, we have now identified the East Coast pattern of tick activity in Wisconsin. To identify pathogen genotypes, I combined amplification of the *OspC* gene with sequencing and have found two distinct forms in animals sampled from northern and southern Wisconsin, which include *OspC* E and G. Comparison of these results with similar studies from the East Coast should illuminate disease dynamics in the two regions.

IMMUNOCYTOKINE TO SELECTIVELY ACTIVATE IMMUNE CELLS WITH IL-2 RECEPTORS IN TUMOR MICROENVIRONMENT

Swetha Saseedhar, Zulmarie Perez Horta (Mentor), Pediatrics

Antigen targeting monoclonal antibody-based cancer immunotherapy is a promising method for the treatment of neuroblastoma. The hu14.18-IL2 immunocytokine (IC) is a fusion protein combining one human IL-2 molecule to each of the heavy chains of the intact anti-GD2 monoclonal antibody (mAb). Early clinical trials have shown that IC treatment can lead to complete responses. However, this therapy is limited by IL-2 induced toxicity. A topic of interest in our lab has been identifying new ways to reduce the toxic side effects caused by these treatments. Previous findings suggest that IL-2 induced toxicity is related to over-stimulation of immune cells expressing intermediate affinity IL-2 receptors ($\beta\geq$ IL-2Rs). Thus, we are evaluating a novel immunocytokine, termed IC35, which targets high affinity IL-2 receptors ($\alpha\beta\geq$ IL-2Rs) and has less interaction with $\beta\geq$ IL-2Rs. Soluble IC35 is hypothesized to systemically activate cells expressing $\alpha\beta\geq$ IL-2Rs, whereas tumor cell-bound IC35 is expected to only activate cells expressing $\beta\geq$ IL-2Rs within the tumor microenvironment. Some activation of $\beta\geq$ IL-2Rs is needed for the anti-tumor effect, and we are working on methods to make these treatments more specific to the tumor microenvironment. We predict that cell-bound IC35 will exhibit a conformation change, called 'the pro-drug effect,' which we hypothesize will induce local, rather than systemic, activation of $\beta\geq$ IL-2Rs expressing cells, making the treatment more precise. If the pro-drug effect is demonstrated in this study, it may have a significant clinical impact on cancer immunotherapy.

FINANCIAL SELF-SUFFICIENCY IN MEXICO'S MICROFINANCE MARKET

Terrence Satran, Stephen Young (Mentor), Geography

Today, there is debate regarding the ways microfinance organizations are growing. In some cases, they rely on private investment but this has led to concerns about over-indebtedness of clients due to aggressive expansion tactics. Other organizations depend on collecting saving deposits, yet there are claims that this hinders long-term financial sustainability due to increased regulations. This raises the question: Does taking deposits from clients increase a microfinance organization's financial self-sufficiency? By examining the case of microfinance in Mexico, I will compare the difference in financial self-sufficiency of deposit-taking institutions and those that do not. I argue that collecting deposits creates greater financial sustainability for microfinance organizations. This research will justify the costs associated with regulations and provide an alternative to private investment funding.

ORIGIN AND DEVELOPMENT OF THE BINARY ARABIC COMPARATIVE

Neda Sattler, Joe Salmons (Mentor), German

This project elucidates the development of the Arabic comparative structures, which have not been previously studied. Arabic comparatives are formed by inserting 'root sounds' into the 'af3alu pattern, as in 'ajmalu 'more beautiful', or by adding 'aktharu before an adjective that contravenes the pattern. I explore the origins from synthetic and analytic Arabic varieties through crosslinguistic comparison of Modern Standard Arabic (MSA) to Arabic dialects and to other Semitic languages. Contrasts between MSA and Arabic dialects establish differences in frequency and semantic/grammatical usage, helping clarify the distributions of each comparative. I argue that the second innovative Arabic comparative developed language-internally. Such results may reflect preferences in world languages to utilize binary comparatives to 'comparatize' adjectives that violate their comparative construction formula.

OBSERVING TESTING EFFECTS ON CHILDREN'S WORD LEARNING THROUGH STORYBOOK READING

Hailey Sawtelle, Haley Vlach (Mentor), Educational Psychology

The purpose of this ongoing study is to examine how children's ability to learn words is impacted by testing, using a storybook. Little experimental research has been done regarding the effectiveness of word learning through storybooks. We created a storybook using 2D line drawings and novel objects alongside familiar objects. This study consists of reading conditions in which the researcher labels each novel object, and testing conditions in which the child is asked to point out the previously learned novel object associated with the novel word. We hypothesize that children will retain more words in the conditions that include testing trials compared to the condition that includes only reading trials, as testing has been shown to improve long-term retrieval for adults.

ASSOCIATION OF SPORT SPECIALIZATION AND NUMBER OF COMPETITIONS

Conner Schacht, Timothy McGuine (Mentor), Orthopedics

Sport specialization is shown to be associated with increased risk of lower extremity injuries (LEI) in athletes. However, sport specialization and sport volume have not been associated with LEI in a large sample of healthy adolescent athletes. Thus, the purpose of our study was to determine the association of sport specialization and sport volume with the history of LEI. 1043 athletes recruited from 18 schools in Wisconsin completed a survey to identify their high school and club sports, primary sport, number of primary sport competitions within the past year and whether they specialized in a sport. Results indicated athletes who specialized in a single sport were more likely to report LEI than their peers. These results can be used to improve how we train athletes.

SWALLOWING ANALYSIS OF RAD AND LRAD PATIENTS IN COMPARISON TO HEALTHY CONTROLS VIA VFSS AND HRM

Nicole Schaen, Corinne Jones (Mentor), Surgery

Head and neck cancers are primarily treated with radiation therapy. This can lead to dysphagia either during/right after treatment concluded (radiation associated dysphagia “RAD”) or years post treatment (late radiation induced dysphagia “LRAD”). Videofluoroscopy (VFSS) provides the ability to observe and rate the functional components of swallowing via x-ray video, though this can be subjective. High resolution manometry (HRM) is an objective tool that uses a catheter to analyze the pressures of different regions within the pharynx during the swallow. The goal of the project is to compare the swallows of RAD and LRAD patients to healthy controls through VFSS and HRM analysis to determine which structures are impacted. We hypothesize that there will be decreased motion in the pharyngeal constrictor regions and velopharynx, specifically.

CELLULAR IMAGING OF THE RESPONSE OF POPLAR ROOTS TO ECTOMYCORRHIZAL FUNGAL SIGNALS

Nathaniel Schleif, Kevin Cope (Mentor), Bacteriology

Mycorrhizal fungi play a critical role in plant nutrition. The most prevalent types of mycorrhizal associations include arbuscular mycorrhiza (AM) and ectomycorrhiza (ECM). AM fungi utilize the common symbiotic pathway to initiate their association with plants. This pathway terminates with nuclear calcium oscillations in root cells which lead to the formation of symbiotic structures. It is not known if similar calcium oscillations occur in response to ECM fungi. To test this, we optimized an *Agrobacterium rhizogenes*-mediated transformation technique for poplar, a common host of both AM and ECM fungi. Utilizing this method, we generated transgenic poplar roots with a highly sensitive calcium reporter (green GECO) that we will use to assay nuclear calcium oscillations in poplar roots in response to exudates from various ECM fungi.

ORGANIC CARBON STORAGE IN SOILS AND SEDIMENTS IN LAKES OF THE CHEQUAMEGON-NICOLET NATIONAL FOREST

Natalie Schmer, Jessica Corman (Mentor), Limnology

Lake browning, or the accumulation of organic carbon (OC) in a lake, has been observed in boreal and temperate regions and could impact lake ecosystems by influencing heat and light dissipation and interactions among lake organisms. This has also been observed in some lakes of the Chequamegon-Nicolet National Forest (CNNF) in northern Wisconsin. Storage sites for OC include soils and sediments, and in order to better understand lake browning and its impact on lake ecosystems, it is necessary to attempt to quantify OC and identify the source. For this project, soil and sediment samples were collected from three lakes in the CNNF in summer 2015. We analyzed organic carbon content using Loss on Ignition (LOI) and compared samples using ANOVA (analysis of variance).

A PLACE-BASED LEARNING ACTIVITY ON THE HISTORY AND IMPACT OF PCBS IN THE FOX RIVER

Stephanie Schmidt, David Hart (Mentor), Geoscience

PCBs are the byproduct of waste from paper mills and have been found in significant quantities in the Fox River of north-eastern Wisconsin. PCBs do not easily break down and are detrimental to aquatic ecosystems when concentrated in river sediments. Because of this, they are being cleaned up through a dredging and sediment remediation project on a 13 mile stretch of the river. My project involves discovering the impacts of PCBs on the Fox River and sharing that knowledge through a technology-centered, place-based learning activity. The activity will look at the history of the Fox River through the location of paper mills along the river and will describe the impacts of pollution through the changing landscape and water quality. I will draw on historical records, maps, and water quality data and utilize collaborative technology that supports place-based learning. This project will eventually become interactive as I complete the history and develop an activity that allows people to submit photographs and short accounts of what they see happening along the river. The activity will show both the negative impacts of PCBs on the environment, as well as the positive impacts of the current clean-up of the river. The goal of this project is to promote environmental stewardship through informative storytelling.

DISCOVER YOUR INNER SHAKESPEARE

Laura Schmitt, Kevin Mullen (Mentor), English

Discover Your Inner Shakespeare was funded through the Wisconsin Open Education Community Fellowship and involved the creation of a summer student literary journal, *The Quill*, that featured the fiction and poetry of young writers in Green Bay, WI. The purpose of the journal was to foster an appreciation for literature and the art of writing, build confidence among young writers, and strengthen the arts culture in the Green Bay community. I collaborated with Mosaic Arts, Inc., a local non-profit organization that promotes arts education, and Kevin Mullen, a UW-Madison writing professor. The project included a free writing workshop where the students were able to receive feedback on their writing and work one-on-one with Kevin. At the end of the summer, the students read their work aloud at Artstreet, an annual arts festival downtown that attracts over 100,000 visitors.

THE EFFECTS OF ALUM ON BACTERIAL COMMUNITIES

Samuel Schmitz, Robin Rohwer (Mentor), Bacteriology

Two years ago, the City of Madison started a pilot program to reduce phosphorus amounts in the Marion Dunn storm water pond in the UW Arboretum. The goal of the pilot program is to put aluminum sulfate, commonly known as alum, into the pond after measurable rain events. The alum will bind to solids and phosphorus suspended in the water and eventually settle on the pond's bottom in a flocculate. We are interested to see how the addition of alum will affect the bacterial communities within Marion Dunn. To study the possible change, Manitou pond was chosen as a control and both ponds were monitored over the course of the past two summers. The first summer acted as baseline data as it appeared the alum was not remaining in the pond. In order to measure the bacteria populations, we used a method called Automated Ribosomal Intergenic Spacer Analysis (ARISA). This allowed us to get a broad overview of the bacterial populations in a cost effective and timely manner. After two summers of data collection, the alum does not appear to be affecting the variability or diversity of the bacterial community of Marion Dunn. However, the data is under further analysis and further research would be highly beneficial.

TYROSINE BIOSYNTHESIS IN LEGUMES: CHARACTERIZING A UNIQUE GROUP OF AROGENATE DEHYDROGENASES

Matthew Schneider, Hiroshi Maeda (Mentor), Botany

Tyrosine is required for protein synthesis in all organisms and serves as a precursor to numerous secondary metabolites. De novo biosynthesis of tyrosine, however, is only carried out by plants and microbes. Plants typically employ a plastid-localized arogenate dehydrogenase (ADH) pathway which is regulated by tyrosine feedback inhibition. Bioinformatic analysis of ADH homologs revealed a set of unique enzymes in legume plants which group distinctly from canonical plant ADH enzymes. Biochemical characterization of purified recombinant enzymes showed strong ADH activity with a substrate affinity and cofactor preference consistent with previously reported ADH enzymes. However, these non-canonical ADH enzymes exhibit a remarkably relaxed sensitivity to tyrosine. Understanding these novel ADH enzymes may allow for increasing agricultural and industrial production of tyrosine and its many derived products.

ISOLATING THE SIGNALING MOLECULES OF ECTOMYCORRHIZAL FUNGI

Kimberly Schnell, Kevin Cope (Mentor), Bacteriology

Arbuscular mycorrhizae (AM) and ectomycorrhizae (ECM) contribute to ecosystem productivity through nutrient cycling and carbon sequestration. The signaling pathway for the establishment of AM symbiosis has been studied using the AM fungus *Rhizophagus irregularis* with the plant *Medicago truncatula*. *R. irregularis* releases Myc factors, or signaling molecules, containing lipochitooligosaccharides (LCOs) that are perceived by the host plant. It is unknown whether ECM release Myc factors as LCOs. Since it is known that non-sulfated LCOs induce root hair deformations in *Vicia sativa*, we performed root hair deformation assays and found that exudates from ECM trigger deformations, suggesting that ECM may release LCOs. We are also currently testing the effects of ECM hyphal exudates on lateral root formation and gene expression in poplar (*Populus tremula x alba*).

