Undergraduate

SYMPOSIUM

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ABSTRACT 2017

Celebrating research, creative endeavor and service-learning

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THE EFFECT OF ADIPOCYTES ON APOPTOSIS RESISTANCE IN OVARIAN CANCER CELLS

Rachel Acevedo, Pam Kreeger (Mentor), Biomedical Engineering

The American Cancer Society estimated that, in 2016, about 22,280 new cases of ovarian cancer were diagnosed and, in five years, only about 46.2% of these women will survive their diagnoses. Ovarian cancer has a high resistance to chemotherapy and the lack of improved treatments has kept the rise of the survival rate sluggish. In order to produce improved therapies to treat ovarian cancer, it is essential that we understand how ovarian cancer cells interact with their microenvironment. In this study, we will determine if the presence of adipocytes prevents the ovarian cancer cells from apoptosis when treated with paclitaxel, a chemotherapy drug. Additionally, we will identify the key proteins the adipocytes are up regulating in the cancer cells to result in this effect.

CAMERA INTEGRATION FOR A NEXT-GENERATION GAMMA-RAY TELESCOPE

Colin Adams, Rachel Fedora, Justin Vandenbroucke (Mentor), Physics

The experimental study of very-high-energy gamma rays is a relatively new exploration with prospects for discovering the origins of astrophysical particle acceleration as well as dark matter candidates. The Cherenkov Telescope Array (CTA) is a next-generation, ground-based, gamma-ray detection instrument. The University of Wisconsin CTA lab and other U.S. collaborators have been tasked with the integration of camera electronics for a novel two-mirror telescope design, denoted the prototype Schwarzschild-Couder Telescope (pSCT). The pSCT will provide a wider field-of-view and better angular resolution than single mirror design telescopes. Scheduled for installation in early summer, the pSCT camera will require a great deal of testing to function properly. We present early calibration results, and discuss the tasks necessary to ensure successful camera operation.

EVIDENCE-BASED INTERVENTIONS FOR SUSPENSIONS OF BLACK AND BROWN STUDENTS IN K–12 INSTITUTIONS

Chetachukwu Agwoeme, Aydin Bal (Mentor), Rehabilitation Psychology and Special Education

This project is a systematic review of current literature on suspensions in K–12 institutions, reviewing their effects on Black and Brown students, as well as analyzing solutions in the literature and comparing best practices to lower the suspension rate for Black and Brown students. In this review, researchers will also provide background of what a suspension is in the K–12 education system as well as its purpose in school disciplinary tactics. The purpose of this study is to analyze the effects of suspension of Black and Brown students' education in the K–12 system and push for more community-based approaches based on the literature to lower the suspension rates in those communities.

EVALUATING THE EFFECTIVENESS OF TASK-BASED FMRI TESTING FOR PATIENTS WITH EPILEPSY

Janerra Allen, Elizabeth Felton (Mentor), Neurology

The objective of this project was to evaluate the effectiveness of task-based fMRI testing with subjects involved in the Epilepsy Connectome Project. Epilepsy is a series of seizures caused by excessive and abnormal nerve cell activity in the brain. Some causes of epilepsy include brain injury, stroke, and brain tumors [1]. The most common form of this disorder is temporal lobe epilepsy which is characterized as recurrent, unprovoked epileptic seizures that originate in the temporal lobe of the brain [2]. The temporal lobe is responsible for memory, language, intellectual and emotional functions [3]. fMRI is helpful in understanding how communication between brain areas change as a result of epilepsy and seizures by studying and assessing some of the major domains of the neural system. These systems include: visual and motor systems; working memory/cognitive control systems; language processing (semantic); social cognition; and emotion processing [4]. The subjects (both epilepsy patients and healthy controls) that are recruited for the study are between the ages of 18–60 and have IQ levels above 70.

UTILIZING EXTREMELY HIGH-FREQUENCY RADIO WAVES FOR FUTURE WIRELESS TECHNOLOGY

Omar Alqahtani, Viet Vo, Akbar Sayeed (Mentor), Electrical and Computer Engineering

As the global market for internet enabled devices continues to grow, the current wireless communication infrastructure must be upgraded to support the rapidly rising demand. To tackle this challenge in emerging 5G technology, our team is developing a prototype utilizing 'millimeter-wave' radio spectrum. The 'CAP-MIMO' prototype is undergoing various tests and experiments to refine its hardware and software. The existing prototype uses a 4x4 antenna array to beam signals in different directions, and we expect this number to increase in future. Eventually, using the testbed we also expect users to be able to surf the internet at speeds hundreds of times faster than current devices. Successful application of 5G technology will have profound effects in many fields, e.g. autonomous vehicles.

TERMINOLOGY IN PATIENT-FACING MEDICAL MOBILE APPLICATIONS

Abdul Rahim Altiti, Mikayla Buford, Catherine Smith (Mentor), Library and Information Studies

The purpose of this study is to analyze the terminology employed in mobile applications, targeting specific patient groups, with the intent of determining how thoroughly the applications' clinical knowledge conforms to standard medical terminology employed in the healthcare field. This is done by collecting multiple mobile applications, both iOS and Android, which target patient groups, and then harvesting all forms of terminology relating to the treatment and symptoms of diseases, within these apps. The terminology is then compared and contrasted with the standard terminologies used by healthcare professionals.

ESTABLISHING A WILD CRANBERRY IN VITRO COLLECTION FOR CONSERVATION AND BREEDING PURPOSES

Aisha Anderson, Lorraine Rodriguez-Bonilla (Mentor), Horticulture

Genetic diversity of wild plants gives breeders the sustained ability to develop new high-yielding, high-quality varieties that can resist constantly evolving pests, diseases and environmental stresses. Developing in vitro collections can facilitate breeders work by helping conserve valuable genotypes that can potentially become new cultivars. Recently, wild cranberry and small cranberry (Vaccinium macrocarpon, Vaccinium oxycoccos) samples were collected in different locations throughout Wisconsin and Minnesota. From this collection we expect to develop a cranberry germplasm of over 400 individuals which will allow us to capture and conserve the genetic diversity of wild cranberry populations.

NEUROPATHOLOGICAL CHANGES INDUCED BY CLOSED-HEAD TRAUMATIC BRAIN INJURY

Icelle Anderson, Craig Atwood (Mentor), Geriatric Medicine

The incidence of traumatic brain injury (TBI) in the United States between 2001 and 2010 in the civilian population was estimated to be 1.7 million individuals (823.7 per 100,000; CDC, 2016). The vast majority of these moderate-to-severe TBIs are caused by closed-head concussions (essentially the brain rapidly accelerating and decelerating into the skull), rather than contusions such as induced by a gunshot wound, or other focal-penetrating injuries. Our laboratory recently constructed a Maryland Model closed-head impact (CHI) injury device that replicates CHI's by inflicting a concussion in anesthetized adult rats with minimum invasive surgery. Using this CHI model, we plan to compare neuronal loss, axonal degradation, astrocyte activation and vascular leakage in uninjured and injured rodent cadavers given a mild or moderate to severe CHI.

EVOLUTION OF A NOVEL GENE EXPRESSION PATTERN IN DROSOPHILA SPECIES

Jer Weann Ang, David Loehlin (Mentor), Molecular Biology

This experiment investigates whether new regulatory DNA sequences are modifications of existing enhancers or come from a different source. In this experiment, we surveyed the expression pattern of Alcohol Dehydrogenase (ADH) enzyme in the gut of Drosophila species and find that novel ring patterns occur in the proventriculus in certain species of the virilis subgroup. We created GFP constructs for the ADH Adult Enhancer (AAE) from three of these species and compared the ring expression patterns in transformants. We also compared the effects of insertion site position and its length on ADH expression. By figuring out the gene sequences that lead to new gene expression patterns, insight can be gained on how these new patterns evolve and what transcription factors are involved in this process.

BETTLE DIGITIZATION

Emmanuel Ankomah, Daniel Young (Mentor), Entomology

Specimens in natural history collections provide a critical link to historical and present species in distributional ranges and their habitat requirements. This research is focused on transcribing collection event label data into a relational database for specimens of the beetle families Megalopodidae and Orsodacnidae, from the well-known ecological tension zone that passes through the Great Lakes region. Amassing similar datasets from other groups of beetles and other regional natural history collections will enable future naturalists, botanists, ecologists, and entomologists to address questions such as those relating to how climate change is altering plant and insect distributions, population dynamics, and plant-insect interactions throughout a changing biogeographic tension zone.

CLINICAL ISOLATES OF CANDIDA ALBICANS IMPAIR NEUTROPHIL EXTRACELLULAR TRAP (NET) RELEASE

Hamayail Ansari, Jeniel Nett (Mentor), Infectious Diseases

The immune system functions to combat foreign pathogenic species in the human body by preventing or limiting infection through complex and pervasive methods. One such antimicrobial method involves capture and digestion of microbes through neutrophil extracellular traps (NETs) that are an integral component to control fungal infections, including Candida albicans. In an immunocompromised host, they may rapidly develop from harmless commensal organisms into invasive, life-threating infectious agents. Candida albicans form surface adherent communities called biofilms that increase resistance to the immune response due to the protected niche created by the matrices for the microorganisms and improved fungal survival. In this study, we examined interactions between neutrophils and the clinical isolates of C. albicans with distinctly varied morphology to illustrate impaired NET release upon biofilm.

CHOLECYSTOKININ TREATMENT PROMOTES PANCREATIC BETA-CELL SURVIVAL IN HUMAN ISLET TRANSPLANTS

Lucille Anzia, Dawn Davis (Mentor), Endocrinology

America faces an unprecedented struggle against obesity, which often precedes diabetes. Diabetes is caused by loss of the pancreatic β-cells, the cells that make insulin. In mouse models of obesity and diabetes, the hormone cholecystokinin (CCK) promotes β-cell survival. Building on these mouse studies, we hypothesized that CCK will protect human β-cells from apoptosis. We transplanted human islets into immunodeficient mice, and measured apoptosis via TUNEL staining after infusion of either CCK or saline via osmotic pump. CCK treatment resulted in 0.1% TUNEL positive β-cells compared to 1.25% in controls ($n=4$, $p<0.05$). These data suggest for the first time that CCK promotes β-cell survival in humans. Implications include improved success of pancreatic islet transplants for the diabetic population.

"QUÉ TIENE?" EXPERIENCES OF MENTAL ILLNESS AND PERSPECTIVES FROM PROVIDERS, PATIENTS, AND CAREGIVERS IN MEXICO

Noe Arriaga, Jonathan Godinez, Isabel Miranda, Alyssa Ramirez Stege (Mentor), Counseling Psychology

The purpose of this research project is to understand the explanatory models of mental illness of patients, caregivers, and psychiatrists in Mexico; i.e., how these stakeholders perceive the cause, onset, and treatment expectations for different forms of mental and emotional distress. The semi-structured interviews provide an in-depth perspective on how culture influences meaning-making of mental illness. Furthermore, the research is contextualized in the current mental health needs, services, and resources in Mexico. Through transcriptions, group meetings, and qualitative thematic analysis coding, we seek to link the common patterns or themes across interviewees to understand the subjective experience of mental illness from the perspective of each stakeholder. Results provide treatment implications for future mental health interventions both in Mexico and with Latinxs in the U.S.

LONG-TERM EFFECTS OF DIFFERING NITROGEN REGIMES ON NORTHERN RED OAK (QUERCUS RUBRA L.) GROWTH

Riley Aschenbrenner, Nicholas Balster (Mentor), Soil science

Many nurseries add large amounts of nitrogen (N) fertilizer to grow tree saplings for out-planting to fulfill reforestation and afforestation needs. When planted, these saplings often have a lower rate of survival and growth compared to saplings originating from field settings. Here we test the hypothesis that differing nitrogen regimes in early stages of growth of northern red oak in the nursery will affect their growth after out-planting. Height and diameter will be measured for 40 trees since establishment to determine differences in relative growth rate between treatments. Tissue N concentration will be quantified from wood and leaves to determine whether the N regime in the nursery affected the growth of northern red oak. Expected results are that trees with less N than a typical nursery regime will have increased relative growth rates compared to trees given nursery-typical N.

WHAT MODIFICATIONS ARE REQUIRED IN THE T4AP DISASSEMBLY PROTEIN TO ALLOW IT TO ASSEMBLE PILI?

Paula Atsaves, Katrina Forest (Mentor), Bacteriology

Type IV a pili (T4aP) are extracellular bacterial appendages that can extend and retract. In Pseudomonas aeruginosa, PilB mediates assembly of the pilus whereas PilT causes pilus retraction. Although we understand the roles of PilB and PilT during pilus dynamics, it is unclear how these proteins with similar structural domains achieve opposing tasks. Therefore, we sought to engineer an assembly motor from a PilT template. Using the retraction motor as a parental protein, we designed various fusion proteins containing domains present in PilB but absent in PilT. We hypothesize that the addition of PilB structural elements to PilT will confer PilT the ability to perform pilus extension. This project will offer insight to the evolution of the disassembly and assembly motor proteins of the T4aP.

TOWARDS ESTABLISHING THE DANIO LINEAGE AS AN INTER-SPECIES NUCLEAR-EGG COMPATIBILITY MODEL

Destiny Baars, Francisco Pelegri (Mentor), Genetics

Inter-species cybrid embryos, involving the nucleus of one species and the egg of another, have been proposed as an approach to generate xenografts for regenerative medicine and cloning to preserve genetic diversity. We plan to determine egg-nucleus boundaries of developmental compatibility in Danio genus interspecies cybrids. My preliminary work has aimed at adapting androgenetic production methods to the zebrafish system, namely chemical enucleation of eggs with a combination of psoralen and long UV treatment. I will subsequently use this method to study developmental competence in interspecies cybrids derived from enucleated zebrafish eggs and nuclear sperm DNA from sister Danio species. This research will contribute to our understanding of early animal development and mechanisms of speciation, and will guide cloning approaches using surrogate inter-species eggs.

PERCEPTIONS OF ACADEMIC AND CAREER PLANNING

Natalie Baccam, Robin Worth (Mentor), Wisconsin Center for Education Research

Academic and Career Planning (ACP) is a Wisconsin program for students to ensure college and career readiness. It is for grades 6–12 and will be mandated for implementation in all public schools for the 2017–18 school year. Our study is part of a 3-year mixed method evaluation study. We are examining the perceptions of 8th and 11th grade students about the usefulness of ACP for firsthand insight into how students are or are not utilizing it, as well as, what is and isn't working for them. The data will be gathered via multiple focus groups in Wisconsin school districts and it will be analyzed qualitatively to look for common themes. The evaluation is intended to help Wisconsin's Department of Public Instruction refine the ACP system.

CHARACTERIZATION OF PROTEASE-ACTIVATED RECEPTOR–3 (PAR3) IN PROSTATE CANCER

Sunwoo Bae, Will Ricke (Mentor), Urology

Protease-activated receptors (PARs) have been described to play a role in various malignancies. While the expression and biological activity of PAR1 and PAR4 have been studied in prostate cancer, the expression nor the biological activity of PAR3 in the prostate has not been investigated. In this study, PAR3 protein levels were measured in various prostate cancer cell lines by Western blotting. To determine whether PAR3 expression is regulated by estrogen, prostate cells were treated with DMSO control or estradiol for 24 hours followed by Western blotting analysis. PAR3 protein levels were lower in highly tumorigenic cell lines compared to non-tumorigenic cells. Estrogen treatment induced a downregulation of PAR3 in highly tumorigenic cell lines compared to the control. This study concludes that PAR3 is downregulated in metastatic prostate cancer specimens and implicates the association of estrogens with prostate cancer progression through PAR3 regulation.

THE IMPACT OF BACKGROUND TELEVISION'S FORMAL FEATURES ON CHILDREN'S ATTENTION

Megan Baryenbruch, Katherine Karabon, Renae Rompre, Xinyi Wang, Heather Kirkorian (Mentor), Human Development and Family Studies

The purpose of our study was to examine children's attention during play when adult-directed TV was on in the background, specifically focusing on how the complexity of different programs affected toddlers' attention. Toddlers (12–24 months) played in a furnished room while being exposed to three 10-minute TV conditions. The conditions varied in formal features: no TV, simple, and complex. The children's 30-minute free play was recorded and we subsequently coded for their visual attention. Our results indicate that toddlers attended more to TV when it was on than when it was off, and more to TV when the formal features of the program were complex than simple. Our findings suggest that the complexity of background TV is a factor that influences children's attention.

WHERE IS NOTCH SIGNALING ACTIVATED IN GERMLINE STEM CELLS?

Sindhuja Battula, Sarah Crittenden (Mentor), Biochemistry

Notch signaling plays a conserved role in stem cell regulation. Regulation of the extent and level of Notch activity is crucial for proper development and health in multicellular organisms, including humans. In the model organism C. elegans, Notch signaling from a single-celled niche, Distal Tip Cell (DTC), functions to maintain germline stem cells (GSCs) in a totipotent undifferentiated state. In this system, the GSC niche has well-defined signaling and receiving cells that are readily accessible for quantitative analysis of Notch signaling. Dogma in the Notch field is that contact between Notch ligand-expressing cells and Notch receptor-expressing cells ensure cleavage to release the Notch intracellular domain (NICD) and that presence of an NICD in the nucleus ensures transcription of downstream targets. I would like to quantitatively test whether Notch is activated in all cells that contact the signaling cell. To test this hypothesis, we generated a strain with GFP-tagged signaling cells and also a strain that tags GLP–1 NICD with a highly specific V5 epitope tag using CRISPR technology. I am outcrossing the tagged NICD strain and am currently working out conditions to visualize NICD in intact germlines through immunohistochemistry methods. Comprehending the Notch signaling mechanism not only increases our understanding of stem cell regulation, but it adds to our understanding of human regenerative medicine, disease and developmental biology.

STRUCTURAL AND FUNCTIONAL CHANGES IN ANISOMETROPIC AND STRABISMIC AMBLYOPIA

Anna Bauman, Nathaniel Miller, Bas Rokers (Mentor), Psychology

Amblyopia is a common visual disorder resulting from poorly coordinated input from the two eyes during development. Although early-life treatments are available, they are only somewhat effective—impairments in stereoscopic depth perception often persist as treatment fails to amend concomitant neurodevelopmental abnormalities. We collaborated with the UW Pediatric Eye and Adult Strabismus Clinic to evaluate the structural and functional differences in the visual systems of effectively and ineffectively treated amblyopes. Using well-validated MRI-based structural (probabilistic DWI tractography) and functional (fMRI population receptive field modeling) techniques, we related each participant's stereoscopic perceptual abilities to the precise neural changes identified throughout their visual systems. We show the magnitude of reductions in structural integrity of thalamic visual pathways relate to the degree of functional and perceptual impairment.

SELLING NOTHING: MARKETING THE MYTHS, METHODS, AND MOVEMENTS OF MINIMALIST CELEBRITIES

Page Bazan, Corrie Norman (Mentor), Religious Studies Program

This project aims to continue Craig Martin's work uncovering the often covert connections between capitalism and so called 'individual religion' discussed in Capitalizing Religion. I extend his analysis to the minimalist lifestyle movement and the writers and bloggers spearheading it. Studying the mythified origins, ritualized methods, and strategically secular moments of these "minimalist celebrities" reveals how they gain and maintain numerous followers. Through blogs, ebooks, online documentaries, digital classes, and exclusive certifications, minimalist celebrities ironically entice their audiences to consume more of their content that valorizes buying and owning less. They are selling nothing and profiting handsomely from it. The writings and works of four minimalist celebrities, Joshua Fields Milburn, Ryan Nicodemus, Leo Babauta, and Marie Kondo, constitute the primary subject of my analysis.

FACTORS CONTRIBUTING TO INVERTEBRATE DIVERSITY IN LAKE MENDOTA STREAMS

Nora Beckemeyer, Julia Hart (Mentor), Center for Limnology

Invertebrates serve significant ecological roles in aquatic ecosystems in terms of their influence on nutrient cycling, food webs and function as bioindicators. However, human activity and changes in land use threaten to alter watershed ecosystems via eutrophication, which results in increased frequency of harmful algal blooms, fish kills, and decreased water clarity. It is possible that the ecological roles that invertebrate communities play in aquatic habitats will shift as a result of eutrophication. This study sought to identify relationships between invertebrate diversity and observed environmental measurements for four major inflows and one outflow of Lake Mendota, a eutrophic lake in Madison, WI. Water quality data (collected using a multiparameter sonde) along with water, sediment and invertebrate samples were collected from each stream throughout June–October 2016. Land use percentages were calculated for each stream's watershed using Geographic Information Systems (GIS) and invertebrate diversity indices were calculated for each stream. The relationships between invertebrate diversity and the streams' land use and nutrient composition were modeled using a multiple linear regression model. A principal component analysis was used to compare the similarity of the streams' invertebrate communities as well as their change throughout the sampling season. This research highlights potential environmental drivers of invertebrate diversity, which is critical information in a changing watershed.

USING STEM CELL BASED MODELS TO EXAMINE INFLAMMATORY SIGNALING IN THE BLOOD BRAIN BARRIER

Olivia Bee, Eric Shusta (Mentor), Chemical and Biological Engineering

The blood brain barrier (BBB) is a specialized cellular barrier that separates the blood stream from the Central Nervous System (CNS) through tight barrier properties. During certain inflammatory diseases, such as meningitis and encephalitis, the BBB fails to maintain its barrier properties. An induced Pluripotent Stem Cell BBB model, that is human based, scalable, and retains barrier properties, is used to explore inflammatory pathways involved in the BBB so we can better understand how the model can be used to study CNS diseases. Here we utilize this superior iPSC derived stem cell model to examine interactions between the bacterial meningeal pathogen Group B Streptococcus and the BBB. A greater understanding of how inflammatory insults interact in the BBB may promote discovery of novel therapeutic interventions.

EXPLORING COMPUTATIONAL TOOLS IN PHYLOGENOMIC ANALYSES OF THE GRYLLOBLATTODEA TREE OF LIFE

Zachary Beethem, Sean Schoville (Mentor), Entomology

Ice crawlers (Grylloblattidae) are a family of insects that thrive in cold and isolated mountainous environments. Of the five grylloblattid genera, only the Grylloblatta genus is found in North America, while the remainder are found spread throughout Northeast Asia and Southern Siberia. Recent research concerning climate change impacts on these ice crawler species and habitats has sparked interest regarding the biodiversity of these species. However, critical information about the phylogenetic relationships among Grylloblatta and species identification of known but unidentified populations of Grylloblatta is needed. Using RNA-seq data and bioinformatics tools, we reconstructed a phylogeny of the ice crawler genera, while also exploring relationships within the Grylloblatta genus.

SINGLE MOLECULE INVESTIGATION OF SPLICEOSOME FIDELITY-ALTERING MUTATIONS IN YEAST PRP5

David Beier, Aaron Hoskins (Mentor), Biochemistry

Prior to translation, pre-mRNAs must be spliced by the spliceosome to remove introns from the coding sequences of mRNA. A component of the spliceosome, the U2 snRNP, interacts with the branchsite (BS) sequence to allow for bulging of the catalytic adenosine. When a mismatch between the U2 snRNP and the BS is identified, formation of the spliceosome is stalled. This interaction is monitored by Prp5. Prp5 is a DEAD-box protein, a family of RNA helicases that transition from an open state to a closed state upon binding of RNA and ATP. A conformational change between open and closed states can be studied by fluorescently labeling Prp5 and measuring FRET efficiency. How Prp5 conformational dynamics affect splicing fidelity is poorly understood. Additionally, two Prp5 mutants, TAG and E235A, are known to affect splicing fidelity. Comparing the distributions of FRET efficiencies of these two mutants to the WT Prp5 will provide insight into how Prp5 preserves the fidelity of the spliceosome.

THE CORRELATION OF EMOTIONAL RECOVERY PHYSIOLOGY AND WORK TO FAMILY CONFLICT

Daniela Beltran Hernandez, Stacey Schaefer (Mentor), Center for Healthy Minds

The nation-wide longitudinal Midlife in the U.S. (MIDUS; http://midus.wisc.edu) study began in 1995, and has followed the same people every 10 years. MIDUS participants provide a wealth of data including self-report, biological, cognitive, daily diary, psychophysiology, and neuroimaging measures. We focus on laboratory measures of both facial and brain responses to affective stimuli to measure individual differences in the time course of emotion. These measures, combined with self-reported emotion, improve our understanding of how Americans age. Based on previous studies examining how work and family interact in the MIDUS dataset, we asked "is emotional recovery predictive of how work stress will affect a person in family conflict?" That is, are people with better emotional recovery less affected by work stress in their conflicts at home? The analysis combines both questionnaire and psychophysiological data, which will be analyzed for a correlation. Self-reported variables will look at job demands, authority, and complexity.

BRIDGING THE YAP BETWEEN MECHANICAL PROPERTIES AND DIFFERENTIATION IN HUMAN PLURIPOTENT STEM CELLS

Josh Bensen, Yefim Zaltsman (Mentor), Biochemistry

Human pluripotent stem (hPS) cells hold potential to revolutionize regenerative therapies and drug screening. A challenge in implementing these technologies is understanding how to control hPS cell differentiation, considering both soluble and insoluble factors. Previous Kiessling group research implicated the localization of a transcriptional coactivator, YAP, in the molecular mechanism by which substrate stiffness modulates differentiation. How YAP localization is regulated in hPS cells remained unclear. We examined several proteins known to interact with YAP, using doxycycline-induced RNA interference. We assessed the changes in localization and transcriptional activity of YAP after knockdown of each protein. Of those tested, only angiomotin (AMOT) family proteins were found to modulate YAP localization. These studies suggest AMOT proteins play an important role in transducing mechanical cues in hPS cells.

A CASE STUDY OF COALITION EFFORTS TO PROMOTE HEALTHY FOOD AND ACTIVITY ENVIRONMENTS FOR CHILDREN

Ryan Berg, Amy Hilgendorf (Mentor), Center for Nonprofits

Obesity, which has been linked to adverse health problems, has become increasingly prevalent in the U.S. over the last few decades. The Obesity Prevention Initiative (OPI) supports coalitions in Wisconsin counties in pursuing policy, systems and environmental changes to support children's health through university-community research partnerships. In gathering mixed methods data about the coalition's work, including survey and interview data about perceptions of obesity and prevention strategies, we can gain understanding of how coalitions approach obesity-related work and the successes and challenges of different approaches. This case study presents the in-depth data and analysis of the process in Marathon County to uncover important trends in how coalitions work towards obesity prevention and offers insights for other coalitions doing similar work.

ANCIENT LEWIS HOLES: THE ACHIEVEMENT OF GREEK ARCHITECTURE

Rachel Berglund, William Aylward (Mentor), Classical and Ancient Near Eastern Studies

This poster examines lewis holes in ancient Greek architecture. Masons carved holes with slanted interiors on the tops of marble blocks that required hoisting onto monuments like the Parthenon in Athens. The holes were fitted with a specially made iron "key," then hooked on a rope suspended from a crane. Lewis irons rarely survive, making the extant holes all the more important. I applied principles of physics to a data set of lewis holes collected from Samothrace. When the mass of the block and the angle slanted side of the hole are known, the forces exerted by the iron can be quantified through simple geometry. These values are diagnostic tools to examine the diffusion of lifting technology within architecture of the ancient Greeks.

MUHAMMAD ALI'S INFLUENCE ON HIP HOP AND SPOKEN WORD AND SEXISM IN AMERICAN CULTURE AND THESE TRADITIONS

Mackenzie Berry, Sara McKinnon (Mentor), Communication Arts

This documentary film project examines Muhammad Ali's influence on the development of Hip-Hop and spoken word traditions. Most histories of spoken word place its rise in popularity in the 1970's and largely erase Muhammad Ali, ignoring his release of a spoken word album with Columbia Records in 1963. This documentary-film based research historicizes and contextualizes Ali's influence and examines the sexism evident in his philosophy and creative works. In its entirety this research will reference books, academic articles, historical footage, and original interviews. The film will engage a series of interviews with those close to Ali personally, biographers, Hip-Hop artists who were influenced by Ali, and Hip-Hop artists and scholars who can speak about sexism reflected in Ali and Hip-Hop.

UNDERSTANDING FACTORS THAT IMPACT THE ACCELERATION/DECELERATION OF A GASOLINE VS HYBRID VEHICLES

Nikita Bhatt, Sue Ahn (Mentor), Civil & Environmental Engineering

In this research project, we aimed to understand the difference in deceleration of gasoline vehicles as opposed to hybrid vehicles. These two different categories of vehicles differ from each other in that hybrid vehicles, in addition to predominantly using a fossil fuel to get powered up, also have a regenerative brake allowing them to store and later utilise the kinetic energy applied by the driver on the brakes. Data was collected of these two-vehicle type's decelerations on an intersection on Regent Street. However, analysis using MATLAB software revealed no significant relationship or differences between the plots for the two vehicle categories considered. Thus, our goals have been refocused to find a new direction using the current data and compare the deceleration against different factors.

TEXT-MINING NIH GRANT CRITIQUES; CAN MACHINE LEARNING ALGORITHMS DETECT REVIEWER BIAS?

Anupama Bhattacharya, Molly Carnes (Mentor), Geriatric Medicine

The National Institutes of Health (NIH) is the largest federal funder of biomedical research, primarily through its R01 Grant mechanism. Female and underrepresented minority (URM) scientists have lower success rates for R01s, but causes for these funding disparities remain relatively unexplored. Prior research shows that gender and racial stereotypes disadvantage women and URMs in scientific peer review processes, and that text analysis of R01 peer reviewers' critiques can help illuminate evidence of such bias. However, powerful text-analytic machine learning algorithms have yet to be utilized for this purpose. To bridge this gap, we use a mathematically robust classification algorithm to show that gender and racial bias is most blatant in critiques of R01 applications in fields with the small proportions of women and URMs.

APPLICATION OF HYDROXYAPATITE ACID/BASE CATALYSTS IN ALDOL CONDENSATION REACTIONS

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

Hydroxyapatite, (Ca10(PO4)6(OH)2), can act as a catalyst or support material in many reactions, such as oxidations of alcohol, due to its acid (PO4) and base (CaOx) functionalities. The molar ratio of these sites can be tuned during synthesis, allowing the relative contributions of acid and base functionalities towards catalytic activity to be determined. Furthermore, the type of atoms that form the acidic and basic sites can be substituted to modify the strength of the sites. To explore the effects of these synthetic parameters, the self-condensation of butanal will be used as a probe reaction. Insight from these studies will aid in optimizing hydroxyapatite compositions for use as aldol condensation catalysts.

ROLE OF SPG3A IN NEURAL MAINTENANCE

Jennifer Bird, Anjon Audhya (Mentor), Biomolecular Chemistry

Mutations in SPG3A have been implicated in early onset hereditary spastic paraplegia (HSP). One mutation, SPG3A p.S398F, potentially affects its activity and is predicted to alter endoplasmic reticulum (ER) morphology, which may contribute to disease. We determined the impact of the p.S398F mutation in induced pluripotent stem cell (iPSC)-derived cortical neurons, as compared to mutated TFG, which affects ER function and underlies a similar form of HSP. SPG3A mutated neurons exhibited normal axonal bundling but reduced axonal outgrowth compared to control neurons, while TFG mutated neurons exhibited abnormal bundling with normal axonal outgrowth. These results suggest mutations in TFG and SPG3A affect ER structure and function via distinct mechanisms, resulting in unique phenotypes that both contribute to the pathogenesis of HSP.

SEARCH FOR GAMMA-RAY BUBBLES AROUND M31 WITH HAWC

Ariana Blair, Joshua Wood (Mentor), Wisconsin IceCube Particle Astrophysics Center

Gamma-ray haloes can exist around galaxies with the most famous example being the two large gamma-ray structures around our own galaxy called the Fermi bubbles. Recently, it has been suggested that a similar structure exists around M31 at GeV photon energies. We investigate whether the proposed structures around M31 are detectable at TeV photon energies with the HAWC Observatory.

EFFECT OF GPX1 GENOTYPE ON SELENIUM BIOMARKERS AND APPARENT DIETARY SELENIUM REQUIREMENTS IN MICE

Andrew Blink, Edward Zemaitis, Roger Sunde (Mentor), Nutritional Sciences

Selenium-dependent enzymes and protein are robust biomarkers of selenium (Se) status that are used to determine Se requirements in animals and humans. Se status regulates levels of some selenoprotein mRNAs as well as expression of all selenoenzyme activities. Our hypothesis is that Gpx1 genotype will alter apparent dietary Se requirements. Male glutathione peroxidase–1 wildtype (WT, Gpx1+/+), heterozygote (Het, Gpx1+/-), and knockout (KO, Gpx1-/-) mice were fed Se-deficient or 0.2 Âµg Se/g diets for 5 wk. Gpx1 genotype dramatically affected Gpx1 but not Gpx3 activity; Se supplementation increased Gpx3 activity regardless of genotype whereas Se-adequate Gpx1 activity increased in Gpx1+/- mice to only ~60% of Gpx1+/+ mice. Ongoing analysis will examine liver Gpx4 activity, and expression of selenoprotein mRNAs.

MECHANICAL ENERGY FROM TIDAL WAVES TO CHEMICAL ENERGY FOR DEEP SUBSURFACE MICROBES

Thompson Bliss, Huifang Xu (Mentor), Geoscience

The piezoelectric effect can transform mechanical energy into chemical energy (such as hydrogen) necessary for deep subsurface microbes to survive. Ocean tides gain mechanical energy from gravitational forces from the sun and the moon. The ocean tide heights and energy levels are non-constant and will change with the current phase of the moon and sun with respect to the earth. The tides then crash on rocks and deform them. Common rock-forming minerals of quartz and serpentine are piezoelectric. The piezoelectric effect can then occur on these deformed minerals in continental and oceanic crust. This research project will focus on whether ocean tides contain the necessary mechanical energy to be transformed into chemical energy via the piezoelectrochemical (PZEC) effect in order to support the microbial communities in deep subsurface environments.

IDENTIFICATION OF DORMANT TUMOR CELLS THROUGH METABOLIC IMAGING

Brenna Bomkamp, Suzanne Ponik (Mentor), Cellular & Regenerative Biology

Sometimes tumors grow in a way that certain parts of the tumor receive little to no oxygen. One might think that this would kill those cells because of the lack of oxygen but they remain alive. This lack of oxygen is called hypoxia. The stress of the lack of oxygen stimulates a dormancy signature that aids in the survival of the cancer cells (Sosa, 2012). Metabolism is a possible way to view dormancy because cancer cells change their metabolism to help them progress and thrive (Burkel, 2016). Cancer reacts to hypoxic conditions by overexpressing HIF–1α which alters metabolism, pH, angiogenesis, erythropoiesis, cell migration, invasion, and inflammation (Jain, 2013). Therefore, therapies that target dormancy mechanisms might be important to eliminate the residual dormant cells (Fluegen, 2016). We will test the hypothesis that hypoxic conditions will induce metabolic changes in breast cancer cells at the primary tumor site and identifying the metabolically altered cells will predict the dormant cell population. Fluorescent lifetime imaging (FLIM) will be used to determine these metabolic changes in 4T1 mouse mammary carcinoma cells cultured in 3D collagen gels.

NURSES- THE KEY TO CREATING PRACTICE CHANGES REGARDING PATIENT MOBILITY

Nathan Borchardt, Barbara King (Mentor), Nursing

Promoting ICU patients' mobility yields significant positive outcomes such as decreasing ICU length of stay and number of days patients are on ventilators. This qualitative study uses a Cognitive Work Analysis as a conceptual framework to identify factors that support or inhibit ICU nurse decision-making for early patient mobility. Data was collected via direct observation. Members of the research team observed four ICU RNs during the first four hours of each shift, for a total of two-shifts per nurse. Interrater reliability was increased by a variety of methods. Data was analyzed using directed content analysis. Themes were identified based on behaviors that nurses exhibited related to decision-making for early patient mobility.

THE EFFECT OF SUPERNUTRITIONAL SELENIUM ON SELENOPROTEIN GENE EXPRESSION AND PROTEIN ACTIVITY

Victor Bourget, Rachel Taylor (Mentor), Nutritional Sciences

Biomarkers are measurable indicators of an organism's status for a specific nutrient. While selenium (Se) is an essential nutrient in human and animal diets, there are no biomarkers for supernutritional Se status in turkeys. The objective of this experiment is to identify biomarkers of supernutritional Se status in breast and thigh muscle. We fed turkey poults a diet containing 0.4, 2 or 5 ug/g Se and quantified the effect of Se by measuring tissue Se concentration, Se-dependent glutathione peroxidase (GPX) activity and transcript expression of Se-containing proteins. There were no differences in growth across groups, indicating the birds were healthy. High Se did not significantly regulate any selenoprotein transcript in breast or thigh. Se concentration and GPX1 and GPX4 activity in tissues will be presented.

HOMEOSTATIC MECHANISMS OF HORMONE TRANSPORT IN THE TOBACCO HORNWORM (MANDUCA SEXTA)

Sloane Bratton, Walter Goodman (Mentor), Entomology

The effects of and relationship between the insect developmental hormone, juvenile hormone (JH) and its extracellular transporter, hemolymph juvenile hormone binding protein (hJHBP) in the tobacco hornworm, Manduca sexta, were investigated. Prior studies demonstrated an increase in hJHBP in a JH-deficient mutant of M. sexta when treated with exogenous JH. However, research into the effects of topical JH on hJHBP in wild-type M. sexta has yet to be tested. Wild-type fourth instar M. sexta were treated with HPLC-purified (10R)-JH I and (10S)-JH I, with dose-response analysis performed for each test substance. The hemolymph collected from M. sexta 24 hours after JH application are in the process of analysis for resultant hJHBP levels via an enzyme-immunosorbant assay (EIA).

NEURAL STEM CELL GENE IDENTIFICATION USING CRISPR CAS9 BASED SCREENING SYSTEM

Michael Bray, Darcie Moore (Mentor), Neuroscience

We are interested in identifying genes that are important for a neural stem cell's ability to asymmetrically distribute cargoes and maintain a diffusion barrier in dividing cells. Learning this about the nature of cells can better equip us to find cures for genomic disease and aging. To do this we will randomly knock out genes using a CRISPR Cas9 based screening system containing a pool of gRNAs to generate knockout mutant neural stem cells. Then we'll probe for those mutants' ability to asymmetrically divide cargoes and probe to determine diffusion barrier strength. Changes in levels of asymmetry and diffusion barrier strength will constitute hits in our screen that we will be able to follow up on to determine which genes are important for those phenotypes.

HOW SOCIAL CATEGORIES AFFECT INFANTS' TRUST AND PREFERENCES

Meredith Braza, Kristin Shutts (Mentor), Psychology

What are the developmental origins of the human tendency to consider social categories when deciding whom to trust and prefer? The current project seeks to shed light on this question through a "trust task" presented to infants (11.5–12.5 months old) and young children (23–25 months old, 29–31 months old, and 35–37 months old) in a controlled laboratory setting. This task assessed infants' and young children's interest in accepting foods and toys from people of different ages (child vs. adult). Findings from this study contribute to our understanding of the development of social categorization and social learning in the early years of life.

PROBABILITY OF REDUCIBILITY OF RANDOM POLYNOMIALS AS THE DEGREE INCREASES

Claire Brekken, Melanie Wood (Mentor), Mathematics

I study the probability that random polynomials with integer coefficients will be reducible over the rationals. I look at three models of monic polynomials differing only in their potential coefficient sets, and the relationships between growing degree, reducibility, and type of factorization when the set of potential coefficients is held fixed. Previous study has been performed to relate the varying cardinality of a coefficient set of a particular polynomial model to the reducibility of those polynomials when degree is held fixed. Utilizing guiding conjectures, hints of universal behavior regarding reducibility of polynomials have been observed. In particular, the probability of reducibility appears to decrease as the degree of the polynomial increases, and low-degree factors seem to comprise the overwhelming majority of factors of reducible polynomials.

LOCAL PUBLIC HEALTH DEPARTMENT FUNDING: AN UPDATED LOOK AT TRENDS & RELATIONSHIP TO HEALTH OUTCOMES

Matthew Brelie, Theresa Watts, Susan Zahner (Mentor), Nursing

The capacity of local health departments (LHDs) to carry out essential public health services that protect and improve public health depends on adequate resources. This study explored trends in LHDs' funding and staffing levels, and the relationship between capacity and health outcomes. Wisconsin LHD capacity measures from 2001 to 2013 and county health outcomes from the 2013 Wisconsin County Health Rankings were analyzed for trends and correlation. Adjusting for inflation, overall LHD funding has declined since 2001. A positive correlation (1.19) between LHD revenue and health outcomes z-score was found. Maintaining LHD capacity may help improve population health.

ATTACHING EGFP TO VINCULIN THROUGH A TWO-STEP PCR DNA CLONING

Michael Brodhead, Joseph Szulczewski (Mentor), Cellular & Regenerative Biology

In the United States, about 1 in every 8 women will develop invasive breast cancer in her lifetime with the death rate being around 1 in 37. What causes this disease to be so lethal is the rapid growth and metastasis of the cancerous cells through the mechanisms of cell migration. Focal adhesions (FAs) are inter-cellular structures that mediate communication between a cell and the surrounding matrix, which is a major contributor to cellular migration. Vinculin, a FA associated protein, and has been shown to have a major role in cellular migration. Attaching eGFP, enhanced green fluorescent protein, to vinculin through a two-step PCR DNA cloning will illuminate vinculin allowing for further studies on how FA dynamics and cellular migration correlate. Having this ability to study this correlation will give a greater understanding on how breast cancer metastasis and the spread of other diseases is controlled by the mechanisms of cellular migration.

ASSESSING COGNITIVE LOAD IN INDIVIDUALS WITH SINGLE-SIDED DEAFNESS WITH A COCHLEAR IMPLANT

Emily Burg, Ruth Litovsky (Mentor), Communicative Sciences & Disorders

Recent technological advances have considerably transformed the candidacy criteria for cochlear implantation. Once only available to adults with profound hearing loss, cochlear implants (CIs) are now a viable option for infants, children, and adults, often with less profound hearing loss, and for individuals with single-sided deafness (SSD), i.e., one ear within normal hearing range and one deaf ear. Evidence suggests that individuals with SSD exhibit benefits from the CI, such as improved speech perception in noise and sound localization. This study employs pupillometry (the objective measure of pupil dilation) to assess whether individuals with SSD gain additional benefit in the form of decreased listening effort in various speech-in-noise conditions.

PEROVSKITE STABILITY

Luke Burlingame, Fuad Ahmed, Daniel Alborta, Dane Morgan (Mentor), Materials Science & Engineering

In the Informatics Skunkworks lab, we are using machine learning techniques to try and predict perovskite oxide stability. Perovskite oxides are easy to synthesize by many methods, often inexpensive, and provide an amazing array of functionality, from efficient catalysis of oxygen reduction to large piezoelectric response. Many exciting perovskites remain to be discovered but when considering a new material it is important to know if it is stable. Our task is to use a Neural Network, a computer program tool based on the human brain, to predict perovskite stability for a wide-range of perovskites by learning on a smaller database. We use different perovskite properties to "teach" the Network the characteristics of the perovskites and have it predict stabilities of unknown perovskites. Currently, we are using various Neural Network techniques with simpler problems (i.e. sine function) using MATLAB.

TEXAS-VI APPLICATIONS

Neel Burman, Jun Wang (Mentor), Engineering Physics

A problem with nuclear plants is that during severe accident process, melting materials of the core will fall into the lower plenum, and bring a steam explosion, which may threaten the integrity of reactor vessel. This means we have to make some experiments and simulations to understand the mechanism and we need to find ways to minimize this. We answer this problem by investigating the depths of water and observing how that impacts the steam explosion process. Also, we look at the mixing time as well to see the effect. We go about this by utilizing Texas-VI, which was developed by Prof. Corradini at the University of Wisconsin–Madison. Texas-VI (Thermal Expansion Analysis Simulation Model) is a transient, three field, 1-D mechanistic model for the steam explosion phenomena. Now we are using the most advanced version Texas-VI. Expected results: five cases were selected for this research, four of which were used to analyze the pool depth, and two were used to analyze the mixing time. Cases one through four were used to observe the effect of pool depth on severe reaction rate because they have constant mixing times Cases three and five were used to observe the effect of mixing time on severe reaction rate because they both have constant pool depths. Through this research, we will get the comparison simulation of mixing time and pool depth and go on to develop ways to reduce the risk of steam explosion accidents in nuclear power plants.

MEASURING THE INTERACTION OF SOLUTES WITH PROTEIN SURFACE TYPES USING VAPOR PRESSURE OSMOMETRY

Taylor Bye, M. Thomas Record, Jr. (Mentor), Chemistry

Interactions of solutes with protein surfaces play a significant role in in vitro and in vivo protein processes such as self-assembly, folding, and ligand binding. In this project, we use vapor pressure osmometry (VPO) to obtain free energy derivatives (called m23 values) that quantify chemical interactions of the polyol sorbitol and the sugar trehalose with alkyl ureas displaying both amide and hydrocarbon groups of proteins. We are dissecting these m23 values into additive contributions from the interactions of the polyol and sugar with hydrocarbon and amide groups. Results of this analysis will allow us to understand the interactions of sorbitol and trehalose with proteins, and their effects on protein folding.

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

Claire–Marie Canda, Lindsey Jager (Mentor), Waisman Center

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

ASSEMBLY OF A CONFOCAL MICROSCOPE FOR SINGLE-MOLECULE FRET STUDIES ON NASCENT PROTEIN FOLDING

Tess Carlson, Silvia Cavagnero (Mentor), Chemistry

Single-molecule fluorescence spectroscopy of molecules labelled with fluorescent dyes capable of Förster Resonance Energy Transfer (FRET) has become an effective and important tool to examine distinct conformational states of proteins. A confocal microscope designed for single-molecule FRET experiments will be assembled and optimized for experiments on protein chains bound to the ribosome. Sample data regarding photon arrival time, FRET efficiency and anisotropy of a newly synthesized globin protein generated in a bacterial cell-free system will be simultaneously collected. Fluorescence lifetimes, rotational correlation times and specific subpopulations (exchanging on a timescale slower than ms) will be determined. Future developments include the analysis of ribosome-bound nascent proteins capable of folding and ribosome-bound nascent intrinsically-disordered proteins (IDPs). These experiments will enable the study of cotranslational intramolecular folding, and interactions with the ribosome the trigger factor chaperone of the protein chain being studied. This data to be collected with the newly assembled single-molecule microscopy setup will provide new insights into conformational states and intermolecular interactions that have been previously undetectable due to ensemble averaging.

MADISON, WISCONSIN: A LIBERAL HAVEN?

Mackenzie Carroll, Sarah Moore (Mentor), Geography

This thesis examines the impacts of systemic racism and de facto segregation in Madison, Wisconsin, in an effort to answer the question, for whom is Madison a "liberal haven"? By studying the effects of housing policies and renewal efforts through a historical and geographic lens, I highlight the existence of significant inequalities in a city that prides itself on its liberal values. To narrow the research, I focus on the diverse South Madison Neighborhood. This thesis challenges the idea of cities as "liberal havens" and studies how geographic isolation can lead to the needs of certain sectors of the population being ignored. As minority populations in Madison continue to increase, acknowledging the roots of systemic inequalities is both timely and necessary.

UPTICA -EMPOWERING WOMEN THROUGH UPCYCLING IN RURAL COSTA RICA

Maria Castillo, Robert Beattie (Mentor), Nelson Institute for Environmental Studies

UpTica is a social venture in San Isidro, Costa Rica, that aims to empower women by co-creating alternative income sources with community members. UpTica promotes environmental stewardship by introducing upcycling as an approach to value waste while encouraging a sustainable behavior of responsible consumption of goods. With Nicol Chinchilla, from Costa Rica, and Sasha Drumm, from the U.S.A., we co-founded a non-for-profit organization that incentivizes community ownership in the creation of a local economy. We piloted UpTica's model by providing a space for three women to produce 250 bags out of donated leftover fabric that would otherwise have been landfilled. UpTica hopes to positively impact more families, divert fabric and plastic from the landfill, and eliminate single use plastic bags consumption.

PUBLIC EDUCATION IN SCIENTIFIC ANIMAL RESEARCH THROUGH COMMUNITY OUTREACH

Jon-Luc Cayabyab, Madilyn Williams, Allyson Bennett (Mentor), Psychology

Community outreach provides an important opportunity to engage with the public, to educate, and to accurately inform students about scientific research. We have developed an outreach program to share knowledge about comparative psychology and behavioral research with nonhuman primates. Our team of UW–Madison undergraduate students engages K–12 audiences with hands-on interactions with enrichment puzzles and video games used for cognitive and learning assessment. Students also lead activities designed to teach about comparisons of human and monkey life stages, major primate species' diets and habitats, and cognitive studies done with rodents, birds, elephants, and primates. Audiences learn about care for animals and the value of scientific discoveries by engaging outreach team members in conversations that include discussion of comparative psychology, animal welfare, conservation, evolution, and ecology.

PARAMEDIC-DELIVERED CARE TRANSITIONS COACHING FOR OLDER ADULTS DISCHARGED HOME FROM THE ED

Nia Cayenne, Manish Shah (Mentor), Emergency Medicine

Suboptimal ED-to-home transitions have been identified as contributors to repeat ED visits in the older adult population. This poster will present the preliminary results of the Care Transitions Intervention (CTI) program that was adapted to the ED to improve this population's transition by coaching patients and their caregivers. The study tests the efficacy of the program via a single-blind randomized controlled study with recruitment in Madison, WI and Rochester, NY. I will report on preliminary data of the study, including enrollment and refusal rates. To date, our research shows that this CTI has significant opportunity, is feasible in the ED context and that paramedic coaches can broaden the scalability of the program. Future work will determine if it is effective.

A SEARCH FOR GAS ACCRETION SIGNATURES IN GALAXIES WITH SDSS IV/MANGA

Keith Celeste, Christy Tremonti (Mentor), Astronomy

Galaxies are believed to grow over time though the infall of gas and dark matter. This supply of fresh gas is believed to be critical to keeping star formation within the galaxy active. However it has proven to be very difficult to detect these inflows observationally. We search for indirect signatures of gas inflows by analyzing the distribution of chemical elements in a sample of several thousand galaxies drawn from the Sloan Digital Sky Survey IV MaNGA project. The gas within galaxies has been chemically enriched by many generations of stars, whereas gas flowing into the galaxy is expected to contain very few elements heavier than Helium. Careful study of galactic chemical abundance maps will enable us to detect abrupt drops in chemical enrichment that may signify gas inflows. We present preliminary oxygen abundance maps and the results of a small pilot study.

STORIES OF THE HOUSEKEEPERS: AN INQUIRY OF OCCUPATIONAL GENDER SEGREGATION

Constance Chang, Leann Tigges (Mentor), Community & Environmental Sociology

Despite the closing wage gap between genders, occupational gender segregation persists in the U.S. Classical human capital theory explains gender segregation as a result of human capital disparity between genders. Data from the cleaning service occupations, however, challenges the classical human capital theory. The three cleaning service occupations discussed in this study (janitorial service, housekeeping and domestic service) although similar in respect to entry requirement and racial composition, have drastically different gender composition. Female workers disproportionately concentrate in housekeeping and domestic services, which have less legal protection and lower pay comparing to janitorial service. This study inquires subjective experience and motivations of female workers entering into female concentrated cleaning services. The study consists of in-depth interviews with three female housekeepers in the Madison, WI area. The findings of the study suggest that the private nature and the lack of social interaction of housekeeping are prominent features that attract female workers. Homophilous social network also provide women ready access into female concentrated occupations. This occupational case study provides insights into individual rationale of job selection and contributing factors to occupational gender segregation.

THE FUTURE OF 4-YEAR-OLD KINDERGARTEN IN THE MMSD

Samantha Chase, Kelly Giuliano, Noor Hammad, Eric Grodsky (Mentor), Sociology

This research can provide valuable information regarding school readiness and effectiveness of previous 4 year-old Kindergarten curriculum and assessments. 4K classrooms in the Madison Metropolitan Area may use our literature reviews on: English Language Learners, non-cognitive skills, discipline, what constitutes a child as "school ready," and curriculum in the classroom. In order to review such information, literature was collected, approved by the project head, outlined and reviewed. It is important to continue looking into what factors determine school readiness and how these can be used to improve the MMSD 4K curriculum.

CONCUSSION REPORTING IN MALE AND FEMALE COLLEGIATE STUDENTS

Edwin Chen, Traci Snedden (Mentor), Nursing

The objective of this study was to describe concussion self-reporting among male and female collegiate students. As concussions result in symptoms that have the potential to disturb learning and physical performance, it is necessary to understand factors influencing the decision to report. We adapted a previously validated survey that assessed the college experience of students with a moderate to severe traumatic brain injury for students with concussion and found that common reasons for not reporting included: didn't realize seriousness (47.2%); didn't think it was an injury (36.1%); and didn't know who to report the injury to (22.2%). This study concludes that collegiate students exhibit concerning reporting rates. Therefore, innovative education programs are needed to ensure collegiate students recognize concussions and understand the importance of reporting.

BIODIVERSITY OF IRON REDUCING MICROORGANISMS IN SOILS AND SEDIMENTS

Yu Chen, Eric Roden (Mentor), Geoscience

Iron is ubiquitous in clays and clay minerals which are common components in soils and sediments. The microbial iron reduction process plays an important role in organic matter degradation and also bioremediation of heavy metals and radionuclides. This study was conducted to determine the biodiversity of iron reducing microbes, which is influenced by Fe mineralogy and extent of reduction, in different soils or sediments. Fresh water from a pond in Madison was used as a source of iron reducing microbes. 16 natural soils and 5 synthetic iron oxide phases were reduced by the microorganisms with acetate as the energy source in neutral-pH growth medium. HCl extraction followed by colorimetric analysis was used to measure reduced Fe [Fe(II)] and total iron concentrations in sample collect over time from the cultures. The amount of Fe(II) produced was used as a measure of the extent of iron oxide reduction. And high-throughput 16s rRNA gene sequencing method is in progress to investigate the iron reducing microbial diversity. Nature soils showed different rates and extents of iron reduction. Synthetic amorphous iron oxide showed a much higher rate and extent of reduction compared with the other four synthetic materials. Our results will shed light on how the iron mineralogy may influence the activity biodiversity of iron reducing bacteria in natural soils and sediments.

INTERACTING PARTICLES AND PARTIAL DIFFERENTIAL EQUATIONS

Yian Chen, Wai-Tong Fan (Mentor), Mathematics

This project aims to use Brownian particle systems to describe reaction diffusion equations. We will try to explore various interactions among Brownian particles such as annihilation, birth and death. By imposing proper probabilistic rules for these interactions, we can show that the particle densities are good approximations for some reaction-diffusion equations. We shall illustrate that this approximation is a useful connection between particle systems and partial differential equations.

MAX-AUTOREGRESSIVE MOVING AVERAGE MODEL: A NEW METHOD TO DO PREDICTION

Zhang Chi, Wai-Tong Fan (Mentor), Mathematics

We perform more in-depth study for an extended max autoregressive models (MARMA), introduced by Philippe Naveau, Zhengjun Zhang and Bin Zhu. This model is extended from max-autoregressive (MAR) and moving average (MA) models, and it shares many of the characteristics of heavy-tailed ARMA process, like stationary and causality. The first phrase of the study is to check these properties using basic mathematical knowledge. Upon the hypothesis of these properties, MARMA can be used to do prediction in our daily life. The next phrase is to fit MARMA to real data, and one example is the weekly maximal of river flow rate data, showing the comparison between the simulated values and the observed values. Furthermore, this study will be useful in finance and can be applied in stock prediction.

MINOCYCLINE ENHANCES MESENCHYMAL STEM CELLS' ANTIBACTERIAL ABILITIES AGAINST ESCHERICHIA COLI

Charlie Childs, Peiman Hematti (Mentor), Hematology/Oncology

Mesenchymal stromal/stem cells (MSCs) have demonstrated wound healing potential through their angiogenic and anti-inflammatory abilities. Poly (ethylene glycol) (PEG) and gelatin-based crosslinked hydrogels can effectively deliver MSCs to wounds, but are subject to microorganism growth on the surface. We've previously shown that adding the antibiotic minocycline to the hydrogel can have antibacterial effects on Staphylococcus aureus (SA) due to minocycline itself and minocycline's enhancement of MSC antibacterial activity. In this study, we determine the antibacterial effects of minocycline pretreated MSCs on the gram-negative bacteria Escherichia coli (E. coli), to determine if the pathways for fighting gram-positive bacteria are conserved. By pretreating the MSCs with minocycline, co-culturing them with E coli and observing colony growth, we found that MSCs had significant antibacterial effects on E. coli.

EFFECTS OF AN EARLY STOP LYN MUTATION ON NEUTROPHIL MIGRATION AND INFLAMMATION

Julia Chini, Anna Huttenlocher (Mentor), Pediatrics

The Src Family Kinase (SFK) Lyn has regulatory roles in immune cells, including neutrophils. As a signaling protein, Lyn has been shown to regulate neutrophil migration and endothelial adhesion, contributing to the body's inflammatory response. A set of patients with systemic neutrophil-induced inflammation have a de novo mutation, Y508*, in the regulatory tyrosine residue of Lyn. When this regulatory tyrosine is phosphorylated the protein becomes inactive, therefore the Y508* mutation is hypothesized to cause a constitutively active Lyn kinase, which in turn is leading to the inflammatory symptoms. Specifically, we hypothesized that Lyn Y508* neutrophils have increased adhesion to endothelial cells, inhibiting neutrophil extravasation from blood vessels in response to signals. Kinase assays demonstrated that Lyn Y508* has increased autophosphorylation and phosphorylation of the substrate SAM68 compared to Lyn WT, supporting the gain of function hypothesis. In addition, Lyn Y508* transduced PLB–985 neutrophil-like cells showed decreased migration towards the chemotactic peptide fmlp. We are currently using microfluidic devices to further characterize neutrophil-like cell migration with both Lyn Y508* and Lyn WT using different chemoattractants and extra-cellular matrix components. These studies will allow for further understanding of how this mutation in Lyn leads to changes in neutrophil function and inflammation, and how these symptoms can be treated.

PARENTS' PERCEPTION OF THE QUALITY OF LIFE OF THEIR INFANT WITH COMPLEX CONGENITAL HEART DISEASE

Chloe Choice, Karen Pridham (Mentor), Nursing

Parents of infants with complex congenital heart disease (CCHD) are relied on to describe their infant's quality of life (QOL). The purpose of the study was to identify parents' perceptions of the quality of life of their infant with CCHD. The secondary analysis of a longitudinal qualitative study used a directed content analysis to achieve the study's purpose. Parental interviews done when infants were between 4–6 months were examined to develop QOL categories. Analysis showed parents' perceptions of their infant's QOL fell into three categories: state of health, physical/emotional wellbeing, and parenting, with each category comprising subcategories. The number of mentions of each QOL subcategory per interview was recorded in order to show the level of importance of each subcategory to parents in perceiving QOL.

ARE DIFFICULT VIDEOGAMES COGNITIVELY-ENRICHING OR ANXIETY-PROVOKING FOR RHESUS MACAQUES?

Kelsey Christianson, Allyson Bennett (Mentor), Psychology

Videogames can provide cognitive enrichment for nonhuman primates; however, challenging tasks may also elicit anxious behavior. The primary questions addressed by this research are: First, whether adult rhesus monkeys exhibit heightened anxiety-like behaviors when engaged with a novel cognitive task presented via a familiar videogame system. Second, whether early life experiences predict individual differences in affective response to challenging videogames. In this study, behavioral response to two videogame tasks, each presented for three 60-minute trials, was measured in two groups of aging rhesus monkeys with different infant social experiences. Together the results will offer insight not only into the effect of videogames on behavior but also on the persistence of the effects of infant experience on emotionality and anxiety across the lifespan.

CHARACTERIZING UNWRAPPING IN TRANSCRIPTION INITIATION BY FRET AND SINGLE-ROUND TRANSCRIPTION ASSAYS

Clare Cimperman, M. Thomas Record, Jr. (Mentor), Chemistry

During initial stages of transcription in E. coli, the RNA polymerase (RNAP) contacts promoter DNA, inducing a series of conformational changes. Upstream DNA wraps around the backside of RNAP to form a closed complex (CC), and then later an open complex (OC). Previous FRET (Fluorescence Resonance Energy Transfer) and foot-printing studies proved that promoter DNA wraps around RNAP in both CC and OC. This poster presents the reversal of FRET, which indicates unwrapping of DNA from the OC during promoter escape upon NTP addition. We paired our FRET experiments with single-round transcription kinetic assays in order to measure the release of RNA transcripts formed. The kinetics of the formation of RNA transcripts formed are consistent with the FRET decrease observed at later time points.

HOW THE SPLICING FACTORS CUS2 AND PRP5 INFLUENCE GLOBAL SPLICING EFFICIENCY IN YEAST

Arthur Clark, Aaron Hoskins (Mentor), Biochemistry

In eukaryotes, splicing is the removal of non-coding introns from pre-mRNA and the ligation of exons to form mRNA. Cus2 and Prp5 are two proteins involved in the early steps of splicing, and are thought to have an antagonistic relationship. We are investigating this relationship using RNA-Seq to study splicing of endogenous yeast introns in Prp5 and Cus2 mutant strains. The initial results indicate that deletion of Cus2 decreases the global splicing efficiency of yeast, particularly the splicing of non-ribosomal protein pre-mRNAs. To investigate this further, we have designed RNA-seq experiments to further test the interplay of Cus2 and Prp5. These experiments will identify which yeast pre-mRNAs are most dependent and most independent of Cus2 and ATP hydrolysis by Prp5 for their splicing.

DEVELOPMENT OF NANOPARTICLE BASED ARTIFICIAL ANTIBODIES FOR THE DETECTION OF TROPONIN-I

Cyrus Colah, Ying Ge (Mentor), Cellular & Regenerative Biology

Troponin-I is a heart protein that can serve as a biomarker for cardiac injury and myocardial infarctions. One of the challenges when working with Troponin-I is that it is difficult to reliably detect or separate Troponin-I from blood for mass spectrometry using traditional assay techniques. Current methods use antibodies generated via animal immune systems. This method has some disadvantages: cost, and batch-to-batch variability. A solution to these inconsistencies could be artificial antibodies based around iron oxide nanoparticles. These nanoparticles could have use both in a clinical setting as a diagnostic tool, or in an academic setting to more accurately understand Troponin-I's structure, mechanism, and relation to heart injury. In this research we identify a peptide that can bind to Troponin-I and develop a synthesis for attaching it to nanoparticles. We also test the particle's binding specificity and develop a mass spectrometry compatible elution condition for releasing the protein.

ANTI-BIAS TOOLKIT FOR INCREASING EARLY CHILDHOOD INCLUSION AND EQUITY

Breana Collins, Larissa Duncan (Mentor), Human Development and Family Studies

Children are aware of race and develop racial biases during early childhood, yet there are few developmentally-appropriate and evidence-based curricula available for reducing bias in early childhood. Therefore, the AWARE lab is developing an anti-bias toolkit and will assess its impact on preschool children's biases. The objectives of this project are to aid early childhood educators in addressing biases in their classrooms and in themselves. The toolkit will include contemplative and anti-bias training, a children's media list, and sample scripts. We hypothesize the toolkit will encourage educators to move beyond a "colorblind" approach, thus decreasing the development of preschool children's biases and increasing their prosocial behavior. The anti-bias toolkit will help early childhood educators to be responsive to inclusion and equity needs in their classrooms.

STUDY EXPECTANCY RESULTS CORRELATED WITH PROTOCOL COMPLIANCE

Lily Comp, Mary Checovich (Mentor), Family Medicine

One major concern with research studies is how compliant participants are with the study protocol which greatly affects study results. This research aims to understand what factors contribute to increased compliance by looking at outcome expectancy. Study participants were instructed to contact study staff when they had symptoms of an acute respiratory infection (ARI). The Wisconsin Upper Respiratory Symptom Survey (WURSS) was completed during each reported cold incident. The study used the WURSS to see if exercise or meditation might affect the number of colds, duration of the cold, and cold severity. Additionally, throughout the nine month study, participants completed pre- and post- expectancy surveys along with weekly logs indicating the time spent exercising or meditating. The results depict how a participant's expectancy of the study affects the participant's compliance with the protocol.

LEOPARDS AND LIONS: MESOPREDATOR BEHAVIOR CHANGES AFTER REINTRODUCTION OF THE APEX PREDATOR

Rachel Conway, Drew Bantlin, Jacob Olson, Adrian Treves, Adrian Treves (Mentor),
Nelson Institute for Environmental Studies

We studied the effects of lion (Panthera leo) reintroduction on leopards (P. pardus) in Akagera National Park in Rwanda in 2015. Lions are expected to affect the behavior of leopards through direct and indirect competition. We analyzed data from 17 camera traps. We measured leopard behavior before and after lion reintroduction by estimating the frequency and duration of leopard visits to cameras. While duration did not significantly change, frequency of leopard visits significantly decreased when taking into account both region and time of day. Time of day was independently significant, revealing the greatest effect at night, when lions were most active. Leopards may have changed to avoid open areas, as observed in other ecosystems. Our findings inform hypotheses about trophic cascades induced by top predators.

MOTHER'S USE OF METALANGUAGE IN RELATION TO CHILD'S VERBAL KNOWLEDGE

Olivia Cook, Janean Dilworth-Bart (Mentor), School of Human Ecology

In formative years of language development in young children, intake of diverse forms of language is critical regarding proper language acquisition. Research has focused on categorizing language by function and how these categories serve specific purposes in teaching language. However there is a lack of research exploring how a child's exposure to different types of language is associated with verbal development. The current study focuses on three language categories used by mothers and how they may be associated with a child's verbal knowledge. We observed 50 mother-child dyads in a free-play setting and coded the mother's language for occurrences of social regulative language, referential language, and metalanguage. We hypothesize that the use of metalanguage by mothers has a positive association with child's verbal knowledge scores.

NEUTRAL LIPID METABOLISM IN B. DERMATITIDIS INFLUENCES TEMPERATURE-DEPENDENT MORPHOLOGIC DEVELOPMENT

Isabelle Cooperstein, Gregory Gauthier (Mentor), Infectious Diseases

Worldwide, the thermally dimorphic fungi cause several million human infections each year. The temperature-dependent morphologic switch between mycelia (22°C) and yeast (37°C) defines the biology of these fungi and is critical for pathogenesis. Knowledge about the mechanisms underlying temperature adaptation remain poorly understood and represent a significant gap in knowledge. Using Blastomyces dermatitidis, the etiologic agent of blastomycosis, as a model system, we identified a GATA transcription factor encoded by SREB (sidereophore biosynthesis repressor in Blastomyces) that governs the transition from yeast to mycelia following a drop in temperature from 37°C to 22°C. SREB null mutants (SREBD) fail to complete the conversion to mycelia, cannot properly regulate iron assimilation, and have reduced biosynthesis of neutral lipids (triacylglycerol, ergosterol) including lipid droplets at 22°C. Altering exogenous iron concentrations did not affect the morphologic defect in SREBD. In contrast, treatment with saturated fatty acids (16:0, 18:0) accelerated the morphologic switch and transiently restored lipid droplet abundance in SREBD at 22°C. Gene expression microarray and qRT-PCR analyses demonstrated reduced transcription of neutral lipid biosynthetic genes including ARE, which is involved with triacylglycerol biosynthesis and ergosterol esterification. Overexpression of ARE in SREBD accelerated the conversion to hyphae at 22°C and increased lipid droplet formation. To assess the influence of ARE on the morphologic switch in wild-type B. dermatitidis we targeted it for gene editing using CRISPR-cas9. Edited strains exhibited impaired conversion to mycelia at 22°C but did not have reduced lipid droplet formation. Collectively, these data suggest that neutral lipids including genes involved with neutral lipid biosynthesis influence the temperature-dependent switch to mycelia.

EXPERIMENTS FOR QUANTIFYING LOCAL DISPLACEMENTS IN SOFT MATERIALS

Nathaniel Corey, Jacob Notbohm (Mentor), Engineering Physics

Cellular processes such as migration during cancer metastasis induce forces and strains in the fibrous material surrounding the cell. The mechanical properties of fibrous biological materials affect the rate and form of such cellular processes. For example, they can direct the location or direction of cell migration. However, the precise relationship between material properties and cell response are unclear because the mechanics of fibrous materials are poorly understood. To study these materials' mechanical properties a new experimental device and method was developed. This device allows for local, full-field displacement measurements of a gel under global tension, and produces image data that can be processed with digital image correlation. The methods were proven viable through experiments with polyacrylamide gel, and further experiments using collagen gels were performed.

LEGISLATIVE BARRIERS TO EQUAL EDUCATION: ADDRESSING NON-STANDARD ENGLISH IN EDUCATIONAL POLICY

Chayce Cornette, Andrew Turner (Mentor), School of Law

The wealth of evidence supporting the negative impact of African American English (AAE) on academic achievement and subsequent failure to recognize AAE in education policy is a failure to provide equal access to quality education. The acknowledgement that MAE language mastery is necessary to succeed as evidenced by the provision of ELL services to non-English speaking students. As AAE students technically speak English, there are not currently any language resources available to them. As the current student population in Madison Metropolitan School District (MMSD) consists of over 55% students of color, there is a need to revisit the currently policies in place to serve student needs. The following analysis will challenge two assumptions: a) that AAE is simply "bad grammar" and b) there is nothing teachers can do for students who speak AAE. Through a qualitative investigation of current policies in place in the MMSD and an examination of the role of AAE on academic achievement. I conclude that AAE is a dialect of English that exhibits consistency and standardization and that there are methods that teach to AAE speakers without devaluing their language by simply dismissing it as "bad" or "wrong."Given the evidence in support of the legitimacy of AAE and the programs available to provide to AAE speakers, the failure to provide these service is a violation of the state of Wisconsin's right to education.

EFFECT OF PRE-EXISTING SPATIAL REASONING SKILLS ON STUDENTS' ABILITY TO UNDERSTAND MOLECULAR CHEMISTRY CONCEPTS

Jainaba Corr, Martina Rau (Mentor), Educational Psychology

Most STEM fields require that students understand Chemistry concepts. The study of molecular structures is an integral part of chemistry that involves concepts pertaining to sub-atomic interactions that are not directly observable. Therefore, they are generally conveyed diagrammatically with visual representations. In this experiment, we asked undergraduate students in an introductory level chemistry course to complete a molecular modelling lab that was a regular part of their chemistry curriculum. Some participants completed the lab as it was usually done while other participants did the same lab on an Intelligent Tutoring System. We administered a spatial reasoning test to all participants and a pre-post test to evaluate learning gains. Results suggest that spatial reasoning skills impact molecular chemistry learning outcomes.

CREATION OF TRANSCRIPTION FACTOR REPORTER LINES IN HUMAN INDUCED PLURIPOTENT STEM CELLS

Evan Cory, Krishanu Saha (Mentor), Biomedical Engineering

Directing and monitoring the differentiation of human induced pluripotent stem cells (hiPSCs) has become an important component of regenerative medicine research. This is especially true in retinal disease research where efficient and rapid creation of homogeneous populations of cells during the process of differentiation represents a barrier towards continuing progress in the field. We addressed this problem through the creation of a hiPSC reporter line for a dynamically regulated transcription factor (OTX2) that is essential in retinal differentiation. Using CRISPR/Cas9 technology, we introduced a knock-in mutation via homology directed repair to insert a fluorescent protein encoding sequence directly after the target transcription factor. The creation of this cell line not only provides a useful tool for collaborators working with retinal differentiation but, also establishes a well characterized protocol for creating any transcription factor reporter line.

SYNTHESIS OF LAYERED DOUBLE HYDROXIDE NANOMATERIALS FOR OXYGEN EVOLUTION ELECTROCATALYSIS

Richard Costello, Lianna Dang (Mentor), Chemistry

Fossil fuels are being consumed at higher rates than ever before. This unsustainable trend must be met with a renewable alternative. Hydrogen gas is one effective answer to this clean energy demand. One method of generating hydrogen gas is by running a voltage through two electrodes submerged in water. Each electrode catalyzes a separate reaction; the oxygen evolution reaction (OER) and the hydrogen evolution reaction (HER). My research focuses on increasing OER efficiency by examining layered, double hydroxides (LDH) as an effective electrocatalyst. These structures are made up of metal hydroxide layers sandwiching non-metal anions. I focus on understanding LDH's performance and formation through electrochemical experimentation and altering synthesis reagents. I also aim at understanding how the synthesis environment effects LDH.