DIABETES-RELATED STRESS IN COLLEGE STUDENTS WITH TYPE 1 DIABETES: A QUALITATIVE SURVEY

Hayley Schreiter, Sarah Kruger (Mentor), Nursing

The purpose of this study was to describe stress in college students with type 1 diabetes (T1D). Method: A survey titled, "Diabetes-Related Stress in College Students with Type 1 Diabetes" was anonymously distributed to 62 college students with T1D to assess perceptions of stress. Findings: Students perceived their stress as different compared to stress experienced by students without T1D. Less than one-fourth of students reported talking to mental health professionals or taking anxiolytics. Conclusions: College students with T1D experience stress that may be perceived as different than students who do not have T1D. Providers should facilitate routine, evidence-based screening for mental health disorders. A valid and reliable diabetes-specific screening tool should be developed for interdisciplinary teams to detect mental health disorders and identify coping mechanisms.

AUTOMATED ISOLATION OF CIRCULATING TUMOR CELLS TO OPTIMIZE AND IMPROVE SPECIFICITY OF IDENTIFICATION

Zachery Schultz, Joshua Lang (Mentor), Medicine

Lung cancer is the leading cause of cancer related mortality. Termed a *liquid biopsy* rare cancer cells can be found in blood of patients with solid tumors via circulating tumor cells (CTCs). Initial capture of cell lines confirmed the viability of isolating CTCs using automated sliding lid immobilized droplet extraction (SLIDE). To enhance the validity of CTC identification in fixed patient samples, CD11b was used in conjunction with CD34 and CD45. This additional marker excluded 64% of cells which were misidentified as CTCs using traditional phenotypes. Optimization experiments revealed staining intensity was greatest when intercellular stains were combined with, instead of proceeded by permeabilization. CTCs offer benefits to the treatment of patients, and this data ensures more efficient isolation and identification methods.

USING CRISPR GENE EDITING TO MAKE AN ISOGENIC CONTROL LINE FOR A HIPSC MODEL OF CONGENITAL BLINDNESS

Mike Schwanke, David Gamm (Mentor), Ophthalmology and Visual Sciences

Leber's Congenital Amaurosis (LCA) is a genetically inherited retinal disorder that causes severe vision loss in infancy, resulting in congenital blindness. Pathogenic variants in 17 genes are known to cause this disorder including LCA16, which maps to the KCNJ13 locus on human chromosome 2. This locus encodes for Kir7.1, an inwardly rectifying potassium channel that is highly expressed in the retinal pigment epithelium (RPE) of the eye. A pathogenic nonsense mutation (W53X) linked to the disease phenotype leads to Kir7.1 truncation and dysfunction. Our research aims to better understand the disease mechanism and test novel therapeutic strategies using hiPSCs derived from a patient homozygous for this mutation. We present data on CRISPR/Cas9 homology directed repair of the gene defect and restriction fragment length polymorphism based screening for identification of a gene corrected isogenic hiPSC line as well as its subsequent molecular characterization. This line is essential as a positive control both to confirm the in vitro mutant phenotype and for further research testing potential clinical therapies.

LAND CHANGE EFFECTS ON TROPICAL SOIL MICROBIAL COMMUNITY STRUCTURE AND FUNCTION

Megs Seeley, Erika Marin-Spiotta (Mentor), Geography

This project assesses the effect of land use change on tropical soil microbial communities through a literature review. Land use change has been demonstrated to shift microbial composition; changing the microbial composition affects biogeochemical cycles. How microbial communities shift in response to land use change remains debated, especially in tropical regions where deforestation rates exceed those in temperate areas. Common land use conversions include pasture, agriculture, tree plantations, and secondary forests. This review synthesizes the results from tropical studies across these different land uses to identify current trends and uncertainties in the field's knowledge.

FLOAT NURSE FATIGUE IN VARIED HOSPITAL WORK ENVIRONMENTS

Danielle Sendelbach, Linsey Steege (Mentor), Nursing

Fatigue in registered nurses (RNs) is associated with decreased performance and job satisfaction, high burnout rates, increased work-related injuries and medical errors. This interview study aimed to discover how inpatient float RNs experience fatigue, what coping strategies they employ, and how work system design impacts fatigue. Interviews were analyzed using directed content analysis. Participants stated that their fatigue increased with difficulty of patient assignments, equality of assignments with other staff members, unit culture and multiple unit switches during a shift. Supportive coping factors included: units that were smaller in size, had a culture of open communication and teamwork, and even or fast paced work flow. This study offers insight into how to address float nurse fatigue, and potentially improve fatigue and coping across nursing staff.

DENSITY MAPPING OF RETINAL GANGLION CELLS IN GLAUCOMA

Gopika SenthilKumar, Gillian McLellan (Mentor), Surgical Sciences

Glaucoma is a leading cause of irreversible blindness due to regional damage to the optic nerve and the retina, specifically the retinal ganglion cells (RGCs). In order to understand features of RGCs in affected regions that make them more susceptible to damage, the objective of this study was to map density of RGCs in animals with spontaneous glaucoma and determine if inherited primary congenital glaucoma (PCG) in cats leads to a consistent pattern of RGC damage. Whole retinas from 3 normal and 5 PCG subjects were flat-mounted and p-phenylaminediamine-stained to allow manual identification of RGCs in photomicrographs. Images of whole retinas were then outlined using Image J and RGC density plots prepared using the R-package 'Retina.' Results of these analyses will be presented.

MICROENVIRONMENTAL CONTROL OF EPIGENETIC TRANSITIONS DURING REPROGRAMMING OF HUMAN CELLS

Stephanie Seymour, Krishanu Saha (Mentor), Biomedical Engineering

Reprogramming mature cells into induced pluripotent stem cells (iPSCs) offers a wide range of possibilities within the medical and biomedical engineering fields. If human adult cells can be efficiently reprogrammed to their pluripotent stem cell states, personalized medicine will become a reality as the cells can be differentiated into any cell type needed for treatment without the risk of host rejection. In this study, we attempt to understand and model these epigenetic transitions through control of the cellular microenvironment. Using a microcontact printing and high-content digital analysis pipeline developed by our lab, we have examined how cells respond to physical stimuli in the context of reprogramming with the goal of identifying and manipulating key biophysical features to increase reprogramming efficiencies.

WHY DICTATORS TRADE: UNDERSTANDING THE DOMESTIC SOURCES OF AUTOCRATIC TRADE POLICY

Teresa Shaw, Susanne Mueller (Mentor), Political Science

Autocracies have different trade barriers than democracies; therefore the variation in trade policies is expected. However, there can be a lack of transparency when it comes to understanding the intricate nature of existing policies within autocratic nations. This presentation aims to show how looking at existing legal trade agreements can give valuable insight into some of the factors that influence trade policies. For example, if a country's dictator has business elites in the inner circle, those factions can benefit considerably and could possibly be mentioned in the original treaty. Looking at a treaty's text can give insight to who benefits within the autocracy and aids in understanding how policymaking and how foreign policy contributes to the survival and fall of authoritarian leaders.

THE JOURNAL OF UNDERGRADUATE SCIENCE AND TECHNOLOGY (JUST)

Kuenzli Shelby, Dietram Scheufele (Mentor), Life Sciences Communication

The Journal of Undergraduate Science and Technology (JUST) is a peer-reviewed journal for undergraduate researchers on the UW-Madison campus. It is run entirely by undergraduate students and allows for other students to publish their work and make their research available to the broader campus community and beyond. Founded by Eddie Ruiz and Stephanie Seymour in the fall of 2015, the purpose of JUST is two-fold: to allow undergraduate researchers to gain experience publishing, editing, and reviewing academic work; and to communicate to the UW-Madison campus and also the broader community about the incredible research done by UW undergraduates. All majors are welcome to be a part of the club and no experience is necessary. The club is designed to improve everyone's skills. Positions include editors, peer reviewers, marketing and outreach teams, financial planners and much more. JUST is improvement of science. JUST is educating researchers and the public. JUST is a great opportunity for all undergraduate students.

TNF ALPHA OVEREXPRESSION DRIVES CITRULLINATION IN INFLAMED MURINE LUNGS AND JOINTS

Daeun Shim, Miriam Shelef (Mentor), Medicine

Rheumatoid arthritis may be initiated by protein citrullination, which leads to anti-citrullinated protein antibodies, which can induce cytokines like TNF α ultimately causing joint and lung inflammation. Further, inflammation increases citrullination suggesting a positive feedback loop. TNF α -overexpressing mice develop inflammatory arthritis similar to rheumatoid arthritis and have increased citrullination of serum proteins. I hypothesized that TNF α -overexpressing mice would also have greater citrullination in their inflamed joints and lungs. To test this hypothesis, western blots using anti-peptidyl-citrulline antibody were performed on ankle and lung lysates from TNF α -overexpressing and control mice. TNF α -overexpressing mice had significantly higher citrullination in lungs and ankles compared to controls. This suggests that TNF α can drive joint and lung citrullination providing support for a feedback loop in rheumatoid arthritis pathogenesis.

SIMULTANEOUS PRESSURE-VOLUME ACQUISITION OF PATIENTS WITH PULMONARY ARTERIAL HYPERTENSION

Heather Shumaker, Eric Dinges (Mentor), Biomedical Engineering

Pulmonary arterial hypertension is an incurable disease that results in elevated blood pressure and stiffening in the pulmonary arteries. Untreated, this disease has an average life expectancy of 2.8 years. The Vascular Tissue Biomechanics lab currently studies the mechanical characteristics of this condition through simultaneously-acquired right ventricular pressure and volume data from human subjects. This data is formatted into pressure-volume (PV) loops to analyze the mechanical impact of disease progression. In contrast to other techniques which combine data from different procedures at different time points, simultaneous PV acquisition minimizes the variability that can be introduced by different experimental conditions.

STOCHASTIC SPATIAL MODELS FOR MORPHOGEN-MEDIATED PATTERN FORMATION

Yu Shuqi, Wai-Tong Fan (Mentor), Mathematics

Morphogens are diffusive signal molecules produced by cells. Its concentration gradients provide positional information by activation target genes in a concentration-dependent manner. Our goal is to rigorously model this morphogen-mediated pattern formation by stochastic particle system, which is a continuous Markov process. We want to show that when the space and time are rescaled suitably, our stochastic particle system converges to a stochastic partial differential equation (SPDE) eventually. We simulate and analyze this process, and compare our model with the SPDE.

CONSTRUCTION AND ANALYSIS OF INFECTIOUS CDNA COPY OF HELA CELL LINE ADAPTED RHINOVIRUS (RV-C15)

Shakher Sijapati, James Gern (Mentor), Pediatrics

Clinical isolate of human rhinovirus C15 (RV-C15) replicates well in transduced HeLa-E8 cells stably expressing CDHR3. However, virus infection causes very mild cytopathic effect (CPE) compared to lab strains of other rhinoviruses. After 10 serial passages of the wild-type RV-C15 (RV-C15-P10) in HeLa-E8 cells, a strong CPE and increased virus progeny yields are observed. We aimed at identification of genomic mutations in RV-C15-P10 that lead to more robust replication and increased virus progeny yields, resulting in more severe CPE. We sequenced the complete genome of RV-C15-P10 and compared it with that of the parental clinical isolate. Missense mutations in VP3, VP1, and 3A proteins were found in RV-C15-P10 genome. The only two key mutations (T125K and E41K) were responsible for increased viral binding and replication.

DEVELOPING A NEW DRUG SAFETY SCREEN

Jonathan Silignavong, Gail Robertson (Mentor), Neuroscience

Human ether a-go-go-related gene (hERG) is a voltage-gated potassium ion channel essential to the cardiac system. Disruptions in hERG activity through mutations or drug block alter repolarizing currents which contribute towards the regulation of cardiac action potentials. Because of its significant role, hERG is the focus of cell-based pharmaceutical tests. The current model for drug safety screening utilizes homotetramers of hERG 1a. Another component, hERG 1b, has been found to interact with hERG 1a. The heterotetramers exhibit differences in repolarizing currents and sensitivity to a wide range of compounds. To have a more physiologically representative model, a cell-based assay comprising hERG 1a/1b heterotetramers is necessary. The goal of this project is to create a stable cell line for screening purposes using the PiggyBac Inducible System.

LITTLE FREE LIBRARIES: DO IT YOURSELF NEIGHBORHOOD PLANNING AND SPATIAL INEQUALITY

Chelsea Simek, Carolina Sarmiento (Mentor), Civil Society and Community Studies

Little Free Libraries are part of a national non-profit organization that encourage community development to be taken into the hands of private citizens. The hypothesis predicts that the distribution of these libraries is uneven and anticipates that more are located in the wealthier, urban areas. Research methods include examining census tracts in Madison, Wisconsin; using participant observation; and performing semi-formal interviews with library caretakers and visitors. To analyze results, maps have been created to mark locations with more Little Free Libraries. Results found most are located in middle, upper class, and urban areas, but anecdotal evidence collected from semi-formal interviews finds high interest in the libraries, indicating that more Little Free Libraries may soon be developed and the uneven distribution reversed.

DESIGNING PEPTIDE LIGANDS TO ACTIVATE G PROTEIN-INDEPENDENT SIGNALING PATHWAY OF PTHR1

Jessica Simon, Samuel Gellman (Mentor), Chemistry

The parathyroid hormone receptor type 1 (PTH1R) is involved in both G protein-dependent and independent signaling modes which effect an array of biological processes. In order to elucidate the effects of each pathway, this study aims to design peptide ligands that will only induce G protein-independent signaling by selectively recruiting β -arrestin to PTHR1. No widely-accepted β -arrestin-biased PTHR1 ligand currently exists, as it is difficult to inhibit the G protein-activating ability of PTHR1 agonists without simultaneously abolishing β -arrestin recruitment. However, we hypothesize that certain chemical modifications of PTHR1 antagonists may sustain β -arrestin recruitment without concomitant G protein activation. The pathway selectivity of chemically-modified PTHR1 antagonists will be evaluated by two types of functional cell assays. Cyclic AMP-based glosensor assay will be used to study Gs protein-dependent signaling pathway, while β -arrestin recruitment will be investigated using bioluminescence resonance energy transfer assay.

CRISPR-CAS9 MEDIATED SPLIT GFP AS SCREENING TOOL AND POTENTIAL WAY OF LIVE IMAGING PROTEINS

Samantha Sison, Kathaleen O'Connor-Giles (Mentor), Genetics

Neurons within the neural circuits that control our behaviors communicate through synaptic connections. Thus, synapse formation is essential for regulated behavior, and changes to synapses are the basis for learning and memory. Using the CRISPR-Cas9 system in *Drosophila*, we propose a modified split-GFP approach for studying synaptic proteins in normal synapses in a living organism. Specifically, we will endogenously tag synaptic proteins with the 15-amino acid split-GFP (11) tag for minimal disruption to the normal function of the protein under study. In tandem, we are generating lines that express split-GFP (1–10) in all neurons. Reconstitution of GFP through genetic crosses will enable visualization of synaptic proteins and provide a marker to screen for engineered lines.

THE ROLE OF HPV ONCOPROTEIN E6 IN ANAL TUMORIGENESIS

Hana Sleiman, Evie Carchman (Mentor), Surgery

HPV oncoproteins E6 and E7 promote the development of anal cancer by disrupting tumor suppressor genes p53 and Rb, respectively. We investigated the impact of E6 alone on anal tumorigenesis as opposed to its effects when expressed with E7. K14E6 and K14E6/E7 transgenic mice were given DMBA and observed weekly for tumor growth. Average number of anal tumors, average anal tumor load (mm), and average total tumor load (mm) in each treatment group were noted at specific time points (5, 10, 15 and 20 weeks). Results indicated that E6 alone is not as effective at inducing anal tumors as when expressed with E7, as only 30% of K14E6 mice developed tumors, while 84% of K14E6/E7 mice had tumors by 20 weeks of treatment.

WHY STORIES MATTER: EXAMINING THE ROLE OF NARRATIVE IN WOMEN'S LIVES

Sarah Rose Smiley, Christine Garlough (Mentor), Gender and Women's Studies

This study works to understand how women use narrative as a tool for empowerment, identity, and communication. Narrative, folklore, and feminist theory provide the foundation of this study. The primary research questions focus on narrative's role in women's lives, and examine how narrative shapes women's identities. By exploring how eight women use narrative in their lives, as well as how narrative and feminism intersect, along with cultural and social contextual factors, I have sought to develop a richer and more complete understanding of narrative and its use by women. Although the results of this study are not generalizable across all women's lives, this study furthers the understanding of narratives in women's lives and the lives of their families, and draws conclusions for further research and study.

EDUCATIONAL OUTCOMES OF STUDENTS OF COLOR AT PRIMARILY WHITE INSTITUTIONS

Hailey Smith, Leann Tigges (Mentor), Community & Environmental Sociology

The purpose of this study is to identify factors that lead to disparate academic outcomes for students of color at Primarily White Institutions (PWIs), defined in this study as institutions with an undergraduate student body more than 70% white. This project uses data from the Department of Education and the National Center for Educational Statistics to describe disparities in academic achievement for full-time undergraduate students of color in the Midwest. The literature suggests that family educational background and environment play a large role in college completion especially for students of color. Regression analyses were used to identify which factors inhibit equal academic outcomes across racial and ethnic groups. The results of this analysis can help PWIs become more accessible for students of color.

CAUSES AND SOLUTIONS TO HEALTH AND SEXUAL ORIENTATION INEQUALITIES

Whistler Somers, Michael Wagner (Mentor), Journalism and Mass Communication

Inequality, in its many forms, negatively affects numerous individuals. This research project sought to understand how issues of inequality, with a focus on health and sexual orientation inequalities, have been assessed and critically understood by academic researchers. Using a content analysis of academic articles examining various inequalities, similarities in what academic researchers believe are the causes and solutions to health and sexual orientation inequalities have been compiled and assessed.

CONTRIBUTION OF REGIONAL ORGANIZATIONS IN DEVELOPMENT OF HUMAN RIGHTS

Yoo Na Song, Lisa Martin (Mentor), Political Science

Several studies measure the influence of international organizations such as the United Nations on the implementation of domestic policy in member countries. However, there are few studies on how regional organizations in particular elicit compliance from its member countries. Regional organizations are special in that states are gathered by regional interests, and the way of drawing state compliance varies for each regional organization. For example, the Association of Southeast Asian Nations (ASEAN) and the European Union (EU) have different approaches and powers of enforcement measures for the member countries. I compare and contrast how the ASEAN and the EU elicit human rights compliance from their member countries and further discuss the ways that they can reach cooperation through joint policy dialogues.

DETERMINING THE IMPORTANCE OF ENVIRONMENT FOR ESTABLISHING INTESTINAL MICROBIAL DIVERSITY

Thomas Sorenson, Federico Rey (Mentor), Bacteriology

The mammalian intestinal tract is host to a multitude of microbial species that have a large impact on different aspects of life. Early life exposures influence the microbial composition of the microbiome. Recent studies suggest that people growing up in rural settings have better health outcomes than their urban counterparts. To potentially elucidate the basis for the improved health outcomes of rural-dwellers, we are investigating whether there is a difference in microbiome diversity and composition as compared to urban-dwellers. Our results will allow us to potentially make correlations between increased microbial diversity and improved health outcomes, especially regarding autoimmune diseases. We are testing this hypothesis by sequencing the 16S rRNA gene from fecal samples obtained from 430 participants of the Wisconsin Longitudinal Study (WLS). The generated results will help to provide evidence that differences in early-life exposures can affect late-life microbiomes and correlate with health outcomes.

INVESTIGATING ENGRAFTMENT OF MOTOR NEURON PROGENITORS

Akshitha Sreeram, Randolph Ashton (Mentor), Biomedical Engineering

Patterning human pluripotent stem cells (hPSCs) into tissue specific cell phenotypes has been integral to creating groundbreaking in vitro disease models and regenerative cell therapies. The Ashton lab has created a novel protocol for differentiating hPSCs into Olig2+ motor neuron progenitors. I propose to use this protocol to investigate their potential for in vivo engraftment. I hypothesize that stem cell engraftment within the chick spinal cord will be enhanced by further patterning the cells to a motor neuron (MN) phenotype. Discovering that phenotypic specification enhances MN progenitor engraftment will have important implications on future regenerative therapy approaches in the spinal cord. Furthermore, engraftment of human motor neurons along the axis of the chick spinal cord will create a humanized animal platform for investigating neurodegenerative disorders.

TODDLERS' ATTENTION IN THE PRESENCE OF BACKGROUND TELEVISION

Brooke Stanek, Melanie Blaser, Britta Gutschenritter, Kaelyn Schreiner, Heather Kirkorian (Mentor), Human Development & Family Studies

Previous research has demonstrated that parents often watch television while children play in the same room at home, and that background television can influence children's play behavior. The purpose of the current study is to better understand toddlers' attention while playing with and without television. Children played in a lab that was set up like a typical living room while a parent completed questionnaires. For part of the session, an adult-directed program played in the background; the television was off for the remainder of the session. We are currently coding videos to track the focus of children's attention throughout the duration of the session (e.g., toys, television, parent), and we plan to analyze the time spent attending to different activities with and without television.

LEARNING IN CARDIAC SURGERY

Hailey Staunton, Joe Raffiee (Mentor), Management and Human Resources

The purpose of our project is to examine how surgeon education and experience influence performance and rates of learning in cardiac surgical procedures and the risk-adjusted mortality rate. It is important to notice correlations between surgeons so a universal education plan could project more successful surgeries. My main tasks include coding the experience, education, specialties, patient reviews, and other characteristics of surgeons in California from Healthgrades.com and other online sources. This will generate an extensive background on all aspects of cardiac surgical performance and how to analyze the statistics for an improvement in healthcare. For example, from looking at detected patterns from the categories, an increase in the number of procedures and conditions that can be treated led to a higher rate of patient satisfaction.

POVERTY IN BETHEL COUNTY, ALASKA

Joshua Steger, Leann Tigges (Mentor), Community and Environmental Sociology

Alaska is rich in beauty, natural resources and landscapes, but we often forget about the poor, native populations that live there. This research explores poverty in Bethel County, which has the highest poverty rate in Alaska. I investigate the factors that influence inequality between this population and others. Using data from the American Community Survey and other secondary sources, I examine how Bethel County's demographic, political, economic, and community factors affect the level of poverty there. Bethel's Native American population is dependent on natural resources and is spatially isolated from other communities, and the cost basic necessities are high. The best options for Bethel County are to invest in community and outreach centers to help increase social capital among residents along with other opportunities.

ISOLATION, CHARACTERIZATION, AND DRAFT GENOME SEQUENCE OF AN ENVIRONMENTAL CELLULOLYTIC BACTERIUM

Andrew Steinberger, Garret Suen (Mentor), Bacteriology

Bacteria of the cellulolytic genus *Cellulomonas* have been isolated from a variety of cellulose rich environments such as compost, animal feces, and soils. This genus is unique in that it contains the only two organisms described as being capable of both aerobic and anaerobic cellulose degradation while generating metabolic by-products such as short chain fatty-acids and ethanol. Here we describe a Gram-positive, motile, rod-shaped facultative anaerobe, designated strain A375-1, isolated from marsh soil along the Howard Temin Path in Madison, Wisconsin, that can also degrade cellulose under both aerobic and anaerobic conditions and produce short chain fatty acids and ethanol as metabolic byproducts. Phylogenetic, genomic, and physiological analysis were performed to identify it as a *Cellulomonas* species and to evaluate its cellulolytic capabilities.

THE EFFECT OF SLEEP ON PHYSICAL ACTIVITY AND ENERGY IN UNIVERSITY UNDERGRADUATE AND GRADUATE STUDENT

Matthew Stewart, Blake Helton, Elizabeth Larson (Mentor), Kinesiology

College students are among the most sleep-deprived of all age groups. Given that sleep is essential to memory and learning, college students need to develop healthy habits to promote college success. While some individuals use exercise to promote better sleep and energy, other students may turn to napping and energy drinks. This project examined the association of sleep, perceived energy and physical activity in UW-Madison undergraduate and graduate students who meet U.S. Department of Health and Human Services 2008 physical activity guidelines (150 minutes of mild/vigorous activity per week). 76% of 193 students in two courses consented to have their data used for analysis. Students completed 6-7 day time diaries recording all daily activities including sleep and rated the degree they experienced pleasure, productivity, rejuvenation, and time pressure during these activities. A brief survey of their age, year in school, gender, height, and weight was also completed. Participant data was de-identified by the research team before analysis. For this analysis, each time diary entry that suggested the student participated in physical activity was coded as either unplanned or planned physical activity. Total time in planned and unplanned physical activity recorded in the time diaries were examined across the subgroups of gender, race, BMI category, age, grade, and season. T-tests were performed to examine difference in physical activity levels between groups. A simple correlation was performed to examine the associations of sleep, average total amount of physical activity performed per day, along with average ratings of how energized the participant felt. This will help better understand the effect of sleep on the amount of physical activity performed and perceived energy.

STUDENT PERCEPTIONS OF THEIR MAJOR AND HOW IT IMPACTS INVOLVEMENT

Joel Stibbe, Michael Callahan, Walter Dekock, Jake Glading, Jiayue He, Matt Van Ommeren, Deanna Zernicke, Elizabeth Foste (Mentor), Economics

Student perceptions of the value of their major (attitudes) develop through personal experiences as well as through a student's perceptions of others' attitudes about the major (subjective norms). We argue that these student attitudes and subjective norms can explain the likelihood that a student will be actively involved with his/her major or department as well as the sense of cohesion the student feels with the faculty and other students in the department. Both cohesion and involvement have been shown to positively affect student persistence, outcomes, and academic achievement. To examine this assumption, we will collect data from 40 undergraduate students of various majors in 5 unique focus groups. Students will be asked about their perceptions about the economics department and how it relates to their involvement in the department and their bonds with others in the department. From these focus groups, we will develop recommendations and suggestions for the department on how to more actively engage undergraduate students.