TIME EVOLUTION OF GALACTIC WINDS

Cory Cotter, Ellen Zweibel (Mentor), Astronomy

Galactic winds are a prime target for simulations because of their importance in galaxy evolution while also being a challenging target for observing. We analyze the time-dependent form of a one-dimensional galactic wind model created by Bustard et. al. (2016, 2017) in order to investigate the feedback loop created by star-formation and the subsequent ejection of gas that quenches the star-formation. The model uses gas dynamics with added terms representing astrophysical effects such as mass and energy input by stars, and radiative cooling. We investigate many different schemes for solving this model including finite volume, WENO, and central schemes and create a numerical solver based on the central schemes. We verify that the solver correctly passes standard tests and test prescriptions of star formation to analyze their effect on the resulting galactic wind.

FUNCTION OF KIR7.1 PROTEIN WITH A NEAR COGNATE CODON INSERTION

Sara Counter, Bikash Pattnaik (Mentor), Pediatrics

Within the eye, inwardly rectifying potassium (Kir 7.1 protein, KCNJ13 gene product) channel is located in the membrane of retinal pigment epithelium (RPE) that contributes to our ability to see. A nonsense mutation in KCNJ13 cause inherited blindness and severe loss of vision at birth. Our lab has shown that the tryptophan at position 53 when is mutated to a premature stop codon produce a truncated protein. Further studies also found that the mutation can be cured by read through compounds, possibly by replacement of the non-sense codon with a near-cognate amino acid. The present study uses site directed mutagenesis to replace four possible near-cognate amino acids at position 53 to determine the localization and function of the protein product.

OPTIMIZING THE DIFFERENTIATION AND TRANSPLANTATION OF PLURIPOTENT STEM CELL DERIVED BETA CELLS

Andrew Curran, Aida Rodriguez Brotons, Daniel Tremmel, Sara Sackett (Mentor), Transplant Surgery

An ideal beta cell replacement therapy for treatment of diabetes strives towards generating an abundant supply of functional beta cells and identifying a minimally invasive, well-vascularized, and retrievable site for transplantation, that is clinically applicable, is of critical importance. We are developing novel approaches to improve the in vitro differentiation process through combining human pluripotent stem cell-derived islet-like clusters (hPSC-ILCs) with a novel human natural pancreatic matrix hydrogel (P-ECM) and hPSC-derived endothelial cells (hPSC-EC). We are investigating the impact of P-ECM on differentiation by analyzing stage-specific gene expression differences through quantitative PCR to determine if co-culture with P-ECM improves specification and function. In vivo mouse experiments will test whether P-ECM embedded hPSC-ECs form sufficient vascular networks to support engraftment of hPSC-ILCs with or without prevascularization.

PHARMACEUTICAL MIXTURE TOXICITY TO ARABIDOPSIS THALIANA

Madison Czerwinski, Joel Pedersen (Mentor), Soil science

Worldwide, treated wastewater is used to irrigate crops and landscapes in arid locations. A concern of using reclaimed wastewater is the uptake of pharmaceuticals and personal care products (PPCPs) by exposed crops, as these organic contaminants are only partially removed during wastewater treatment. Little is known about how PPCPs affect plants exposed to contaminated wastewater. In humans, pharmaceuticals administered together can interact and affect the effectiveness of one another; field crops irrigated with treated wastewater are invariably exposed to mixtures, providing the possibility of PPCP interactions in planta. We examined the phytotoxic effects of PPCP mixtures on Arabidopsis thaliana plants using root elongation assays. By comparing obtained data to theoretical mixture toxicity predictions, we can determine if pharmaceuticals act antagonistically or synergistically within the plant.

NETWORK ANALYSIS OF POLITICAL DONOR POLARIZATION IN WISCONSIN GUBERNATORIAL AND LEGISLATIVE RACES

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

Since the 2012 recall election of Governor Scott Walker, political polarization in Wisconsin has become a major topic of research. Research on Wisconsin's politics has shown that there is mass polarization in Wisconsin's electorate. However, there is little research done on polarization of political donors and the policy implications of donor polarization. The conventional notion among party fundraisers is that donors in Wisconsin are mainly partisan, but bipartisan issue donors exist. If there are bipartisan donors, their main issues may be issues that could gain bipartisan support. This study intends to fill this research gap by studying networks of political donors in Wisconsin. I use data from the Wisconsin Campaign Finance Information System, Wisconsin's official campaign finance database, to create network analyses of donors to candidates for Wisconsin's state-wide and state-legislative races. Through network analysis, this study found that political donor networks have become more polarized since the 2012 election. Future research plans to look at the policy implications on this polarization among donor networks and potential differences in candidate behavior based on their donor networks.

INCIDENCE OF GRAFT-VERSUS-HOST REACTIVITY FOLLOWING HEMATOPOIETIC STEM CELL TRANSPLANTATION

Elaine Dandan, Dana Baiu, Mario Otto, Nicole Philipps, Dana Baiu (Mentor), Pediatric Oncology

Following a hematopoietic stem cell (HSC) transplant, favorable clinical outcomes depend heavily on expedited reconstitution of the immune system and the absence of graft versus host disease (GVHD). Using a clinical HSC graft technique that depletes αβTCR T cells, while preserving other immunoprotective cell populations (such as γT cells), might help prevent GVHD. Immunocompromised mice will be used to implement this HSC graft technique. These mice will be monitored for GVHD for 12–15 weeks and tissues will be harvested. The histology of liver, lung, gut and skin will be analyzed by microscopy for the presence of cellular infiltrates, as a sign of GVHD.

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

Thomas DeGuire, Dylan Solomon, Hannah Chapman (Mentor), Political Science

Autocratic governments are beginning to adapt techniques to manipulate information communication technologies to build public support. This study is aimed at understanding how these regimes specifically utilize these technologies. We examined case studies of particular techniques that have been implemented and the public's response to the government. The two main instances we examined are China's "My Questions to the Prime Minister" and Russia's "Direct Line with Vladimir Putin." We focus on China and Russia because they are two of the most technologically capable regimes. Through examining this question we hope to gain a better understand of how autocratic regimes function in today's evolving world.

STRUCTURAL AND BIOCHEMICAL CHARACTERIZATION OF THE U6 BIOGENESIS PROTEIN USB1

Andrew DeLaitsch, Samuel Butcher (Mentor), Biochemistry

The spliceosome is an essential molecular machine responsible for the removal of non-coding introns from eukaryotic pre-messenger RNA. A crucial component of the spliceosome, U6 small nuclear RNA, is post-transcriptionally modified by a 3′–5′ exonuclease called *U s* ix *b* iogenesis protein (Usb1) prior to incorporation into the spliceosome. I expressed and purified recombinant S. cerevisiae (yeast) Usb1 which was used to obtain a crystal structure at 1.8 ,Ñ´. Furthermore, to biochemically characterize how yeast Usb1 processes RNA, I incubated recombinant Usb1 with a fluorescent RNA substrate and monitored exoribonuclease activity via denaturing polyacrylamide gel electrophoresis. In addition, I present our progress towards determining a co-structure of Usb1 with RNA in its active site with the goal of structurally characterizing how the enzyme recognizes and processes RNA.

BETWEEN THE BARS: THE RELATIONSHIP BETWEEN CORRECTION OFFICERS AND INMATES

Kaitlin Dinkel, Melanie Murchison (Mentor), Sociology

The American prison system housed around 2 million inmates in 2014 and that number continues to grow daily according to the Bureau of Justice. Every inmate that enters into the system comes to contact with corrections officers regardless of the crime they've committed or how long of a sentence they are serving. Do these interactions between the officers and the inmates have an impact of both sides emotional well-being? I have conducted research on inmate's perceptions of their correctional officers and also interviewed officers in an attempt to find an answer to this question. I go into detail about the conditions of the prisons, the treatment and behavior of the inmates, and the toll the job has on both officers and inmates. This research will help to reduce reoffending and in-prison violence and also make a healthier life for the corrections officers.

INVESTIGATING THE MOLECULAR MECHANISMS OF C. ELEGANS GERMLINE STEM CELL FATE REGULATORS

Jon Doenier, Judith Kimble (Mentor), Biochemistry

Germ stem cells (GSCs) require regulatory proteins to either maintain their identity or coordinate their development. In C. elegans, genetic methods have identified several genes that influence GSC fate decisions, including sygl–1, lst–1, and nos–3. While a fundamental genetic understanding of these genes has been established, the mechanisms underlying their role in cell fate decisions remain elusive. Preliminary studies suggest that these genes directly control mRNA fate. To test this, we are developing an in vivo tethering assay to determine if and how these genes regulate mRNA translation, localization, and turnover. Studying the mechanisms of GSC regulatory proteins will increase our understanding of stem cell differentiation control, which has broad implications in the fields of developmental biology and regenerative medicine.

EMERGING ADULTS' USE OF ALTERNATIVE APPROACHES FOR TREATING DEPRESSION

Yanzey Dominguez-Argueta, Nancy Pandhi (Mentor), Family Medicine

Depression is a mental health disorder often characterized by a sense of sadness, a loss of interest in normal activities, and a change in eating habits. Greatly impacted by this condition, emerging adults (ages 18–29), often have difficulty seeking traditional treatment due to stigma, lack of insurance, and lack of access to health care. Difficulties such as these can lead to a search for alternative approaches to manage depression. This project will examine the experiences of emerging adults' use of alternative approaches through a secondary analysis of 38 interviews conducted throughout the United States. The collected knowledge may offer an understanding of how and why emerging adults utilize alternatives, and diversify options for managing symptoms for those who do not see change with traditional treatment.

EFFECTS OF COGNITIVE ENRICHMENT AND OTHER ENVIRONMENTAL FACTORS ON HAIR CORTISOL IN RHESUS MACAQUES

Gabby Douglas, Allyson Bennett (Mentor), Psychology

The physical and cognitive environments in which an animal is raised and resides in are well-established modulators of biobehavioral outcomes and overall well being in human and nonhuman primates. Cortisol levels can be a reliable indicator of well being as well as a marker of biobehavioral irregularities in animals. The aim of the present study was to evaluate the range of variation in hair cortisol across a wide range of housing and cognitive environments for rhesus monkeys. The preliminary results suggest that cognitive enriched environments-those in which monkeys had extensive opportunity for puzzle and videogame play-could contribute to decreased hair cortisol. The finding provides the foundation for controlled investigation to directly evaluate the impact of specific cognitive enrichment strategies on primate health and well-being.

INFANT NEURAL AND EMOTIONAL DEVELOPMENT: RELATIONS WITH MATERNAL SENSITIVITY TO DISTRESS

Kristin Dowe, Hill Goldsmith (Mentor), Psychology

Mothers (N=105) were recruited during pregnancy to study how early maternal stress and adversity impacts infant neural and emotional development. Infants underwent magnetic resonance imaging at one month, and infant behavioral development and maternal sensitivity were assessed at 6 months during a laboratory visit. Mother-infant dyads participated in the Still Face Paradigm, a distressing task in which infant regulation, affect, and maternal sensitivity were coded. Infants whose mothers were more sensitive at age 6 months had smaller volumes of the right sagittal striatum and right amygdala, and larger bilateral volume of the insula at age 1 month. Although causal relations are likely complex, this empirical link between maternal sensitivity and infant neurodevelopment points to a crucial role for early nurturing environment.

CHILD BEHAVIOR PROBLEMS AND ENJOYMENT OF TIME TOGETHER AMONG SIBLING DYADS IN AUTISM SPECTRUM DISORDER

Kimberly Drastal, Sigan Hartley (Mentor), School of Human Ecology

Relatively little is known about the factors that support positive sibling relationships between children with autism spectrum disorder (ASD) and a typically developing (TD) brother/sister. The objective of the current study was to examine the association between the internalizing and externalizing behavior problems of children with ASD and enjoyment in the sibling relationship with a TD brother/sister. Analyses included 62 couples who had a child with ASD and a TD child. Parents reported on child characteristics and the sibling relationship. Results indicated that the child with ASD's level of externalizing behavior problems, but not internalizing behavior problems, were significantly negatively associated with enjoyment in the sibling relationship. Findings may inform the development of services targeted at fostering positive sibling relationships.

CONFIRMING ANTIBIOTIC INDUCED BACTERIAL KNOCKDOWN USING QPCR IN LEAF-CUTTER ANT FUNGUS GARDENS

Zachary Dumar, Cameron Currie (Mentor), Great Lakes Bioenergy Center

Leaf-cutter ants utilize a fungal cultivar as an external stomach to break down plant polysaccharides into simpler monomers. A community of bacteria lives in consortium with this fungus, and the composition of this community is well conserved between different ant colonies. These bacteria have several possible functions, such as nitrogen fixation and processing of plant polysaccharides, but their exact role remains uncertain. To gain insight into the possible role of this community, we conducted an experiment involving antibiotic treatment of leaf-cutter ant fungus gardens. We could not detect any visual differences between groups treated with different antibiotics, suggesting that the bacterial community may not serve an essential function. We are now analyzing these samples using quantitative polymerase chain reaction to confirm bacterial knockdown within samples.

DO MONOLINGUAL AND BILINGUAL CHILDREN DIFFER IN THEIR VIEW OF LANGUAGE WHEN CATEGORIZING?

Kailey Durkin, Margarita Kaushanskaya (Mentor), Communicative Sciences & Disorders

Social categories, which are formed from an early age, have a strong influence on the development of our individual and collective identities. Therefore, we are interested in whether language also functions as a social category and whether it will take precedence over other cues to forming categories. We are comparing monolinguals to bilinguals to see if they differ in what they pay attention to when forming categories. The participants are Spanish-English bilinguals and monolinguals, between ages 5–7. The data will be collected through a computer game where the children will be presented with stimuli that could be categorized by color or the language spoken. We hope that our findings will give us insight into whether children with different language histories treat language differently when forming categories.

APPLIED PSYCHOLOGICAL SCIENCE: A MODEL EVIDENCE-BASED METRIC TO ASSESS PRIMATE COGNITIVE ENRICHMENT

Mackenzie Dutton, Allyson Bennett (Mentor), Psychology

The broad goal is to provide empirical evidence that informs evidence-based practices and policies to promote psychological well-being of animals in a range of captive settings. Standardization of care is essential for animal welfare, and also for transparency, rigor, and replicability in science. This study focuses on cognitive environmental enrichment (CEE). A comprehensive review of scientific evidence was used to select meaningful characteristics and dimension of CEE, develop a model metric, and systematically evaluate environmental enrichment plans received from zoos, sanctuaries, and research facilities. The analysis revealed substantial variation across facilities and within facility type. To our knowledge, this is the first proposal of a comprehensive evidence-based metric to assess CEE. The model provides a rigorous framework to advance equitable care practices for nonhuman primates.

ELECTROSTATIC CONTRIBUTIONS OF AROMATIC RESIDUES IN PROTEIN-CARBOHYDRATE INTERACTIONS

Stephen Early, Laura Kiessling (Mentor), Chemistry

Protein-carbohydrate interactions play critical recognition and signaling roles in a diverse array of biological processes—from stem cell differentiation to immune responses. However, the intermolecular forces that govern protein-carbohydrate interactions have not been quantitatively elucidated. Given the dogma in the field and our data, the goal of this study is to understand the molecular basis for aromatic-carbohydrate interactions. Unlike aliphatic residues, aromatic amino acids present electronegative π-electron systems that can interact with carbohydrate C-H bonds through CH-π interactions. We posited that if electrostatic contributions are important for CH-π interactions in protein-carbohydrate complexes, differences in the electronics of the aromatic systems and carbohydrate C-H bonds would determine participation in such interactions. We, therefore, sought to design a system to interrogate the molecular basis for aromatic-carbohydrate interactions within proteins. Using the immunologically relevant lectin, galectin–3, the stability and lactose binding affinity of galectin–3 variants at CH-π acceptor residue, W181, were assessed through differential scanning fluorimetry and isothermal titration calorimetry. We observed that the replacement of W181 with the smaller aromatic residues phenylalanine, tyrosine, and histidine diminished both protein stability and binding affinity, while replacement of W181 with an aliphatic methionine residue maintained protein stability but abrogated lactose binding. Supported by stability and binding data for the galectin–3 variants, we conclude that CH-π interactions are particularly important in promoting the stability of carbohydrate binding proteins as well as their affinity for binding β-galactosides through the contribution of electrostatics versus dispersive interactions.

PRISE: PROMOTING RESEARCH, INNOVATION, SCIENCE, AND ENGINEERING

Stephen Early, Megan McClean (Mentor), Biomedical Engineering

The goal of PRISE: Promoting Research, Innovation, Science, and Engineering is to foster an open and all-inclusive scientific community-partnership with underserved communities in the Madison area. The impetus of this outreach program is to increase accessibility and heighten interest in a scientific career through the exploration of basic-science phenomena and experimentation. The outreach program focuses upon the Madison Metropolitan School District with hopes to promote the principles of scientific observation, questioning, experimentation, and analysis through hands-on activities that illuminate the wonder that lies at the core of scientific inquiry. Additionally, PRISE implements scientific mentorship opportunities for volunteers through the Middle School Science Symposium that allows members to gain knowledge through service learning that can be applied in developing lesson plans. Currently, PRISE is partnering with other community leaders and science educators to develop an effective curriculum to present fundamental scientific research methodology and basic biological systems to middle school students.

UNEARTHING THE SECRETS OF THE UNIVERSE: SIMULATING NEUTRON CALIBRATIONS FOR THE MINICLEAN DETECTOR

Nathan Eggen, Kimberly Palladino (Mentor), Physics

Using RAT, a Geant4-based Monte Carlo analysis tool, I have run neutron calibration simulations to estimate the time calibrations will require for the experiment MiniCLEAN. MiniCLEAN is a direct dark matter detection experiment that will begin taking data this spring. It is located 6,800 feet underground at SNOLAB in Sudbury, Ontario, Canada. The experiment uses liquid argon as its detection medium, searching for Weakly Interacting Dark Matter (WIMPs). The neutron source Americium Beryllium (AmBe) generates neutrons that will scatter off of argon nuclei in the detector to calibrate what a dark matter collision would look like. A framework for data processing, ROOT, was then used to interpret the simulated data set and the source was found to generate 7 to 8 events per minute.

BASKING IN THE SUN: THE THERMOREGULATION OF ALPINE PARNASSIAN BUTTERFLIES

Christian Eken, Sean Schoville (Mentor), Entomology

Butterfly coloration is often thought to relate to environmental conditions, with color patterns relating to climate or selection by predators. To test the climate hypothesis, I designed an experiment to determine whether or not the size and/or color of the red and black pigmented phenotypes of the butterfly species Parnassius clodius affected the quantity of heat absorbed in adult butterflies. Temperature absorption of preserved butterfly wings or bodies was measured under controlled conditions. By comparing different wing regions (with varying pigmentation) within individuals, I found limited evidence to support the hypothesis that color pattern determined differences in temperature absorption. While these results are negative, this experiment suggests that butterfly color pattern may not be responsive to climate change and that other factors in the environment might drive phenotypic diversification.

GIRLS GYMNASTICS INJURIES IN UNITED STATES HIGH SCHOOLS 2008–2012: A NATIONAL SUMMARY

Hannah Ellis, Traci Snedden (Mentor), Nursing

Approximately 18,000 students participate in US high school girl's gymnastics, annually. Gymnastics is a highly athletic and demanding sport that induces significant strain on female bodies, increasing risk of injury during high school and beyond. The overall purpose of this study is to describe girls' high school gymnastics injuries in relation to other high school sports on a national level. Data collected by the National High School Sports-Related Injury Surveillance Study from 2008 to 2012 were analyzed. Findings revealed that although injuries have decreased among gymnasts on an annual basis, the overall injury rate remains high compared to other high school sports, especially in competition. The results of this study provide guidance for nurses when engaging in important adolescent safety and sports injury conversations.

AUTOMATION BREEDS CONSISTENCY—A STEP TOWARDS MORE RELIABLE AND VALID SPIKE SORTING ALGORITHMS

Chris Endemann, Matthew Banks (Mentor), Anesthesiology

Spike sorting, the process of separating action potentials ('spikes') arising from multiple neurons recorded on a single electrode into clusters of spikes corresponding to individual neurons, is critical to high-throughput investigations of the neural basis of behavior. However, this potential currently is limited by the poor validity (due to insufficient verification procedures) and reliability (due to the dependence of user set parameters on the algorithm's output) of modern spike sorting algorithms. We sought to address these issues by developing an algorithm to automate spike sorting using a popular software package ("WaveClus"). We ran WaveClus with 144 carefully chosen parameter settings followed by a merging step to reduce "overclustering" and a ranking step to select the most probable sort configuration of all configurations produced for a given dataset. Performance of the automated pipeline was evaluated on 65 simulated datasets—all of which the pipeline chose nearly the most accurate sort configuration of all tested parameter combinations and cluster merge possibilities (average range in accuracy per dataset = 19.07% to 70.35%; chosen sort configuration accuracy within 11% of max possible accuracy on average). These results demonstrate the benefit and importance of implementing automated spike sorting solutions to improve both the reliability and validity of spike sorting results.

PANCREATIC ISLET MORPHOLOGY ASSOCIATES WITH TYPE 2 DIABETES MELLITUS (T2DM) IN PCOS MONKEY MODEL

Erica Engstrand, Valerie Aguilar, Colleen Krueger, David Abbott (Mentor), Obstetrics & Gynecology

The purpose of this investigation is to compare the morphology of pancreatic islets in polycystic ovary syndrome (PCOS)-like and control monkeys. In quantitating infant female, and adult male and female, pancreatic islet area for extracellular fibrin, a possible biomarker of prior inflammation, we hypothesize increased area for extracellular fibrin in PCOS-like monkeys. We believe that extracellular fibrin predicts development of metabolic disease, including T2DM. Our prior studies showed all PCOS-like monkeys exhibiting pancreatic beta cell defects compared to controls, but only adult, PCOS-like females showed an increased incidence of T2DM. We expect our morphological results to demonstrate an increased ratio of extracellular fibrin to total islet area in PCOS-like adult female monkeys, alone.

PANCREATIC ISLET FIBROSIS IN PCOS-LIKE MONKEYS: BIOMARKER FOR METABOLIC DISEASE?

Erica Engstrand, David Abbott (Mentor), Obstetrics & Gynecology

This investigation was designed to explore whether inflammation of the endocrine pancreas (islets) occurs in polycystic ovary syndrome (PCOS)-like adult female monkeys. Previous studies in which subjects were affected by pancreatic toxicity have found that pancreatic islet fibrosis is a consequence of islet inflammation. The sources of toxicity may be related to dysfunctional white fat cell development, compromising the ability of PCOS women and PCOS-like monkeys to safely store fat, thus triggering inflammation. We will assess pancreatic sections from a group of PCOS-like and control monkeys to identify the degree of prior inflammation from area of extracellular fibrin found within pancreatic islets. We hypothesize that increased fibrosis diminishes pancreatic ability to release insulin in response to glucose.

CONCEPT TO PRODUCT: CUSTOM GAMES FROM EPISTEMIC GAMES GROUP

Jonathan Erbe, Spencer Linse, Austin Meyer, Brendan Eagan (Mentor), Educational Psychology

Teachers have access to a variety of educational software, but most are either too general or are tedious to customize. Workpro is an easily customizable, online tool that gives students an authentic learning experience focused on problem solving in professional situations. This software allows teachers to easily create educational simulations that satisfy the unique needs of a specific class, or group of students. In order for Workpro to function properly, there needs to be a healthy and productive relationship between developers and testers, who maintain the simulations. We have organized this relationship as a cycle which consistently leads to customized, user–Friendly, dependable software.

CONSERVATION OF HUMMINGBIRD HABITAT AND DIVERSITY

Daniel Erickson, Scout Kirby, Nicole Perrett, James Berkelman (Mentor), Forest & Wildlife Ecology

Our study examines threats to global hummingbird diversity and management strategies to reduce these threats. Their specialization with nectar-producing plants makes hummingbirds especially vulnerable to habitat loss due to agriculture, urbanization, and changes in flower phenology induced by climate change. Without their main food source, hummingbird populations may decline significantly. We recommend conservation of hummingbird populations through habitat restoration, citizen science bird surveys, educational programs, implementation of new fire regimes, and diverse forest management. Further research is needed to enhance our understanding of the full impact of these threats and the success of our recommendations on the effects of habitat loss on hummingbirds.

USING GENETICALLY MODIFIED HUMAN-INDUCED PLURIPOTENT STEM CELL LINES TO INVESTIGAGE BLUE AND RED/GREEN CONE SPECIFICATION

Zachary Erlichman, Elizabeth Capowski (Mentor), Waisman Center

Retinal degenerative disorders are one of the leading causes of blindness, affecting people of all ages. These diseases mainly stem from genetic mutations affecting retinal cell types including photoreceptors, which has led to an interest in studying differentiation patterns of retinal progenitor cells. Photoreceptors come in two general varieties: low light-responsive rods and high-acuity/color-responsive cones. In photoreceptor progenitors, NRL expression has been shown to promote rod formation, while the absence of NRL leads to cone production. In cone progenitors, the protein Thrβ2 specifically induces M- and L-cones (green and red cones) as opposed to the default S-cone (blue cone). We have engineered a human induced pluripotent stem cell (hiPSC) line that knocks out NRL and instead expresses Thrβ2 from both copies of the endogenous NRL promoter with the intent of converting rods to M-cones. Not only will this shed light on the genetic factors that control retinal progenitor cell differentiation, but will help create an efficient protocol for specifying photoreceptor cell types and producing a cell-based therapy for the treatment of retinal degeneration.

SPANISH FOR THE AGES: SECOND-LANGUAGE ACQUISITION ACROSS THE PERIOD OF CRITICAL DEVELOPMENT

Rachel Fader, Rajiv Rao (Mentor), Spanish & Portuguese

This research aimed to discover the effects of learning Spanish at different ages on the ability to acquire Spanish phonology in a native-like manner. It is often accepted in the field of linguistics that it becomes unlikely that one is capable of acquiring the sound systems of a language with native ability after the period of critical development (commonly defined as the period until pre-puberty or 12 to 14 years old). Three participant groups, determined based on the age at which individuals learned Spanish, were asked to complete a series production and perception tests. The data concerning the acoustic analysis of vowel production and relative intensity of voiced occlusive consonants were measured using Praat software, while the perception data were analyzed based on the proper identification of voiced occlusive consonants versus unvoiced occlusive consonants. This project attempted to unveil the quantitative and qualitative differences between individuals who are native Spanish speakers, those who began learning Spanish during the period of critical development, and those who began learning Spanish after this period. In addition, this data hoped to show whether or not there is a definitive age after which native-like acquisition of Spanish phonology is no longer possible, or if the skill of learning the sound system of languages deteriorates with age.

NON-STEROIDAL ANTI-INFLAMMATORY DRUG USE DOES NOT AFFECT IN VIVO NEUTROPHIL EXTRACELLULAR TRAPS

Lauren Fahmy, Miriam Shelef (Mentor), Rheumatology

Rheumatoid arthritis (RA) is an inflammatory autoimmune arthritis. Neutrophil extracellular traps (NETs) may drive disease progression by displaying the targets of autoantibodies. Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used to reduce pain and inflammation in RA. However, neutrophils treated with NSAIDs in vitro generate more NETs, suggesting that NSAIDs could exacerbate RA in the long run. It is unknown whether typical human use of NSAIDs affects NETosis. To address this, we quantified NET formation by neutrophils from control and RA subjects who were NSAID users and non-NSAID users. No difference in NET frequency between NSAID and non-NSAID users was detected. Thus, although NSAIDs can drive NETosis in vitro, typical NSAID use in vivo does not alter NETosis.

TELL MY STORY WITH ART

Xiaojing (Monica) Fan, Rebecca Kautz (Mentor), Art

I always feel I am different from others. I am not the girl my parents or teachers want me to be. I came to the United States at age 18 to make a difference. After trying various disciplines, I found art is the best way for me. In this talk, I want to share my experience through finding my love in art, and how to tell my story through art. I am going to show my politically inspired artwork to tell people what its like to be a queer female, immigrant of color, in the 21st century. I want to share the therapeutic potential of art and why it is important in today's environment.

MEASURING CONNECTIVITY WITH EPISTEMIC NETWORK ANALYSIS

Cayley Farrell, Cheyenne Quandt-Walle, Erik Role, Brendan Eagan (Mentor), Educational Psychology

Connectivity is a key element of many scientific theories, from how people integrate skills and knowledge in complex problem solving to how different regions of the brain interact. In order to understand how connectivity explains various phenomena, we need a tool that can measure it. Using a novel statistical technique, Epistemic Network Analysis (ENA), we can identify, quantify, and visualize connections in a metric space. For example, ENA has shown that surgeons don't add up pieces of knowledge to operate, they integrate them. Additionally, ENA reveals how children develop different neural connections as they learn to associate mathematical quantities with symbols. In these and other cases, ENA models of connectivity visualize entire network structures rather than isolated connections, which is advantageous over other analytical techniques.

ISOGENIC BLOOD BRAIN BARRIER (BBB) MODEL USING HIPSCS

Madeline Faubion, Matthew Stebbins (Mentor), Chemical and Biologican Engineering

The blood-brain barrier (BBB), or brain capillaries, creates a barrier from blood borne neurotoxic substances from brain entry, which can be a bottleneck to delivering CNS pharmaceuticals. The creation of an isogenic in vitro BBB model using human-induced pluripotent stem cell (hiPSC) could contribute novel insight into BBB pathology in brain disorders and drug delivery across the BBB. Endothelial cells form the physical BBB, while pericytes sit adjacent to endothelial cells and are critical for BBB development. An hiPSC-derived pericyte-endothelial cell model of the BBB decreased overall barrier permeability, elongated tube growth, and decreased transcytotic activity in endothelial cells. The incorporation of multiple BBB cell types contributes a novel BBB model for early research and pharmaceutical development studies of the BBB.

DEVELOPING A PROTOCOL TO COAT TISSUE-CULTURE PLATES WITH DECELLULARIZED HUMAN PANCREATIC HYDROGEL

Austin Feeney, Sara Sackett (Mentor), Transplant Surgery

The extracellular matrix (ECM) is a complex of proteins, unique to each tissue and capable of guiding cell morphology, signaling, and differentiation. We are developing a tissue-engineered platform from the human pancreas, whereby most cellular components must be removed before use in cell culture. However, it is critical to retain components specific to the pancreatic ECM (P-ECM). The decellularized pancreatic matrix is characterized for preservation of ECM proteins, immunogenicity, and DNA content. The P-ECM is lyophilized and digested in pepsin to solubilize the ECM components for hydrogel polymerization. Multiple approaches were designed for developing a coating protocol that resulted in a platform most similar to Matrigel-coated wells as characterized by Coomassie Blue. The hydrogel is used to coat tissue-culture plates for cell culture differentiation experiments.

THE GLASS MEDIUM

Joshua Fernandez, Helen Lee (Mentor), Art

I am working with Helen Lee at the Glass Lab at UW Madison. We are working on manipulating slugs of glass that contains all of the letters, symbols and characters on a keyboard. A larger project will be generated from the system. I am primarily working on assistance with shaping the glass, cutting the glass, and collecting the extra materials needed for the project. So far I have collected and refined the entire keyboard and am working on filling in some of the letters and characters that didn't have the correct measurements. I have learned that when dealing with such an unique material it is imperative to be very critical of detail and measurements so that all of the pieces of the puzzle can come together correctly.

DISCRETE CURVES AND THEIR INVARIANTS ON THE CONFORMAL SPHERE

Evan Fernandez, Stephanie Shi, Jaden Umana, Gloria Marí-Beffa (Mentor), Mathematics

In mathematics, when observing discrete curves like polygons, which are essentially sets of unconnected data points, analyses such as derivatives prove to be difficult. However, through procedures including normalizing curves and factoring matrices, our team finds moving frames of various discrete curves in order to infer the invariants of the polygon. From this derivation, we extract the polygon's curvature and torsion, which describe how it changes in space. Currently, we are analyzing a discrete curve in a Mobius sphere to find formulas that generalize the curvature and torsion. We would like to apply these formulas to curves in other dimensions of non-Euclidean geometries, and if successful, this concept might allow geometric variations on any data set to be codified, impacting modern life in countless ways.

OPTIMIZATION OF GENOME SEQUENCING IN LOW VIRAL LOADS OF SIV USING A TILED AMPLICON APPROACH

Nicolas Fesser, Shelby O'Connor (Mentor), Pathology & Laboratory Medicine

Traditionally, Simian Immunodeficiency Virus (SIV) has been sequenced using a set of four primers whose amplification coverage spans the entire viral genome. This approach, however, does not allow for accurate and precise sequencing at low viral loads. My thesis is built around a new methodology inspired by Zika research in which I use 37 new primer sets instead of the 4 and place them in a staggered conformation across the genome. I will test to see if this new approach improves the efficacy of the old protocol at high viral loads as well as to see if it allows us to accurately sequence the virus at viral loads too low to sequence using the traditional approach.

POSTURAL STABILITY MEASURES IN A PILOT TRIAL OF TAI CHI FOR ADHD

Kenneth Fiala, Grace Herbeck, Alexander Converse (Mentor), Waisman Center

Attentive Deficit Hyperactivity Disorder (ADHD) is a condition characterized by inattention, hyperactivity, and impulsivity. The purpose of this research is to see the effects of Tai Chi on postural stability in UW–Madison undergraduates with ADHD. Subjects were placed into a Tai Chi class, Kickboxing class, or neither. Pre- and post-intervention assessments were completed using a Wii board to monitor postural stability during a series of poses. Analysis of results is ongoing. Preliminary results showed significantly greater balance durations in poses with eyes open than with eyes closed. Anterior-posterior sway measures were greater for poses with eyes open than closed. We expect that further work with these measures will shed light on mechanisms of potential therapeutic effects of Tai Chi for individuals with ADHD.

PRELIMINARY ASSESSMENT OF GENETIC DIVERSITY IN WILD CRANBERRIES

Sarah Fierek, Lorraine Rodriguez-Bonilla (Mentor), Horticulture

Food security is becoming an important aspect of plant breeding programs, especially breeding for highly nutritional crops such as fruits. Cranberries (Vaccinium macrocarpon), are considered to be a "superfruit" due to their vast amounts of healthy antioxidants and other phytochemicals. In Wisconsin, there are several populations of cranberries growing in the wild. We are interested in understanding the genetic diversity and structure of these groups to compare and potentially introduce helpful traits into cultivated cranberries. To asses the genetic diversity of these samples, 10 Simple Sequence Repeat (SSR) markers are being analyzed using an influorescent Polymerase Chain Reaction (PCR) technique. We will also analyze genetic diversity estimators and get a preliminary understanding of the structure of wild populations of cranberries.

EARLY LIFE STRESS MODERATES LINKS BETWEEN ASSOCIATIVE LEARNING AND PEER ATTACHMENT IN ADOLESCENTS

Rachel Filipiak, Seth Pollak (Mentor), Psychology

We examined the extent to which associative learning ability is linked to the quality of adolescents' peer relationships and how lifetime stress damages these developments. We hypothesized that associative learning would predict peer attachment, and that lifetime stress exposure would moderate this relationship. Data from a community sample of adolescents confirmed our prediction. Adolescents with lower lifetime stress had higher quality peer attachments compared to those who experienced significant life stress, $F(1,53) = 3.16$, $p<.08$, but lifetime stress did not influence associative learning performance. While controlling for IQ, associative learning predicted peer attachment only in the low-stress group, $r(33) = .32$, $p<.07$. Results suggest that under normal circumstances, basic associative learning skills facilitate social functioning, but other factors may impair social skills in stress-exposed adolescents.

THE EFFECTS OF SOIL MOISTURE ON PORTABLE X-RAY FLUORESCENCE AND VISIBLE-NEAR INFRARED SPECTROSCOPY

Sean Fischer, Alfred Hartemink (Mentor), Soil science

Portable X-ray fluorescence (pXRF) and visible-near infrared spectroscopy (vis-NIR) are instruments used in soil science, and are able to measure various soil properties. Measurements are affected by soil moisture. This study seeks to quantify the effects of soil moisture and air-dried soil sample types were re-wetted in the laboratory to six different moisture contents and subsequently analyzed. These were of two textural classes, a fine sand and a silty loam. As the experimental data is analyzed, it seems that soil moisture content will be positively correlated with an increase in the absorbance of vis-NIR spectra. Elemental intensity in spectra given by pXRF will be reduced, yielding lower elemental concentrations. The results of this study may improve soil analysis using pXRF and vis-NIR spectroscopy in the field.