HELIUM ION ENERGY MEASUREMENT FOR A SOLAR WIND IMPLANTATION DEVICE

Alexander Strange, Gerald Kulcinski (Mentor), Engineering Physics

Helium-3 could be used as a fuel for society's future power production needs. Unfortunately, helium-3 does not exist in large quantities on Earth. There is, however, at least 1 million tonnes of helium-3 within a 3 meter depth of the lunar surface. This helium originates from the solar wind impinging on the lunar surface. The Fusion Technology Institute has developed preliminary miner designs to extract helium-3 from lunar soil, but the process of helium-3 extraction has not yet been demonstrated. A helium implantation device has been constructed to enable Earth-based tests of helium extraction from lunar soil simulant. Knowledge of the helium ion energy spectrum produced by the implantation device is required to be able to characterize how well the device simulates solar wind implantation. An apparatus for measuring the helium energy spectrum has been designed and the results from its operation will be used to help improve the implantation device.

SPECIAL EDUCATION TEACHER READINESS WITH ENGLISH LANGUAGE LEARNERS

Brandon Stringer, Allison Lueke, Taucia Gonzalez (Mentor), Rehabilitation Psychology & Special Education

The main goal of this research project was to determine the strategies and challenges special education teachers encountered working with linguistically diverse students with disabilities. To observe these challenges and strategies, surveys were distributed to special education teachers throughout schools located in Arizona and California. These surveys were composed of multiple choice and short answer questions that were later coded. The coding of the survey responses has led to the analyzing of the data collected and has pinpointed specific areas in special education teaching that may need improvement.

EXPANDING PUBLIC ENGAGEMENT IN CONSERVATION EDUCATION

Andrew Strother, Gregory Goar (Mentor), Air Force Aerospace

The project Expanding Public Engagement in Conservation Education focused on providing educational events that connect local residents and educators to Kenosha County's newest park, the Sustainable Living and Environmental Education Park. This project's specific goals were to promote learning in nature by linking families with wildlife, encouraging K-12 educators to utilize local parks and natural resources as educational materials, and urge citizens to engage in and practice responsible decision making skills related to wildlife and natural resource management. These goals were ultimately accomplished through a series of three projects, each of which was individually designed to achieve a certain goal. This effort supported the stated goal of the park, which aims to intertwine recreation and education to encourage widespread adoption of sustainable living practices.

AFFECTS OF CHONDROITIN SULFATE PROTEOGLYCAN ON THE DIFFERENTIATION OF NEURAL CELLS IN VITRO

Morgan Suhre, Lindsey Jager (Mentor), Neurology

Chondroitin sulfate proteoglycans (CSPGs) play a major role in development and repair of the central nervous system (CNS). In development, CSPGs act as guidance cues for neuronal growth and connections. More recent research has been exploring their role in synaptic pruning as well. Following injury to the CNS, CSPGs inhibit neurite regrowth, but their specific role in this inhibition continues to be researched. While much research has been done on the affects and treatment of CSPGs in vivo, research has yet to conclude what the affects of CSPGs are in vitro. This systematic review discusses the affects of different types of chondroitin sulfate proteoglycans on the survival and differentiation of neural stem cells in vitro.

COMPARING AREAS OF DISAGREEMENT AMONG YOUNG ADULT DATING COUPLES AND EMPTY NEST COUPLES.

Katie Sullivan, Kristen Krueger, Lauren Papp (Mentor), Human Development and Family Studies

This study draws from two recent studies conducted in the UW Couples Lab: one that included 51 adult dating couples and another including 55 midlife married couples living in the empty nest. The purpose is to identify strongest areas of disagreement reported by couples in these different developmental life stages. Levels of disagreement were assessed by both partners completing the Areas of Disagreement survey (Roberts, Tsai, & Coan, 2007). We hypothesized that the greatest areas of disagreement among both young adult dating couples and midlife empty nest couples would involve communication and money.

SYNTHESIS OF SILVER-DIAMOND/GOLD-DIAMOND NANOCOMPOSITE FOR VISIBLE LIGHT INDUCED CO₂ PHOTOREDUCTION

Adarsh Suresh, Robert Hamers (Mentor), Chemistry

The current study investigates visible light photoactivation of diamond semiconductor, a solid-state solvated electron source for photoreduction reactions. Current methods utilize UV-light for CO₂ photoreduction while it is desirable to utilize visible light as it is safer and more abundant. Visible light, however, cannot transmit enough energy to create direct electron transitions across diamond's bandgap (5.5eV). It is hypothesized that plasmonic metal-nanoparticles facilitate solvation of electrons by providing an intermediate energy level. Metal-nanoparticles are synthesized on the diamond surface; the nanocomposite is subject to high-pressure CO₂ photoreduction under visible light. The experiments are validated by analysing SEM/UV-VIS/IR data, and calculating yield/selectivity of CO against competitive reduction species. This approach could unravel novel, energy-efficient photoreduction pathways for converting CO₂ into chemical feedstocks.

CHARACTERIZATION AND COMPARISON OF MATRIX A3 GRAPHITE WITH IG-110 NUCLEAR GRAPHITE

Colin Swee, Raluca Scarlat (Mentor), Engineering Physics

Microstructural differences between Matrix A-3 and IG-110 Nuclear graphite are important to assess experimental accuracy when IG-110 is used as a surrogate material. XRD analysis was used to determine the d(002) spacing which was in turn used to calculate the degree of graphitization of the two samples. This calculation revealed that A3 has a smaller degree of graphitization relative to IG-110. This result is found to be consistent with heat treatment's effect on the graphitization. Crystallite sizes (both in plane and out of plane) and porosity of the samples were also compared using raman spectroscopy and optical image analysis respectively. While analyzing porosity via optical light spectroscopy, polarized light spectroscopy, and SEM imaging, binder and filler properties were extrapolated using Matlab evaluation.

ANALYSIS OF THE ROLE OF FLS2 PRR GENE IN MEDICAGO TRUNCATULA

Erin Sweeney, Jean-Michel Ane (Mentor), Bacteriology and Agromony

Plants have defense response systems to microbes. Identification of microbial molecules, also called Microbe Associated Molecular Patterns (MAMPs), within the species is the first step of plant immunity. The specific mechanisms responsible for identification are Pattern Recognition Receptors (PRRs). The PRR gene called FLS2 and its function within the legume *Medicago truncatula* is of particular interest. The study of FLS2 in *Medicago* is being conducted via addition of a synthetic flagellin peptide and inoculation of *M. truncatula* FLS2 mutants. With a lack of knowledge on the role of FLS2 in symbiotic relationships of legumes (including *Medicago*) yet a plethora of data collected on said relationships in model organism *Arabidopsis thaliana*, our research will fill in gaps regarding the role of FLS2 role in *Medicago truncatula*.

PRESCHOOLERS' WORD LEARNING FROM EBOOKS VS. PRINT BOOKS

Jenna Tabatchnick, Megan Gates, Kylie Markeland, Haley Steffanus, Heather Kirkorian (Mentor), Human Development and Family Studies

Previous research on preschoolers' learning from electronic books compared to print books has yielded mixed results. The purpose of this study is to examine the impact of different book mediums and interactivity on preschoolers' (3 to 5 years) ability to learn novel words. Participants (N=80) will be read a novel story that was designed to teach new words. The book will be either an interactive eBook, non-interactive eBook, interactive print book, or non-interactive print book. The book will introduce five words created in a lab to make sure they are unfamiliar. Of particular interest is whether the number of words children learn from the books is more dependent on the medium or interactivity.

PREREGISTRATION OF 16- AND 17-YEAR-OLD VOTERS: CASE STUDIES OF HAWAII AND FLORIDA

Jennifer Tasse, Barry Burden (Mentor), Political Science

Young voters' traditionally poor turnout in elections is often blamed on apathy and disengagement, but the history of registration makes clear that it has long been a system that creates barriers for transient or inexperienced voters. Young voters have not yet formed voting habits and are a transient population. Policies that aim to form habits, update registration rolls and operate within already existing state agencies could boost youth turnout. The preregistration of 16 and 17-year-old voters in some states has been proven to do just that. Hawaii and Florida have both implemented the policy working closely with school boards and administrators to register students in schools. Supervisors utilize a range of tactics to preregister students and empower them to vote once eligible.

SUPPORT GROUPS AND MOTHERS OF CHILDREN WITH AUTISM SPECTRUM DISORDER

Desiree Taylor, Sigan Hartley (Mentor), Human Development and Family Studies

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that affects over 3 million people in the US. Mothers of children with ASD report heightened levels of parenting stress. The goal of the present study was to examine the use and benefit of family support groups in a sample of 183 mothers who had a child with ASD (aged 5–12 years) from Wisconsin. Results indicated that 36 (19.3%) of mothers attended a family support group. Independent sample T-tests showed that mothers who attended family support groups had children with a higher severity of ASD symptoms, and reported a higher level of parenting stress than mothers who did not attend family support groups. Findings have implications for understanding gaps in family support group usage and benefit.

PERFORMATIVE ART AND WELL-BEING

Sandie Thao, Steve Quintana (Mentor), Counseling Psychology and Educational Psychology

Performative art can be empowering and healing to both the performer and the audience themselves. Our focus group right now is spoken word performance. Our research further understands the process and impact a piece may have on the audience and performers, themselves. We are examining both the psychological risks and benefits of a performer's experience from the very beginning of creating their piece, to performing it. There will be interviews conducted with voluntary participants who would like to share their stories and with our qualitative analysis of these interviews, we hope to determine any psychological risks affecting the performer themselves or benefits to their well-being.

THE RELATIONSHIP BETWEEN ELECTRON TRANSPORT SYSTEM FUNCTION AND AGING

Julie Thelen, Rashpal Dhillon (Mentor), Biomolecular Chemistry

The mitochondrial deacetylase, SIRT3, has been linked to extended lifespan via caloric restriction. With age, mitochondria show a deterioration of respiratory capacity due to defects in the electron transport system. However, few studies have established the link between SIRT3 expression and mitochondrial function. In this study, we compare mitochondrial respiration capacity between SIRT3 wild type and knockout mice, fed control and calorie restricted diets, at 5, 15, and 25 months of age. Aerobic metabolism was examined using maximal velocities of all electron transport complexes and citrate synthase. The activity of these enzymes will be compared to oxygen flux data of intact mitochondria from the same mice to assess the oxidative phosphorylation capacity between these tissues. These results may establish key mitochondrial targets for extending lifespan.

INNOVATION IN UNDERGRADUATE LEARNING: COLLECTIVE INTELLIGENCE IN QUANTITATIVE REASONING (CINQR)

Cal Thomas, Kyle Casey, Amanda Himmerich, Amir Assadi (Mentor), Mathematics

The Quantitative Reasoning (QR) measure of the GRE General Test assesses mathematical skills. Presumably, the UW-Madison undergraduate QR requirement addresses understanding of mathematical concepts, ability to reason quantitatively, and to solve problems with quantitative methods. The theme of the CinQR project is to propose a new genre of pedagogical approaches for more effective QR instruction inspired by the emerging brain research, called Collective Intelligence. Accordingly, in hopes to improve QR instruction and learning, this project explores combining the advances in cognitive and affective neurosciences with social networks. Specific aims of this research are: (A) To qualitatively and quantitatively through direct observation and interactions with students in Math 141 (Spring 2016) strengths and weaknesses of the Collective Feedback Projection* (CFP) in student learning of specific topics the syllabus; (B) To explore and discover the most significant factors that influence learning within the Collective Feedback Projection (CFP); (C) To prepare a scientific report with the effects of CinQR to enhance UW-Madison resources for future instruction and learning in QR and potentially other undergraduate courses.

* The Collective Feedback Projection (CFP) is a particular collective intelligence paradigm developed by Professor Assadi as an outcome of his NSF-funded research (Symmetry Across Curriculum.)

SOLICITED AND UNSOLICITED ADVICE

Courtney Thompson, Kai Pham, Lyn Van Swol (Mentor), Communications Arts

Our research, Solicited and Unsolicited Advice, examines how people react to advice based on perception of power in a writing exercise. Through text chat, participants shared their problems with a peer, and that peer wrote back with advice. The peer giving advice was actually a researcher. By prefacing the text chat with prompts to invoke or remove power, we were able to manipulate how powerful the participant felt. Whether the participant declined the advice (unsolicited) or accepted it (solicited), advice was given for the problem. We conclude that reactions to advice depend on the level of privacy and the significance of the problem. Additionally, less powerful participants felt satisfied to receiving and implementing unsolicited advice, whereas more powerful participants were less willing and unhappy.

NICKEL-CATALYZED HYDROBORATIONS OF STYRENES

Eric Touney, Jennifer Schomaker (Mentor), Chemistry

First-row transition metal catalysis offers a cheaper, more environmentally sustainable alternative to second and third row transition metal catalysts. Nickel has shown great promise as a tool for the borylation of alkenes to yield boronic esters, but it is challenging to control the regiochemistry of reactions of simple olefins. Herein, we report the synthesis of benzyl boronic esters via nickel-catalyzed hydroboration. A series of novel N-heterocyclic carbene (NHC)-phosphine nickel complexes were synthesized to optimize this transformation. New heteroleptic NHC-phosphine complexes were found to display a broad substrate scope and maintain the integrity of yield and regioselectivity when challenged with substrates bearing increased steric hindrance. The heteroleptic complexes also tolerate both electron-withdrawing and electron-donating groups better than previously investigated bisphosphine and Ni(0) complexes

FLUID ENDURANCE

Brigid Transon, Andrea Harris (Mentor), Dance

This performance is a presentation of three dance solos combined into a trio. The dance confronts issues that are experienced by women regardless of their class, race or nationality. The first solo addresses domestic abuse and the struggle to preserve one's sense of self. The second solo is about social oppressions, such as the media's objectification of the female body, and how to cope with the sense of powerlessness this creates. The final solo deals with depression and the struggle to keep going when one is at the point of giving up. This performance embodies my research of internal and external challenges women face, and is delivered through the overlap movement and spoken word. In developing this piece there was a specific focus to ensure each woman had a strong voice.

REPROGRAMMING MSL5 TO RECOGNIZE MUTANT BRANCH POINT SEQUENCES DURING SPLICEOSOME ASSEMBLY

Brexton Turner, Aaron Hoskins (Mentor), Biochemistry

Saccharomyces cerevisiae Msl5 is an essential protein responsible for the assembly of a catalytically active spliceosome. Msl5 mediates spliceosome assembly through the recognition of the intronic branchpoint sequence 5'-UACUAAC. Upon binding, Msl5 establishes an interaction with U1 bound to the 5' splice site before recruiting the U2 snRNP to the intronic branchpoint sequence. We have generated and expressed mutant Msl5 proteins containing L176N and L167A/Q255A mutations, designed to bind specifically to mutant branch point sequences 5'-UACUACC and 5'-UACAAAC, respectively. Electrophoretic mobility shift assays will be performed to determine if reprogrammed Msl5 can specifically recognize and bind to a mutant branch point sequence. The reprogramming of Msl5 can be used to generate an orthogonal Msl5 system in vivo, and to analyze the effectiveness of intron splicing containing different branchpoint sequences.

MECHANOSENSITIVE CHANNELS: A PATHWAY FOR INNER MEMBRANE PERMEABILIZATION IN E. COLI BY INDOLICIDIN

Meghan Turner, James Weisshaar (Mentor), Chemistry

The current antibiotic-resistance epidemic has led to increased focus on antimicrobial peptides (AMPs), short, host-defense peptides multi-cellular organisms, as potential prototypes for the design of novel antibacterial drugs. In vitro studies of vesicles have suggested that AMPs likely permeabilize bacterial membranes by forming discrete pores. However, live bacteria have an extensive array of transmembrane proteins, which the peptide could alter to cause permeabilization. Single cell, in vivo fluorescence microscopy was used to determine the importance of each of *E. coli*'s seven mechanosensitive channels to membrane permeabilization, cell growth, and cell survival. I have identified MscM, the "mini" mechanosensitive channel, as a potential pathway for the AMP indolicidin's permeabilization of the cytoplasmic membrane of *E. coli*

SMART ASTHMA MANAGEMENT: STATISTICAL MODELING AND PROGNOSTICS OF RESCUE INHALERS

Rayyaan Usmani, Patricia Brennan (Mentor), Nursing

Asthma is a complex lung disease that impacts more than 22.2 million Americans; rescue medication inhalers help treat asthma exacerbations. The Smart Asthma Management team analyzes 99 patient-generated temporal event logs of rescue inhaler use to develop predictions of future uses of asthma inhalers. As part of the larger study, I investigated the precision (of the events predicted, how many occurred), recall (of the events that occurred, how many were predicted), and accuracy (did we predict when an event did or did not occur) for use in a hidden Markov model-based prediction strategy. I found that the accuracy metric is affected by the event density, while prediction recall is not. I also plan to investigate how the seasonal variation (month) may influence these metrics.

THE LINK BETWEEN FRACTION MAGNITUDE REPRESENTATIONS AND MATH SKILLS

Nina Vakil, Edward Hubbard (Mentor), Educational Psychology

An understanding of fractions is an essential foundation for comprehending numerous mathematical concepts. However, children and adults struggle with fraction comprehension and computation. This difficulty may be due to individuals' inability to process numbers holistically on the mental number line. To understand how fractions are mentally represented on the mental number line, we tested 103 adults on a battery of tasks including university placement exams, a number line estimation task, IQ, and a written fraction assessment. Results from a magnitude comparison task revealed whether adults use holistic or componential strategies to process fractions. More holistic fraction processing strategies were correlated with higher math achievement. This study sheds light on how different adults mentally represent fraction magnitude, and how these representations affect formal math achievement.

TECHNOLOGIES OF PARTICIPATORY GOVERNANCE IN NON-DEMOCRACIES: A THEORETICAL FRAMEWORK

Joaquin Valdez, Haley Massa, Hannah Chapman (Mentor), Political Science

In this research, we look at the use of deliberative and discursive participation in governments, along with the psychological effects of deliberative participation. Often deliberation has been described as a cornerstone of democracy, but recently, non-democracies have been using these techniques. With the rising interest in deliberative tactics, this research aims to explore the implications deliberative participation may have on a society based on its psychological effects, and the different ways that deliberation is used in different societies. We do this by analyzing how deliberation affects citizen's attitudes, legitimizes governments, and can be altered to work inside non-democracies. From this we can see why a non-democracy may try to encourage some forms of deliberation in order to legitimize and stabilize their government.

WHAT ARE THE ETHICAL RESPONSIBILITIES OF COUNTRIES THAT EXPORT NUCLEAR POWER?

Kevin van Duysen, Raluca Scarlat (Mentor), Engineering Physics

Nuclear energy will arguably be one of the major energy sources during the 21st century, thanks to its affordability, reliability and low CO₂ content. According to World Nuclear Association (WNA), about 30 developing countries might acquire nuclear power or build further nuclear plants by 2030. To this end, these countries will have to import nuclear plants from the countries that master the leading nuclear technologies. Such a deployment of nuclear plants in countries with very little experience in the nuclear area entails some risks, and thus an ethical responsibility for exporting countries. The proposed presentation aims at analyzing this responsibility and determining how it is shared. It intends also to show that deciding not to export nuclear power triggers other types of ethical issues.

INVESTIGATING THE NEURAL BASIS OF DEVELOPMENTAL GERSTMANN'S SYNDROME

Maiyer Vang, Edward Hubbard (Mentor), Educational Psychology

Gerstmann's Syndrome (GS) is a neurological condition characterized by four components: difficulties with writing (dysgraphia), math (dyscalculia), finger knowledge, and left-right confusion. In adults, the syndrome occurs after an injury to the left parietal lobe. However, the presence of developmental GS in children is not fully understood. To test whether developmental GS depends on the same mechanisms as in adults, we will utilize functional and structural MRI and diffusion tensor imaging (DTI) to analyze the neural activations and connections for each of the four skills implicated in GS. We expect parietal activation for each skill, connected by a common white matter tract. This research will provide insight to the characteristics of developmental Gerstmann's Syndrome and eventually help with rehabilitation of affected individuals.

CELL AND MOLECULAR TECHNIQUES ASSOCIATED WITH VASCULAR BIOLOGY

Jazmin Vargas, Bo Liu (Mentor), Surgery

Cardiovascular disease is still one of the leading diseases worldwide. The Bo Liu lab focuses on the study of underlying mechanism regulating abdominal aortic aneurysm and restenosis. The goal of my first year research experience has been to learn and gain exposure to several cell and molecular techniques associated with vascular biology that will enable to me comprehend the intercellular interactions that take place during vascular disease. Some of the primary techniques that I have learned about are the extraction and detection of proteins, cell culture, hematoxylin staining, immunofluorescence, migration assay, and bone marrow extraction. My future direction involves learning about flow cytometry and western blotting.

GELATIN-PEG HYDROGEL AS A FLEXIBLE, LONG DURATION 3D CELL CULTURE SYSTEM

Joseph Vecchi, W. John Kao (Mentor), Biomedical Engineering

Most cells in vivo are not arranged in a monolayer like how they are traditionally cultured in vitro on TCPS. This results in phenotypic changes when cultured in vitro and non-translatable results from biological assays such as toxicity tests in drug development. This study utilizes a 3D cell culture system made from crosslinking Gelatin-PEG-Cysteine and PEGdA to create a semi-interpenetrating network (sIPN). This sIPN is flexible in the material ratios used, cells can be encapsulated in it and cultured with viability longer than 2D TCPS, microtissues can be encapsulated in the system, and RNA can be extracted for RT-PCR studies. This tool could allow for the optimization of culture of many cell types with possible applications in differentiation studies, drug development, or disease progression studies.

IT'S CULTURAL, NOT RELIGIOUS: HOW BHARATANATYAM HAS SHAPED SOUTH ASIAN FEMALE IDENTITY IN THE USA

Tejaswini Vemuganti, Corrie Norman (Mentor), Religious Studies

Bharatanatyam is a women's dance from South India that is taught to and performed by Indian-American girls in many places including Wisconsin. The popularity of bharatanatyam has increased dramatically over the last couple of decades. It employs multiple levels of myth making to become a rite of passage for second-generation South Asian girls in the United States. Bharatanatyam has incredible significance in the formation of a shared South Asian identity not only for those who learn it but also for the larger South Asian American community. Analyzing the role of bharatanatyam as a new rite of passage allows insight into how identity is shaped for young adults and how they in turn shape it by reinterpreting it for themselves.

TRANSGENERATIONAL RESPONSES

Elvis Vidal, Bermans Iskandar (Mentor), Nuerological Surgery

The central nervous system (CNS) does not typically regenerate axons in adult mammals. Treatments that stimulate CNS repair and regeneration would have extensive clinical impact on patients with spinal cord injuries, stroke, and neurodegenerative diseases. Our laboratory studies show that folic acid enhances CNS axon regeneration by epigenetically altering DNA through methylation, and that the effect is inherited by subsequent generations. My study aims to determine the gender of inheritance of the phenotype. Specifically, we will be studying the effect of male-only and female-only folic acid treatment on transgenerational axon regeneration. So far, preliminary results show that the F1 generation animals regenerate injured spinal axons better than controls, but not as much as when both male and female F0 animals are treated. The results of the study would increase our understanding of the transgenerational effects of folate and may not be limited to the CNS.

BRONSTED-EVANS-POLANYI CORRELATIONS ON HETEROGENEOUS CATALYSTS AT HIGH SURFACE COVERAGE

Daniel Vigil, Manos Mavrikakis (Mentor), Chemical and Biological Engineering

Density Functional Theory (DFT) is a state of the art computational tool that allows researchers to examine chemical processes with atomic level detail. DFT can be used to evaluate heterogeneous catalyst surfaces and guide production of more useful catalysts, which have significant environmental and economic impact. Most DFT studies are performed on clean surfaces, analogous to a zero pressure system. In reality, chemical reactors operate at high pressures. This study will examine the effect of surface coverage on the thermodynamic and kinetic barriers to carbon monoxide (CO) dissociation on twelve metal surfaces. The results will illuminate the effect of surface coverage on chemical reactions and illustrate the importance of accounting for this effect in DFT simulations.

PRAGMATIC EFFECTS ON INTONATION IN HERITAGE SPEAKERS OF SPANISH

Alexander Villalba, Rajiv Rao (Mentor), Spanish and Portuguese

The objective of my research is to analyze the intonation of heritage Spanish speakers, especially in regards to the use of sarcasm. Heritage speakers were raised speaking Spanish at home before entering school, whereas native speakers grew up in a Spanish-speaking country. To allow a diverse set of data, participants have various levels of proficiency and countries of ancestry. In order to measure intonation, heritage Spanish speakers read 15 sentences in both a sarcastic and sincere tone. Pitch range, average pitch, and speech rate are measured through a phonetic software and analyzed. Our data all be compared to those of native speakers in order to shed light on an area of distinction in their linguistic systems based on background differences.

MOVING BEYOND WORDS ON THE PAGE: RACE AND WRITING CENTERS

Meghan Villalpando, Emily Hall (Mentor), English

This project explores how students of color at UW-Madison perceive the Writing Center satellite location at the Multicultural Student Center (MSC). My project first discusses previous research on the politics that surround the location of a writing center. Second, I turn to first-hand interviews with students of color at UW-Madison and original research that explores the intersection of physical space and race. I conclude that these students of color perceive a clear distinction between social and academic spaces, and the MSC Writing Center is situated at the border between these two spaces—neither wholly accessible nor inaccessible. This research highlights that physical geography alone does not make the MSC Writing Center accessible to students of color.