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

Julie Fischer, David Wassarman (Mentor), Genetics

Traumatic brain injury (TBI) is a major cause of death in the U.S. In instances of TBI, patients often receive general anesthesia (GA) before undergoing surgery. Some studies have suggested that anesthesia affects the body differently when normal biological processes are disrupted by stresses such as TBI. Also, it is known that genotype is important for determining outcomes of TBI, but it is unknown how genotype affects outcomes from a combination of anesthetics and TBI. I have developed a method to identify which genotypes are most sensitive to administration of GAs in the context of TBI (GA-TBI model). In studies of a single fly genotype, I have found that different types of GAs, isoflurane and sevoflurane, function differently in the GA-TBI model, that isoflurane or sevoflurane exposure prior to TBI reduces the probability of death following TBI, and that isoflurane exposure after TBI increases the probability of death. I will apply this model to different genotypes to identify genes involved in the pathways responsible for GA-TBI outcomes. These findings will be applicable to clinical settings, where patients of diverse genotypes are treated with GAs in the context of TBI.

BEYOND WALLS, ELECTRIFIED FENCES, AND TIME: THE MUSIC OF GIDEON KLEIN IN THE HOLOCAUST

Devorah Fisher, Teryl Dobbs (Mentor), Music

The Holocaust is often taught in a way that portrays a bleak image of existence reduced to survival alone, lacking any culture. These images fail to give over the full depth of what happened. Thinking of the victims strictly as tortured prisoners fails to tell the stories that extend beyond the confines of walls, electrified fences, and time, to impact the world outside of the Holocaust. Studying the music of the ghettos and camps, such as music composed by Gideon Klein in the Theresienstadt Ghetto, brings the people and humanity back to the story of the Holocaust. Through Klein's music, I will form a deeper picture, a picture that includes starvation and pain but also tells of self-expression and a desire to uplift the people of the ghetto. Klein's courage and passion is applicable today in our own lives and in understanding the lives of those currently suffering similar persecution.

SELECTION OF RADIOSENSITIZERS BASED ON HRAS MUTATION IN HEAD AND NECK CANCER

Michael Fisher, Randy Kimple (Mentor), Human Oncology

For many head and neck cancer (HNC) patients, concurrent cetuximab and radiation is not successful. Ras alterations are present in 10% of HNCs; the role of these mutations in HNC is unclear. Employing wild-type (WT) and mutant HRAS HNC derived cell lines, we examined 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 HRAS cells to be resistant to radiosensitization by cetuximab and sensitive to both MEK/ERK and Akt/mTOR inhibition. siRNA knockdown of HRAS radiosensitized mutant cell line SCC22B, but not WT cell lines relative to non-targeting control. Initial results following the in vivo assessment of these compounds (tumor control dose 50 assay) indicate that MEK/ERK inhibition radiosensitizes SCC22B-derived tumors.

CULTURAL GENOCIDE OF THE JEWISH PEOPLE

Timothy Fitzpatrick, Teryl Dobbs (Mentor), Music

The Holocaust is often considered as a horrific event in which Adolf Hitler's Nazi regime oppressed and killed various ethnic and political groups in Europe, most notably the Jews. Regarded as the most expansive genocide in history, it is estimated that six million of the nine million Jews in Europe were systematically exterminated. While many people attribute the main atrocity of the period to the state-sponsored persecution of various "inferior" ethnic groups throughout the continent, the extent of cultural genocide and subversion of traditions within the Jewish demographic is often overlooked. My project will focus on the corruption of cultural identity imposed by the Nazi regime upon the Jewish people and its lasting effect on the Jewish community in Poland. This act not only dehumanized prisoners, but stripped them of their identity, setting the stage for the postwar cultural revival that would continue long after the war.

GENETIC MUTATIONS AND FOLLICULAR FLUID STIMULATION LEAD TO PROGRESSION OF EARLY STAGE OVARIAN CANCER

Will Flanigan, Andy Fleszar (Mentor), Biomedical Engineering

High-grade serous ovarian cancer (HGSOC) is the deadliest gynecological disease. The high rate of mortality can be attributed to an inability to diagnose HGSOC in its early stages, stemming from a general lack of understanding of the disease's origins. In this study, we sought to determine how the two most common genetic mutations in HGSOC—TP53 and BRCA1—and stimulation with follicular fluid affect the cancerous progression of fallopian tube epithelial (FTE) cells. Using CRISPR, we successfully knocked out Brca1 in WT FTE and p53R270H/+ FTE cells generating a panel of four cell lines. Preliminary data indicate that these mutations and environmental ques increase proliferation and provide resistance to anoikis, a form of programmed cell death.

INHIBITING THE INFLAMMASOME TO IMPROVE LISTERIA MONOCYTOGENES AS A CANCER IMMUNOTHERAPEUTIC PLATFORM

Emily Forster, John-Demian Sauer (Mentor), Medical Microbiology

Listeria monocytogenes (Lm) is a genetically tractable intracellular bacterium that induces strong innate and adaptive immune responses in its hosts. These characteristics make Lm a promising immunotherapeutic platform for delivery of tumor antigens directly to host cells. One method in development is tumor antigen-encoding DNA delivery by Lm through bacteriolysis, allowing the host cell to express complex tumor antigens. However, we have shown that lysis of Lm triggers a cytosolic innate immune response, the inflammasome. Surprisingly, we have found that inflammasome activation impairs the host adaptive immune response. Loss of caspase–1, and thus active inflammasomes, in vivo improves the CD8+ T cell response to wild-type Lm, suggesting that even low-level inflammasome activation is detrimental to immunity. To address this, we have engineered Lm to express novel inflammasome inhibitors, PYRIN-only proteins (POPs), block inflammasome activation. We hypothesize that POP-mediated inflammasome inhibition will prevent the detrimental consequences of inflammasome activation by Lm. This strategy will likely improve the host adaptive immune response, making Lm more successful as a cancer immunotherapeutic platform.

THE COMPLEX COMBATANT: CONSTRUCTIONS OF VICTIMHOOD AND PERPETRATOR-HOOD IN NORTHERN UGANDA

Kyra Fox, Scott Straus (Mentor), Political Science

In the wake of the Lord's Resistance Army (LRA) conflict in Northern Uganda, communities struggle to define "victims" and "perpetrators" of a conflict that transformed civilians into combatants. From 1987 to 2007, the LRA abducted children in Northern Uganda to fight a war against the government. This research examines the complex victimhood and perpetrator-hood of former LRA combatants. It questions how this complexity is constructed by combatants themselves, local communities, and the International Criminal Court. Data was collected from November–December 2016 in Gulu district and Kampala through case studies with former combatants, focus group discussions, and interviews with opinion leaders. This research concludes that former LRA combatants exhibit overlapping factors of victimhood and perpetrator-hood, and that victim/perpetrator status is constructed by different actors based on unique self-interest.

UNLOCKING THE PRE-PUBERTAL HYPERANDROGENEMIA/OBESITY RELATIONSHIP IN POLYCYSTIC OVARY SYNDROME

Sylvia Frazier, David Abbott (Mentor), Obstetrics & Gynecology/WNPRC

Polycystic ovary syndrome (PCOS) is a female reproductive disorder characterized by hyperandrogenemia. Found in 15% of women, it is associated with obesity, type 2 diabetes, and other metabolic disorders. Although PCOS has been extensively researched in adults, the origins of PCOS in pre-puberty is unclear. The leading model of pre-pubertal PCOS indicates obesity leading to hyperandrogenemia. The current study explores pre-puberty origins by following 17 female rhesus macaques though pre-puberty while manipulating testosterone (T) by administering an aromatase inhibitor letrozole (LET), blocking T conversion into estradiol. Results showed increased body weight accompanying increased T in LET treated monkeys. Our preliminary data analyses propose hyperandrogenemia causes obesity, contrary to the established model, potentially because we explored PCOS longitudinally across puberty, unlike previous studies.

IDENTIFICATION OF STAPHYLOCOCCUS AUREUS BIOFILM INHIBITORS FROM MARINE SPONGES

Samuel French, Skylar Carlson (Mentor), Pharmacy

While antibiotic resistance is on the rise, antibiotic approval rates have plummeted. This research identifies biofilm inhibitors, a non-bactericidal solution to the resistance problem, by investigating small molecules extracted from marine sponges. Marine sponges house stable, diverse bacterial communities that are remarkably free of biofilms—a potential source of biofilm inhibitors. A collection of sponge samples collected from the Florida Keys (N = 100) underwent extraction, fractionation, and chemical profiling via ELSD-HPLC. Each fraction was then screened for biofilm inhibition activity in Staphylococcus aureus. Current work in the lab is underway to isolate and identify the molecules responsible for the observed activity. Identified small molecules could ultimately be used as a biofilm resistant coating for medical devices.

REGIONAL CORPUS CALLOSUM VOLUME AND HANDEDNESS IN MACAQUES (MACACA MULATTA)

Madeline Friedman, Allyson Bennett (Mentor), Psychology

Lateralization refers to the structural and functional differences between the hemispheres of the brain. Lateral bias in hand use is a behavior that can provide insight into neural lateralization. Determining handedness in primates more evolutionarily distant from humans, such as the rhesus macaque, can inform our understanding of the evolutionary pattern of brain lateralization. Inter-hemispheric communication is needed for lateralization. The corpus callosum connects the two hemispheres of the brain and is composed of five distinct regions. The anterior midbody and medial midbody regions are the locations of interhemispheric connection for cortices involved in fine motor control. Our goal was to evaluate the relationship between region-specific corpus callosum volume and strength of hand preference in non-human primates.

RELATIONSHIPS BETWEEN OPIOID GENE EXPRESSION AND AFFILIATIVE COMMUNICATION IN EUROPEAN STARLINGS

Ryan Fuglestad, Lauren Riters (Mentor), Zoology

Little is known about how the brain adjusts communication to match specific social contexts. Unlike communication in a breeding setting, affiliative communication occurs without the external reward of copulation. Previous studies on European starlings suggest affiliative communication may be intrinsically rewarded. Opioid neuropeptides induce reward, and opioids are present in brain regions implicated in reward and song production, including the medial preoptic nucleus, periaqueductal gray, and ventral tegmental area. I hypothesized that opioids in these regions underlie affiliative song-induced reward. Using quantitative polymerase chain reaction (qPCR), I compared relative gene expression of four opioid-related genes (mu-, delta-, kappa-opioid receptor, proenkephalin) in these brain regions of 25 starlings that produced differing amounts of affiliative song. Results suggest a role for opioids in affiliative communication.

STELLAR EVOLUTION OF THE NGC 602 REGION IN THE LOW-DENSITY WING OF THE SMALL MAGELLANIC CLOUD

Leah Fulmer, John Gallagher (Mentor), Astronomy

The young star cluster NGC 602 and its surroundings in the Wing of the Small Magellanic Cloud (SMC) exhibit active star formation despite low ambient mass and gas densities. Located in a dynamic environment, this region displays complex gas motions including Hα and HI shells (Nigra+ 2008); therefore, it is possible that the observed star formation was induced by shell-shell interactions. Given its low density, kinematic complexity, and active star formation, the NGC 602 region acts as a natural laboratory for studying star formation processes in extreme environments. By incorporating NUV photometric data and stellar spectra to identify young, massive stars, we hope to offer a more complete understanding of which ambient conditions are sufficient and/or necessary for stellar birth.

PHOSPHORUS PATTERNS IN THE YAHARA LAKES

Paul Gabriel, Jessica Corman (Mentor), Center for Limnology

Concentrations of phosphorus, a nutrient linked to eutrophication, dropped in the water column of Lake Mendota after 2009. This project investigates the cause of the drop. As there has been no obvious change in phosphorus input to the lake, I hypothesize the drop was caused by a change in internal lake processes. Coincident with the drop, calcite appeared in lake sediment, suggesting calcite co-precipitation of phosphate may be responsible for the shift. To test this hypothesis, I will create a model using consolidated data from the Long Term Ecological Research Network. I will examine the model for shifts in geochemical characteristics. This project will give us a better picture of how phosphorus is internally regulated and lake ecological processes.

THE EFFECT OF DIETARY MACRONUTRIENTS ON SERUM C-REACTIVE PROTEIN IN THE NHANES SAMPLE

Natalie Galles, Christopher Coe (Mentor), Psychology

Conclusions about the impact of diet and health frequently ignore the multivariant relationships existing between macronutrients and the metabolic and demographic status of participants. Using data generated from the 2003–04 National Health and Nutrition Examination Survey (NHANES), we examined the simultaneous effects of dietary macronutrients, metabolic status, and demographics on C-Reactive Protein (CRP), an acute phase reactant associated with inflammation and cardiovascular disease. We hypothesized that there would be a neutral or beneficial effect of dietary fibers, proteins, fatty acids (saturated, monounsaturated, polyunsaturated), and cholesterol, and a more deleterious effect of sugars and starches. When adjusted by the appropriate covariates we observe an inflammatory effect of sugar and an anti-inflammatory effect of fiber, but no significant effects of starch, protein, fats, or cholesterol.

BENEFITS OF HAVING A SIBLING WITH AUTISM

Cynthia Gauthier, Sigan Hartley (Mentor), Human Development & Family Studies

Growing up with a sibling who has autism spectrum disorder (ASD) is a unique experience. A great deal of research has focused on the potential negative impacts of this relationship for the typically developing (TD) brother or sister. In contrast, little research has explored the benefits. The current study explores the parent-reported benefits of having a sibling with ASD for the TD brother or sister. Qualitative analyses were conducted based on written responses to open-ended questions in a sample of 31 mothers and fathers who had a child with ASD [aged 8–15 years] and a TD child. Results have implications for challenging myths about the negative impacts of ASD and finding ways to optimize benefits for TD brothers and sisters.

SCIENTIFIC SALVATION: MYSTICAL EXPERIENCE AND THE AMERICAN PSYCHOLOGY OF RELIGION, 1880–1930

Samuel Gee, Corrie Norman (Mentor), Religious Studies Program

The "Psychology of Religion," a popular but short-lived discipline in the fin-de-siècle American academy, introduced new ways of positioning natural science in relation to religion. The discipline, pioneered in the 1880s, sought to use the novel methods of psychological science to empirically investigate the nature of religious experience. The psychologists of religion were an intellectually diverse group of scholars, but all concerned with the role of religion in society and the perceived loss of vital spiritual experience. In this context, and despite their differences, I argue that the psychology of religion was defined by a tendency to view Science itself as one way to access the core of religious or "mystical" experience, thereby turning Science into a modern path to salvation.

HOW SINGLE PARENTING AFFECTS COLLEGE PERFORMANCE

Chloe Gehl, Maggie Bertucci Hamper (Mentor), English

This study is a classroom ethnography in which my mentor sat in on a remedial writing class held at Madison College for every session and conducted formal interviews with these students. After the interviews were completed and I transcribed the audio files of individual students, I began comparing and contrasting them to one another using grounded theory coding in order to discover the underlying reasons that these students dropped out of school. This project is not yet complete, but preliminary findings suggest that students don't drop out because they aren't smart enough for the classes, but because it can be very difficult to go to school when you are single parent, especially when you don't have anyone to help you with your children while you are trying to further your education.

IN SEARCH OF BALANCE: A COMPARISON OF NEO-PATRIMONIAL REGIMES IN ETHNICALLY FRAGMENTED SOCIETIES

Jason Geissler, Scott Straus (Mentor), Political Science

This paper explores the main features of the neo-patrimonial regimes of Yugoslavia and Côte d'Ivoire pertaining to the maintenance of peace between ethnic groups. These features are compared between countries to identify similarities and differences. The author argues that inter-group violence may be prevented through establishing patron-client relationships that bind some members of each ethnic group to their head of state. Such relationships are very likely to entail corruption and cannot be conducted in the same manner in different countries. Furthermore, heads of state must fulfill at least some of the demands of each ethnic group to establish trust of the citizenry that the head of state will act in good faith when mediating inter-group conflict.

BICAUDAL-C RNA BINDING PROTEIN: A PROTEOLYTIC ANALYSIS

Thomas Geissler, Michael Sheets (Mentor), Biomolecular Chemistry

Bicaudal-C (BicC) is a regulatory protein in animal cells—including those of humans—that is critical to embryonic development. Prior research by the Sheets lab has shown that mutations in BicC can result in many embryonic defects such as polycystic kidney disease. Although the function of BicC is known, little is known about its structure or how it binds to RNA. Currently, the Sheets lab is attempting to address this knowledge gap by performing proteolysis experiments on BicC. By breaking the protein down and determining which elements are binding with the RNA, the Sheets lab will be able to determine the structure and binding pattern of BicC. Understanding how BicC binds to its RNA targets will give us a better understanding in how defects in BicC can lead to disease and in the future how to effectively treat diseases caused by defective BicC mutants.

THE ROLE OF TIMING IN CHILDREN'S SCIENCE LEARNING: SIMULTANEOUS, SPACED, AND MASSED PRESENTATIONS

Hannah Georgeson, Melissa Rosenfeld, Haley Vlach (Mentor), Educational Psychology

The timing of learning has been shown to affect children's conceptual development. In fact, the literature contains a paradox in how timing affects learning: both simultaneous and spaced presentation schedules have been shown to facilitate generalization of knowledge. The current study examined how simultaneous, massed, and spaced presentation schedules affect preschoolers' generalization of science concepts. Preschoolers were presented with novel scientific concepts on the three learning schedules and immediately tested with a generalization task. The results found that preschoolers benefit more from simultaneous presentations than from massed or spaced presentations. Our future research will investigate if we observe the same pattern of results at a delayed test. These preliminary findings suggest that educators should use simultaneous presentations to promote children's immediate learning of science concepts.

IS NORMAL REALLY NORMAL? THE EXAMINATION OF THE COLLAGEN ECM AS A BIOMARKER FOR FUTURE BREAST CANCER

Ryan Gigstad, Patricia Keely (Mentor), Cellular & Regenerative Biology

The risk of developing breast cancer is elevated in individuals with collagen dense breast tissue. Furthermore, it has been shown that in invasive cancers, poor survival rates are directed in part by collagen fiber orientation. My hypothesis is that there are detectable differences in collagen fiber structure and organization that may predict or contribute to breast cancer incidence. Preliminary results have indicated that there are clear differences in the collagen fibers between the normal tissue of individuals with no history of breast cancer and those who have had or will develop breast cancer. By identifying pre-disease biomarkers, it would be possible to sort individuals based on the level of cancer risk they present, thus allowing for optimal monitoring and treatment.

SPHAGNUM PALUSTRE: A MOSS BOGGING DOWN ITS COMPETITION IN KOHALA, HAWAII ISLAND

Bridget Gilmore, Kevin Barrett (Mentor), Zoology

Sphagnum palustre (S. palustre) is a pervasive moss that is considered to be indigenous to Hawaii Island. Over the past 100 years, its abundance has increased significantly, greatly impacting its ecosystem. The moss creates a habitat in which few other plants can flourish. S. palustre plays an active role in creating wet, nutrient-poor mires in order to gain a competitive advantage. This research seeks to discover the epicenter of S. palustre in Kohala, Hawaii and determine its historical abundance in relation to other moss species in order to elucidate the relationship between its rapid growth and the timing of human activity in Hawaii. This relationship can help inform how S. palustre may respond to a changing climate in a human-dominated landscape.

MECP2 PROMOTES GABA CIRCUIT DEVELOPMENT TO REGULATE SENSORIMOTOR GATING

Cole Gilsdorf, Marc Wolman (Mentor), Zoology

Dysfunction of the transcriptional regulator methyl-CpG-binding protein 2 (mecp2) is associated with neurological disorders, including Rett Syndrome and schizophrenia. These disorders stem from imbalanced neural circuit activity due to neurodevelopmental defects. Our research shows that mecp2 mutant zebrafish show impaired sensorimotor gating, which we observed through a reduced prepulse inhibition (PPI) of the acoustic startle response. We also found that mecp2 mutant zebrafish develop fewer connections within a GABAergic inhibitory microcircuit that regulates startle PPI. The PPI deficit was improved by chronic, pharmacological enhancement of GABAergic inhibition, and we found that stimulating insulin-like growth factor 1 (IGF1) signaling during development reverses the mutants' GABA connectivity and PPI deficits. Together, these findings suggest that MeCP2-IGF1 signaling promotes the development of GABAergic microcircuits to control sensorimotor gating.

MBD1 REGULATES NEURONAL LINEAGE COMMITMENT THROUGH MAINTAINING ADULT NEURAL STEM CELL IDENTITY

Charles Giuliani, Xinyu Zhao (Mentor), Neuroscience

MBD1 belongs to a family of methyl-CpG binding proteins that are epigenetic "readers," linking DNA methylation to transcriptional regulation. MBD1 is expressed in neural stem cells residing in the dentate gyrus of the adult hippocampus (aNSCs), and MBD1 deficiency leads to reduced neuronal differentiation, impaired neurogenesis, learning deficits, and autism-like behaviors in mice; however the precise function of MBD1 in aNSCs remains unexplored. Here, we show that MBD1 is important for maintaining the integrity and stemness of NSCs, which is critical for their ability to generate neurons. MBD1 deficiency leads to the accumulation of undifferentiated NSCs and impaired transition into the neuronal lineage. Transcriptome analysis of neural stem and progenitor cells directly isolated from the dentate gyrus of MBD1 mutant (KO) and wild type (WT) mice showed that gene sets related to cell differentiation, particularly astrocyte lineage genes, were upregulated in KO cells. We further demonstrated that in NSCs, MBD1 directly binds and represses specific genes associated with differentiation. Our results suggest that MBD1 maintains the multipotency of NSCs by restraining the onset of differentiation genes and that untimely expression of these genes in MBD1-deficient stem cells may interfere with normal cell lineage commitment and cause the accumulation of undifferentiated cells. Our data reveal a novel role for MBD1 in stem cell maintenance and provide insight into how epigenetic regulation contributes to adult neurogenesis and the potential impact of its dysregulation.

CHARACTERIZATION OF BUDDING YEAST DNA REPLICATION ORIGINS THAT USE THE BAH DOMAIN

Austin Gluth, Catherine Fox (Mentor), Biomolecular Chemistry

Improper genomic replication may hinder an organism's survival through emergence of genetic diseases. In eukaryotes, replication begins at defined chromosomal loci called DNA replication origins (origins) with the binding of the origin replication complex (ORC). In yeast ORC binds specific DNA sequences. In multicellular organisms such as humans, this complex is conserved, but the binding sequences are not; therefore, various chromatin environments must aid in specifying origins. Currently it is unclear whether chromatin environments in yeast help define origins. Based on an examination of Orc1BAH-dependent origins by a previous lab member, I hypothesize that the Orc1BAH domain of ORC binds a nucleosome upstream and immediately adjacent to the ORC binding site. Furthermore, I propose that specific DNA elements are essential for the proper positioning of this nucleosome. To test this hypothesis, I will perform a series of deep-sequence enabled plasmid-based assays in budding yeast.

MENTAL HEALTH PERCEPTION AND TREATMENT PRACTICES IN THE INDIGENOUS COMMUNITY OF SARAGURO, ECUADOR.

Luis M. Gonzalez-Quizhpe, Steve Quintana (Mentor), Counseling Psychology

Treatment models popular in North America and Western Europe are based on western occidental medicine, current cultural ideologies and in social economical contexts. To inform treatment models in Latin America, cultural adaptions are suggested. To formulate treatment adaptations for indigenous populations in Latin America, it is important to first learn the perception and care within mental health of these people. The current research was based on five perspectives: perceptions of mental well-being within indigenous communities, awareness of contextual factors that contribute mental distress, contemporary mental health treatments, perceptions of mental health providers within indigenous populations, and collaboration within the mental health care system in the region. Conducted in Saraguro, Ecuador, these concepts were examined through on-site interviews with mental health providers in the region.

NURR1 KNOCKDOWN IN SUBSTANTIA NIGRA PROPOSED TO RESULT IN COGNITIVE DEFICITS IN RATTUS NORVEGICUS

Sara Grange, Corinna Burger (Mentor), Neurology

Many Parkinson's disease (PD) patients suffer from cognitive impairment. Reduced secretion of dopamine (DA) from substantia nigra (SN) to striatum results in motor deficits in PD patients, but little is known about its effects on cognition. Nurr1 is a nuclear receptor expressed in SN neurons and regulates DA expression. The role of Nurr1 in PD-related cognitive deficits has not yet been studied. We hypothesize that reduced levels of Nurr1 in the SN, leading to decreased DA in striatum, will result in cognitive deficits in Rattus norvegicus. Knockdown of Nurr1 in SN with an anti-Nurr1 ribozyme was unsuccessful. CRISPR/Cas9 will be used to knockout Nurr1 before performing cognitive and behavioral testing to help reveal the role of Nurr1 in the cognitive behavior of PD patients.

EARLY ADOLESCENCE SOCIAL MEDIA INITIATION ISSUES IN RELATION TO PEER ENGAGEMENT

Kyra Gravelle, Ashley Prudhom, Cole Schenck, Victoria Shear, B Brown (Mentor), Educational Psychology

Early adolescents' use of social media has risen drastically in the past decade (O'Keeffe & Clarke-Pearson, 2011), prompting questions about how youths begin using social media and what determines their patterns of use. The present study examined how peers influence early adolescents' choices and use of media platforms. Qualitative analysis techniques applied to semi-structured interviews with a diverse sample of 36 adolescents age 10–13 revealed that most waited for peers to provide cues about social media use. Choice of social media platforms and decisions about what to post were influenced primarily through peer pressure or encouragement and behavioral display (showing individuals what to do). Findings suggest how parents and school adults can guide early adolescents to healthy social media use.

CLOTHED AND TERRIFIED

Talia Gray, Wesley Morgan, Sam Wunsch, Eric Hoyt (Mentor), Communication Arts

"Clothed and Terrified" depicts issues that many women face everyday. I use parody and satire as a mechanism to expose audiences to life experiences that may be different than their own. "Clothed and Terrified" is rooted in the idea that comedy has the potential to engage an unsuspected audience in order to help them understand other perspectives. I hope this comedy short can be used to expose people to the female life perspective in a way that people will begin to listen and maybe even begin to try to understand experiences that are different than their own.

CORTICOTROPIN-RELEASING FACTOR (CRF) NEURONS IN THE PREFRONTAL CORTEX MODULATE WORKING MEMORY

Rebecca Green, Sofiya Hupalo (Mentor), Psychology

The prefrontal cortex (PFC) regulates higher cognition. PFC dysfunction is implicated in a variety of disorders, including ADHD. CRF is a neurotransmitter prominent in the PFC, however, little is known about the cognitive actions of PFC CRF neurons. To address this, we used a chemogenetic approach to express excitatory or inhibitory artificial receptors selectively in CRF neurons. Following validation of this approach, we examined the cognitive effects of activation and inhibition of these artificial receptors. Activation of PFC CRF neurons impaired cognition as measured in a working memory test. Conversely, suppression of these neurons improved working memory, similar to ADHD drugs (e.g. Ritalin). Collectively, this suggests that PFC CRF neurons may represent a novel drug target for the treatment of ADHD.

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

Samantha Greuel, Lori Anderson (Mentor), Nursing

A concussion is a brain injury caused by a blow to the head or body that causes the brain to move rapidly back and forth. Athletes in the United States sustain 1.6–3.8 million sports-related concussions yearly. Complications can occur including prolonged symptoms, cognitive deficits, depression, and cumulative brain function deterioration. This project's purpose was to add a concussion module to the eSchoolCare web program, which gives school nurses guidance on caring for students with chronic conditions. A literature review was performed and resources identified. Nurses should recognize that each child's injury is unique and care must be managed as such, following physician orders. Return to school should occur before return to play and should be gradual based on the student's symptoms, implementing accommodations as needed.

ENHANCING TYROSINE METABOLITE BIOSYNTHESIS IN ARABIDOPSIS BY STIMULATING UPSTREAM TYROSINE SYNTHESIS

Daniel Griffith, Hiroshi Maeda (Mentor), Botany

This study aimed to enhance the biosynthesis of various downstream tyrosine derived metabolites in Arabidopsis thaliana. Previous experiments have elevated betalain and tocopherol levels in plants by introducing pathway-specific enzymes PgDODA, CYP76AD1 and HPT1. Additionally, other studies have discovered that the Tyr biosynthesis enzyme BvADH2 from Beta vulgaris (beet) experiences relaxed Tyr inhibition. To further increase betalain and tocopherol levels in vivo, this study combined these metabolite synthesizing enzymes with the de-regulated BvADH2 enzyme of Tyr biosynthesis. Extensive biochemical and physiological analyses revealed that overexpression of these enzymes drastically elevated Tyr, while partially reducing Phe levels. These results suggest that de-regulated BvADH2 can successfully redirect carbon flux from Phe to Tyr biosynthesis in plants.

THE RELATIONSHIP BETWEEN POLLEN IDENTITY AND QUANTITY OF TWO SOCIAL BEE POLLINATORS

Cecilia Grinis, Danny Minahan (Mentor), Zoology

Honey bees (Apis mellifera) and bumble bees (Bombus impatiens) are social bees that are common pollinators of many crops and wildflowers. Bee species collect pollen from many sources throughout the summer, but they tend to be flower constant within a foraging bout. In this study we seek to determine the relationship that exists between the amount and identity of pollen collected by these social bees and how this changes through time and among sites in a suburban-agricultural landscape. We hypothesize that as the pollen species richness increases over time, the average pollen sac weight will decrease for both honey bees and bumble bees, with bumble bees still having heavier pollen sacs than honey bees. This research can be used to inform future bee conservation strategies.

OBSTACLES UNDERREPRESENTED PEOPLE IN THE IT INDUSTRY ENCOUNTER

Megan Grove, Dorothea Salo (Mentor), Library and Information Studies

I present a case study of obstacles faced by individuals marginalized in the IT industry, and how such individuals overcome these obstacles. The story of Dominique DeGuzman, a lesbian, non-white woman from a low socioeconomic background, illustrates (among other obstacles) imposter syndrome as well as bias and underrepresentation in the workplace. Ms. DeGuzman overcame imposter syndrome via mentors and a strong support network. To combat bias and underrepresentation, she created a discussion aimed at awareness and recognition of these issues.

X-RAY QUANTUM CALORIMETER FILTER TRANSMISSION MEASUREMENTS

Rachel Gruenke, Dan Mccammon (Mentor), Physics

X-ray Quantum Calorimeter (XQC) is the rocket payload that contains silicon thermistor detectors used to detect astrophysical soft x-rays. XQC also contains six filters that sit between the gate valve and the detector, which block radiation outside of the soft x-ray energy spectrum. To analyze the astrophysical data from a flight, it is necessary to understand the x-ray transmission of these filters. This project involves experimentally measuring these transmissions. This included creating a mounting system to facilitate the configuration of said experiment. The collected transmission data can be fit to a model of the thickness and composition of each of the six filters, which will in turn be used to correct for astrophysical x-rays blocked by the filters in flight.

GROWTH DURING BRAIN REGENERATION IN ADULT DROSOPHILA MELANOGASTER

Cayla Guerra, Grace Boekhoff-Falk (Mentor), Cellular & Regenerative Biology

Work in my host laboratory has demonstrated that adult Drosophila melanogaster are capable neural regeneration after a penetrating traumatic brain injury (PTBI). This topic is of interest because models of neural regeneration are rare, and the mechanisms regulating neural regeneration remain unknown. The purpose of my research is to focus specifically on the trachea and to test whether they grow following injury. The tracheal system carries air into the Drosophila body and eliminates carbon dioxide. The trachea therefore might be predicted to grow with increased metabolic load during neural regeneration. If trachea are found to grow during regeneration, I will test whether they do so through proliferation versus elongation of the tracheal cells. Basic Drosophila melanogaster tracheal structure, function, and development support and provide rationale for this research. This information is part of a greater survey in how the brain regenerates after PTBI. The long-term goal of our work is to understand the mechanisms by which brains can be induced to regenerate. We anticipate that our work will have clinical implications for the treatment of human brain injury and neurodegenerative disorders.

A SOCIOLOGICAL INTERPRETATION OF PLACE-BASED POVERTY: GOSHEN COUNTY, WYOMING

Joshua Gutzmann, Leann Tigges (Mentor), Community & Environmental Sociology

This research is a survey of place-based poverty in Goshen County, Wyoming. It is intended to provide insight into the challenges unique to rural areas in combatting poverty through an analysis of poverty rates from sources such as the Bureau of Labor Statistics and the U.S. Census Bureau. In addition to poverty rates, I examine local labor market factors and state-level policies which effect the unique poverty rates in the county. I find that certain rates are highly unusual (i.e. the child poverty rate is double the adult poverty rate). This analysis reveals an example of how industry, demographics, and more affect specific communities in very different ways. I conclude that poverty manifests itself in a place-based manner which is unique from community to community.

GENOME SEQUENCE ANALYSIS OF YAMADAZYMA LANIORUM F.A. SP. NOV.: A NEW D-XYLOSE ASSIMILATING YEAST

Max Haase, Chris Hittinger (Mentor), Genetics

Candida tenuis was described by Diddens & Lodder (1942) and is considered one of the few known yeasts to ferment D-xylose. Two strains representing the sister species of C. tenuis were isolated from the bark of Acer saccharum in two Wisconsin ecosystems. Differentiation of the novel species was based on analyses of the genes encoding the ITS and D1/D2 sequences of the large subunit of the ribosome and on whole genome sequence analysis of 53 yeast species. Based on sequence analysis of the XYL1 (xylose reductase), ITS, and D1/D2 genes three strains of C. tenuis: CBS 4113, CBS 4285, and CBS4435, are recognized as cryptic strains of an unidentified Scheffersomyces sp. We propose Yamadazyma laniorum f.a. sp. nov. to accommodate the strains yHMH7 and yHMH613.

POSSIBLE IL–1B PROCESSING VIA MMP CLEAVAGE PATHWAY

Madeline Haedt, Nizar Jarjour (Mentor), Pulmonary Medicine

The increasing prevalence of allergic asthma associated with eosinophils has made it a priority to understand this inflammatory pathway. IL–1beta is important for differentiation of IL–17-producing T cells (Th17), which are associated with increased asthma severity. In contrast to other inflammatory cells that utilize the NLRP3 inflammasome-mediated pathway for IL–1beta maturation/release in response to pathogens, we propose that eosinophils respond to the inflammatory cytokines IL–3+TNF to release mature IL–1beta via the proteolytic enzyme MMP–9. To test this hypothesis, we stimulated eosinophils with IL–3+TNF in the presence of caspase (NLRP3 pathway) or MMP–9 inhibitors and assessed the release of mature IL–1beta. MMP–9, but not the caspase inhibitor reduced eosinophil secretion of IL–1beta. These finding suggest that MMP–9 may be a therapeutic target in eosinophilic asthma.

OUTCOMES OF PALS: IMPROVED PHYSICAL FUNCTION IN OLDER AFRICAN AMERICANS

Emily Hammer, Kimberlee Gretebeck (Mentor), Nursing

A lack of physical activity (PA) correlates with decreased mobility, poor health outcomes and loss of independence as people age. PALS (Physical Activity for Life for Seniors) is a culturally-adapted program for older African Americans (AA). The purpose of this pre-posttest quasi-experimental study was to improve physical function and self-regulation through PALS. Participants (n=34, Mean age=67.76 years) participated in a 10-week PALS group exercise program. Results indicated that participants improved Usual Gait Speed, 6 Minute Walk, Timed Up and Go and self-regulation ($p<.0001$) following the PALS program. The results indicate that PALS increases physical function for older AAs which may lead to improved health outcomes.

MULTILOCUS APPROACH TO SPECIES-TREE RECONSTRUCTION WITH RECOMBINATION

Zonglin Han, Calvin Kosmatka, Sebastien Roch (Mentor), Mathematics

ILS (Incomplete Lineage Sorting) and recombination are two main confounding problems for species-tree analysis. ILS is a population phenomenon caused by the failure of two closer lineage coalescing before the coalescing of two less closer lineage. Previously, Prof. Sebastian Roch mathematically analyzed several multilocus methods considering only ILS effect. However, recombination is also a big problem that cannot be ignored. Thus, we used MATLAB to simulate the coalescence process with recombination and analyzed its effects. One important model we used was SMC (Spatial Markovian Coalescent). The power of SMC is to approximate the coalescent process as Markov Process as well as reducing computational complexity.

FECUNDITY AND DEVELOPMENT OF HALYOMORPHA HALYS ON HOST PLANT VERBASCUM THAPSUS.