QUASAR ABSORPTION AND GALAXY GEOMETRY: IS STAR FORMATION THE CAUSE FOR DIFFUSE GAS AROUND GALAXIES?

Andrew Villanueva, Britt Lundgren, Jennifer Witt, Christy Tremonti (Mentor), Astronomy

In order to understand the fundamentals of our universe, astronomers must start small and understand the nature of the gas distribution in and around galaxies. Galaxies are known to be surrounded by a halo of diffuse gas that can only be measured by the light it absorbs from a bright background light source such as a quasar. Our goal is to study the origin of the diffuse gas by characterizing the galaxies that produce the absorption. We are using high resolution imaging from the Hubble Space Telescope to measure the position, inclination, orientation and morphology of the galaxies. These measurements will enable us to test the hypothesis that the gas is being driven out of the centers of galaxies by star formation.

EFFECTIVE CAPTURE OF PROSTATE CANCER CELLS FOR METABOLIC ANALYSIS

Nihal Voruganti, Joshua Lang (Mentor), Medicine

Circulating tumor cells (CTCs) can be captured from blood samples of patients with advanced prostate cancer. Molecular analysis of CTCs can be performed using a platform known as Versatile Exclusion-based Rare Sample Analysis (VERSA). The VERSA is an efficient way to load, capture, and stain CTC cells using a VERSA plate with three adjacent wells designated for loading, capturing, and protein staining CTC cells for complex molecular biology processes and analysis. In this proposal, we seek to test two different prostate cancer cell lines, LnCAP and DU145, for a new molecular endpoint in CTCs: metabolic analysis. Using these cell lines, we can identify different metabolic signatures that can be tested in CTCs as a biomarker for identifying treatment resistance at an early stage. Future studies will test patient samples for these biomarkers.

MICROORGANISM BILLIARDS

Colin Wahl, Saverio Spagnolie (Mentor), Mathematics

Boundaries can have many different consequences on the locomotion of microorganisms. Experiments and numerical simulations have shown that certain types of microorganisms have a particular interaction with a wall: either through contact or hydrodynamic interactions with the boundary, the body rotates away from the surface and departs at a critical angle that is independent of the angle of incidence. We explore the billiard-like motion of a model microorganism in a confined domain. We characterize the possible trajectories in 2D regular polygons and in 3D infinite cylindrical and square tubes. We also explore the effect of a background flow on the dynamics. The results may help in development of novel entrapment mechanisms that may have biomedical applications.

EFFECTS OF 2,4-D EXPOSURE ON THYROID HORMONE CONCENTRATIONS OF LARVAE FATHEAD MINNOWS

Morgan Walcheck, Gavin Dehnert (Mentor), Zoology

The aquatic herbicide 2,4-Dichlorophenoxyacetic acid (2,4-D) is the active ingredient in many widely used commercial herbicide formulations in the US, but we do not fully understand its environmental effects. Recent studies have shown 2,4-D, formulation WAM40, causes a decrease in survival of fathead minnows, which might indicate a developmental endocrine hormone disruption. Few studies have explored 2,4-D's effects on the endocrine system and the results were conflicting. The present study investigated the effects of 2,4-D, WAM40 formulation, exposure on thyroid hormone in larval fathead minnows from fertilization to 30 days post hatch. This study found a significant decrease in levels of T4 (T3 precursor) in 2.00ppm exposure compared to control. No significant difference was found in T3 (active thyroid hormone) exposure compared to control.

AGE-DEPENDENT MICROGLIAL RESPONSES TO HYPOXIA-ISCHEMIA IN THE DEVELOPING BRAIN

Alex Waldman, Peter Ferrazzano (Mentor), Pediatrics

The aim of the current study was to assess for differences in the effect of microglial suppression on HI-induced brain injury in neonatal (P9) and juvenile (P30) mice. We hypothesized that administration of minocycline after HI would result in suppression of microglial activation in both age groups, and would improve brain injury after HI in younger mice. We saw that the effect of microglial suppression on HI-induced brain injury varied with age. Neonatal minocycline-treated mice demonstrate early improvement in injury which was not sustained to 60 days post-HI, while P30 treated mice demonstrate sustained improvements in cerebral atrophy and memory. This suggests that the late microglial response seen solely in P30 mice is neurotrophic and contributes to late sustained improvements.

THE EFFECT OF COLLAGEN DEPOSITION IN MICE PROSTATIC URETHRAS

Alexandra Walkush, Maximiliano Cisneros, Will Ricke (Mentor), Urology

Benign prostatic hyperplasia (BPH) is the most common prostate problem in men over 50. It has been theorized that collagen deposition around the prostatic urethra contributes to BPH. However, the correlation between collagen deposition and BPH is unknown. The amount of overall collagen, as well as the differing collagen bundle sizes, could alter the urethra's ability to expel urine. A group of mice exposed to testosterone and estradiol, to simulate the hormonal milieu in aging men, was compared to an untreated control group. Picro-sirius red was used to analyze collagen bundle size and deposition around the prostatic urethra of the groups. While initial analysis is underway, our hypothesis proposes that mice exposed to testosterone and estradiol have increased collagen deposition around the prostatic urethra.

DEVELOPMENT OF A CODING FRAMEWORK TO CLASSIFY CLINICAL DOCUMENTATION REGARDING COGNITION

Lily Walljasper, Andrea Gilmore Bykovskyi (Mentor), Nursing

Older adults with cognitive impairment (CI) such as dementia are at heightened risk for negative outcomes during and following hospitalization, including avoidable re-hospitalization. Despite this risk, CI is commonly unrecognized during hospitalization with nearly 40–60% of dementia patients lacking any diagnosis in their electronic medical record (EMR). There is a missed opportunity to utilize the real-time information available in the EMR to facilitate detection of CI for use in machine learning applications. As a first step in this process, we developed a multi-faceted coding framework to identify and categorize clinical documentation present in the EMR of dementia patients that is indicative of CI. This presentation will report on the methodological procedures used to develop and implement this framework including strategies to ensure inter-coder agreement.

STUDY OF SI/SIGE HETEROSTRUCTURE AS QUBIT DEVICE MATERIAL

Bai Yang Wang, Mark Eriksson (Mentor), Physics

A quantum computer will differ from a digital computer in that it must be constructed with coherent and scalable quantum bits (qubits) which make use of quantum-mechanical phenomena. My study examines a Si/SiGe heterostructure's performance as device material for semiconductor qubit. Specifically, I measured the charge mobility of the two-dimensional electron gas within a Si/SiGe Hall-bar. The charge mobility tells about the material's defect concentration and layer interface smoothness, which affects the qubit properties. Thus, my study contributes to the understanding of the Si/SiGe heterostructure's potential in making a high-quality qubit.

BIOMATERIAL REGULATION OF CELL PHENOTYPE FOR VOCAL FOLD SCARRING

Sarah Wang, Susan Thibeault (Mentor), Surgery

Most regenerative treatments for vocal fold scarring involve biomaterial implantation in injured vocal fold. Current methods in biomaterial development do not consider the intercellular interactions of the myofibroblasts, or scar tissue, and surrounding macrophages with the injected material. The objective of this study was to examine the modulatory concomitant effects of an anti-scarring cytokine-linked biomaterial on scar phenotypes under 3D co-culture. Basic fibroblast growth factor (bFGF), an activator of wound healing, was linked to a poly(ethylene glycol)-diacrylate hydrogel. Myofibroblasts were encapsulated in the hydrogel and pro-inflammatory macrophages were seeded on the surface of the hydrogel construct. After 7 days of co-culture, cells were characterized by extracellular matrix gene expression and cytokine, chemokine, and growth factor concentrations.

ZHUANGZI'S BUTTERFLY—A HYBRID ANIMATION SHORT OF 3D AND THE HAND-DRAWN

Xueyan Wang, Stephen Hilyard (Mentor), Art

I am interested in creating animations and characters in a hybrid way that combines the painterly aspects of traditional art making with computer-generated qualities altogether to bring an illusion of life from both 2D and 3D. This 2D-3D combination may take the form of tattooing on a digitally 3-dimensional body, or having characters reside in a dimension-ambiguous world, etc.; in general I would like to have the feel of the raw brush stroke into the mathematically determined digital worlds. The content of my works reflects on a range of psychological states and inter-cultural ideologies and may be built upon traditional cultures, both those of the West and of the East; my works have been inspired by folklore mythologies, by the pity and sadness associated with sublime beauty in Japanese cultures, by the floating-world worldviews in Buddhism, by the ways of life provided by Chinese Daoist visions, etc. In creating this part digital and part hand-drawn work that I present, I was interested in exploring the delicate relationship of those considered realities to those thought of as non-realities. The work helped me articulate and reflect on the delicate notion of distinguishing the two as separates.

INFLUENCE OF GROUNDWATER ON TREE GROWTH VARIABILITY DURING DROUGHT

Lorenzo Warrington, Dominick Ciruzzi (Mentor), Civil and Environmental Engineering

Drought variability is increasing across the United States and in many other regions around the globe affecting timing and quantity of water to forests. In order to make effective management decisions, it is important to evaluate and understand natural components in an ecosystem that reduce drought vulnerability. It is well established that shallow groundwater plays a role in vegetation growth in dry, arid ecosystems; however, the extent of groundwater influence on vegetation growth in wetter ecosystems is essentially unknown. This research evaluates tree growth variability in multiple tree species in a temperate forest during drought and non-drought years across a depth to groundwater gradient (1–9 m) over the past 30 years. Our hypothesis is that trees in regions of shallower groundwater will grow at a more consistent rate than trees in regions of deeper groundwater across a range of weather conditions. Preliminary results indicate individual trees influenced by groundwater. In general, variability in tree growth was lower and more consistent where shallow groundwater was present. Further, tree growth was consistently higher during wetter years and when groundwater was shallower. These relationships can help guide sustainable water and forest management decisions if upscaled to the watershed and forest stand scale. Understanding and identifying regions of groundwater influence in forests can help identify naturally occurring drought resistant zones and drought vulnerable zones.

THE ROLE OF CLOCKWORK ORANGE AND MICRORNA IN THE DROSOPHILA MELANOGASTER CIRCADIAN CLOCK

Noah Waters, Katherine Scheuer (Mentor), Genetics

Circadian clocks help organisms adapt to environmental changes by synchronizing physiology and behavior with their surroundings. Understanding circadian rhythms holds implications for many health concerns, including cancer and Alzheimer's disease. *Drosophila melanogaster* is a popular model organism with a circadian clock. This clock is an oscillator governed by positive and negative feedback loops. Clockwork Orange (CWO) is part of the *D. melanogaster* clock and plays a role in regulating cell physiology and metabolism. CWO also acts as both a transcriptional activator and repressor. MicroRNA (miRNA) represses CWO and therefore affects both the clock and other developmental and physiological processes influenced by CWO. This study examines the role of CWO and miRNA by incorporating them into an *in silico* model of the *D. melanogaster* circadian clock.

EXPLORING THE ROLE OF PROTEOGLYCAN IN YAP LOCALIZATION IN HUMAN PLURIPOTENT STEM CELLS

Benjamin Weber, Yefim Zaltsman (Mentor), Biochemistry

Mechanical signals, such as substrate stiffness, can contribute to cell fate decisions. The Kiessling group has previously implicated the transcriptional coactivator YAP as a mediator of substrate stiffness in human pluripotent stem cells. On stiff surfaces YAP localizes to the nucleus, where it promotes self-renewal, whereas on soft surfaces its nuclear exclusion leads to differentiation. This study examined the role of transmembrane proteoglycans syndecan-4 (SDC4) and CD44 as potential upstream regulators of YAP localization. We show that on stiff surfaces, knockdown of both SDC4 and CD44 may lead to decreased nuclear localization of YAP, while knockdowns of either protein alone has no effect. Our initial results implicate proteoglycans as potentially key molecules in sensing changes in substrate stiffness and relaying that information to downstream effectors.

INVESTIGATING THE EFFECT OF BFD, FPR, NFSB, AND YQJH ON FUR TRANSCRIPTIONAL REGULATION IN E.COLI

Allison Weisnicht, Patricia Kiley (Mentor), Biomolecular Chemistry

Fur (ferric uptake regulator) is an iron-sensing transcription factor that generally functions as a repressor when bound to its corepressor, Fe²⁺. Iron is essential for the survival of cells, but it can be toxic at high levels. Thus, it is crucial for cells to maintain iron homeostasis by regulating the storage and uptake of iron, and Fur plays a major role in this process. However, other proteins are also important in maintaining iron homeostasis including Bfd, Fpr, NfsB, FtnA and YqjH. These proteins were also candidates to potentially affect Fur regulation. Thus, the goal of my research was to study how these proteins affect Fur function by comparing wild-type Fur regulation to Fur regulation in Bfd, Fpr, NfsB, FtnA and YqjH knockout mutants. My experimental results did not show a difference between the wild-type and knockout strains. However, further analyses, including iron-downshift experiments, need to be performed in order to fully understand the effect of these proteins on Fur.