Kate Handberg, Benjamin Jaffe (Mentor), Entomology

I tested the suitability of Verbascum thapsus, (Mullein) to serve as a host plant for the Brown Marmorated Stink Bug, Halyomorpha halys. H. halys is a major pest across a wide range of ornamental plants and crops. During early spring, when H. halys is emerging from diapause, few of its known host plants are available. V. thapsus is a perennial plant that may serve as an important early season host for H. halys. I compared the developmental times and fecundity of H. halys on V. thaspus to a known host (Phaseolus vulgaris; green bean). Preliminary results suggest V. thaspus can serve as a suitable host for H. halys. This knowledge helps predict dispersal patterns of H. halys and develop more effective management plans.

ERRORLESS VERSUS ERRORFUL LEARNING IN ADULT WORD LEARNING

Jessica Handler, Kayla Hui, Alexandra Peterson, Haley Vlach (Mentor), Educational Psychology

Learning new words is a fundamental process in human cognition. What remains unknown in the study of adults' word learning is how memory processes are affected by errorful versus errorless learning. Across 4 experimental conditions, we manipulated the number of opportunities for adults to make possible errors during word mapping and retrieval. Preliminary results showed that word learning via errorless retrieval was most advantageous at an immediate test. We predict that errorful learning is more beneficial for long term learning and are currently conducting a follow up study with a one day testing delay. These results will allow us to know when and how retrieval errors benefit adults' word learning.

EXPLORING FRESHMAN AND THEIR SOCIAL ADJUSTMENTS TO COLLEGE

Josh Hang, B Brown (Mentor), Educational Psychology

Using the Balance-Integration Theory of college student adjustment (Brown et al., 2016), this study analyzed freshmen's transition to college, focusing on social adjustments. Forming peer relationships, a hallmark of adolescent development, is a critical task for most college freshmen. Interviews with 33 students fall and spring of freshman year suggested there might be a critical period for friendship formation early in the freshman year. Initial analyses indicated that fellow dorm floor residents were especially strong candidates for friendships. Less likely sources of new friendships included roommates and peers encountered in class, school organizations, and social parties. Ethnicity, personality, and academic vs. social orientation also influenced success in friendship formation. Study findings enhance our understanding of friendship formation and creation of social support systems during late adolescence.

VERTICILLIUM WILT STUDIES IN POTATO: THERMAL IMAGING AND DISEASE DETECTION

Caroline Hanson, Arun Kumar (Mentor), Horticulture

My lab's research focuses on disease detection and genetic resistance in potato to a fungal pathogen, Verticillium dahliae. Since this fungus affects vascular bundles in plants, we expect diseased plants to have impaired transpiration, which helps in cooling of leaves. Our project attempts to determine whether there is a relationship between the canopy temperature of potato with disease progression. Temperature and inoculation did not show correlation in past experiments, but this is attributed to lack of controls for time of day, comparison plants, etc. This experiment will include side-by-side comparisons of inoculated and disease-free plants at similar times of day using thermal imaging cameras. Research into early disease detection methods, such as thermal imaging, aids in genetic research and decrease crop losses of potato farmers.

FROM NOTES TO WORDS: INFORMATION TRANSFER BETWEEN MUSIC AND SPEECH IN INFANT LEARNING

Allison Hare, Jenny Saffran (Mentor), Psychology

Can music facilitate infants' ability to segment words from a novel language, and does the type of music matter? We will explore these questions by presenting infants with musical sequences in conjunction with a novel language stream. The number of tones per musical sequence will be matched with the number of syllables per word of the language, and infants will hear either cello or trumpet tones. The cello bears a stronger resemblance to the human voice, meaning infants may give it more attention; therefore, we hypothesize infants exposed to cello will be better at segmenting words than infants exposed to trumpet. We hope to elucidate the relationship between music and language and expand upon existing literature on the role of statistical learning in language development.

HISTORY OF POTATO PRODUCTION AND COLORADO POTATO BEETLE OUTBREAKS IN THE UNITED STATES (1850–1935)

Benjamin Havlicek, Michael Crossley (Mentor), Forest & Wildlife Ecology

Colorado potato beetles (CPB) have been a pest to potato farmers since the early 17th century. Being a species of low dispersive ability, its rapid colonization of North American potato agroecosystems in the late 1800s is surprising. This begs the question, did growth in potato production in the U.S. facilitate the expansion of CPB? By quantifying county-level potato yield data between 1850 and 1935, we created maps showing country-wide potato production and calculated connectivity between potato agroecosystems. Using literature regarding CPB outbreaks, we mapped locations of known outbreaks. The study aims to determine if outbreak locations coincide with connectivity of potato agroecosystems from 1850–1935. The findings may help determine whether CPB outbreaks were human facilitated or motivate future investigations of other factors of facilitation.

EFFECTIVE DIFFUSIVITY OF AN ELLIPTICAL ACTIVE BROWNIAN PARTICLE

Ye He, Wai-Tong Fan (Mentor), Mathematics

We study the two-dimensional Brownian dynamics of an ellipsoidal active Brownian particles (ABps) subject to a magnetic field. These micro-swimmers are potentially useful in drug-delivery and target medication. We assume that the ABps moves at a low Reynold number at temperature T in a rotating external magnetic field with a permanent magnetic field intensity quantity and the ABps can only rotate along the azimuthal direction &theta and velocity U=U_0[cos&theta(t),sin&theta(t)]. Then we establish the physical model and solved for the probability density function (PDF) of &theta . After that we use the PDF to compute the mean square displacements (MSD) and the diffusion coefficients in each direction. Finally, by observing how the MSD and the diffusion coefficients change as time, particles' shape, activity and the external magnetic field change, we find out how the Brownian dynamics behave as the above factors vary. Our results show that the long-term diffusion coefficients in the two directions are the same number which the diffusion will become isotropic after the transition time. We quantify how the transition time increases when the velocity U increases or the magnetic frequency decreases. Based on these results, when it comes to medication where the microorganisms swim inside human body and approach the specific cells, we know how to vary the factors to better control the micro-swimmers.

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.

MASS SPECTROMETRY-FOCUSED METHOD DEVELOPMENT AND APPLICATION FOR CRUSTACEAN NEUROPEPTIDE ANALYSIS

Kylie Helfenbein, Amanda Buchberger (Mentor), Pharmacy

Neuropeptides are important regulatory molecules that can be used to study signaling between the brain and other organ systems. The crustacean nervous system is simple and well-defined, which allows for the global analysis of multiple neuropeptides under different conditions. It is crucial that the neuropeptides be extracted properly so that minimal sample is lost or destroyed. The solvent, temperature, and processing differently affect effective extraction. Different methods were tested to isolate such variables and conclude the most optimal combination, which involved sonicated extraction with acidified methanol at 4 degrees Celsius. These optimized methods for neuropeptide extraction have been utilized for understanding physiological differences observed in biology, such as that between male and female subjects.

FONIO: A GRAIN FOR THE FUTURE

Graham Henning, Kat Kuchin, Spencer Luedtke, Andrew Maule, Sara Patterson (mentor), Horticulture

For centuries, villages across the Sahelian regions of West Africa have relied on the ancient grain crop fonio Digitaria exilis for its disease and drought tolerance, rapid growth rate, and nutritional value. Fonio is a source of sustenance during the "hungry season," providing essential vitamins and amino acids that other regional crops are lacking. Although these benefits and others have established it as a staple crop across the region, it has not been thoroughly domesticated. The Patterson lab is currently analyzing almost a hundred unique fonio accessions. This presents a unique opportunity to karyotype several landrace lines, tracking variance across West Africa. The determination of ploidy level will be essential for future breeding studies; and will also have important implications in genome sequencing assembly and analysis. Previous research has demonstrated significant diversity across the region. I will be presenting what further exploration is necessary to document variation between cultivars of interest.

REGULATION OF ASYMMETRICALLY SEGREGATED CARGOES IN MITOTIC NEURAL STEM CELLS

Jieun Heo, Darcie Moore (Mentor), Neuroscience

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

EXPLORING IDENTITY NEGOTIATION THROUGH LITERARY PRACTICES IN CHILDREN OF IMMIGRANT FAMILIES

Jadid Hernandez, Sareyah Ahmed, Adeana Bentley, Catherine Lilly (Mentor), Curriculum & Instruction

This study explores the intersectionality of identity and literacy negotiated by young children in immigrant families from different backgrounds. Thus far, results have shown that all students negotiate identity, however, some students hurdle their transition at different times. The project begins by synthesizing relevant research on children's identity negotiation. Theoretical frames that form the basis of the claims related to intersectional identity negotiation are then explored. This 7-year longitudinal collective case studies of 10 immigrant students involves observations, spoken data, and student-created artifacts (e.g., writing samples, maps, photographs, drawings). Data sources were designed to highlight literacy practices and identity construction across time. These cases have revealed intersectional networks of identity negotiation which entails self including language, gender, technological practices, nationality, and race.

ANALYZING THE ISOLATION PRECAUTION HABITS OF HEALTH CARE PROFESSIONALS IN MADISON

Camilo Hernandez, Nasia Safdar (Mentor), Infectious Diseases

Multi-drug resistant organisms (MDROs) such as Clostridium difficile and methicillin-resistant Staphylococcus aureus (MRSA) are responsible for deadly infections, costing hospitals both lives and money. The purpose of this multi-facility and multi-tiered study is to standardize methods to assess the use of barrier precautions (PPE) and hand hygiene (HH), alcohol gel or soap and water, of healthcare professionals (HCPs) at UW Health and the VA hospital. Observations on the use of hand hygiene (HH) and barrier precautions (PPE) practices of health care professionals (HCPs) when entering and exiting patient rooms under isolation precautions for multi-drug resistant organisms are in the process of being assessed. Assessed use of barrier precautions and hand hygiene will provide information for standardizing methods to assess the use of barrier precautions at the local level. Future research may lead to the creation of intervention studies and ideally lower transmission risk.

THE PROPOSED INCREASE OF REM SLEEP AND DECREASE IN SEIZURES IN SILIBININ TREATED MICE

Alexis Hernandez Abrego, Kara Vogel (Mentor), Neurology

Temporal Lobe Epilepsy (TLE) is one of the most common causes of complex partial seizures in adults. In TLE elevated nitric oxide (NO) can sensitize neurons and cause neurodegeneration. Additionally, NO is known to reduce rapid eye movement (REM) sleep. Silibinin, a constituent of Milk Thistle, which has been used for 2,000 years as an herbal remedy, is an anti-inflammatory and anti-oxidant. It has been shown to reduce inducible nitric oxide synthase (iNOS), a producer of NO. I hypothesized that due through inhibition of iNOS that application of silibinin in a mouse model of TLE can reduce spontaneous recurrent seizures and increase REM sleep and thereby extend lifespan. I will present preliminary efficacy data for silibinin in our mouse model.

EXPLORING THE IMPACT OF CAPSTONE COURSE "HOW KIDS AND BIRDS CAN SAVE THE PLANET"

Mackenzie Hess, Anke Keuser (Mentor), Nelson Institute for Environmental Studies

This project explains and assesses the impact of the Environmental Studies 600 Capstone Course: Last Child in the Park: How Kids and Birds can Save the Planet. This service-learning course partners with Sherman Middle School's Nature Club and is unique in the fact that it affects three different communities within Madison. This project uses interviews with members from the University—both past students who have taken the course and staff who created the course, Warner Park volunteers and workers, and Sherman Middle School students involved in Nature Club to assess how this course has impacted each community since the course's founding in 2011. The overarching goal of this project is to help show the influence of a service-learning course on campus.

DIETARY PREEN OIL IMPROVES GROWTH AND SURVIVAL IN LARVAL FATHEAD MINNOWS

Brady Hirshfeld, Caroline Barry, Terence Barry (Mentor), Animal Science

Compared to terrestrial livestock, aquaculture is a more environmentally-sound and resource-efficient method of producing animal protein. Larval growth and survival rates are limiting factors in fish production, and are constrained by unhealthy fish affected by chronic inflammation. A preen oil extract from birds was previously shown to reduce chronic inflammation in mice; therefore, we hypothesized that when consumed by fish, preen oil would increase growth through reduced inflammation. We've found that dietary preen oil-coated dry feeds in larval fathead minnows (Pimephales promelas) can increase growth rate by 23%, and significantly improves larval survival in both typical and abnormally stressful conditions, relative to isocaloric controls. Such improvements, if effective commercially, could aid a transition to improved, sustainable protein production for a growing population.

MILITARY UNIT SUPPORT AND COMBAT EXPERIENCES DURING DEPLOYMENT: ASSOCIATIONS WITH PTSD SYMPTOMS

Michele Hiserodt, Maleeha Abbas, Kasey Kallio, Megan Schultz, Kathryn Thomas, Mary Wyman (Mentor), Psychiatry

For military personnel, deployment in a combat zone is a risk factor for symptoms related to post-traumatic stress disorder (PTSD). Receiving social support during deployment may serve a protective role. This cross-sectional study investigates the relationships between combat exposure (specifically, objective combat experiences and subjective perceptions of threat to safety), social support within one's military unit during deployment, and PTSD symptoms. Surveys were completed by 2,400 Wisconsin National Guard members upon return from deployment. We examine variability of report within each unit. We hypothesize that unit support is more strongly associated with PTSD symptoms than combat exposure and that subjective reports of perceived threat during deployment are more strongly associated with PTSD symptoms than objective combat experiences. Data analysis is ongoing.

THE SCIENCE OF FASCIA MEETS THE ART OF DANCE MAKING

Molly Hodgson, Andrea Harris (Mentor), Dance

This project is motivated by my belief in somatic practices and a human's anatomical awareness as benefits to uncover new bodily perspectives and possibilities for embodiment. This study will explore recent data on fascia lines in order to guide a choreographic project. Drawing on text and studio-found research, I will apply knowledge of internal connections in the human body to the creative process with bodies in space. This study will explore the process of implementing the scientific concept fascia lines and their function into a creative practice. Based on an understanding of fascial connections in the body, four dancers, including myself, will compile a structured dance to reveal what and how a scientific understanding of the human body's composition can supplement a choreographic project.

IMPACT OF METABOLISM ON TOXICITY OF CARBAMAZEPINE IN PLANTS

Rebecca Hoehn, Joel Pedersen (Mentor), Soil Science

Carbamazepine, an anti-epileptic drug often found in treated wastewater, can be taken up into crop plants irrigated with reclaimed wastewater. Carbamazepine is metabolized into 10,11-epoxycarbamazepine and 10,11-dihydroxycarbamazepine in humans and plants. Humans can be exposed to carbamazepine and its metabolites by consuming contaminated crops. 10,11-epoxycarbamazepine is more toxic than carbamazepine in humans. We are testing the hypothesis that 10,11-epoxycarbamazepine is more toxic than carbamazepine in plants. To accomplish this, we exposed Arabidopsis thaliana seedlings to graded concentrations of carbamazepine, 10,11-epoxycarbamazepine, or 10,11-dihydroxycarbamazepine and examined the impact of the compounds on root elongation. Seeds were grown in vertical petri dishes containing pharmaceutical-amended agar. Roots were measured to determine the extent to which elongation was retarded. Dose-response data will be shown for carbamazepine and its metabolites.

THE IMPACT OF TEMPERATURE AND SALINITY ON SEED GERMINATION IN DIFFERENT VARIETIES OF ALFALFA

Alayna Hoesly, Emma Nelson, Johanne Brunet (Mentor), Entomology

Alfalfa (Medicago sativa) is subjected to various abiotic stresses while being grown as a forage crop, especially the increase in temperatures and soil salinity associated with Global Warming. A laboratory experiment was initiated to evaluate the effects of the abiotic stresses of temperature and salinity on germination percentage and radicle length for conventional and genetically modified varieties of alfalfa (Round-Up Ready, HarvXtra, and varying fall dormancy levels). The alfalfa seeds were germinated in petri dishes with saline solutions of varying concentrations (0, 50, 100, and 150 mm). The germination response of the seeds was determined over a range of temperatures (15, 25, and 35 °C) for a period of four days. The number of germinated seeds was counted every 24 hours and used to calculate germination percentage. Radicle lengths, measured on day four, were used to calculate the average radicle length.

ASSESSING THE CONSEQUENCES OF EXPOSURE TO TOUCH-SCREEN DEVICES IN YOUNG CHILDREN

Elizabeth Hoff, Jenny Saffran (Mentor), Psychology

Touch-screen devices are deeply embedded into today's society, with many children owning their own device and using them independently on a daily basis (Kabali et al., 2015). The distracting features in many popular applications are a cause for concern. Yet, the effects of these devices on childhood cognitive development, particularly the function of selective attention, have not been clearly specified. Selective attention refers to an individual's ability to focus on a specific stimulus, maintain attention, and resist distractions. The ability to selectively attend has been tied to many forms of learning, including visual statistical learning (VSL), which is the ability to track patterns between visual information. The proposed study will use VSL to examine the potential relationship between touch-screen device exposure and selective attention. I hypothesize that young children with greater exposure to touch-screen devices will (a) show less selective attention to a central task and (b) attend to distracting stimuli more frequently than those with less exposure.

CONFIRMATION OF TOLL-LIKE RECEPTOR 1 (TLR1) H305L SNP GENOTYPES IN WISCONSIN PRETERM INFANTS

Caitlin Hoffman, Wenxiang Luo (Mentor), Pediatrics

The leading cause of neonatal mortality is preterm birth. Preterm birth has been associated with many health problems, such as lung disease, vision loss, and neurodevelopmental disabilities. The focus of this project is on Toll-like receptors (TLRs). TLRs are proteins that play a key role in the function of the innate immune system and therefore, mutations in regions that encode these genes could lead to premature birth. The objective of this study was to test a DNA sequencing approach in discrimination and confirmation of minor allele genotypes in TLR1 SNP H305L in Wisconsin infants. Our approach based on PCR, DNA ligation, and DNA sequencing has successfully discriminated SNP genotypes of TLR1 SNP H305L. It could be used in other SNPs with low minor allele frequency.

PREDICTING AND INTERPRETING THE HOFMEISTER EFFECTS OF SALTS WITH NUCLEIC BASES AND AROMATICS

Runyu Hong, M Thomas Record (Mentor), Chemistry

The interaction between salts and nucleic acid bases or aromatic compounds plays an important role in noncovalent bio-polymer assembly processes such as DNA helix formation and protein-nucleic acid interactions. The project determines effects of five salts contains Hofmeister ions (NaF, KBr, KSCN, NH4Cl, NH4Br) on the solubility of 11 model compounds to experimentally quantify salt-model compound preferential interactions μ23. μ23 are obtained from the derivative of the logarithm of the model compound solubility with respect to the molal concentration of salt. These data are analyzed to predict interactions of these Hofmeister salts with the five functional groups of nucleic acid bases. The results are used to predict the interactions between Hofmeister salts and other organic compounds and effect of Hofmeister salts on nucleic acid processes.

ORGANIZATIONAL INVESTMENT IN HUMAN CAPITAL

Jacob Horwitz, Bukky Akinsanmi (Mentor), Management & Human Resources

The resource-based view literature on human capital theory suggests that firms seeking a superior market position should not invest in general human capital because it is neither rare nor non-substitutable. It is assumed that endowed general human capital will depart as a result of labor market demands, and organizations will not be able to appropriate rent from their investments. Observed firm behavior, however, contradicts this. In the United States, organizations invest over $134 billion annually on formal classroom training usually designed to build up general human capital (Noe 2010). This project explains why firms may invest in such assets despite the heightened risk of loss. It proposes that organizations invest in general human capital in order to increase employee-level absorptive capacity for firm-specific organizational knowledge stock—a resource which the literature has shown to be a driver of competitive advantage. It also identifies common (not rare) and core task-related general human capital as the boundary conditions in which organizations may intensify their investments without increasing their risk of loss.

LARGE LOCAL VOID, SUPERNOVAE TYPE IA, AND THE KINEMATIC SZ EFFECT IN A LAMBDA-LTB MODEL

Benjamin Hoscheit, Amy Barger (Mentor), Astronomy

There is substantial and growing observational evidence from the normalized luminosity density in the near-infrared that the local universe may be under-dense on scales of several hundred Megaparsecs. Our objective is to test whether a void described by a parameterization of the observational data is compatible with the latest data on supernovae type Ia and the linear kinematic Sunyaev-Zel'dovich (kSZ) effect. Our study is based on the large local void radial profile observed by Keenan, Barger, and Cowie (KBC) and a theoretical void description based on the Lemaitre-Tolman-Bondi model with a nonzero cosmological constant (Lambda-LTB). We find consistency with the KBC void from both the 'Supercal' supernovae type Ia dataset and linear kSZ constraints from the South Pole Telescope.

COMPARING ENVIRONMENTAL EDUCATION AND COMMUNITY-BASED CONSERVATION STRATEGIES IN MADISON AND AUTLÁN

Holly Howe, Angela Ingrassia, Riley Lenoch, James Berkelman (Mentor), Forest & Wildlife Ecology

The purpose of this project is to compare environmental education and community-based conservation strategies in Madison, WI and Autlán de Navarro, Jalisco, Mexico. Both study sites are mid-sized cities in agricultural contexts. We will examine government and grassroots initiatives that aim to improve public awareness of environmental issues and promote sustainable solutions. This project will have a particular emphasis on K–12 public school curriculum, agricultural practices, land use strategies, and public involvement in sustainability and conservation initiatives.

EFFECT OF CANDIDA GLABRATA ON NEUTROPHIL'S FUNCTION

Amanda Hoyer, Jeniel Nett (Mentor), Infectious Diseases

Patients with indwelling medical devices, such as venous catheters, are at risk for invasive disease caused by various fungal and bacterial pathogens. In these patients, organisms adhere to the device surface and proliferate as a biofilm of resilient cells. The host immune system and conventional anti-infectives are often not capable of eradicating biofilms, so these infections can have devastating consequences. One of the immune system's defense strategies is to have neutrophils release neutrophil extracellular traps (NETs) to trap the foreign pathogens. These biofilms inhibit neutrophils from releasing NETs. Candida albicans has commonly been used as a model biofilm, so more is known about its impact on neutrophil function. My research has been focused on studying Candida Glabrata's effects on a neutrophil's ability to release NETs.

LEARNING, REPRESENTATIONS AND TECHNOLOGY

Jessica Hsu, Martina Rau (Mentor), Educational Psychology

The purpose of this research is to investigate the extent to which representational competencies, the knowledge and skills that lets one navigate with visuals, transfers across visual representations. The hypothesis is based on the fact that aided visual representation to text can enhance student's learning and that one must be able to make and see connections in the what they are learning in order for one to comprehend the material. We interview Organic Chemistry students with a written set of questions designed to assess the role that visual representations play in their learning of new material. This research will establish effective ways for educators to use representations to help students succeed in STEM learning.

WHAT MAINTAINS COLOR PATTERN VARIATION WITHIN THE PARNASSIUS CLODIUS BUTTERFLY?

Mryia Hubert, Sean Schoville (Mentor), Entomology

The Clodius Parnassian butterfly (Parnassius clodius) shows an extensive amount of variety in the melanism and pattern on the wings within the species. This phenotypic variation spans across different parts of the western coast of the United States and into Canada, including a large range in elevation. It is unclear why multiple color patterns are maintained across the distribution of this species. It may be caused by natural selection, with increased melanism selected in cooler environments, and red aposematic coloration selected in environments with greater predation. Building upon morphological data collected from over 600 samples, hypotheses of the role of natural selection versus genetic drift in generating this diversity will be tested. Morphological data will be compared to genetic data targeting a specific gene in the mitochondrial DNA, in order to assess the degree of genetic differentiation among phenotypically different populations.

DIFFERENTIAL ANALYSIS OF FAST GROWING AND SLOW GROWING ASPEN GENOTYPES

Jacob Hutner, Jennifer Riehl (Mentor), Entomology

Due to climate change, quaking aspen (Populus tremuloides), an economically and ecologically important forest tree faces dangers from drought, defoliation, and disease. Aspen synthesize phenolic glycosides, a secondary metabolite, to mitigate pressures from herbivores, at a potential cost to its growth rate. Using resources from a large association mapping common garden, I examined differences between the top and bottom 10 aspen genotypes for total biomass in regards to phenotypic variation in phenolic glycoside concentration and percent leaf area damage. Preliminary results indicate that the low-growth genotypes exhibit significantly ($p<0.001$) more leaf damage than the high-growth genotypes. The results of my study will provide important information for forest managers and conservation groups in genotypic and phenotypic selection to maintain aspen populations and biodiversity despite environmental threats.

DETERMINING THE ROLE OF THE F-BAR PROTEIN CIP4 IN CORTICAL NEURONAL MIGRATION

Brandon Huynh, Erik Dent (Mentor), Neuroscience

Neuronal migration occurs in three main steps: (1) extension of the leading process, (2) nucleokinesis, or migration of the cell body, and (3) retraction of the trailing process. This mechanism is seen in cortical neurons radially migrating from the ventricular zone up to the outer cortical plate. Throughout the migration process, specific intracellular mechanisms dictate the migration rate and the size and length of cellular components. Cortical neuronal migration depends on the coordination of both the actin cytoskeleton and the plasma membrane. In neurons, F-BAR proteins such as Cdc42 Interacting Protein 4 (CIP4) can bind to the plasma membrane and facilitate actin reorganization. CIP4 is also highly expressed in the cortex at embryonic ages that coincide with the greatest neuronal migration activity. Previous studies from our lab suggest that CIP4 inhibits neurite outgrowth in neurons, in vitro. Preliminary data suggests that in vitro, CIP4 KO neurons have delayed cortical migration. CIP4 may act to inhibit neuritogenesis and allow for proper migration in the cortex.

ROLES OF OUTCOME EXPECTANCY AND IMAGING ABILITY IN EFFECTS OF CB STRATEGIES FOR CANCER SYMPTOMS

Heather Hynick, Kristine Kwekkeboom (Mentor), Nursing

In this study, we tested brief cognitive behavioral (CB) strategies on co-occurring pain, fatigue, and sleep disturbance in advanced stage cancer patients. Previous studies demonstrate that CB strategies may improve symptoms for some patients. The purpose of this study is to test if effects of the CB intervention on symptom cluster severity and distress are moderated by imaging ability and mediated by improvements in outcome expectancy. We will analyze data from a randomized controlled trial of the CB intervention in N=163 patients receiving treatment for advanced cancer experiencing pain, fatigue, and sleep disturbance. Results may explain how the CB strategies improve symptoms and determine if imaging ability is an important skill necessary for symptom relief.

BENEFIT: WHAT MOVES YOU

Tiffany Ike, Sara Mckinnon (Mentor), Communication Arts

This presentation will explore how physical activity can positively affect one's mental health within the artist community. The purpose of this study is to understand how exercise and art are both used as restorative processes for people battling with mental illnesses, specifically depression and anxiety, and how they intersect. This research assesses the benefits of linking the outlets of creativity and exercise together and how different art mediums can be used to construct motivational systems that can encourage someone to begin and sustain forms of physical activity and improve their holistic health.

EFFECTS OF MATERNAL PSYCHOPATHOLOGY ON DEVELOPMENT OF INFANT ANXIOUS TEMPERAMENT

Bailey Immel, Hill Goldsmith (Mentor), Psychology

The development of stranger fear in infants shows considerable variation among children, and this variation is likely due to multiple factors. One of these factors involves transmission from mothers, such that more fearful mothers have more fearful infants. We examined relations between mothers' anxiety and depression and the intensity of distress displayed by infants during a lab-based stranger approach paradigm. Data were collected as part of a larger longitudinal study. Children were assessed at 6 months (72 Males, 77 Females) and mothers' age ranged from 20.6 years to 42.6 years with a mean age of 33.4 years at the time of assessment. Mothers completed measures assessing depression and anxiety, and infants participated in a laboratory based fear-eliciting task at 6 months (N=100). Maternal anxiety and depression, combined to create a single score, correlated r = .33 with higher levels of infant stranger fear for girls ($F(3,92)=3.72$, $p=.01$, $R2=.11$), but not boys. Potential biological and behavioral mechanisms explaining this parent-child association and the related gender differences will be explored.

THE TRANSFORMATION OF BRACHYPODIUM DISTACHYON

Kenneth Jackson, Ray Collier (Mentor), Agronomy

Brachypodium distachyon is a grass plant that serves as an experimental model for wheat. Only a few genotypes of B. distachyon have been successfully genetically transformed including 21–3, the genotype from which the reference genome sequence was generated. Interestingly, recent studies indicate that genotypes other than 21–3 demonstrated greater variation in their response to environmental stress, relative to the comparatively unresponsive 21–3. In light of this information, genotypes 30–1 and TR13a, both of which have been shown to have strong phenotypic responses to heat and water stress, were selected to test the hypotheses that embryogenic callus generated from these genotypes are capable of a) regenerating and b) can be genetically transformed. Expanding the range of B. distachyon genotypes, especially including those more responsive to environmental signals, will enhance the application of B. distachyon as a model for studying the impact of altered growth conditions on important crop plants like wheat.

PREFERENTIAL INTERACTIONS OF SUGARS WITH NUCLEOBASES AND AROMATICS

Emilio Jacobo, M. Thomas Record, Jr. (Mentor), Chemistry

In this project, I am obtaining the data needed to quantify the chemical interactions of sugars with model compounds displaying nucleic acid and protein functional groups, and thereby interpret or predict effects of sugars on biopolymer processes. To accomplish this, I am determining the interactions of two sugars (disaccharides trehalose, sucrose) with a set of model compounds displaying the major C, N, and O functional groups of biopolymers. Analysis of these data yields coefficients (α values) that quantify interactions of these sugars with these functional groups, relative to interactions with water. I find that these interactions are additive. Interactions of sugars with nucleobase carbonyl O are unfavorable, while interactions with nucleobase C and N functional groups are favorable. In the future, I will determine the effect of temperature on these interactions to dissect them into energetic and entropic (order, disorder) contributions.

ROBIN'S SENSORY BOARD

Siddhant Jain, Eric Arndt, Benton Denlinger Drumm, Daisy Garcia, Sara Jorgensen, Jacob Lindsley, Alex Rosenflanz, Thomas Thelen, Mitchell Tyler (Mentor), Biomedical Engineering

Our client is a woman who needs a device that will provide cognitive and sensory stimulation throughout the day. She is diagnosed with a severe form of cerebral palsy and consequently is wheelchair bound. This requires that she receive cognitive and sensory stimulation from a portable device that can be attached to her wheelchair. We have designed and created a device that will help her maintain her confidence in her ability to use her senses. Our Enhanced Sensory Board has a programmable embedded controller that controls a video display, audio speaker, patterned colored lights, and a fan for personal cooling, all integrated into a system that attaches to her wheelchair.

EVALUATING HUMAN PLURIPOTENT STEM CELL-BASED PHOTORECEPTOR TRANSPLANTATION IN RODENT MODELS

Shivani Jain, Michael Phillips (Mentor), Waisman Center

Photoreceptor (PR) dysfunction and subsequent cell loss is a leading cause of blindness worldwide, and is ultimately responsible for vision loss in several inherited retinal dystrophies. Despite recent advances in human pluripotent stem cell (hPSC) therapies, PR replacement therapies in human patients are currently untested. Preclinical animal studies have consequently become essential to developing these therapies and to test their safety and efficacy. Using rodent models, the ongoing aims of our study are to optimize production of hPSC-derived PRs, refine cell delivery techniques, evaluate visual function through dark-adapted electroretinography (ERG) and optokinetic tracking (OKT) tests, and investigate cell survival and migration through histology. Ongoing studies are focused on determining the time course for transplanted hPSC-PR survival, integration, and potential functional rescue of rodent models of retinal disease.

HOW GAINING OR LOSING MONEY AFFECTS DECEPTION AND MONEY ALLOCATION

Emma Jardas, Lyn Van Swol (Mentor), Communication Arts

This study investigated how framing, deservingness, and risk-taking affect deception in a money allocation task. Participants took a rigged 12-question quiz which gave every participant 7 correct questions. Those in the loss-frame started with $12 and lost $1 for every question wrong; those in the gain-frame started with $0 and gained $1 for every question correct. Participants had to divide the money between themselves and a partner via text chat; they could deceive to keep more money for themselves. Allocators gave less money to their partner in the loss-frame and when perceiving higher deservingness. Risk-seekers gave their partners less money in the gain-frame condition. Deservingness was the only factor which affected honesty; those who felt more deserving were less honest with their partner.

SYNTHESIS OF POLYMERIC ANTIGENS TO STIMULATE CROSS PRESENTATION VIA CATHEPSIN S-MEDIATED PATHWAY

Angie Jasper, Laura Kiessling (Mentor), Chemistry

Cross presentation is an important antigen presenting process in dendritic cells that mediates CD8+ cytotoxic T cell activation against exogenous antigens. These cells are the major defense against viruses and cancer as they identify infected cells and induce their apoptosis. However, many traditional vaccines fail to recruit robust CD8+ T cell responses. One proposed pathway of cross presentation involves antigen processing in the early endosome by cathepsin S. We hypothesize that antigens that selectively target dendritic cells for cathepsin S processing will yield robust CD8+ T cell responses. Polymeric antigens were functionalized with a mannoside ligand to target dendritic cells for receptor mediated internalization to endosomes. These polymers also bear a T cell epitope containing either a cathepsin S-sensitive or insensitive linker to release a peptide for cross presentation upon polymer internalization and endosomal processing. We expect that cathepsin S-sensitive polymers will increase CD8+ T cell activation and that systematically designing vaccine constructs with these tailored attributes will lead to improved cytotoxic cell-mediated immunity.

BAYESIAN PHYLOGENETIC ANALYSIS OF ALPINE BEETLE SPECIES NEBRIA

Kalene Jasso, Sean Schoville (Mentor), Entomology

This project aims to determine the spatial relationship and diversification of flightless alpine beetles (Nebria) found in mountain ranges in the western portion of the United States. The nucleotide sequence data for the mitochondrial gene CO1 is analyzed using Bayesian methods to create phylogenetic trees that allow us to see the diversification within Nebria vandykei and N. paradisi. We then use this data along with past climate information and Random Walk Theory to estimate Nebria movement during past climate change. We find N. vandykei populations originated in northern California and then dispersed northwards through the Cascade Range in a step-wise manner and southwards to the Sierra Nevada Mountains. We compare this dispersal pattern to co-distributed species N. paradisi.

THINKING ABOUT DATA

Victoria Jay, Martha Alibali (Mentor), Psychology

Judging covariation, the relatedness of events, from data is challenging for both children and adults. Past studies suggest that this difficulty might stem from a tendency to focus on numerical values rather than proportions when interpreting data. This study investigates whether children (ages 9–11) and adults who are primed to think in terms of proportions solve covariation problems using more sophisticated strategies than participants who are primed to think about numerical values. Preliminary analyses indicate that for neither children nor adults did priming condition influence the accuracy of judgments of covariation. Analyses of participants' strategy use are ongoing. We hypothesize that participants who are primed to think about proportions may consider more of the cells in the contingency tables when evaluating the data.

DIFFERENTIAL DECODER EVALUATION USING PSEUDO-RANDOM TESTING

Nathan Jay, Barton Miller (Mentor), Computer Science

Computer programs, from games to scientific simulations, begin as human-written and human-readable source code, but computers require programs to be encoded in the binary language of the computer processor. Unfortunately, most common encodings, like Intel's Pentium (in laptops, desktops and supercomputers) and ARM (in all mobile devices), have become absurdly complex. Surprisingly and despite the complex encodings, analyzing and modifying binary code plays a critical role in computer forensics, virus detection, and supercomputing. Binary decoding provides the foundation for these techniques by converting binary instructions into useful semantic information, but when decoders fail, the foundation crumbles; performance metrics become inaccurate, debuggers become buggy, security tools become insecure. My work has used novel testing techniques to identify and contribute to fixing errors in these binary decoders.

THE IMPORTANCE OF AUTOPHAGY IN THE TIME OF ONSET OF ANAL SQUAMOUS CELL CARCINOMA

Annie Jen, Louise Meske, Evie Carchman (Mentor), Surgery

Human papilloma virus (HPV) is the number one risk factor for anal cancer development, with 95% of invasive anal cancer cases linked to HPV16/18 infection. Autophagy is an intracellular protective degradative mechanism that has been identified as an important pathway in cancer development. To investigate the role of autophagy in timing of onset of HPV-associated anal tumors, the Carchman Lab has developed a HPV16 K14E6/E7 double transgenic mouse model where key HPV oncoproteins are expressed in addition to conditional, localized epithelial knockout of an essential autophagic protein (Atg7) using Cre-LoxP technology. Our preliminary data presented inconclusive results, likely due to small sample size. This information will likely impact future treatment design for HPV-related anal cancer.

PREDICTING DAMPING OF A CANTILEVER BEAM WITH A BOLTED JOINT USING QUASI-STATIC MODAL ANALYSIS

Emily Jewell, Matt Allen (Mentor), Engineering Physics

Bolted joints in assembled structures are responsible for significant damping in built-up structures which gives rise to nonlinear behavior. Additionally, the effective stiffness and damping at the joint are typically unknown which creates uncertainty in the modeling process. Consequently, improved modeling methods are desired that will address the nonlinearity of the jointed structure while also providing reasonable predictions of the effective stiffness and damping of the joint as a function of loading. One such proposed analysis method is quasi-static modal analysis (QSMA), which has previously shown promising results on models with bolts represented by discrete slider elements. This work explores the efficacy of QSMA for 2D and 3D finite element models.

EARLY CHANGES IN GENE EXPRESSION IN AIRWAY EPITHELIAL CELLS FOLLOWING HUMAN RHINOVIRUS INFECTION

Alyssa Joachim, James Gern (Mentor), Pediatrics

Human rhinoviruses (HRVs) infect the respiratory system of humans and are the cause of the majority of common colds. There are over 100 types of rhinoviruses, divided into 3 families: A, B, and C. Past studies have investigated cellular responses at 24 hours post-infection when cells begin to release inflammatory factors; however, this study examined how rhinovirus infection of human epithelial cells in vitro at early time points of 4 and 8 hours affected cellular function as depicted by changes in RNA expression levels and protein quantification. We studied this by infecting three 12-well plates of epithelial cells, each plate from a different donor, with RV-A, RV-B, and RV-C. We then used RNA sequencing to determine how gene regulation was affected within the host cells at each time point. With this information we were able to find pathways that may be involved in the cellular responses. This study allowed us to look at how cells immediately respond to infection and develop further studies to investigate how this impacts the course of the infection.

THE ASSOCIATION BETWEEN PROFESSIONAL SUPPORT AND PARENTING STRESS IN PARENTS OF CHILDREN WITH ASD

Haley Johnson, Sigan Hartley (Mentor), School of Human Ecology

Parents of children with autism spectrum disorder (ASD) frequently interact with healthcare professionals due to their child's ASD-related services and behavior problems. In the current study, 185 married couples from Wisconsin that have a child with ASD (aged 5–12 years) self-reported how much positive and negative support they received from healthcare professionals. Results indicated that mothers reported a significantly higher level of positive ($t(373) = 14.69$, $p < .001$) and negative ($t(372) = 18.76$, $p < .001$) support from healthcare professionals than fathers. Negative support from healthcare professionals, in particular, was significantly associated with level of parenting stress in mothers, $b = 0.45$, $t(182) = 2.58$, $p = .011$, after controlling for child behavior problems. Results have implications for supporting families of children with ASD.

COMPUTATIONAL STUDY ON THE EFFECT OF AC GATE VOLTAGES ON SI/SIGE QUANTUM DEVICES

Noah Johnson, Mark Eriksson (Mentor), Physics

Quantum information represents a new path for probing our understanding of the fundamental properties of quantum mechanical systems and highlights the possibility of harnessing these systems for a new type of computer, a quantum computer. One system being utilized for the basic unit of quantum information, or a qubit, is a Si/SiGe double quantum dot. My project involves computationally studying the effect of electrical ac gate voltages on the time evolution and qubit gate fidelities, a measure of the gate's merit, of the double quantum dot hybrid qubit in silicon. My work will become an interface tool for use directly in the lab in order to determine optimal settings for the control parameters being implemented in experiments on the qubits along with their theoretical results.

FAMILY DRAWINGS AND ATTACHMENT IN YOUNG CHILDREN WITH JAILED PARENTS

Nicole Johnson, Luke Muentner, Julie Poehlmann-tynan (Mentor), Family Studies

The goal of the present study was to examine children's family relationships when parents were incarcerated. The study included a subsample of 44 children, ages 2 to 6 years, with currently jailed parents. Children were assessed at home with the Attachment Q-sort and Family Drawing protocol; the children's drawings have been coded and are included in this preliminary analysis. Children's attachment security scores were similar to studies with clinical samples, but there was no relation between children's security scores and the family drawing codes.

PYRUVATE CARBOXYLASE CONTROLS HABITUATION LEARNING

Laura Johnson, Marc Wolman (Mentor), Zoology

Animals are constantly bombarded with sensory stimuli and to behave appropriately, their nervous system must filter unimportant stimuli. For this, all animals exploit a fundamental form of learning, called habituation, which is observed as a progressive response decline to repetitive, yet insignificant stimuli. Despite its conservation and relevance to prevalent mental health disorders, the molecular-genetic pathways that regulate habituation remain unclear. We performed a genome-wide screen for zebrafish mutants that show reduced habituation and identified pyruvate carboxylase a (pcxa) as a critical regulator. Pyruvate carboxylase is a mitochondrial enzyme that stimulates the TCA cycle and production of its many biological derivatives. Here, we describe results from experiments that aim to determine the critical timing and derivatives of pcxa activity that are required for habituation.

CHARACTERIZATION OF GNRH NEURONS DERIVED FROM STEM CELLS: PULSATILE HORMONE RELEASE

Courtney Johnston, Ei Terasawa-Grilley (Mentor), Pediatrics

GnRH in the hypothalamus is released in a pulsatile manner at ~60 min intervals and plays a key role in the regulation of reproduction. Previous studies in this lab showed that primary GnRH neurons derived from monkey embryos also release GnRH in a pulsatile manner. Because, recently this lab was successful in generating GnRH neurons from human stem cells, the present study examines whether GnRH neurons derived from stem cells behave like primary GnRH neurons. This is done using a perifusion experiment of stem cell derived GnRH neurons, from which samples are collected at 10 min intervals followed by a radioimmunoassay. The hypothesis to be tested is that the GnRH neurons derived from stem cells will behave like primary neurons and exhibit similar properties.

RECURRENT NEURAL NETWORKS ON IBM TRUENORTH FOR OPTICAL FLOW

Erik Jorgensen, Mikko Lipasti (Mentor), Electrical and Computer Engineering

IBM's TrueNorth neurosynaptic system provides an appealing platform for deploying numerical algorithms for ultra-low power, real time, and mobile applications. A recurrent Hopfield neural network is used to solve for the Moore-Penrose matrix pseudoinverse to solve a broad class of linear optimizations. The TrueNorth hardware platform is heavily constrained through weight quantization and severely limits range and precision of numerical representation and computation. We show that a flexible, robust, and real-time implementation of an optical flow algorithm can be deployed on TrueNorth with minimal resource allocation and high energy-efficiency. These results show promising potential for TrueNorth as an ultra-low power generalized matrix inverse calculator.

THE IMPORTANCE OF HAND HYGIENE IN PREVENTING INFECTION

Evan Juntunen, Infectious Disease

The spread of infection between patients and health care professionals is the cause of millions of illnesses and thousands of deaths per year. Hospital-borne infections can usually be prevented through the proper use of hand hygiene and protective gear by health professionals. The Hand Hygiene study was intended to standardize methods of preventing infection while assessing its use by health care professionals. I used direct observation to observe the ways in which health care professionals applied such gear and used different methods of hand washing. The data in this study can be used to determine errors in the current standardized approach to preventing infection, and could also be used as a base for similar research studies.

MESENCHYMAL STEM CELLS DERIVED EXOSOMES EDUCATED MACROPHAGES TO TREAT GRAFT VERSUS HOST DISEASE

Sabrina Kabakov, Christian Capitini (Mentor), Pediatric Oncology

Graft versus host disease (GVHD) is one of the leading causes of mortality in patients post-Bone Marrow Transplant (BMT). Currently, when patients reach severe GVHD levels, they are treated with corticosteroids that suppress the immune system and, therefore, mitigate the positive aspect of GVHD, graft vs. tumor (GVT) effect that several patients need to achieve remission after BMT. Recently, human Mesenchymal Stem Cell (MSC) derived exosomes were discovered to regulate the immune system and enhance anti-inflammatory response to GVHD. In addition, our lab previously demonstrated that co-culturing MSCs with macrophages, led to a novel type of macrophage that decreased the effects of GVHD. MSCs can eliminate the need for corticosteroids, and allow for the positive effects of GVT to continue. We hypothesize that MSC derived exosomes educated macrophages (MeEMs) would have the same effect, if not better than our previously used MSC educated macrophages. To determine if MeEMs will have an anti-inflammatory response against T cells, the main immunological cause of GVHD, we are testing the cellular markers via flow cytometry using markers: CD80, CD86, CD252, PD-L1 and PD-L2 and protein expression via ELISA using markers: IL-10, TGF beta, and IL-6. After in vitro analysis, we will study GVHD in a previously extablished mouse model through analyzing peripheral blood, spleen, and other mouse tissues to determine if the same anti-inflammatory effect is still present. Results of this study could show that MeEMs are a potential way to treat GVHD and will be a step towards developing a novel cellular therapy using MeEMs to manage symptoms of GVHD.

E. COLI CONTAMINATION OF THREE DRINKING WATER SOURCES FOLLOWING NATURAL DISASTER IN RURAL ECUADOR

Joshua Kalman, Caden Lambie, Amelia Rossa, Catherine Woodward (Mentor), Botany

Many natural disasters result in compromised water supply systems; the April 16, 2016 earthquake in Ecuador hindered clean water access to coastal, rural communities. Our study observed and field tested bottled, filtered, and unfiltered water sources shared among small communities near Tabuga, Ecuador. Following the membrane filter to agar media sampling protocol, bottled and filtered water sources were found to be less contaminated with Escherichia coli than unfiltered sources. We offer guidelines on maintaining the functional integrity of water filters and advocate a support network for their integration and persistence. To allocate relief materials where they are most needed, we support a quantified, categorized contamination guideline for the implementation of need-based drinking water resources in similar public health scenarios.

MEALTIME STRATEGIES FOR CHILDREN WITH AUTISM SPECTRUM DISORDERS: OBSERVED AND REPORTED BEHAVIORS

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

Mealtime is affected in families with children with autism spectrum disorders (ASD) as they report negative mealtime behaviors, increased focus on the child with ASD, and increased stress levels. This study identified and triangulated parent reported and observed strategies used to support children's mealtime participation. Twelve families with a child between the ages of 2 and 7 years with ASD participated in videotaped mealtime observations and semi-structured interviews. Videos were reviewed using qualitative conventional content analysis, while transcribed parent interviews used thematic analysis. Similarities and differences were found when comparing the observed and parent-reported mealtime strategies to support their child. Understanding the relationship between parent-reported and observed mealtime strategies will support the development of family-centered interventions to promote mealtime participation for children with ASD.

LIKE SHOUTING IN A SNOWSTORM

Steven Kaplan-Pistiner, Lisa Gralnick (Mentor), Art

I have been investigating the traditions and history of the fields of metalsmithing and printmaking I worked to analyze systems of power and how they manifest in ornamentation, pattern, and the objects we carry with us. Through innovative and new experimentations in lithography and enamel work, I have been able to utilize symbols and iconography otherwise unavailable to metalsmiths. Like Shouting in a Snowstorm is a body of work that explores the duality of permanence and the ubiquity of being lost. In these works, patterns and megalithic symbols of triumph and endurance manifest themselves in diminutive and wearable ornament, brought together both because of and in spite of the histories that dictate their form.

STRUCTURAL MECHANISMS UNDERLYING ETHANOL'S ACTIONS

Sritejasvinithi Karimikonda, Cynthia Czajkowski (Mentor), Neuroscience

Since its discovery, alcohol has been consumed and produced by humans. In a recent survey on drug use, close to 90% of people ages 18 or older stated that, at some point in their lifetime, they drank alcohol (NSDUH). Despite alcohol's widespread use, how alcohol exerts its behavioral effects (e.g. sedation, intoxication, anesthesia) remain unclear. Alcohol, chemically known as ethanol, interrupts brain function by changing how neurons in the brain send signals throughout the brain and to the rest of the body. Many effects of ethanol are mediated by binding to typeA γ-aminobutyric acid receptors (GABAARs) in the brain. GABAARs are pentameric ligand-gated ion channels that inhibit neuronal signaling. Ethanol enhances the function of GABAARs but the precise mechanisms underlying how ethanol modulates GABAAR activity are still unknown. Recently, high-resolution crystal structures of a prokaryotic homopentameric ion channel GLIC, were determined in the absence and presence of ethanol. Due to the structural and functional similarities between GLIC and GABAARs, GLIC can be used as a model to study how ethanol binding induces structural changes in the GABAAR that enhances its function. I will use electron paramagnetic resonance (EPR) spectroscopy to map ethanol-mediated motions in GLIC. My experiments will reveal the structural mechanisms underlying alcohol's potentiating actions, which will provide new insights into how alcohol mediates its actions in the brain.

THE SMALL RADIO TELESCOPE THAT COULD: THE MILKY WAY RADIAL VELOCITY DIAGRAM AT 21CM

Celeste Keith, Christopher Anderson, Doreen Beeler, Emily Brewer, Nathan Eggen, Nathaniel Hilliard, Celeste Keith, Sean Kelley, David Nestingen-Palm, Nikki Noughani, Matthew Thornton, Bo Yang, Snezana Stanimirovic (Mentor), Astronomy

Using the 21-cm atomic hydrogen line from interstellar gas, we measure emission intensity across various lines of sight over the Milky Way disk with the 2.3-meter Small Radio Telescope (SRT). Our goal is to produce the I-Vr diagram which shows the overall rotation pattern of the Milky Way, as well as its large scale spiral-arm structures. We measured hydrogen spectra every three degrees along the Milky Way plane. For each spectrum, the observed frequency was converted to radial velocity using the Doppler equation. We used the calibration diode to estimate the spectral filter shape. We find that our observations are in agreement with previous I-Vr works using larger, more robust observing systems. This shows that the SRT system produces reliable and consistent observations.

EYEWITNESS IDENTIFICATION ACROSS THE COUNTRY

Hailey Kertscher, Lucie Butner (Mentor), School of Law

Since there is not one standard protocol for eyewitness identification and testimony in the U.S., it is important to assess the different methods being utilized in given states, as well as assess their effectiveness. Our team has gathered police reports, photo lineups, and other case materials from states across the country that have different protocols, and we have set up a coding instrument through Microsoft Excel in which we can compare cases. In any given case, we look at what kind of identification was used (live lineup, photo lineup, show, etc.), whether or not the eyewitness testimony was used, if the lineup was double blind, etc. This is an important study that may expand knowledge on the use of eyewitness testimony, the methods by which they are obtained, and the validity of varying protocols.

GENERATION OF CHD8 KNOCK-OUT HUMAN IPS CELLS USING CRISPR/CAS9 SYSTEM

Jason Kim, Qian Bu (Mentor), Waisman Center

Chromodomain helicase DNA binding protein 8 (CHD8) plays an important role in early cerebral cortical development through the regulation of prenatal genes of the cell cycle and WNT/beta-catenin signaling. Previous studies showed de novo mutations of CHD8 have been linked to Autism Spectrum Disorder (ASD) and mice heterozygous for CHD8 mutations manifesting ASD-like behaviors. To demonstrate the role of CHD8 in human cerebral cortical development, I will use the CRISPR/Cas9 system combine with puromycin selection scarless gene editing methods to insert a stop cassette in the CHD8 exon 2 loci to knock out this gene in the human induced pluripotent stem cells (iPSCs). This new cell line then can be used as a human model to study and find treatments to diseases and conditions related to the lack of expression of CHD8.

INVESTIGATING THE ROLE OF GLFT2 IN MYCOBACTERIAL CELL WALL ASSEMBLY

Lili Kim, Laura Kiessling (Mentor), Chemistry

The disease tuberculosis remains difficult to treat, possibly due to the thick, complex cell wall of its causative agent Mycobacterium tuberculosis (M. tb). A core component of this cell wall is the galactan carbohydrate polymer. In M. tb, galactan elongation is mediated by the galactofuranosyltransferase GlfT2. Previous data from enzymatic and cell wall assays suggests that GlfT2 controls the length and linkages of the galactan intrinsically. However, this hypothesis has yet to be tested in vivo. Though the function of GlfT2 is evolutionarily conserved, galactan patterns vary across species. By transferring GlfT2 homologues into Mycobacterium smegmatis and performing phenotypic analysis, we can determine whether galactan features are controlled by GlfT2 alone or if it is influenced by other components of the cell wall synthesis pathway.

INVESTIGATING THE EFFECTS OF ALL-TRANS RETINOIC ACID ON PIN1 AND ERα PROTEIN IN BREAST CANCERS

Alexandra Kissel, Natalia Solodin (Mentor), Oncology

Estrogen receptor-alpha (ERα) regulation is crucial to the effectiveness of endocrine therapy in ERα-positive breast cancer. Pin1 regulates numerous proteins' functions and abilities within the cell and has been shown to control ERα protein levels post-translationally by interacting with the serine 118 phosphorylation site. Pin1 attenuates the effectiveness of ER-targeting drugs, leading to tumor growth. A direct inhibitor of Pin1 would make endocrine therapy overall more effective for breast cancer. A few inhibitors are known, but none have produced realistic treatments. A recent paper suggests that all-trans retinoic acid (ATRA) inhibits and degrades active Pin1. Our initial investigation of this study has shown contradictory results. Our goal is to determine the effects ATRA has on ERα and Pin1 in ERα-positive breast cancer.

FALSE FEEDBACK AS A POTENTIAL MOTIVATOR FOR TASK PERSISTENCE

Victoria Klaas, C. Shawn Green (Mentor), Psychology

Perseverance of effort is related to various positive life outcomes. While much of the work on this domain has focused on how an individual's internal personality contributes to persistence, here we investigated how information obtained from the outside world affects persistence. College students completed an ambiguous novel-object classification task in which they were given false feedback reflective of different levels of ability and/or learning. Our hypothesis was that feedback indicating higher rates of learning would lead to greater persistence at the task due to the individuals' belief that continued effort would result in even higher levels of performance. Future research may lead to the use of false feedback strategies that can promote persistence across real life situations, such as physical therapy and rehabilitation.

CAN COGNATES TRIGGER CODE-SWITCHING?

McKenzie Klein, Margarita Kaushanskaya (Mentor), Communicative Sciences & Disorders

Code-switching is a frequently utilized phenomenon in bilingual communication characterized by a shift from one language to the other. This study looked to experimentally assess whether code-switching is triggered by language co-activation. Co-activation was induced by having bilinguals produce cognates, pairs of words that sound similar and share meaning across two languages such as "plant" in English and "planta" in Spanish. English-Spanish bilingual adults were asked to produce sentences based on images of cognate or non-cognate objects. If code-switching can be triggered by the co-activation of the non-target language, then the images containing cognates will elicit more code-switches and likely more pauses and repetitions. This study will yield insight into the phenomenon of code-switching, and will help to further understand why bilinguals often switch languages.

MANAGEMENT RECOMMENDATIONS FOR LARGE FELIDS IN MEXICO BASED ON TECHNIQUES APPLIED AROUND THE WORLD

Valerie Knurr, Kristina Kennedy, Rachel Larson, James Berkelman (Mentor), Forest & Wildlife Ecology

Large felids are important in maintaining ecosystem equilibrium and regulating prey population sizes. However, populations of felids, specifically pumas (Puma concolor) and jaguars (Panthera onca) in Mexico, are threatened by habitat fragmentation due to demographic isolation, urbanization, agricultural practices, and other human-caused habitat alterations. Large carnivore populations must be preserved but also managed to minimize conflict with humans and livestock. These complex relationships require an array of management strategies, such as regulated harvest, eradication, and preservation. We compare and contrast these techniques for large felids around the world, while focusing on cases in the United States and Mexico. Based on our findings, we provide suggestions to improve management strategies of pumas and jaguars in Mexico.

GENERATION OF GNRH NEURONS FROM HUMAN STEM CELLS

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

Hypothalamic gonadotropin releasing hormone (GnRH) neurons regulate puberty onset and reproductive function. Impaired fibroblast growth factor 8 (FGF8) signaling has been shown to result in either the absence or reduction of GnRH neurons in individuals with hypogonadotropic hypogonadism. We hypothesized that the treatment of human pluripotent stem cells (hPSCs) in vitro with FGF8 following duel-SMAD inhibition of bone morphogenic protein/transforming growth factor β (BMP/TFGβ) signaling would result in the generation of GnRH neurons. To test this hypothesis, we treated hPSCs with FGF8 post duel-SMAD inhibition of BMP/TGFβ signaling. Immunocytochemical characterization and confocal microscopy analysis of differentiated cell colonies indicate that sequential BMP/TFGβ signaling inhibition and FGF8 treatment is effective in inducing GnRH neurogeneration. An anterior forebrain neuroprogenitor intermediate is not necessary for GnRH neurogeneration.

DEVELOPMENTAL AND PSYCHOSOCIAL FUNCTIONING AT 24 MONTHS IN CHILDREN OF MOTHERS WITH PPD

Mallory Kopp, Nicole Johnson, Thomas Pearson-Green, Roseanne Clark (Mentor), Psychiatry

Postpartum depression (PPD), a significant public health concern affecting 10–15% of mothers, has been associated with difficulty in maternal provision of sensitive and responsive care for her infant. PPD can persist, contributing to risk for developmental delays/ disturbances in children. This study examines whether positive mother-infant interactions promote better developmental outcomes for 90 children whose mothers experienced PPD. Mother-infant interaction quality was assessed using the Parent-Child Early Relational Assessment (Clark,1985) to systematically rate affect and behavior. Children's developmental outcomes were evaluated at 24 months using the Bayley Scales of Infant Development II and the Infant-Toddler Social-Emotional Assessment (Carter et al, 1999). Preliminary evidence suggests that length of exposure to maternal depressive symptoms, maternal history of relational trauma and education, contribute to differential outcomes for children.

NEURONAL REACTIVATION IN THE CA3 HIPPOCAMPAL REGION IN MEMORY FORMATION DUE TO PATTERN COMPLETION

Marissa Korte, Lauren Peretz, Peter Lipton (Mentor), Neuroscience

The purpose of our research is to discover the circuit-level mechanism in the CA3 hippocampal region of the brain used to recall an event from viewing a small portion of the event (a partial cue). There is support that a partial cue activates a subset of the cells in the CA3 region that were previously activated by an original stimulus. We used immediate early gene (IEG) expression in the cells of the CA3 region to determine whether recall from a partial cue is associated with activation of the original cellular representation of the event and, further, to determine whether the degree of recall is related to the degree of overlap between the cell patterns activated during recall and during the original stimulus.

WORDS LIKE LEAVES: AN INTRODUCTION TO CLASSICAL JAPANESE POETRY AND ITS RELEVANCE TODAY

Olivia Kostreva, Charo D'Etcheverry (Mentor), Asian Languages & Cultures

This project aims to introduce a type of traditional Japanese poetry, called *waka*, through the analysis of a poem from the classical epic, "The Tales of Ise." In its tone and form this verse showcases the poetic conventions of the day. It also achieves the ultimate goal of much of classical Japanese poetry: self-expression by means of the world around us. By describing a familiar scene at night, the speaker makes his feelings accessible to all people, even to modern readers over one-thousand years later. It may further serve as an example of how to understand and express our own feelings.

CHARACTERIZING HETEROTROPHIC ORGANISMS GROWING IN COCULTURE IN AUTOTROPHIC CONDITIONS

Janavi Kotamarthi, Natalie Cook (Mentor), Civil & Environmental Engineering

The lab has been enriching for nitrifying organisms in a nitrite media. After the nitrite is converted to nitrate, we then plate these organisms on agar plates, and over several generations we are going to attempt to select for individual heterotrophic organisms on these plates. We are attempting to determine if the heterotrophic organisms we've selected on the plates are somehow producing their own carbon source or if the Nitrite oxidizing bacteria are somehow producing carbon that the heterotrophs are consuming. We will pick cultures from the plates and put them into 100 ml of the liquid media. Our goal is to see if nitrification will occur with and without a carbon source and if these heterotrophs can grow alone in the new media.

EFFECTS OF CALORIC RESTRICTION ON GLYCEMIC REGULATION IN RHESUS MONKEYS

Maddie Kruk, Joseph Kemnitz (Mentor), Cellular & Regenerative Biology

Effects of moderate caloric restriction on glycemic regulation have been evaluated longitudinally since 1989 in a project on aging and health of rhesus monkeys. Control subjects (C) were allowed to eat ad libitum, while restricted animals (R) were fed 20–30% less than their individual baseline levels as measured during young adulthood. Metrics that showed improvement after restriction for R compared to C animals include basal blood glucose and insulin concentrations, insulin sensitivity and insulin secretion in response to glucose challenge, and glucose tolerance. Restriction protected against development of type 2 diabetes mellitus. In future research, the effects of calorie restriction and aging on molecular markers of pancreatic beta cell function will be examined in tissue collected at necropsy from C and R monkeys.

HEAT TRANSFER IN A BASAL SYNAPSID WITH A SOFT TISSUE SAIL FORMED BY HYPERTROPHIED NEURAL SPINES

Aaron Kufner, David Lovelace (Mentor), Geoscience

Soft tissue sails formed by hypertrophied neural spines occurred in many clades of tetrapods including Archosauria, Temnospondyli, and Synapsida. It has been suggested that this sail may have been used for thermal regulation, sexual display, or species recognition. To quantify the heat transfer capabilities of the sail, we subjected a sailed and non-sailed 3D model to computational fluid dynamics (CFD) simulations using the program ANSYS Fluent to generate a heat transfer coefficient (HTC) for each model. We used these coefficients to determine potential physiological behaviors using the model Niche Mapper, and compared the results to those generated from HTCs derived from volumetric models within Niche Mapper. These results could shed light on the early evolution of thermal regulation in stem-mammals.

CREATING AN IN-VITRO MODEL OF THE AORTIC VALVE

Christine Kujawa, Kristyn Masters (Mentor), Biomedical Engineering

Advanced age is the strongest risk factor for Calcific Aortic Valve Disease (CAVD). Changes in the ECM of aortic valves are seen with increased age, but age has not yet been incorporated into in-vitro models of the aortic valve. The heterogeneous cell population of the valve is also something that has not been implemented in studies with CAVD. In this project, an aged ECM is created through the use of collagen gel treated with advanced glycation end products (AGEs), which increase with age. To create a more holistic model of the valve, a co-culture of both activated and quiescent VICs (aVICs, qVICs) is seeded on these gels. High cholesterol, another risk factor for CAVD, is introduced into the model by treating the culture with oxLDL. This model is an important tool because it will allow us to more thoroughly understand how the combination of risk factors, such as increased levels of oxLDL and age related changes in the ECM, contribute to the onset of CAVD. Ongoing work will include the use of methacrylated gelatin (gelMA) instead of collagen so that the mechanical properties of the gels can be tailored to model age related changes in ECM architecture.

TAGGING VIMENTIN AT THE GENOMIC LEVEL FOR MODELING IN MICE AND IN VITRO

Kailee Kujawski, Darcie Moore (Mentor), Neuroscience

Vimentin is an intermediate filament of the cytoskeleton that is asymmetrically inherited by the daughter cell during stem cell division. However, it remains unclear whether or not the inheritance of vimentin causes decreased proliferation. Previously, the only way to image vimentin in vitro was to genetically overexpress it along with a fluorescent tag and view it under a fluorescence microscope. However, this overexpression has been found to affect the localization of vimentin in dividing cells, and may affect the cell's physiology. A novel cloning technique, CRISPR-Cas9, allows scientists to edit a protein at the genomic level without disrupting the cell's basic biology. We intend to utilize this mechanism to add a fluorescent tag to endogenous vimentin, making it possible to visualize this protein without overexpression.

A STUDY IN YELLOW: THE TRANSFORMATION OF TURMERIC FROM SPICE TO SUPERFOOD

Meghna Kurup, Claire Wendland (Mentor), Anthropology

Plant-based medicines are central to many ancient healing traditions. In Indian Ayurvedic medicine, turmeric, a yellow root, has long been recognized as both a treatment for conditions as disparate as migraines and bone fractures and for its colorful uses in religious worship and offerings, purification ceremonies, and sacrificial rites by South East Asians. Today, turmeric has emerged as something akin to a "superfood" in the United States. Disguised as supplements and invigorating lattes, turmeric has become a popular phenomenon and commercial health-food success. Meanwhile, biomedical studies have just begun to investigate its efficacy. This study will offer insight into how traditional Indian knowledge of turmeric percolates through a society across the Atlantic, and how aspects of knowledge and practice are altered or lost in translation.

SOCIAL IDENTITY AND TAKING UP SPACE: CONFIDENCE IN BLACK ADULTS WHEN COMMUNICATING WITH CLINICIANS

Natalie Kustner, Elisa Torres, Noah Weatherton, Linda Oakley (Mentor), Nursing

Social identity influences the health communication efficacy of patients and clinicians. Research shows that Black patients can believe clinicians do not listen carefully and are quick to draw assumptions. However, we do not understand how patient gender, body size, and race, as social identities, might influence the perceived health communication efficacy of Black patients. Our study of community Black adults explores the influence of these social identities on perceived health communication efficacy. In males, the relationship between body mass and perceived health communication efficacy is positive. In females, increased body mass is associated with decreased perceived efficacy. Emotions and environmental mastery mediate the association in both gender groups. In Black women, social identity appears to uniquely influence health communication efficacy.

DELETION OF PHOSPHATE TRANSPORTERS UP-REGULATED DURING POPLAR-MYCHORRIZAL SYMBIOSES BY CRISPR/CAS9

Jack Kwan, Kevin Cope (Mentor), Bacteriology

Global climate change is a major issue confronting the world. Alternative fuel sources are essential for mitigating this problem. Poplar trees are a potential source of lignocellulosic biofuel, and due to their association with mychorrhizal fungi, they can be grown sustainably on marginal land. However, the molecular mechanisms controlling poplar-mychorrhizal associations are poorly understood. Therefore, we sought to optimize a CRISPR/Cas9 genome editing system in poplar to perform candidate gene knock-out studies. We designed and synthesized small guide RNAs targeting a beta-glucuronidase transgene in poplar. These sgRNAs were cloned with Cas9 and a green fluorescent protein into a binary vector. We are utilizing Agrobacterium rhizogenes-mediated transformation to incorporate these components into poplar to validate CRISPR/Cas9 genome editing efficiency.

SOIL ORGANIC MATTER CONTENT IN PRAIRIE VS AGRICULTURAL SOILS

Bryce Lackey, Edward Boswell (Mentor), Biological Systems Engineering

Measuring the soil organic matter content of soils can help evaluate the effectiveness of land restoration practices. In this study, I will compare the soil organic matter content of soils collected from an agricultural field and an adjacent 15-year old restored prairie at the Pope Farm Conservancy in Verona, WI. I will measure soil organic matter content at two soil depths (0–5 and 5–10 cm) in each of the land management types using the weight loss-on-ignition method. Additionally, a correction factor will be determined to arrive at an estimate of soil organic carbon content, which could help inform future studies.

THE COW PROJECT: TRANSFORMING UGANDAN AGRICULTURAL PRACTICES

Jacquelyn Laitsch, Helena Record, James Ntambi (Mentor), Biochemistry

In order to create a space for agricultural innovation in the village of Lweza, Uganda, a Rural Agriculture Resource Demonstration Center (RARDC) was constructed by students from the University of Wisconsin–Madison in 2014, during a global health field experience course. Located within a community that relies primarily upon subsistence farming for nutrition, the RARDC functions as a garden through which modern and efficient agricultural methods can be tested, taught, and disseminated. The ultimate goal of the RARDC is to empower local farmers, especially women and unemployed youth, by improving economic and food security. Our project aims to maximize crop output and promote sustainability of the RARDC through the addition of four cows and a cow crown. Used together, the cows enhance the quality of fertilizer while the cow crown improves the quality, quantity, and ease of fertilizer collection. Thus far, the addition of cows to the RARDC has drastically improved soil quality, resulting in a noticeable increase in crop yield. By enhancing economic and food security, our project works to reduce the prevalence of unemployment, poverty and malnutrition in the village of Lweza, Uganda.

PERCEPTION OF EMOTION EXPRESSION IN CLINICAL POPULATIONS

Andrew Langbehn, Paula Niedenthal (Mentor), Psychology

When we observe a facial expression of emotion, we often mimic it. This automatic mimicry supports accurate emotion recognition. Acute facial paralysis caused by nerve damage, bell's palsy, or other neurological disorders disrupts the normal production of facial expressions. We predict that this disruption in the production of facial expressions also disrupts the recognition of facial expressions in others. The goal of the current research is to quantify through photography, videography, and emotion recognition tasks the ability of people with facial paralysis and a population of healthy controls to interpret facial expressions of emotions. A representative population of 80 participants will be tested. This work will give us insight into the processes of emotion recognition, allowing for better treatment for patients suffering from facial paralysis.

EXPIRED BREATH 13C- DELTA VALUE AS AN INDICATOR OF METABOLIC STATUS IN PERFORMANCE TRAINING

Jordyn Laufenberg, David Eide (Mentor), Nutritional Sciences

Advancements in the measurement of the 13C/12C isotope ratio of expired breath CO_2 provides a new opportunity for non-invasive, individualized feedback regarding energy status and macronutrient metabolism. CO_2 is a waste product of the oxidation of organic compounds in the body, thus breath testing can be used to monitor changes in the rate of oxidation of carbohydrates vs. lipids, assuming that protein is small and constant. Taking into consideration that lipid carbon contains relatively less 13C than that of carbohydrates, isotope ratios may be useful in tracking reliance on lipid oxidation vs. carbohydrate, in a practical training situation. The aim of this study is to demonstrate the efficacy of 13°C/12°C isotopic ratio feedback and macronutrient metabolism counseling on improving athletic performance.

CHRONOTROPIC RESPONSE AND COGNITIVE FUNCTION IN A COHORT AT RISK FOR ALZHEIMER'S DISEASE

Lena Law, Ozioma Okonkwo (Mentor), Geriatric Medicine

The objective of this study was to examine the association of chronotropic response (CR) and heart rate recovery (HRR), two indices of cardiovascular function, with cognitive performance in a cognitively healthy, late-middle-aged cohort at risk for Alzheimer's disease (AD). Ninety participants underwent exercise and neuropsychological testing. Analyses revealed significant associations between CR and cognition in three domains. However, HRR was not significantly associated with cognitive function. These findings indicate that, in this cohort, CR is a stronger correlate of cognition than HRR. Overall, this study reinforces the idea that cardiovascular health plays an important role in cognitive function, specifically in an at-risk cohort; and interventions that promote vascular health may be a viable pathway to preventing or slowing cognitive decline due to AD.

ANALYSIS OF DEFECTS IN CRYSTALLINE SILICON-GERMANIUM NANOMEMBRANES

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

Silicon-Germanium (Si1-xGex) 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.

THE DIAGNOSTIC SIGNIFICANCE OF CONFESSIONS IN SHAKEN BABY SYNDROME

Hanjoo Lee, Keith Findley (Mentor), School of Law

The main objective of this project is to determine which cases of Shaken Baby Syndrome involve coerced or manipulated confessions. The medical diagnostics of SBS (Shaken Baby Syndrome) have been put under question due to biomechanical engineers' inability to recreate its three main symptoms, subdermal hematoma, subdermal edema, and retinal hemorrhaging. Thus, researchers have focused on court cases involving suspects who confess to causing a baby's injury through shaking and using evidence from those cases to prove SBS symptoms. So, this research is to make sure that these cases have legitimate confessions that were not at all manipulated. Methods in achieving this objective is to develop code for a qualitative analysis software (MAXQDA) to determine the kind of interrogation method an officer uses to correlate it to a certain outcome of a confession (being manipulated or not). For results, we expect a correlation between different methods of police interrogation to certain suspect outcomes, overall we expect to be able to determine actual evidence of SBS and finally give conclusive medical evidence for SBS.

THE INFLUENCE OF LEAN MASS ASYMMETRY ON JUMP LANDING FORCE ASYMMETRY

Hana Lee, David Bell (Mentor), Kinesiology

Lean mass is an important component of strength. However, between limb differences may negatively influence performance and increase injury risk during athletic tasks. The countermovement jump is a functional test that requires strength and flexibility, and provides information relative to sports performance. Previous research has examined the influence of between limb lean mass asymmetry (LMA) on force and power asymmetry during the take-off phase of jumping. The results indicated that lean mass is a significant factor to force and power production, and explained some of the variance for force and power output. However, it is unclear if the same relationship would be seen during landing, where injury occurs. The purpose of this study is to investigate LMA and the relationship to landing force asymmetry.