SCHOOL FOOD CULTURES: A MULTI-COUNTRY COMPARISON OF SCHOOL FOOD PROGRAMS

Kelly Weldon, Jennifer Gaddis (Mentor), Civil Society and Community Studies

American cafeterias are known for their unhealthy heat-and-serve meals of pizza and chicken patties, and it begs the question: do other countries have similar school lunches? To answer this, I conducted a literature review of five countries' school lunch programs and compared my findings with data on the U.S. National School Lunch Program (NSLP). I found that these other countries take a more holistic approach to defining the goals of their school lunch programs. Unlike the NSLP, which prioritizes food cost, official policies put forward by other countries more aggressively promote student wellbeing, environmental sustainability, and cultural heritage. In sum, my research serves to show that adopting similar practices in America is imperative for the health of our children.

DOES NITROGEN ADDITION LESSEN THE EFFECT OF ROAD SALT ON CAREX STRICTA?

Leah Weston, Joy Zedler (Mentor), Botany

Nutrients and road salt carried in agricultural and urban runoff have impacts in downstream sedge meadows. Nitrogen increases the availability of a growth-limiting nutrient. Salt, applied to icy roads in winter, runs in to wetland communities in spring, where it can inhibit plant growth. Learning how these two contaminants commonly interact and affect *Carex stricta*, the dominant plant in tussock sedge meadows, is important to understanding overall human impacts on native wetlands. We hypothesized that salt would decrease growth, but that nitrogen addition would mitigate the effect. Our test of salt + nitrogen on the growth of *Carex stricta* in mesocosms demonstrated a wide range of variability among individual containers receiving the same treatment. This suggests that maximum leaf length, leaf area index, and biomass were unable to detect effects—or that the coping mechanism to varying combinations of nitrogen and salt is not identical among *Carex stricta* mesocosms. Aboveground end-of-season biomass measurements showed a range of 4.7 to 130.2g dry tissue harvested per plot (0.17m²) for containers receiving the same treatment. *Carex stricta* may be adaptable to a wider variety of environmental conditions than previously realized. We recommend more stressful treatments, earlier in spring, to investigate whether *Carex stricta* is stressed by salt and nitrogen addition.

EVOLUTION OF PREPHENATE DEHYDROGENASE IN LEGUMES

Josh Westphal, Hiroshi Maeda (Mentor), Botany

Tyrosine is an amino acid important for proteins but also responsible for many secondary metabolites; such as vitamin E and morphine. There are two known pathways for Tyrosine biosynthesis prephenate dehydrogenase (PDH), common in microbes, and arogenate dehydrogenase (ADH), used by plants. Curiously some Legumes have both ADH and PDH enzymes, possibly providing alternative pathways to tyrosine derivatives. A phylogenetic analysis, tracing PDH activity within the legume family, showed intermittent distribution of PDH activity, with peanut being near a taxonomic boundary of presence and absence of PDH. Thus, characterization of the peanut enzyme could illuminate the key residues responsible for PDH activity and improve the production of medicinal and nutritional tyrosine derivatives in other plants.

SEA SURFACE EMISSIVITY AND TEMPERATURE MEASUREMENTS FROM THE M-AERI DURING THE ACAPEX CAMPAIGN

Matthew Westphall, Jonathan Gero (Mentor), Space Science and Engineering Center

The Atmospheric Emitted Radiance Interferometer (AERI) measures atmospheric infrared radiation, which is used to obtain temperature and humidity profiles. The instrument was designed by the Space Science and Engineering Center and is used in the Atmospheric Radiation Measurement (ARM) program for studies of atmospheric processes. In early 2015, the AERI measured the infrared radiative properties of the Pacific Ocean near California for the ARM Cloud Aerosol Precipitation Experiment (ACAPEX). ACAPEX aimed to study the precipitation patterns and droughts of the Western United States. From this dataset, the temperature and infrared emissivity of the ocean surface were computed. Accurate knowledge of both quantities are critical for satellite meteorology. The results of this experiment were compared with those of a similar 1995 experiment in the Gulf Coast.

THE EVOLUTION AND DESTRUCTION OF NATURE FOR MANKIND

Jennifer Wildes, Leann Tigges (Mentor), Community and Environmental Sociology

In this poem, I present the world's transition from human beings seeing themselves as connected and within nature to using nature for our own economic gain. This poem analyzes a variety of sources, from the Bible to Oreskes and Conways Merchant of Doubt, which allows for a better understanding of this transition. Our human society has turned into a society that is focused on capital and profit, which has undermined our understanding of the importance of nature. As we are in the middle of a new epoch, our anthropogenic tendencies have transformed our thinking of nature into a commodity. By highlighting the emphasis of capitalism in juxtaposition to the destruction of nature, the tension between these two may lead to a push for better conservation of nature and a turn away from capitalism to a more collective society.

ELECTROCHEMISTRY TECHNIQUES TO STUDY CORROSION AND MASS TRANSPORT IN FLUORIDE MOLTEN SALTS

Kyle Winkler, Francesco Carotti (Mentor), Engineering Physics

The thermo-physical properties of fluoride molten salts make them suitable for thermal energy storage and power production applications. Fluoride-Salt Cooled High-Temperature Reactor (FHR) uses fluoride salt (flibe) as the heat transfer fluid of the primary loop. By applying to molten salts electrochemical techniques that are well established for water system the material transport and corrosion properties of fluoride molten salts can be studied and understood. The application of electrochemistry techniques in fluoride molten salt begins with the development of a reference electrode, which is the goal of the ongoing research in our group. The electrochemical research and heat transfer applications of molten salts is crucial toward the design of molten salt nuclear reactors that can lead to a more efficient way of producing carbon-free energy.

THE EFFECT OF BCL-2 EXPRESSION IN ASTROCYTES ON RETINAL NEOVASCULARIZATION

Catherine Wintheiser, Christine Sorenson (Mentor), Pediatrics

Angiogenesis is a key component of retinal vascular development regulated in part by B-cell Lymphoma 2 and Vascular Endothelial Growth Factor. For preterm infants, high levels of oxygen in incubators down-regulate VEGF and stunt vascularization. Upon re-exposure to normal oxygen levels, ischemic retinal conditions trigger overexpression of VEGF, causing pathological angiogenesis and retinopathy of prematurity (ROP). Left untreated, this causes retinal detachment and blindness. I studied the effects of Bcl-2 expression in astrocytes to understand its role in overall vascularization. After regulating neovascularization and vaso-obliteration, I discovered there is not a significant correlation between Bcl-2 expression in astrocytes and vascular development. This is important because it prompts further research to determine what cell or combination of cells affect vascularization, leading to improved ROP therapies.

JUNIOR LAB RESIDENT'S APPROACH TO COMPLEX URINARY PATHOLOGY

Anna Witt, Shannon Dimarco (Mentor), Surgery

Surgical residents are typically responsible for performing complex urinary catheterizations. However, it remains unclear whether residents have the skill and knowledge to address complex scenarios. The aim of this study is to determine if residents can navigate the work-up and subsequent decision-making in complex clinical scenarios involving the urinary tract. We hypothesize that residents will make inconsistent decisions for clinical scenarios where they suspect pathological conditions. Forty-five general surgery residents (PGY 2–4) were presented with two patient scenarios and were asked to verbalize difficulties encountered while catheterizing each patient. Inconsistencies in resident's initial work-up and subsequent decision-making in complex urinary catheter scenarios reveal a lack of experience. Our findings suggest residents may not be consistently trained in proper procedure protocols for consultation and decision making.

NEUROTRANSMITTER PROJECT: SEROTONIN (5HT-2A, 5HT-2C, 5HT-6) CELL RECEPTORS

Nicole Wlodarski, Jennifer Gajeski, Tara Kamnetz, Mark Brownfield (Mentor), Comparative Biosciences

Our research works to better understand the distribution and ultimately determine specific functions of the 5HT-2a, 5HT-2c, and 5HT-6 receptors in a rat's hypothalamus. For each receptor being tested, one experimental rat group receives an agonist specific for the receptor, while one control rat group receives the antagonist and agonist targeting the receptor. The agonist induces a signal cascade culminating in c-fos in cell nuclei that is observable through immunofluorescence. After the rat brains are perfused, the sections are sliced and double-stained with antibodies, first against c-fos and second against hypothalamic hormones. Cellular staining reveals antigen binding to the receptor. The antigens have a fluorescent label—red for c-fos and green for peptides. The label shows us which cells are activated by the tested receptors.

MITOCHONDRIAL DNA ANALYSIS OF ISOLATED POPULATIONS OF THE MONTANE BUTTERFLY: PARNASSIUS CLODIUS

Bailey Wolding, Sean Schoville (Mentor), Entomology

Parnassius clodius varies phenotypically depending on its habitat. The larvae and the adult forms are a much brighter yellow at low altitudes, while the higher altitude populations are a dull yellow. Through comparison of mitochondrial DNA sequences between fourteen populations of *P. clodius* from Oregon, California, Utah, Washington, and Canada we are attempting to understand how genetic diversity within montane insects varies among phenotypically different populations. We isolated and analyzed mitochondrial DNA from the thoracic tissue of *P. clodius* and performed PCR. We then used DNA sequencing to assay CO1 nucleotide variation. We used population genetic statistics to compare genetic divergence between populations. Our results thus far have concluded that there are some significant differences between the populations of *P. clodius*.

EFFECTS OF TRIPLOIDY AND DROUGHT ON PHYSIOLOGY AND GROWTH OF POPULUS TREMULOIDES

Max Wrobbel, Rick Lindroth (Mentor), Entomology

Polyploidy in plants may contribute resistance to abiotic stressors such as acute drought. Triploids differ from diploids in terms of growth vigor. These differences are hypothesized to provide selective advantages during periods of stress. Triploidy occurs at high frequency in trembling aspen (*Populus tremuloides*) populations in the central Intermountain West, suggesting that triploidy may confer selective advantages during drought. To test the selective advantages of triploids under drought, micropropagated aspen were grown in a mesocosm experiment, and subjected to various levels of drought (control, mild). Measurements of physiology and growth were taken and leaves were collected for defensive chemistry analysis. This research seeks to explain whether triploid aspen have a selective advantage during drought, information that is critical to seedling establishment in a changing climate.

INVESTIGATION OF ANGIOGENIC PROPERTIES OF MURINE OMENTUM FOLLOWING TRANSPLANTATION

William Xiang, Wade Bushman (Mentor), Urology

The omentum is a well-vascularized intra-abdominal fat pad that often adheres to sites of intra-abdominal inflammation or injury, providing effective tissue reinforcement and a source of vascular supply. However, a limitation in its use is that many times the mobility of the omentum is constrained. Thus, this project addressed the hypothesis that the omentum can be used as a free graft. To do so, omentum grafts were transplanted from transgenic Red Fluorescent Protein (RFP) to Green Fluorescent Protein (GFP) mice and analyzed with fluorescent microscopy to (1) determine whether a free omental graft remains viable and if so, (2) characterize the neo-vascularization of the recipient bed. Absence of necrotic tissue, intact nuclei in fibroblasts and adipocytes, and intact vasculature would all support these points.

THE EFFECTS OF ANXIETY ON THE STRESS RESPONSE SYSTEM OF CHRONIC HIVES PATIENTS

Megan Xiong, Marcia Slattery (Mentor), Psychiatry

Chronic Idiopathic Urticaria (CIU) is a skin condition with no known cause or cure. Studies show that people with hives often report high levels of stress, as well as anxiety. This study investigates whether patients with hives have an abnormal stress response, and whether anxiety contributes to this. Patients with chronic hives and healthy controls underwent a lab stress test called the Trier Social Stress Test (TSST). The TSST consists of a public speaking task that induces stress and activates the hypothalamic pituitary adrenal axis (HPA), the biological stress response of the body. Subjects completed stress and anxiety assessments. Blood tests measured cortisol levels as an assessment of HPA function. Analyses will examine the relationship of anxiety and stress markers in subjects.

THE SOCIAL GRADIENT: PSYCHOSOCIAL FACTORS THAT LEAD HMONG PATIENTS TO TYPE 2 DIABETES

Steven Xiong, Vera Tsenkova (Mentor), Institute on Aging

Health disparities refer to different amounts of access to healthcare services and variations in health outcomes between groups. Within the United States, health disparities have been observed in various minority groups compared to majority groups. Hmong are one of the immigrant Asian subgroups with increasing rates of obesity and Type 2 Diabetes. This research will study health disparities within sample populations of the Hmong in Wisconsin and Minnesota. By reviewing research journals and books, this research will compare and contrast statistical and qualitative evidence from studies to propose a novel understanding of the mechanisms that lead to Type 2 Diabetes. Each research article documented high rates of diabetes among Hmong people and gives strong indications that a health disparity exists.