STUDY OF ESTROGEN'S EFFECT TOWARDS PAR1 EXPRESSION

Sang Yoon Lee, Will Ricke (Mentor), Urology

Estrogens are involved in normal and pathologic growth of the prostate. Protease-activated receptors (PARs) are associated with various types of disease. While the expression of PAR1 has been studied in prostate cancer, whether its expression is hormone-regulated is unknown. The objective was to investigate the effects of estrogen on PAR1 expression in prostate cancer. To determine if PAR1 expression is regulated by estrogen, various human prostate cells (including non-tumorigenic and tumorigenic) were treated with estradiol-β for 24 hours and RNA was collected. PAR1 mRNA levels were measured by RT-qPCR analysis. Estrogen treatment induced an upregulation of PAR1 in highly-tumorigenic cell lines compared to the untreated cells. This study concludes that PAR1 is regulated by estrogens and this effect occurs primarily in aggressive prostate cancer.

CAN LEARNING THAT BIAS IS CUMULATIVE HELP WHITE PEOPLE BE MORE RECEPTIVE TO BLACK PEOPLE'S CONCERNS?

Oliver Lees, Patricia Devine (Mentor), Psychology

The current sociopolitical climate highlights interracial tension as a pressing issue. In order to reduce these tensions, it is important to understand their source. We suggest one source of tension comes from White and Black people evaluating the same event differently, with White people viewing any given event as an isolated incident, and Black people seeing it as contributing to a cumulative lifetime of similar incidents. We are exposing participants to a manipulation of these perspectives, and subsequently having them analyze scenarios in which Black people confront perceived racial slights. If, as we expect, participants exposed to this manipulation view these confrontations as more justified than the control group, then the present study can have implications that open the door for conversations about racial bias.

NPU STRESSOR TASK: EVALUATING A SURROGATE ENDPOINT FOR STRESS MECHANISMS IN SUBSTANCE USE DISORDERS

Jansen Legreid, John Curtin (Mentor), Psychology

Most smokers attempting to quit are unsuccessful. Research reliably demonstrates a relationship between stress and relapse of smoking; however, little research has examined stress reactivity in addicted individuals and whether individual differences in startle potentiation can predict success in a smoking cessation attempt. This current study examined stressor reactivity via startle potentiation during the No-Shock, Predictable Shock, Unpredictable Shock (NPU) cued shock stressor task to evaluate its validity as a surrogate endpoint. Overall stressor reactivity (i.e., average of unpredictable and predictable startle potentiation from the NPU stressor task) and selective unpredictable stressor reactivity (i.e., unpredictable startle potentiation minus predictable startle potentiation from the NPU stressor task) were examined as predictors of continuous abstinence during a two-week smoking cessation period to evaluate their validity as surrogate endpoints for smoking relapse. Furthermore, nicotine deprivation status at the time of the NPU stressor task was examined as a predictor of continuous abstinence as well as moderating effects of stressor reactivity on this clinical outcome.

ELECTROCHEMICAL STUDIES OF HYDROGEN IONS IN MOLTEN FLIBE (LIF-BEF2)

Liu Leo, Francesco Carotti (Mentor), Engineering Physics

Tritium management is an important topic for the development of the Fluoride-Salt-Cooled High-Temperature Reactors (FHR). At high temperature, tritium penetrates the metal barrier of the heat exchangers and reaches the atmosphere through power generation facilities, leading to the environmental problems. We plan to develop electrochemistry techniques to understand the behavior of the tritium in FLiBe, the primary coolant in FHR. In this project, we are developing a method to introduce Hydrogen Ions, used as surrogate for tritium, in the molten FLiBe salt and measure its concentration with voltammetry experiments in the sealed electrochemistry reaction cell heated to a temperature of around 650 degree Celsius. We intend to see the concentration of Hydrogen Ions reaches a level sufficient to perform electrochemistry experiments for tritium transport.

STOCHASTIC SPATIAL MODEL FOR RESISTANCE EVOLUTION FOR BT CROPS

Kai Li, Craig Knuth, Karen Perez Hoyos, Wai-Tong Fan (Mentor), Mathematics

Bt crops are widely used genetically engineered plants that produce Bacillus thuringiensis (Bt) toxins to kill pests. Since they kill most, but not all, of susceptible larvae, the resistance allele can be rapidly selected. To decrease the rate of resistance evolution, the refuge strategy is often employed, in which host plants without Bt toxins are introduced into the Bt field to promote survival of susceptible pests. We develop stochastic spatial models for the interacting population dynamics of pests with different genotypes. These models offer insight into the mechanisms of resistance evolution, such as quantitative relationship between the rate of evolution and various model parameters including the size and spatial distribution of the refuge field and the initial level of resistance allele.

INTERACTION OF EURO-AMERICAN SETTLEMENT, VEGETATION PATTERNS AND SOILS IN THE NORTHERN MINNESOTA

Mengyu Liang, Joseph Mason (Mentor), Geography

From studying pollen and charcoal in lake sediments, scientists have reconstructed the past climate, fire frequency and intensity as well as the vegetation patterns in the state of Minnesota. They concluded that the climate was wetter 4,000 years ago and fire occurrence was less frequent, and both factors have led to forest invasion into prairie vegetation and shaped the modern day natural landscape in the region. An additional factor in understanding the past landscape's relation to the modern landscape is Euro-American settlement and land use in this region over the past two centuries. Both climate-and land-use-induced vegetation change have significantly affected soils, especially their storage of carbon. To reveal more about their interaction, Public Land Survey data and digital soil surveys will be used to study whether there is a mismatch between soil and vegetation patterns during the Euro-American settlement era. The spatiotemporal relationship between soil and vegetation patterns may reflect soils' delayed response to past vegetation change. The project will then compare the earliest aerial images to the modern day's images to study the early Euro-American settlement in relation to vegetation and soil, as well as whether this relation has been changing in recent decades. This research is needed in order to understand the effects of past vegetation change and human land use on soils and their carbon storage.

BREAKING DOWN BARRIERS: ASSISTANCE TO THE UW ODYSSEY PROJECT

MaKayla Liebeck, Emily Auerbach (Mentor), Division of Continuing Studies

This project involves working with the UW–Madison Odyssey Project, an award-winning college jumpstart program for adults who have faced financial and other barriers to continuing their education. Through my readings, meetings with faculty, and interviews with students, I am determining ongoing hurdles low-income students face after completing the Odyssey Project. I am researching scholarships and other funding opportunities, wrap-around services, and additional sources of help, especially for students who wish to continue their education at the UW–Madison and Madison College. I am perusing research papers, utilizing online resources, and meeting with representatives from scholarship offices and community services for students in the Madison area. I am creating a potentially life-changing document for Odyssey staff to use to inform students of options, contacts, and additional resources.

DROSOPHILA MODEL TO INVESTIGATE THE LONG-TERM EFFECTS OF BLUNT TRAUMA INFLICTED EARLY IN DEVELOPMENT

Jorgo Lika, David Wassarman (Mentor), Genetics

Traumatic injury is the leading cause of death between the ages of 1 and 46, making it a significant healthcare problem. Primary injuries due to blunt trauma (BT) induce cellular and molecular events that cause secondary injuries, which may promote death. Currently, there are no medical treatments to prevent secondary injuries from BT. We have developed a fruit fly (Drosophila melanogaster) model of BT with the goal of identifying cellular and molecular pathways that cause secondary injuries. Our approach is to characterize adult phenotypes that are caused by BT at the third instar larval stage of development. We found that BT causes melanization and death of larvae. Melanization is a well-characterized outcome of activation of the innate immune response. Moreover, we found that larvae that survive the primary and secondary injuries and develop to adulthood have a reduced lifespan. These data indicate that secondary injuries from BT persist for a long time and can be transmitted throughout development. We are currently determining whether activation of the innate immune response in larvae continues into adulthood and is causing the reduced lifespan. This study is the first step to discovering the mechanisms underlying secondary injuries and preventing them. Treatments that prevent secondary injuries should improve the morbidity and mortality of traumatic injury.

THE SEARCH FOR ASTROPHYSICAL TAU NEUTRINOS IN ICECUBE

Piper Lincoln, Shikhar Mittal, Donglian Xu (Mentor), Wisconsin IceCube Particle Astrophysics Center

A neutrino is a fundamental particle found in three distinct flavors: the electron neutrino, muon neutrino, and tau neutrino. Neutrinos from outer space are mass produced in astrophysical objects via nuclear processes. The origin of cosmic rays is still largely unknown after a century of discovery. Neutrinos are expected to be produced in violent collisions that occur at such cosmic ray acceleration sites. Because neutrinos are chargeless, they can point back to their source once detected. The IceCube Neutrino Observatory at the South Pole is built to detect astrophysical neutrinos, aiming to decode the origin of cosmic rays. We will present work that contributes to a better understanding of the properties of antarctic ice and assists in the discovery of astrophysical tau neutrinos in IceCube.

RIVER AND COASTAL ECOSYSTEM MANAGEMENT IN MEXICO

Analise Lindborg, Nevan Baus, Melissa Nelson, James Berkelman (Mentor), Forest & Wildlife Ecology

Freshwater is an invaluable resource, and very little of Earth's total freshwater supply is readily accessible for most species. Rivers are unique transport systems that provide accessible freshwater across continents and eventually influence coastal ecosystems. River deltas provide nutrients and important habitat for freshwater and marine species. They allow for the movement of anadromous fish, and provide sanctuary for marine species in developmental life stages. The quality of water output from rivers heavily influences the health of these coastal ecosystems. This paper uses case studies to explore the relationship between river management and subsequent coastal habitat quality near river deltas in Mexico. Based on practices implemented in the U.S., we make suggestions for how Mexican management of river and coastal ecosystems might be improved.

CORRELATING VISUAL EVOKED POTENTIAL AND OPTIC NERVE AXON COUNT IN GLAUCOMA

Jacob Lindemann, Gillian Mclellan (Mentor), Surgical Sciences

Glaucoma is a predominant cause of blindness worldwide. This blindness results from loss of or damage to neurons of the optic nerve. A non-invasive measure of axon loss is needed for use in longitudinal studies of treatment effects. The purpose of this study is to validate visual evoked potential (VEP) as a measure of axon loss in a spontaneous glaucoma model. VEP data were acquired in anesthetized subjects and the amplitude of the P2 component and root mean square (RMS) of early wavelets in VEP waveforms were quantified using Matlab. Axon counts were obtained using a semi-automated method in PPD-stained cross sections from corresponding eyes. Correlation between VEP results and axon loss will be established in Excel. Results will be presented.

MYELOID CELL RECRUITMENT TO THE BRAIN FOLLOWING STROKE IS DUE TO VEGF SIGNALING

Anders Lindstedt, Matyas Sandor (Mentor), Pathology & Laboratory Medicine

Stroke is a widespread medical condition, affecting 15 million people globally every year. In this disease, there is primary neuronal damage due to hypoxia and secondary damage due to immune cell-mediated, inflammation. Myeloid cells, phagocytic immune cells, are responsible for inflammation during the early stages of acute stroke, but the molecular mechanisms for how these cells contribute to stroke pathology is still unknown. One potential factor is Vascular Endothelial Growth Factor (VEGF), a protein known to induce myeloid cell recruitment in other CNS diseases. Both myeloid cells and VEGF are present following acute stroke, but the relationship between these two components in the context of acute stroke is unclear. Our preliminary evidence suggests that pro-inflammatory myeloid cell recruitment following acute stroke is mediated by VEGF.

COMPUTATIONAL MODEL OF A HIGH CONTRAST IMAGING MODALITY FOR RETINAL VASCULATURE OBSERVATION

Melanie Loppnow, Jeremy Rogers (Mentor), Biomedical Engineering

Diabetic retinopathy, age-related macular degeneration, and glaucoma are examples of diseases that cause damage to the structure of the retina. The resulting functional defects can, and often do, result in blindness. Presently, researchers are searching for methods of observing the retinal vasculature without using uncomfortable, potentially harmful invasive techniques. This study focuses on a new noninvasive, high contrast imaging modality. While this method had yielded amazing qualitative results, there are still outstanding questions about the mechanism and the role of scattered light. Additionally, making changes to the device hardware is expensive and time consuming. This study provides insights into the operation of the device. To accomplish the optimization task, a computational model of the imaging tool was developed.

INFLAMMATION AND DEPRESSION IN ADVANCED CANCER PATIENTS WITH A SYMPTOM CLUSTER

Sarah Loring, Kristine Kwekkeboom (Mentor), Nursing

As many as half of cancer patients experience sub-clinical depression, known as depressed mood. Researchers have proposed an inflammatory model, suggesting that pro-inflammatory cytokines may explain co-occurring (clustered) symptoms and depressed mood in cancer. If this model is accurate, anti-inflammatory medications commonly used in cancer treatment may affect depressed mood by reducing pro-inflammatory cytokine levels. This analysis examined the influence of anti-inflammatory and anti-depressant medications on pro-inflammatory cytokine levels and severity of depressed mood in 159 patients experiencing the pain, fatigue, sleep disturbance symptom cluster while receiving chemotherapy for solid tumor cancers. The inflammatory model was not supported in this sample. Corticosteroid use was negatively related to select pro-inflammatory cytokine levels, but neither medications nor pro-inflammatory cytokines predicted depressed mood.

UTILIZING GENERATION OF ONCOGENIC MUTATIONS TO BETTER UNDERSTAND CRISPR-CAS9 OFF-TARGET EFFECTS

Meng Lou, Jared Carlson-Stevermer (Mentor), Wisconsin Institutes of Discovery

In recent years, CRISPR-Cas9 has become the system of choice to use in developing therapeutics for genetic diseases. Cas9 functions through the use of a short guide RNA that denotes the locus of interest via base pairing interactions. After the locus is identified in the cell, Cas9 forms a double strand break and DNA repair mechanisms are recruited. However, due to the tolerance of DNA-RNA mismatches there is a potential to create off-target mutations at similar sites in the genome. This possibility is increased when Cas9 is expressed constitutively within the cells as is the case in many ongoing in vivo trials. Here, off-target CRISPR-Cas9 gene edits localized at 2 sites known to cause a chromosomal translocation that has been identified in several forms of cancer will be examined and reverse-engineered to identify potentially hazards of over-expression of gene editing methods. Examining this CRIPSR-Cas9 system in the context of cancer genesis would reveal insights on the safety of CRISPR genomic engineering in developing gene therapeutics before conducting clinical trials.

EXPLORING ALLOSTERIC PRINCIPLES OF TRANSCRIPTIONAL REPRESSOR ROLR

Hannah Lou, Megan Leander (Mentor), Biochemistry

Allostery is a property that allows proteins to act as nature's "switches." These switches allow for a complex phenomenon that leads to activation or inhibition of molecular activities. Allosteric proteins recognize environmental cues at one site and undergo a conformational change to elicit a response at a distant site. In spite of successful approaches in understanding the allosteric ensemble via X-ray crystallography, Nuclear magnetic resonance (NMR) spectroscopy, and molecular dynamics simulations, little has been explored in identifying the molecular basis by which allostery functions. Here, we will dissect the allosteric network by determining properties of amino acids that establish this allosteric network. Our aim is to distinguish allosteric hotspots amino acids that help propagate allostery within the RolR protein. Mechanistic foundation in allostery offers promising advances in biotechnology, drug development, and translational medicine.

MUTANTS OF USB1 IN YEAST AND THEIR FUNCTIONALITY COMPARED TO THE WILD-TYPE

Stefani Lucarelli, Allison Didychuk (Mentor), Biochemistry

Poikiloderma with neutropenia (PN) is a disease in humans that is linked to mutations in the gene C16orf57, which codes for the protein Usb1. Usb1 is an enzyme that removes nucleotides from the 3' end of U6 small nuclear RNA (snRNA). I expressed and purified the homolog of Usb1 from the model organism Saccharomyces cerevisiae (yeast). Using a denaturing polyacrylamide gel activity assay, I found that different mutations of a phenylalanine residue near the active site affect the rate of Usb1 activity. These experiments helped contribute to the understanding of the mechanism of U6 snRNA end processing by Usb1. Understanding how yeast Usb1 functions will help understand how mutations in Usb1 contribute to PN in humans.

DEVELOPMENT OF A QUANTITATIVE RELAXOMETRY TEMPLATE IN THE INFANT BRAIN

Megan Lucas, Andrew Alexander (Mentor), Medical Physics

There are relatively few parameters or methodologies described in the literature for the processing of magnetic resonance imaging (MRI) scans for infant brains, which is problematic for the field of neurodevelopment. The purpose of this project is to describe the methods used to process neuroimaging data obtained from the MRI of infants between three and eight months of age, using mcDESPOT methods, and the development of a quantitative relaxometry template to obtain measurements such as T1, T2, and myelin water fraction (MWF) maps. MWF is a measure of myelin water content, and can be used to visualize and quantify myelination in the developing brain. The usage of this neurodevelopmental data will be in a novel study investigating its relationship to the gut microbiome and behavioral data.

THIRD-PARTY RATING SYSTEMS

Emma Lucas, Kevin Chung (Mentor), Marketing

The purpose of this research is to understand how repeated interactions and known identities affect the objectivity of service providers and third-party raters. Various industries rely on third-party raters to fairly assess service quality. Our experiments use a computerized economic program to quantify how subjects make decisions. To test our criteria, we run several experimental rounds per group, and change whether subjects identities are known or unknown for different experimental groups. The data supports knowing the other subject's identity and repeated interactions between subjects affects the objectivity of both parties. Nonobjective decision patterns in the data represent how bias is created in third-party industries. By quantifying bias, we can help industry professionals identify and prevent unethical rating systems.

DETECTING THE INITIAL SIGNS OF PUBERTY IN MALE RHESUS MACAQUES

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

To assess the sequential events of puberty in male rhesus monkeys, changes in circulating levels of luteinizing hormone (LH) in the morning (AM) and evening (PM) were tracked alongside testosterone (T) and testicular size in male monkeys ranging from 11 to 42 months of age. Preliminary data indicates that 1) PM LH started to increase around 32 months, with both AM and PM LH levels peaking at 42 mo and 2) an increase in T levels and testicular volume appeared to be parallel with changes in LH levels, although the number of samples was too small to make a clear correlation. The goal of this project is to continually track LH, T and testicular volume in order to pinpoint physical characteristics of pubertal initiation.

EFFECT OF METHYLATION CYCLE AGONISTS ON THE REGENERATION OF INJURED SPINAL AXONS IN VITRO

Susan Luo, Bermans Iskandar (Mentor), Neurosurgery

Experimental interventions aimed at improving the injured adult central nervous system (CNS) remain disappointing partly because the adult CNS has poor regenerative capacity. Our laboratory has previously shown that folic acid (FA), a key methyl donor in the mammalian central nervous system, significantly enhances axonal regeneration following injury, via enzymatic modifications of the folate pathway and DNA methylation. Following this, the results of our recent in vivo studies have shown that regeneration can occur independently of the folate pathway. Specific agonists of the methionine-methylation pathway, methionine and the essential methionine synthase cofactor methylcobalamin, enhanced the rodent spinal axonal regeneration after injury in the absence of FA. This prompted us to investigate whether the observed regenerative effect is actually neuronal. We aim to investigate whether the dorsal root ganglion (DRG) neurons of the spinal cord injured rats treated with methionine or methylcobalamine show increased axon growth in vitro. The results of additional studies will provide further mechanistic insights on the specific involvement of the methionine-methylation pathway in CNS repair, paving the way for potential combinational therapy to spinal injury and CNS disorders.

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

Madalyn Lupinek, Edward Boswell (Mentor), Biological Systems Engineering

The fundamental relationship between soil aggregation and microbial processes has been recognized as a primary component of carbon cycling in soil. However, the mechanistic relationship between soil microbes and soil aggregation is not yet fully understood, especially with regards to predicted changes in wintertime processes such as freeze-thaw cycles. This study examines microbial populations as part of an ongoing study investigating soil aggregation and carbon dynamics with respect to changes in freeze-thaw cycles in prairie and agricultural soils. This will be done using a direct extraction, chloroform fumigation method. These data will improve our understanding of the impact of wintertime processes on the interaction between soil microbes and soil aggregate dynamics.

FUNCTIONAL SUPPORT ANTECEDENTS TO DYSPHAGIA AMONG NURSING HOME RESIDENTS WITH DEMENTIA

Jordan Madden, Andrea Gilmore Bykovskyi (Mentor), Nursing

Dysphagia, or difficulty swallowing, is prevalent among people with dementia (PWD) and contributes to increased risk for dehydration, malnutrition, and pneumonia. While most PWD require functional support/assistance with mealtimes, the relationship between different functional supports and dysphagia is unknown. Our objective was to develop timed-event observable measures for specific functional support tasks in order to explore whether specific caregiver actions related to functional support may mitigate or precipitate incidents of dysphagia. To achieve this aim, we developed and tested the feasibility and reliability of a computer-assisted coding framework using a sample of 23 video-observations. Our findings suggest that the developed observational measures for functional support are feasible and reliable, and that both eating and feeding performance tasks are relevant to dysphasic events.

USING VELOCITY ANISOTROPY TO ANALYZE TURBULENCE IN GIANT MOLECULAR CLOUDS

Alecio Madrid, Audra Hernandez (Mentor), Astronomy

For this project, I will study the role of magnetohydrodynamic (MHD) turbulence in the star formation process within the Milky Way Galaxy. Using 13CO(1–0) molecular line emission mapping of 10 known giant molecular clouds (GMCs), I will analyze MHD turbulence through statistical analysis of the cloud's velocity anisotropy. Burkhart et al. (2014) showed that a high level of velocity anisotropy in simulated GMC models is highly indicative of a strong magnetic field, and thus by statistically studying the velocity distribution of observed GMCs, I will be able to map the change of magnetic energy across the full range of cloud scales. My project will be the first study to analyze turbulence in observed GMCs by mapping of magnetic field strength using velocity anisotropy statistical methods.

THE INFLUENCE OF FAMILY INCOME ON STUDENTS' COLLEGE MAJOR PREFERENCES IN BRAZIL

Joao Pedro Magalhaes Souto Maior, Chris Taber (Mentor), Economics

Motivated by Bourdieu's analysis of taste and dialoguing with previous U.S. studies, this senior thesis explores the relationship between family income and college major choice in Brazil. Using data from the ENEM (Brazilian National High School Exam), the research relies on a multinomial logit model to estimate the effects of family income groups in the choice of five academic areas. A descriptive interpretation of the results suggest that low-income students, in the same way as in U.S. studies, tend to prefer more instrumental and market-based majors. Moreover, it shows that interactions between income groups and scores can alter such trend. Therefore, it concludes that, in the Brazilian context, a more comprehensive causal analysis needs to account for the different effect of scores across income groups.

PARAMETERS UNDERLYING EXCITABILITY OF PYRAMIDAL NEURONS IN γ2R43Q MICE DISPLAYING ABSENCE EPILEPSY

Carson Mahant, Mathew Jones (Mentor), Neuroscience

Absence epilepsy is a condition characterized by brief petit-mal seizures concurrent with a lapse of consciousness. One type of absence epilepsy is associated with a point mutation on the γ2 subunit (γ2R43Q) of the GABAA receptor. The γ2R43Q mutation has been shown to interfere with surface expression of the extrasynaptic GABAA receptor which results in a dysregulation of tonic inhibition (TI) in thalamic and cortical neurons. TI is a slow, persistent current that occurs outside neuron synapses. We used pharmacological manipulation to examine how loss or excess TI influences the excitability of neurons in the somatosensory cortex of γ2R43Q knock-in mice and wild type mice. We found evidence that γ2R43Q mice might have a compensatory response from lacking TI and further experimentation is underway.

IMPLICATIONS OF PRESCRIPTION DRUG MISUSE DURING MIDLIFE FOR INDIVIDUAL AND RELATIONSHIP HEALTH

Molly Malone, Lane Steinhaus, Lauren Papp (Mentor), School of Human Ecology

An extensive literature based on individuals documents the risks associated with prescription drug misuse, defined as a person taking medication prescribed for others, or taking their own medication for a different reason or in an alternative dose than intended. Here, we build on recent evidence suggesting close relationships as a context for understanding the occurrence and implications of prescription drug misuse. A sample of 37 heterosexual couples in established romantic relationships (M length = 21 years) completed surveys describing recent prescription drug use behaviors as well as multiple personal and relational health domains. Engaging in recent misuse is hypothesized to hold negative implications for individual (e.g., poorer sleep, elevated depression and anxiety symptoms) and relationship (e.g., lower satisfaction) functioning.

FRAGILE X RELATED PROTEIN 1 (FXR1P) REGULATES PROLIFERATION OF ADULT NEURAL STEM CELLS

Sydney Malone, Xinyu Zhao (Mentor), Neuroscience

Fragile X related protein 1 (FXR1P) is a member of the fragile X family of RNA-binding proteins. Proteins within this family are known to regulate neurogenesis, a process affected in neurological disorders. FXR1P is not as widely studied as other members including FMRP and FXR2P. The goal of this study was to elucidate the function of FXR1P in adult neurogenesis. We used an inducible mouse model that allows us to investigate how FXR1P deficiency in adult neural stem cells (aNSCs) affects proliferation and neural differentiation. Deletion of FXR1 in aNSCs resulted in fewer adult-born cells in the dentate gyrus (DG) overall, reducing populations across different stages of neurogenesis. We hypothesized that this reduction in new cell numbers resulted from impaired proliferation, which we confirmed both in vivo and in vitro, indicating FXR1P's role in regulating aNSC self-renewal and maintenance in the adult brain.

SOCIAL, PHYSICAL, AND PSYCHOLOGICAL OUTCOMES OF THE AFRICAN AMERICAN PALS PROGRAM

Cheyenne Mangan, Kimberlee Gretebeck (Mentor), Nursing

Physical activity (PA) is essential for healthy aging among older adults. Older African American (AA) adults do not actively participate in PA programs because existing programs are not culturally framed for their unique needs. There is a need to culturally adapt PA programs for AAs to improve physical function and maintain long-term PA. The purpose of this research is to identify the participant perceived benefits after the 10 week culturally adapted PA program. We held four focus groups in Milwaukee and Madison with 37 participants. Three themes emerged from the focus group results; social, physical, and psychological benefits. These results show that a culturally adapted PA program has countless benefits for AA older adults.

WORD LEARNING ACROSS MEDIA

Kylie Markeland, Lexie Deignan, Mary Pulvermacher, Kaelyn Schreiner,
Heather Kirkorian (Mentor), Human Development and Family Studies

This study examined the impact of book formats, how they are used, and previous touchscreen experience on preschoolers' (3–5 years) ability to learn novel words. Participants (N= 100) were read a novel story (interactive eBook, non-interactive eBook, interactive print book, or non-interactive print book) designed to teach new words. In interactive conditions, one group of children triggered interactive features while experimenters triggered interactive features for another group. Parents completed a survey on children's media and touchscreen use. Children in e-book conditions learned more words than those in print book conditions, with no effect for child-interactivity. We hypothesize that experimenter-interactivity and prior touchscreen experience will increase children's learning. Results of this study can inform parents and educators on the book formats and experiences that enhance learning.

LONG TERM QUALITY OF LIFE FOR GASTROPARESIS PATIENTS

Sarah Marowski, Anne Lidor (Mentor), Surgery

Gastroparesis (GP) is a disease of delayed stomach emptying. Severe cases cause nausea, vomiting, and abdominal pain leading to frequent emergency room visits and hospitalization. Gastric neurostimulation (GNS) is a surgical treatment intended to reduce symptoms, and may decrease the need for anti-nausea, pain, and psychiatric medications. Currently there are no studies looking at the long-term quality of life or medication usage (QOL) after GNS placement. This study compares pre- and postoperative QOL metrics collected through chart review and phone surveys of patients receiving GNS between 2005 and 2016.Twenty patients were evaluated. There was a significant decrease in the number stomach motility and anti-nausea medication taken after surgery. The QoL data is yet to be analyzed, however our preliminary data suggests that GNS may be an effective treatment for gastroparesis long term.

CLEANING THE STREAM: A WISCONSIN UNION RECYCLING INITIATIVE

Samuel Marquardt, Rhianna Miles, Caroline Mitchell, Bret Shaw (Mentor), Life Sciences Communication

Union South's waste stream is in need of improved sorting and a cleaner compost deposit. Therefore, our goal is to improve the Union's waste disposal cycle, and increase stream purity. After conducting interviews, on-site trash audits, quantitative surveys, and observing Union South customers, we determined that people are not properly sorting several commonly used Union items. The main barriers to improper sorting include a lack of knowledge, time, and lack of motivation. Further, our results elucidated items most often incorrectly sorted, such as compostable to-go containers, used napkins, and plastic silverware. Our results narrowed down promising solutions and tactics, including: social norm establishment via social media campaigns, and educational outreach methods such as stickers indicating which bin an item should be thrown in, signs, and informational posters. This campaign will be carried out over a one-year period, and we will analyze its effectiveness with follow-up surveys and a trash audit to quantify changes in stream purity and student attitudes about recycling and composting.

MEASURING SOIL AGGREGATE STABILITY USING NEW TECHNIQUES

Krista Marshall, Leah Johnson, Edward Boswell (Mentor), Biological Systems Engineering

Prairie restoration is a widely accepted practice for reclaiming degraded landscapes, sequestering carbon, and restoring native soil fertility. An important measure for assessing improvements to soil quality is aggregate stability however, traditional aggregate stability tests can be time consuming and difficult to replicate. This study investigated the utility of laser diffraction analysis, a relatively quick and repeatable method, for quantifying aggregate stability. We measured soil aggregate stability in restored prairie and agricultural soils collected from the Pope Farm Conservancy in Verona, WI. Results indicate that aggregate stability, as measured by laser diffraction, was general higher in prairie versus agricultural soils and that the method is a promising alternative to traditional aggregate stability techniques.

THE USE OF DISTRIBUTED COGNITION FOR PHIM IN THE HOME

Tom Martell, Anna Jolliff, Nicole Werner (Mentor), Industrial & Systems Engineering

Patients have a high burden of personal health information management (PHIM). Distributed cognition suggests that cognition is not only an internal process; it is spread among technology, individuals, and spaces. We combined interviews and observation in virtual homes to explore how distributed cognition to support PHIM is shaped by the sociotechnical system. Our results suggest that patients personalize their environments to support the cognitive work associated with PHIM. Patients also use the home environment to support technology use and storage related to PHIM. Finally, we found that patients personalize their home to facilitate PHIM based on individual motivations such as need for privacy and security. These results will inform technology design to support PHIM, accounting for the individual and their sociotechnical system.

CURATION OF THE ARCHAEOLOGICAL AND MODERN SNAILS AT THE UW–MADISON ZOOLOGICAL MUSEUM

Kelly Martin, Laura Monahan (Mentor), Zoology

In the University of Wisconsin–Madison Zoological Museum, there exists a collection of over 250,000 archaeological and modern land snails, which were collected between 1966 and 1977 from archaeological sites across the United States. This significant collection was amassed under the direction of David A. Baerreis, a prominent archaeologist and professor at UW–Madison. Due to staff constraints at the Museum, the collection had never been fully curated nor provided conservation storage. This collections management project aims to make the collection accessible to researchers, thus providing the opportunity to discover information about past and present environments and show how climate change affected human occupation and habitation. Completion of this extensive project ensures the long-term survivorship of the collection and opens the door for countless research opportunities.

ROLE OF AF9 IN THE REPROGRAMMING OF MOUSE EMBRYONIC FIBROBLASTS

Cesar Martinez, Rupa Sridharan (Mentor), Cellular & Regenerative Biology

There are over 200 cell types in the human body, all with identical genomes, that behave and function very differently due in part 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. Depletion of Dot1L, a histone methyltransferase, has been shown to increase somatic cell reprogramming. Since Dot1L does not have a DNA binding domain, it is hypothesized to be targeted to DNA via its interacting proteins, such as AF9. This targeting is important because it allows Dot1L to methylate histone 3 lysine (K) 79 (H3K79me), an important epigenetic mark. Thus, AF9 and Dot1L protein interaction may be an important step in the reprogramming process. In order to study this interaction, we used CRISPR/cas9 technology to target AF9 in mouse embryonic fibroblasts. Only heterogeneous mutations in AF9 were observed, suggesting that AF9 function is necessary for cellular survival. In future studies, we will investigate which specific domains within protein AF9 are essential in its interaction with Dot1L during the reprogramming process. We will accomplish this suppling AF9 domains before depleting endogenous AF9.

PROGRESSIVE MUSLIMS THROUGH DISCOURSE: A LINGUISTIC ETHNOGRAPHY

Maria Fernanda Martinez Rodriguez, Katrina Thompson (Mentor), African Cultural Studies

The label "progressive Muslim" is a relatively new term used to describe Muslims "who view Islam as an evolving religion" (Minwalla, et al, 2005). The purpose of Dr. Thompson's research is to examine how progressive Muslims construct their faith and identities using talk and texts, including how they describe and differentiate themselves from other Muslims. To achieve this, Dr. Thompson relies on participant-observation and audio-recording of progressive Muslim group meetings, as well as interviews with progressive Muslims. The interviews explore (1) explore the interviewees' relationship to Islam; (2) their use of language in prayer and interactions with other Muslims; and (3) their interpretation of Islam, various religious texts, and the term "progressive" in relation to their identity.

INTERMEDIATE WHEATGRASS AND SILPHIUM AS PERENNIAL DUAL-USE CROPS

Zainah Masri, Kim Asseily, Emily Rau, Valentin Picasso Risso (Mentor), Agronomy

Thinopyrum intermedium (Intermediate wheatgrass) is being cultivated for commercial use as a dual purpose crop, for human and animal consumption. Silphium integrifolium is a potential perennial oilseed crop. Their perennial root systems can reduce nutrient leaching and soil erosion. The objectives of this research are to evaluate the germination, growth and forage quality of intermediate wheatgrass. Seeds samples for germination tests and forage samples for quality analysis were collected from a field experiment in Arlington, WI at different harvest dates. Growth rate measurements of vernalized and non-vernalized Intermediate wheatgrass and Silphium individual plants were conducted at Walnut Street Greenhouse in Madison, WI. It is hypothesized that germination rate will increase with later harvest, vernalized plants will flower and the non-vernalized plants will remain in its vegetative state, and that the forage quality will increase when harvested later in the fall. These projects assessed the growth and forage quality merits for intermediate wheatgrass and Silphium as a dual-use crop.

BIOCHEMICAL INVESTIGATION INTO NOVEL ACTIVITIES OF YEAST SPOUT-SUPERFAMILY RNA METHYLTRANSFERASES

Hannah Mast, Aaron Hoskins (Mentor), Biochemistry

The SPOUT superfamily of S-adenosyl-L-methionine (SAM) dependent methyltransferases are involved in post-transcriptional RNA modifications. Nep1, a SPOUT superfamily member, methylates rRNA at the N1 position of a post-transcriptionally incorporated pseudouridine in the 18S rRNA of Saccharomyces cerevisiae (yeast) and in humans is implicated in cases of Diamond-Blackfan anemia. We found that Nep1 can bind and methylate a specific pseudouridine found in the U2 snRNA in vitro, suggesting that Nep1 may also play a role in splicing regulation. Given this finding, other SPOUT proteins may also be able to modify snRNAs and be involved in splicing regulation. YGR283C and YMR310C are two other yeast SPOUT methyl transferases whose specific biological functions are not known but are known to interact with the U2 snRNP yeast protein, Lea1, and the yeast homolog of dyskerin, a protein involved in pseudouridylation of the U2 snRNA. We have expressed yeast YGR283C in E. coli and purified the protein for biochemical and structural characterization. Fluorescence polarization assays and electrophoretic mobility shift assays will be conducted to quantify YGR283C binding affinities for snRNAs. Filter binding assays will be used to quantify [3H]-methyl incorporation from SAM into snRNA substrates. Together these studies will elucidate the function of these previously uncharacterized SPOUT superfamily members.

EFFECTS OF CO-INFECTION WITH MYCOBACTERIUM TUBERCULOSIS ON SIV DIVERSITY AND ESCAPE

Jaffna Mathiaparanam, Shelby O'Connor (Mentor), Pathology & Laboratory Medicine

Co-infection of Mycobacterium Tuberculosis (Mtb) is the leading cause of morbidity in HIV+ individuals. It is well known that Mtb pathogenicity increases with the co-infection of HIV, likely due to the suppression of the CD4 T-cell immune response. I explored the possibility that Mtb infection may also affect immune responses, leading to an increase in virulence of HIV, extrapolated through an SIV model. Using Next Generation sequencing techniques, I examined changes in the frequency of variants in epitope regions from plasma samples collected from cynomolgus macaques infected with SIV and then co-infected with Mtb. Increases in diversity, especially in epitopes, after Mtb exposure could indicate increased viral replication or the re-activation of reservoirs, both of which could lead to an increase in SIV pathogenicity.