STEMBUDS: A MENTORING PROGRAM FOR PROMOTING BROADER PARTICIPATION IN STEM

James Xu, Sihan Man, Mitchell Nathan (Mentor), Educational Psychology

Self-efficacy and interest both have central influence on setting occupational and educational expectations according to social cognitive theory. This longitudinal study investigated the effectiveness of an undergraduate-led STEM mentoring club in improving the Science, Technology, Engineering, and Math (STEM) self-efficacy and interest measures of a group of underrepresented sex balanced middle school students from Dane County, Wisconsin. In the study, we look to compare our underrepresented student participants with a different student group within the community to find significant differences in efficacy/interest for STEM. We also look to explore the variables within the mentoring events that might significantly affect the STEM efficacy/interest of students.

HARDENING OF MATERIALS USING PLASMA IMMERSION ION IMPLANTATION (PIII)

Yufan Xu, Cary Forest (Mentor), Physics

A new plasma confinement scheme has been developed for researching hot, dense, astrophysical plasmas on the Plasma Couette Experiment (PCX). This Hilldale project is focused on using these astrophysical plasmas to explore Plasma Immersion Ion Implantation (PIII) at plasma regimes not typically accessed for this application. PIII involves placing a workpiece into plasma and pulsing it at large negative voltages to attract and implant ions. PCX plasmas, with electron temperatures of ~ 10 eV and plasma densities of $\sim 10^{11}$ cm⁻³, are higher performance than typical PIII set-ups. Both computer simulations and detailed material surface analysis performed by Scanning Auger Microscope and Vickers Hardness Tester successfully shows better nitrogen implantations were performed by PIII in PCX than beamline ion implantation and other conventional hardening methods.

IMPACTS OF MICROBIAL COMMUNITIES FOR POTATO PRODUCTION IN WISCONSIN

Diane Xue, Rachel Christenson, Richard Lankau (Mentor), Plant Pathology

This project explores management impacts on microbial community structure and the consequences for disease suppression and crop nutrient acquisition in potato crops. Disease suppression studies will focus on the common scab infection, a tuber blemish which reduces potato quality. Soil, roots, and potato tubers were sampled from 44 sampling locations in Wisconsin to develop a model of management practices associated with common scab suppression. This survey will be paired with a study of soil microbial communities to link management practices to disease suppression via alteration of microbial communities. Finally, greenhouse experiments will be performed to isolate microbial community contributions to common scab suppression and nutrient acquisition. This project will increase knowledge of potato-associated microbial community structure and function under diverse management practices.

EXPLORING OLDER HMONG ADULTS' EXPERIENCE WITH AN ORAL ONLINE SURVEY

Aylee Yang, Tararinsey Seng, Maichou Lor (Mentor), Nursing

While survey is increasingly used in research, limited research has focused on how survey can be tailored to non-English literate patients. The purpose of this study was to explore older Hmong adults' experiences in taking an oral online survey, the 12-item short form health survey (SF-12). Thirty older Hmong, ages 50 and above, listened to pre-recorded Hmong translations of the SF-12 and were interviewed after they completed the online survey about their experience. Interviews were audio recorded, transcribed verbatim, and translated into English. Transcripts were analyzed using directed content analysis. Older Hmong reported they were unfamiliar with survey in general, but they liked the oral survey. The length of the survey was "just right"; the survey questions were consistent with their health conditions; and they prefer to have a family helper assist them in completing the online survey. Future research could test the oral survey with other non-English literate patients and their family helpers.

EFFECTS OF WALLEYE PREDATION ON THE GROWTH OF YELLOW PERCH

Pakou Yang, Terence Barry (Mentor), Animal Sciences

We tested the hypothesis that walleye predation stimulates the growth of yellow perch. Yellow perch (5.2 ± 0.2 g) were stocked into three 600-L raceways (214 fish/tank). The treatment groups were: (1) control, (2) walleye stocked in the raceway, and (3) walleye stocked in a separate 225 L circular tank that discharged into the raceway. After six weeks the perch in treatments 1, 2 and 3 weighed 10.1 ± 0.6 , 14.4 ± 0.7 , and 15.3 ± 1.2 g, respectively. We conclude that an odor associated with walleye predation stimulates the growth of yellow perch. Next steps are to (1) repeat using a replicated design, and (2) identify the growth-promoting chemical(s). Our results have important implications for the aquaculture industry.

KNOCKOUT OF SIGMA-1 RECEPTOR HAS NO SIGNIFICANT EFFECT ON ARPE19 CELL VIABILITY

Annie Yao, Lianwang Guo (Mentor), Surgery

Age-Related Macular Degeneration (AMD), a common cause of central vision loss, is primarily caused by the death of retinal pigment epithelial (RPE) cells. The Sigma-1 receptor (SR1) has been previously reported to promote cell survival. Using a novel SR1 knockout (SR1KO) ARPE19 cell line generated in our lab, we investigated whether the SR1 plays a protective role for RPE. Cell stress was induced with paraquat, in wild type and SR1KO ARPE19 cells, in the absence or presence of a SR1 agonist (activator), i.e., Pre084, (+)-Pentazocine, or DTG. MTT assay showed no significant difference in cell viability between wild type and SR1KO, either with or without treatment with a SR1 agonist. We will investigate this result further with a different cell viability assay.

BRAIN STEAROYL-COA DESATURASE-1 DEFICIENCY PROTECTS AGAINST HIGH-FAT DIET-INDUCED METABOLIC DISORDER

Alina Zdechlik, James Ntambi (Mentor), Biochemistry

The high prevalence of obesity has classified it as a significant health problem due to the potential for it to increase the risk for development of other metabolic disorders including insulin resistance and hepatic steatosis. Maintenance of metabolic health requires extensive crosstalk among numerous tissues, including brain, adipose and liver. Previous work on the role of brain fatty acids and systemic metabolic regulation has focused on effects of exogenous fatty acids while the role of endogenously synthesized brain fatty acids is not well described. We previously demonstrated that whole-body deficiency of stearoyl-CoA desaturase (Scd)-1 in mice protects from high-fat diet (HFD)-induced obesity, hepatic steatosis and insulin resistance. However, the contribution of brain-specific Scd1 deficiency in protection from these diet-induced metabolic disorders has not yet been described. Our lab developed an Scd1 brain knockout (BKO) mouse model using the cre-Lox system in which cre expression was driven by the Nestin promoter. BKO mice gain significantly less weight and exhibit reduced hepatic triglyceride accumulation after 18 weeks of HFD feeding. Further, high-fat diet-fed BKO mice have improved glucose tolerance compared to Lox controls, suggesting increased glucose disposal in skeletal muscle and adipose tissue.

EFFICACY OF TWO HAND HYGIENE METHODS FOR CLOSTRIDIUM DIFFICILE SPORE REMOVAL

Caroline Zellmer, Nasia Safdar (Mentor), Medicine

Background. Given the widespread use of alcohol-based hand sanitizers in healthcare settings, and the increasing prevalence of *Clostridium difficile* (*C. difficile*) we aimed to assess the effectiveness of alcohol-based hand sanitizers in killing *C. difficile* on the hands of patients with *C. difficile* infection (CDI). **Methods.** Patients with CDI during the index admission were included in the study. Patients must not have performed hand hygiene within 30 minutes of enrollment. Each patient was randomized to a hand hygiene method: alcohol-based hand sanitizer or washing with soap and water. Bedridden patients who were randomized to soap and water had hand washing performed at the bedside. Sampling was completed by glove juice technique before and after hand hygiene was performed. Cultures were plated and incubated anaerobically and evaluated 48 hours later for growth. **Results.** Patients ranged in age from 52 to 74 years old. 88% of participants were male, 12% were female. Based on preliminary data, 17.6% (3/17) of patients had any confirmed growth of *C. difficile*. One patient had suspected *C. difficile* growth after washing their hands with soap and water. The other three patients had growth before and after using alcohol-based sanitizer. Six percent (1/17) of enrollees were randomized for soap and water but were bedridden and used soap and water at the bedside. **Conclusions.** We did not find heavy contamination with *C. difficile* on the hands of our study sample, suggesting that patients' hands may not be the primary mode of *C. difficile* transmission in all instances. However, attention to patient hand hygiene is important given that 17% of patients had growth of *C. difficile* on their hands. Strategies to effectively accomplish hand hygiene in patients with CDI are needed.

CVD/PVD METHODS FOR TRANSITION METAL DICHALCOGENIDES THIN FILM AND HETEROSTRUCTURE FABRICATION

Yi Zhang, Melinda Shearer (Mentor), Chemistry

In recent years, transition metal dichalcogenides (TMDs) as a group of emerging two-dimensional (2D) layered semiconductors have attracted considerable attention for their potential applications in electronic, optical, and solar devices due to their unique layered structure, natural abundance, and suitable bandgaps. Their layered structure provides coupling options that can lead to almost endless varieties of electrical properties and enables new physics to be explored. However, TMD research is limited by difficulties in fabricating high quality thin films and complex heterojunctions suitable for investigation. Recently, multiple preparation routes for TMD nanostructures have been demonstrated. Among them, chemical vapor deposition (CVD) and mechanical exfoliation/transfer are more commonly used, but each have significant drawbacks. Often laboratory CVD processes are less reproducible due to delicate deposition condition requirements and side reactions; exfoliation/transfer made junctions may not always yield satisfactory coupling. We propose to develop reliable combination of CVD/physical vapor deposition (PVD) procedures to produce high crystallinity TMD heterostructures without exfoliation and transfer.

BODY MASS INDEX AND INFLAMMATION AMONG CANCER PATIENTS RECOVERING FROM STEM CELL TRANSPLANTATION

Lillian Zheng, Erin Costanzo (Mentor), Psychiatry

The present study examined the relationship between BMI and inflammation among individuals with cancer recovering from hematopoietic stem cell transplantation (HSCT). Participants' (N=73) BMIs were classified as normal (n=22), overweight (n=23), or obese (n=28) according to CDC criteria. Inflammatory markers (IL-10, IL-6, IL-8, TNF α) were assessed with electrochemiluminescence detection pre-transplant, 30, 100, and 200 days post-transplant. ANOVA models indicated that normal weight participants had the highest TNF α levels pre-transplant ($F(2,59)=3.095$, $p=0.053$) and obese participants had the highest IL-6 levels 100 days post-transplant ($F(2,65)=3.178$, $p=0.048$). There were no other significant differences in inflammation based on BMI. While results did not show a strong relationship between inflammation and BMI overall, a low or high BMI could increase risk for inflammation after HSCT in some cases.

DETECTING RESPIRATION AND HEART RATES THROUGH ACCELERATOR AND GYROSCOPE

Keren Zhu, Hua Shao, Xinyu Zhang (Mentor), Electrical & Computer Engineering

Monitoring heart rate and respiration rate are common and necessary for personal health or fitness. Current technologies of detecting these rates require special sensors which increases the cost and may not provide very accurate results. We did experiments to process the signals from accelerator and gyroscope which are available on a smart phone or a smart wristband. Through several averaging and low pass filters, we can detect respiration and heart rates from the resulting data. This application may bring respiration and heart rates detection to everyone with a smart device, without any additional sensor or device, benefiting both the fitness and the health.

WHY NOT ASK POTENTIAL USERS WHAT THEY LOVE OR HATE ABOUT PROGRAMMING LANGUAGES?

Andrew Zietlow, Laurence Loewe (Mentor), Genetics

It is universally acknowledged that many non-programmers confronted with programming languages are in want of a route to escape confusion. This is surprising, since the semantic complexity of programming languages pales next to the language of any student, even if it feels like the opposite as learning human languages is “child’s play.” Creating contradiction-free descriptions of complex systems is harder in languages with more ambiguity, which language designers must avoid like kryptonite. The innovative design process of the new Evolvix programming language seeks to invert the typical flow of semantics that ‘informs’ users of definitions they have to use. Instead, potential users grade syntax designs or improve them using intuitive semantic skills to better align final language design choices with the natural expectations of most users, while removing more ambiguities. Here we develop a survey for rating sentence structures to identify top choices that make real-world ideas in code as readable as possible for outsiders (and programmers!) without resorting to ambiguity. We aim to minimize bias as we maximize qualitative and quantitative user-feedback, positive and negative in order to evaluate what makes a language easier to learn and harder to misunderstand.

INFERRING THE MUTATIONAL TIMELINE IN HUMAN COLORECTAL CANCER USING APPROXIMATE BAYESIAN COMPUTATION

Luli Zou, Richard Halberg (Mentor), Medicine

Most investigators believe that human colorectal cancers arise as a result of the stepwise accumulation of a series of mutations that provide a selective advantage and consequently lead to clonal sweeps. Recent studies have demonstrated, however, that mutations arise very early as a tumor just begins to form, and that their persistence in a tumor depends on neutral evolution. In this study, Approximate Bayesian computation was employed to infer the mutational timeline of human colorectal polyps based on targeted sequencing data. Posterior distributions of the mutational timeline favor early mutation accumulation when the tumor is undetectably small instead of the current paradigm of stepwise clonal sweeps. This new understanding of tumorigenesis profoundly affects approaches to prevention and possibly even impacts therapy.