PUTTING QUALITY INTO QUALITATIVE QUESTIONS

Austin Matsche, Christian Schmieder (Mentor), Center for Cooperatives

At a Data Jam workshop, UW–Extension educators gather to analyze data and to learn how to use qualitative data analysis software. Our research project evaluates if the Data Jams make analysts more proficient and self-confident. Specifically, we focus on how this software can be used as a teaching tool for qualitative research; we want to figure out how educators' use of the software and knowledge of methods are connected. We created a qualitative interview guide to find out how educators think about their research workflow. In this session I will describe how we used a multistep process to design quality interview questions.

REACTION DYNAMICS OF ATMOSPHERIC NITROGEN OXIDE REMOVAL BY THE SEA-SURFACE MICROLAYER

Melvin Matthew, Gilbert Nathanson (Mentor), Chemistry

Gas-liquid interfaces are abundant in nature and are rich in unexplored chemistry. Of particular interest is the air-water interface in sea-spray aerosols, which is relevant to tropospheric air quality as a sink for harmful anthropogenic nitrogen oxide emissions. The study of dinitrogen pentoxide absorption at the sea-surface microlayer is proposed, with attention to the effects of naturally-occurring biomolecule concentrations in seawater on the rate of dinitrogen pentoxide absorption. This interfacial reaction will be probed using molecular beam scattering, a vacuum-based technique which gives a blow-by-blow picture of absorption and reaction dynamics at the surface. A better understanding of these pathways may shed light on the role sea-spray aerosols play in scrubbing smog-forming nitrogen oxide emissions from coastal cities.

ANALYSIS OF THE CONTRACTION OF THE NORTHERN HEMISPHERE, LOWER-TROPOSPHERIC, WINTERTIME COLD POOL

Kirsten Mayer, Jonathan Martin (Mentor), Atmoshperic & Oceanic Sciences

Recent research has revealed that the areal extent of the Northern Hemisphere, lower tropospheric, wintertime cold pool has been systematically shrinking over the past 66 years (Martin 2015). An intriguing aspect of that analysis was the discovery that the cold surge phase of the East Asian Winter Monsoon was almost always present in conjunction with extreme cold (+2√≥) days. The analysis, however, did not explore extreme warm (–2√≥) days and their associated atmospheric circulation phenomena in any depth. Therefore, the proposed work aims to employ the self-organizing maps (SOM) methodology in order to gain new insight into the nature of hemispheric circulation anomalies associated with such extreme events with specific focus on the previously unexamined extreme warm events. This work will identify the 3D atmospheric structures that are most often associated with these extreme days and, consequently, will lead to a better understanding of the variability of large scale circulation anomalies associated with Northern Hemisphere winter in a warming world.

ROOTEDNESS: THE ROLE OF LAND RIGHTS IN THE POLITICAL DEVELOPMENT OF EL SALVADOR, 1969–PRESENT

Gillian McBride, Erica Simmons (Mentor), Political Science

The purpose of this thesis was to analyze the role of the distribution of land rights in the development of the political climate of El Salvador, from the onset of the 1969 "Soccer War" to the present day. The areas explored in this research include key pieces of agrarian and land reform legislation executed during this time period, campaign tactics of major political parties, changes in the distribution of land dedicated to export-oriented agriculture relative to subsistence agriculture and urban growth, and the experiences of individual Salvadorans. This research will provide valuable insight into the importance of land rights to the historical study and political analysis of El Salvador and furthermore, of including local perspectives in these pursuits.

BIOCHEMICAL STUDIES OF SUB2 DESIGNED TO BE SENSITIVE TO CHEMICAL ANALOG INHIBITION

Jack McCann, Sarah Hansen (Mentor), Biochemistry

Sub2 is an essential protein involved in assembly of the spliceosome. The timing and mechanism for Sub2 involvement at the early stages of assembly is unknown and will be investigated in these experiments. To look at Sub2 timing and mechanism, we will inhibit its function using ATP analogs, similar to analog-sensitive kinase inhibition. This can be done by creating a mutation that enlarges the ATP binding site in Sub2, finding an analog that inhibits mutant Sub2 function, and comparing it to wild type (WT) function. We will perform mutagenesis to create the mutation (F64A) and purify the protein. Then we will test ssRNA binding and dsRNA unwinding properties of WT and mutated Sub2. Preliminary results show that the F64A mutation reduced binding to ssRNA in the presence of non-hydrolysable ATP, while a proposed negative control mutant, DEAD-Sub2, bound ssRNA similar to WT. This is interesting because F64A-Sub2 is not lethal in yeast, yet DEAD-Sub2 is reported to be lethal, prompting future research.

INVESTIGATING THE EFFECTS OF BDNF IN DEVELOPING HUMAN FOREBRAIN NEURONS

Alec McCann, Timothy Catlett (Mentor), Neuroscience

Axon guidance is central to nervous system development. Extracellular guidance cues are transduced via cue-specific receptors in the axonal growth cone to promote the extension, retraction, attraction, or repulsion necessary for target acquisition and ultimately the correct wiring of the nervous system. Induced pluripotent stem cells (iPSCs) are a potent model system for studying normal human development and disease. This project utilized immunofluorescence to quantitatively assess iPSC-differentiated early forebrain (hFB) neuron response to the canonical guidance cue brain-derived neurotrophic factor (BDNF). The results show that BDNF stimulation has a significant effect on growth cone morphology in serum-starved early human forebrain neurons. This research led to a more robust fundamental understanding of human nervous system development and informed my laboratory's iPSC modeling of Autism Spectrum Disorders.

INVESTIGATING PHENOTYPIC DIFFERENCES AMONG FIBROBACTER ISOLATES FROM VARIOUS HERBIVORES

Caroline McCormick, Garret Suen (Mentor), Bacteriology

Herbivores rely on microbial symbionts in their gut to assist in their digestion of plant material. In order to understand this partnership, it is necessary to investigate conserved members of these communities, e.g. cellulose-degrading bacteria from the genus Fibrobacter. Molecular characterization of 45 strains of Fibrobacter, recently isolated in our lab, identified nine different phylotypes among them. We hypothesized that these phylotypes occupy distinct ecological niches in vivo, and tested this by investigating specific phenotypes. Isolates were screened for growth on cellulose and xylan. Growth was determined by quantifying cellular protein and fermentation products using Bradford's assay and high-performance liquid chromatography, respectively. The results revealed a unique phenotype among isolates obtained from horse feces.

VESTIBULAR AND VISUAL CONTRIBUTIONS TO MOTION SICKNESS

Michelle McGuire, Cynthia Fowler (Mentor), Communicative Sciences & Disorders

Motion sickness is a common debilitating condition. However, little is known about its pathogenesis, and behavioral countermeasures against motion sickness remain ineffective and sparse. This study will compare responses to the vestibular and visual stimuli that evoke motion sickness. Normal hearing participants have been recruited to undergo vestibular tests, including vestibular evoked myogenic potentials and videonystagmography, and to watch 3D videos in the Oculus Rift. The goal is to increase the understanding of the physiological responses to provocative stimuli that cause motion sickness. This study also aims to characterize individuals who are susceptible to motion sickness by visual-only stimulation and determine if they differ from those who are susceptible to vestibular-only stimulation. Results may have implications for rehabilitation methods and for developers and patrons of 3D video games.

ASSOCIATION OF ARBUSCULAR MYCORRHIZAL FUNGI WITH CARROTS

Ian McIntire, Alyssa Joachim, Michelle Pearson (Mentor), Cellular & Molecular Biology

The purpose of this study is to better understand nutritional outcomes for water-stressed carrots that have a symbiotic relationship with species of arbuscular mycorrhizal fungi (AMF). During AMF symbiosis, plants benefit from increased access to water and nutrients delivered by the fungus. This symbiosis is important for crops grown in low-input systems like organic systems. Carrots are an important source of carotenoids, and it is unknown whether interactions with AMF alter carotenoid profiles of carrots. Using high performance liquid chromatography (HPLC), we can evaluate whether carotenoid profiles differ among carrots engaged in symbiosis with distinct AMF species. Additionally, we evaluate how soil water limitation impacts carotenoid profiles for symbiotic and non-symbiotic carrots.

CHALLENGING SENIOR STIGMA: GAINING PERSPECTIVE FROM THE UNSEEN MAJORITY

Matthew McKeever, Sarah Bauer, Claire Burke, Brooke Eliason, Matthew Mckeever, Ellie Miller, Lucas Perkl, Dominique Perry, Salma Salama, Tararinsey Seng, Laura Skornia, Rachel Sobiesk, Bridget Sperry, Abbey Vadnais, Brianna Young, Yvette Egan (Mentor), Nursing

Although only 5% of people over the age of 65 reside in nursing homes, this is often the only exposure that nursing students have to the older adult demographic. The Challenging Senior Stigma project helped reveal the unseen majority that live fully independent lives. Nursing students were matched with an older adult from the Madison area who ranged in ages and each actively involved in their local community. Throughout the project, students were able to practice and fine tune their health history interview and educational teaching skills. Not only did students benefit from the experience, but the older adults benefited from forming relationships with the students and gaining insight on their own health.

CHARACTER WEIGHTED LEVENSHTEIN DISTANCE: A NEW METRIC

Catherine McSorley, Nils Hjortnaes, Ryan O'Connor, Joe Salmons (Mentor), German, Nordic & Slavic

Lexicostatistical and phylogenetic analysis of languages provides interesting and useful data about the historical relationship between languages that can be analyzed more quickly and with more data than other, non-computational, methodology. We propose a new language distance metric based on the phonetics of semantically equivalent words by using a modified version of Levenshtein Distance to calculate distance between words. We test this new metric using widely accepted phylogenetic trees. These metrics and resulting distances can give us a better idea of the shape of language families, and can inform and fuel further quantitative research—tree models for example. After comparing our output with accepted trees, we believe this algorithm could provide more information useful in expanding knowledge of language evolution.

EVIDENCE-BASED COGNITIVE ENRICHMENT FOR MONKEYS: VIDEOGAMES VS FORAGING PUZZLES

Brooke Meidam, Allyson Bennett (Mentor), Psychology

The study's primary purpose was to evaluate different cognitive enrichment strategies in order to provide evidence that can inform practices and policies for nonhuman primate care. The study investigated whether rhesus macaques interact more with a foraging puzzle or a videogame when given a concurrent choice between the two. Behavioral data was collected for twenty one-minute intervals during presentations of videogames alone and during simultaneous presentation. A direct comparison was made between intervals of active manipulation in each condition. The preliminary results demonstrated that when given a concurrent choice between the two strategies, monkeys will use both in order to maximize reward. Ongoing study is aimed at determining whether this pattern of results is sustained beyond the initial concurrent choice presentations.

RELATING ANTEMORTEM BIOMARKERS WITH POSTMORTEM ALZHEIMER DISEASE PATHOLOGY

Colleen Mellert, Shahriar Salamat (Mentor), Pathology & Laboratory Medicine

Alzheimer Disease pathology is characterized by neurofibrillary tangles and senile plaques, thought to result in the accumulation of tau and betta-amyloid in the CSF. Presence of these proteins in the CSF could provide an early detection tool. Twelve AD participants underwent lumbar punctures and donated their brains as part of the research with the Wisconsin Alzheimer's Disease Research Center. We related the antemortem tau and betta-amyloid levels in the CSF to the Braak and Braak staging of neurofibrillary tangles found in the postmortem brains. We observed trending relationships between these values although no relationships reached statistical significance. Due to the low sample size of our study, more research must be conducted to form a more concise relationship.

CHARACTERIZATION OF PLANT-TYPE TYROSINE BIOSYNTHETIC ENZYMES FROM BACTERIA

Yusen Men, Hiroshi Maeda (Mentor), Botany

Tyrosine, an imperative aromatic amino acid for protein synthesis in all living cells, exists as a precursor for countless downstream metabolites. Tyrosine synthesis typically takes place through either arogenate dehydrogenase (ADH) or prephenate dehydrogenase (PDH) pathway in plants or microbes, respectively. Our lab previously identified that Asp222 residue determines the substrate specificity of plant ADH enzymes and further identified ADH/PDH homologs from a unique bacterial clade also having Asp at the corresponding residue. To test if these microbial homologs possess ADH enzyme activity, I biochemically characterized the enzyme from Ochrobactrum intermedium, a representative of the clade. The results demonstrate ADH enzyme activity from Ochrobactrum intermedium, highlighting the key role of the Asp residue also in a microbial ADH enzyme and suggesting the presence of the ADH tyrosine pathway in microbes.

A CASE STUDY OF COALITION EFFORTS TO PROMOTE HEALTHY FOOD AND ACTIVITY ENVIRONMENTS FOR CHILDREN

Samantha Meyer, Amy Hilgendorf (Mentor), Center for Nonprofits

Obesity, which has been linked to adverse health problems, has become increasingly prevalent in the U.S. over the last few decades. The Obesity Prevention Initiative (OPI) supports coalitions in Wisconsin counties in pursuing policy, systems and environmental changes to support children's health through university-community research partnerships. In gathering mixed methods data about the coalition's work, including survey and interview data about perceptions of obesity and prevention strategies, we can gain understanding of how coalitions approach obesity-related work and the successes and challenges of different approaches. This case study presents the in-depth data and analysis of the process in Menominee County to uncover important trends in how coalitions work towards obesity prevention and offers insights for other coalitions doing similar work.

INCARCERATED PARENTS OF YOUNG CHILDREN: RACIAL DISPARITIES IN MENTAL HEALTH

Zoe Milavetz, Lexi Frerks, Delaney Haese, Julie Poehlmann-Tynan (Mentor), Family Studies

There are significant racial disparities in arrest, conviction, and incarceration in the U.S. In this NIH-funded study of 165 jailed parents with young children, we examined disparities among Caucasian, African American, and Other (Other includes Native American, Asian, Latino and Unknown) racial groups. Using data from Adult Self-Report (part of the Achenbach System of Empirically Based Assessment), completed by the incarcerated parent during their jail stay, we examined the T-Scores from the following mental health scales: Attention Deficit-Hyperactivity (ADH) Problems, Avoidant Personality Problems, and Antisocial Personality Problems. Using a one-way ANOVA and post-hoc tukey hsd tests, we examined differences for Caucasian, African American, and Other individuals. We also compared education and household income levels in the jailed parents to see if there were any significant disparities between the three different racial groups. We found that the Caucasian jailed parents had the highest T-scores for all three of the mental health variables, indicating that they reported more ADH, Avoidant Personality, and Antisocial Personality symptoms than African American and Other races. When we looked at the education and income variables we did not find any statistically significant differences, although we expected that African American parents would experience more poverty and a lower level of education. We will discuss the findings in terms of possible ways to intervene and potential effects on the children of incarcerated parents.

SYNTHESIS OF MODEL HEME-THIOLATE LIGAND PRECURSORS WITH VARIABLE INTRAMOLECULAR HYDROGEN BONDING

Michael Milbauer, Luc De La Villefromoy, Matthew Dent (Mentor), Chemistry

Heme-thiolate proteins perform diverse biological functions; however, the origin of this functional divergence is not understood. Evidence suggests that the cysteine(thiolate) hydrogen bonding (H-bonding) network influences heme function. Computations predict that H-bonding modulates the extent of unpaired electron spin delocalization in model heme-thiolates and that this modulation can be detected using electron paramagnetic resonance (EPR) spectroscopy. We seek to develop EPR spectroscopy as a probe that connects H-bonding to functional divergence. We are constructing a series of model heme-thiolate complexes with intramolecular H-bonds of variable strength and number. We synthesized a series of aryl thiolate precursors and characterized their intramolecular H-bond strengths using NMR spectroscopy. Additionally, we are developing synthetic strategies to access aryl thiolates with two intramolecular H-bonds and their heme complexes.

INVESTIGATING NEW MATERIALS TO HELP SLOW DOWN SEVERE ACCIDENTS IN NUCLEAR REACTORS

Laura Miller, Jun Wang (Mentor), Engineering Physics

The purpose of this project is to investigate various Accident Tolerant Fuels Materials in order to develop safer, more efficient, cladding materials for nuclear reactors. In it we used the TRAC/RELAP Advanced Computational Engine (TRACE), and MELCOR (with SNAP) to simulate different aspects and components of the nuclear reactor core degradation process for light water reactors, primarily pressurized water reactors (PWRs) and boiling water reactors (BWRs). For this project, researchers modeled the systems using simplified reactors, which have four fuel rods as opposed to the usual sixty-four, in hopes of achieving the goals of the project. By performing numerous calculations, simulations, and analysis of different substances and benchmark experiments, FeCrAl has been confirmed by researchers as a better cladding material and more are being investigated.

THE EFFECT OF SPORT SPECIALIZATION ON JUMP LANDING MECHANICS

Madeline Miller, David Bell (Mentor), Kinesiology

In recent years, youth sports participation levels have increased tremendously. Accompanying this increase in participation is also a trend toward early specialization, or training in a single sport year-round at the exclusion of other sports. Specialized athletes have been shown to have an increased risk of sustaining an injury, but the mechanism for this increased risk is unknown. A factor that has previously been correlated with increased risk of sustaining a lower limb injury is poor jump landing mechanics. The Landing Error Scoring System (LESS) is a reliable tool for analyzing jump landing mechanics. During this study, athletes from different high schools from a variety of sports were assessed over the course of multiple school-years for landing mechanics using the LESS and for specialization status. This data was then used to examine the relationship between specialization status and jump landing mechanics. With the knowledge from this study, prevention measures could be targeted at those groups identified as being most at risk for knee injury.

THE INFLUENCE OF 20TH CENTURY CONSUMERISM ON MODERN POSTURAL YOGA IN AMERICA

Samantha Minor, Gudrun Buhnemann (Mentor), Asian Languages & Cultures

Modern postural yoga is a phenomenon that has overrun today's popular culture. Yoga began to take roots in America in the 1800s, yet it was not until the 20th century that it became an essential part of popular culture and a million-dollar industry. In my research, I collected textual data ranging from primary accounts of early American practitioners of yoga to recently published economic analyses. Using a historical timeline, I will make clear connections between the evolution of consumerism in the United States and the development of modern postural yoga as a marketable recreation, rehabilitation, and religious practice. My analysis reveals a coherent relationship between the consumer, the market, popular culture, and one of the world's most ancient and continuous practices.

THE HETEROGENEITY OF HOFBAUER CELLS

Arielle Mora Hurtado, Leticia Reyes (Mentor), Pathobiological Sciences

Hofbauer cells (HBCs) are fetal macrophages within the placenta that may be significant for placental development and a healthy pregnancy. HBCs display an array of cell surface proteins that may reflect different functions. This project will identify distinct HBC phenotypes associated with normal and complicated pregnancies. HBCs from uninfected and experimentally infected Macaque monkeys will be characterized with a panel of antibodies that recognize host cell proteins associated with specific HBC functions. HBCs isolated from placenta will be analyzed by flow cytometry. HBCs phenotypes will be linked to specific locations within the placenta. We anticipate finding different HBC phenotypes in healthy and infected placenta. These findings may be useful in addressing gestational complications such as preterm birth, preclampsia, miscarriage, and maternal or neonatal morbidities.

MGAT2 DEFICIENCY ALTERS BILE ACID METABOLISM IN MICE

Jackson Moran, Eric Yen (Mentor), Nutritional Sciences

Mice deficient in the enzyme MGAT2 (*Mogat2*$^{-/-}$) exhibit protection from obesity. Bile acids are known to modulate energy metabolism. This study investigates whether *Mogat2*$^{-/-}$ mice have altered bile acid metabolism. Tissue, plasma, and fecal samples from *Mogat2*$^{Äi/Äi}$ and control mice were analyzed by enzymatic bile acid quantification. Characterization of bile acid species in plasma was accomplished by HPLC-TMS, and mRNA expression of bile acid signaling genes in the liver and distal intestine were quantified by quantitative PCR. *Mogat2* deficiency alters concentration and composition of plasma bile acids, and expression levels of multiple bile acid signaling genes are altered at the mRNA level. These findings merit further investigation of the role of bile acid signaling in the metabolic phenotype of *Mogat2* deficiency.

ENERGY DISSIPATION IN CARTILAGE AND THE SUBCHONDRAL BONE

Liam Moreland, Corinne Henak (Mentor), Mechanical Engineering

Osteoarthritis, which is caused by damage to cartilage, causes a large economic and quality of life burden. The role of bone in protecting cartilage from damage is unclear. For this study, samples of cartilage with bone attached are removed from pig knees. These samples are then put into a uniaxial testing machine and loaded in cyclic compression. After testing, energy dissipation of the sample is calculated. This process is repeated on the cartilage alone after removing the bone. Preliminary results suggest that the bone affects dissipation within the sample, potentially protecting cartilage from damage.

STRAIN DISTRIBUTION IN FASCICLES FOLLOWING THE INTRODUCTION OF A PARTIAL TEAR

Jared Muench, Darryl Thelen (Mentor), Mechanical Engineering

A common challenge surrounding clinical treatment of partially-torn tendons is whether to pursue non-operative, conservative rehabilitation or invasive, surgical methods. Major considerations include the extent of damage and capacity for tear propagation. Tissue mechanics are often complicated by the hierarchical structure of tendon, ranging from macro-scale tendons to sub-micron fibrils. Partially-torn tendon fascicles exhibit cell necrosis patterns that suggest altered tissue mechanics surrounding the injury site. A custom-made device has been designed to cyclically load a rat tail fascicle while simultaneously monitoring force and displacement. We hypothesize future testing using this device will show elevated strain invariants in regions consistent with observations of cell death. The information obtained could expand clinical knowledge used in treatment planning and be leveraged to enhance tissue-engineering tendon constructs.

PHYSIOLOGICAL STRESS IN MOTHER-CHILD DYADS WITH AUTISM SPECTRUM DISORDER DURING MEALTIME

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

Up to 89% of children with autism spectrum disorder (ASD) are reported to have feeding challenges interfering with mealtime experiences. Challenging feeding behaviors create stress in the mother-child relationship. Objective measures of this stress have not been captured on the dyad during mealtime. This study aims to assess the physiological stress of mothers and children with ASD during mealtime by measuring their heart rate variability simultaneously. Ten mother-child dyads will participate in the study with a child with ASD between the ages of 3 to 5 years. Heart rate variability will be measured on both the mother and child during a baseline activity, free play session and mother-child eating experience. Results will characterize stress in mother-child dyads, identifying future intervention targets for family-centered interventions.

EFFECTS OF LISTSERV COMMUNICATION ON FARMER'S MARKET COMMUNITIES

Michael Mussar, Alfonso Morales (Mentor), Urban & Regional Planning

This study is designed to understand how communications of individuals using the Farmers Market Coalition (FMC) listserv (an email system that specifically deals with food systems) affects the various individuals and communities that participate. The FMC, a non-profit organization based in the United States, is responsible for monitoring a listserv used by farmers' market managers and others from around the country. The database is comprised of various email interactions between those associated with farmers' markets across the country. This work builds on work done by Maclovia Quintana and Alfonso Morales, with the intention of updating themes to reflect the evolution of the communication tools. The research identifies assorted ideas that seem to be present in multiple emails, with the goal of gaining an understanding of the primary reasons for the emails, and in turn the associated impacts.

LITERACY AND IDENTITY

Eloisa Negrete Garcia, Catherine Compton-Lillly (Mentor), Curriculum & Instruction

The basis of Dr. Catherine Compton-Lilly's longitudinal study is to investigate how nine immigrant children use literacy to express themselves and how they perform and build their identity as they move across home, school, and community spaces. The idea is to honor the complicated work that is undertaken by these young minds and feature the importance of helping immigrant children navigate through their transnational experiences. To do this, data is collected from family and teacher interviews, child observations in a classroom setting, literacy tests, transcriptions and coding. Dr. Compton-Lilly has found patterns between literacy practices and identity constructions across time and a correlation between the ways children read, write, observe, use text and the way they show their intersectionality.

THE FUNCTIONAL CONSEQUENCES OF MANDIBLE SHAPE EVOLUTION IN GIANT HOUSE MICE FROM GOUGH ISLAND.

Jacob Nelson, Bret Payseur (Mentor), Genetics

We used the extremely large Mus musculus domesticus mouse population from the remote Gough Island (GI) to study how the evolution of shape may affect the performance of a morphological trait. In this study, we asked how GI mice divergence in mandibular shape from a mainland strain (WSB) might have affected their jaw performance. We found that GI mice display significantly greater maximum bite force after correcting for body weight than WSB. However, GI mice show no significant difference in maximum gape relative to body weight compared to WSB. Comparisons in morphological changes between strains suggest relative decreases in the mandibular symphysis length and molar load arm length may play a role in the evolution of increased relative bite force in Gough Island mice.

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

Haley Nemeth, Thomas Sutula (Mentor), Department of Neurology

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

EQUITABLE FITNESS FOR SENIORS: THE STRONGWOMEN PROGRAM AND INSURANCE REIMBURSEMENT IN WISCONSIN

Gina Nerone, Courtney Saxler (Mentor), Wisconsin Partnership Program

StrongWomen is an evidence-based, strength-training program for seniors, proven to improve muscle mass, bone density, arthritis symptoms, balance, healthy weight, sleep, and mental health. Classes are taught worldwide, with 15,000 seniors participating in Wisconsin alone. I have worked with UW–Extension Shawano County for the past year to make these fitness classes more accessible statewide. The recurring class fees present a barrier for many seniors with insufficient fixed incomes, compounding preexisting health inequities. Through strategic communication methods and cost-benefit analysis, our goal is to have the cost of the classes reimbursed via health insurance. This presentation highlights the importance of helping seniors thrive from a medical and sociological perspective, and discusses the challenges and successes of building partnerships and practicing meaningful and equitable public health.

UNDERSTANDING WHY THE U.S. SUPREME COURT SIDES WITH THE EXECUTIVE BRANCH IN ADMINISTRATIVE LAW

Daniel Nesslein, Mikayla Sandin, Devin Judge-Lord (Mentor), Political Science

An agency is defined as a specialized organization that is given power to make policies by the government. Our research consists of analyzing United States Supreme Court cases to assess the impact of 55 factors, most importantly, if it makes a difference to the court if the agency's policy was made through notice and comment rulemaking or some other form of rulemaking, and the likelihood of the court upholding federal agencies' policies. Notice-and-comment rulemaking is when the agency publishes the policy for the public to comment on before enacting the policy. The research could create a greater participation in government policies and understanding in how the Supreme Court makes decisions.

COLONIZATION BY SYMBIOTIC FUNGI DIFFERS ACCORDING TO WATER AVAILABILITY

Nguyen Nguyen, Michelle Pearson (Mentor), Cellular & Molecular Biology

Arbuscular mycorrhizal fungi (AMF) attach to plant roots, growing intracellular structures that help hosts by delivering nutrients and water. AMF help plants access key nutrients such as phosphorus, sulfur, nitrogen and other micronutrients in the soil. AMF symbiosis is especially beneficial for plants in systems where nutrients are at a deficit. The fungi receive plant sugars in exchange. We seek to determine if AMF structures (arbuscules, vesicles, and hyphae) differ within a fungal species (using two isolates), between high and low water conditions, and if the differences are driven by host plant cultivars. This work aims to quantify AMF structures in the roots of carrots and to assess whether there are correlations between fungal structure prevalence and carrot yield.

PORPHYROMONAS GINGIVALIS MEDIATED DISRUPTION OF AUTOPHAGY AND ATHEROSCLEROSIS

Chloe Nickel, Leticia Reyes (Mentor), Pathobiological Sciences

Atherosclerosis is the hardening and narrowing of the arteries due to a buildup of plaque, which can block blood flow and cause heart attacks and stroke. Its cause is unknown, but it's now recognized that impaired autophagy in endothelial cells contributes to the development of atherosclerosis. Porphyromonas gingivalis (Pg), a common oral bacteria, is also able to invade endothelial cells and disrupt autophagy in these cells, which is linked to atherosclerosis. Our objective is to determine if Pg mediated disruption of autophagy is a mechanism which promotes atherosclerosis, or if the damage linked to it is only caused by inflammation. We are using a mutant of Pg that has all of the same effects except it is not able to disrupt autophagy. My role has been scoring the extent of atherosclerosis in aortas of control, Pg, or Pg mutant-inoculated mice by performing special staining to measure autophagic activity and the type of inflammation present in the aorta.

INVESTIGATING PLANETARY BOUNDARY LAYER DEPTH RETRIEVAL FROM MULTIPLE INSTRUMENTS

Kip Nielsen, Ankur Desai (Mentor), Atmoshperic & Oceanic Sciences

The Planetary Boundary Layer (PBL) is the lowest part of the atmosphere and its behavior is strongly impacted by its interaction with the surface. Through a case study analysis over the last week in September 2016, the effectiveness of 5 instruments were compared to each other for observing PBL depth and its diurnal dynamics. The site for data collection in Park Falls, WI consisted of a data-recording trailer and a 400-meter-tall tower capable of performing measurements at fixed heights. This inter-comparison of atmospheric variables provides increased confidence in the best methods for retrieval of boundary-layer properties. Concurrently, it provides insight into the evolution of the part of the atmosphere that both affects and is affected by our daily lives.

VALIDATION THAT VOLUNTARY WHEEL RUNNING PARADIGM INCREASES THE RATE OF NEUROGENESIS

Annie Novak, Xinyu Zhao (Mentor), Neuroscience

Different factors can affect the rate of neurogenesis, the process by which neural stem/progenitor cells (NSPCs) can proliferate and differentiate into new neurons in the mammalian brain. It is known that neurogenesis persists throughout life in the hippocampus, which supports healthy brain function. Mice with access to running wheels exhibit increased hippocampal cell proliferation, enhanced production of newborn neurons, and accelerated maturation of new neuron morphology. Our laboratory is currently performing experiments to assess changes in gene expression specifically within newborn neurons as they mature in a voluntary wheel running paradigm. This study will confirm that our 11-day voluntary exercise experimental design increases the rate of neurogenesis in NesCre-ERT2::Ai14 mice. To achieve this, mice will be split into running and non-running groups, and neurogenesis will be assessed by counting the number of newly-created Ai14+ cells and the number of actively proliferating BrdU+ cells.

EDUCATION AND RECIDIVISM IN INCARCERATED PARENTS WITH YOUNG CHILDREN

Shannon O'Neill, Gretchen Aubel, Julie Poehlmann-Tynan (Mentor), Family Studies

Mass incarceration within the U.S has been an increasing problem within the last 60 years. Most incarcerated individuals are parents, which has implications for children. Our study focuses on incarcerated parents with young children and aims to determine whether educational attainment within these parents relates to rates of recidivism within a year's time along with the type of crime committed. Our study looks at how educational attainment by gender relates to recidivism. Data on parents' education level and crimes committed was collected from a study conducted by Dr.Poehlmann-Tynan. We hypothesize that incarcerated parents with more education will recidivate less, commit less serious crimes and when accounting for the same educational attainment level, women will recidivate less than men. These findings highlight the importance of reducing recidivism.

CHARACTERIZING NANOPARTICLE ASSOCIATION WITH BACTERIAL CELL WALL INTERFACES BY SOLID STATE NMR

James O'Rourke, Emily Caudill (Mentor), Soil Science

Nanomaterials are being increasingly employed in a variety of industries; however their release can prove harmful for local ecosystems. Gram-positive bacteria are ubiquitous in aquatic and terrestrial environments and are essential to ecosystem function. To determine which cell wall peptidoglycan (PG) and/or wall teichoic acid (WTA) chemical moieties dictate nanoparticle (NP) interaction, Bacillus subtilis wildtype and mutants were cultured in 100% 13C and 15N M9 minimal media. Sacculi purity was verified by TEM and 1H solution-state NMR. Whole sacculi were exposed to cationic polymer-wrapped 10 nm gold NPs. 1D 31P and 2D 13C–13C solid-state NMR of mutants lacking alanyl and glycosyl WTA moieties showed non-trivial peak shifts relative to wildtype. This information will be used to determine the specific WTA/PG moieties interacting with nanoparticles.

THEMES WITHIN AFRICAN-AMERICAN MEN'S SCHOOL EXPERIENCES

Oona-ife Olaiya, Janean Dilworth-Bart (Mentor), Human Development & Family Studies

Previous research shows that African-American males have been marginalized within school settings. It is important to consider black male narratives regarding personal histories when discussing barriers to school success. The underlying theory of intersectionality drives this research; it posits that multiple traits of an individual link to form one holistic identity. These intersections are related to multiple forms of discrimination that an individual may face. The purpose of this phenomenological study will be to discover what underlying themes are present within descriptions of African-American males school experiences. Five semi-structured qualitative interviews were conducted with African-American fathers. Each interview was transcribed and thematic coding will be used in order to identify potential patterns related to whether participants believe race and gender played a role in their school experiences.

OVERCOMING CETUXIMAB RESISTANCE BY TARGETING HER FAMILY OF RECEPTOR TYROSINE KINASES WITH PAN-HER

Rachel Orbuch, Deric Wheeler (Mentor), Human Oncology

The Epidermal Growth Factor Receptor (EGFR) antibody cetuximab is effective in treating head and neck squamous cell carcinoma (HNSCC) and non-small cell lung cancer (NSCLC). Despite cetuximab''s initial clinical success, intrinsic and acquired resistance often result. NSCLC and HNSCC acquired resistance models show robust upregulation and dependency on HER family members: EGFR, HER2, and HER3. Thus, in our study we used pan-HER, a mixture of six antibodies, to target multiple HER receptors. We found that pan-HER inhibited proliferation in both NSCLC and HNSCC cell lines with intrinsic and acquired resistance. Additionally, following pan-HER treatment expression levels of all three proteins and downstream activation of MAPK and AKT decreased. Our results indicate that synergistic antibody mixtures may represent an effective cancer treatment to overcome cetuximab resistance.

INVESTIGATING ANALOGS OF EFLORNITHINE, AN IRREVERSIBLE INHIBITOR OF ORNITHINE DECARBOXYLASE

Luke Oxtoby, Jennifer Schomaker (Mentor), Chemistry

Eflornithine is a fluorinated amino acid analog that is an effective treatment for African Trepansomiasis (sleeping sickness). Analogs of eflornithine featuring a motif known as an aminated stereotriad, which is found in numerous biologically active natural products with known anti-cancer and anti-parasitic properties, will be investigated using biological assays. Synthetic methodologies developed in the Schomaker group will allow for a rapid and modular synthesis to access six analogs of eflornithine featuring aminated F-N-O stereotriads. Current progress on this synthetic procedure will be reported along with future plans for screening biological activity.

EMERGING ADULTS' USE OF SUPPLEMENTAL ACTIVITIES FOR DEPRESSION TREATMENT

Grace Padgett, Natalie Wietfeldt (Mentor), Family Medicine

Depression, a mood disorder, is an epidemic in the United States that leaves individuals feeling dejected and lacking the energy to complete everyday tasks. Emerging adults (ages 18–29) are a population that struggle finding appropriate treatments for their depression. However, some have discovered supplemental activities to traditional treatments. This study will investigate experiences that emerging adults have when implementing these kinds of strategies into their mental health care treatment regimen. Through secondary analysis of 38 consumers transcripts, emerging adults experiences utilizing alternative approaches will be assessed. Content analysis will be used to find common ideas and themes among consumers experiences. The analysis of holistic treatments for depression will provide qualitative information on emerging adults use of alternatives to traditional mental health care, and their utility.

THE TRIGGER LOOP OF RNA POLYMERASE IS A POSITIONAL CATALYST OF TRANSCRIPTION AND PROOFREADING

Michael Palo, Tatiana Mishanina (Mentor), Biochemistry

Transcription requires multi-subunit RNA polymerases (RNAPs) in all forms of life. The trigger loop (TL), a highly conserved mobile domain of RNAPs, plays a key role in nucleotide addition and RNA hydrolysis reactions. A universally conserved TL histidine residue has been proposed to act as a general acid and base in RNAP activities, but experimental data to date has been inconclusive. We showed that glutamine substitutions of the TL His and a neighboring TL arginine, which preserve polar interactions but are incapable of acid-base chemistry, did not affect the rate of E. coli RNAP activities. However, they did affect backtracking of the enzyme, which is necessary for proofreading. We propose an alternative model in which the TL functions as a positional catalyst of RNAP activities.

INHIBITION OF MEK/ERK AND AKT/MTOR PATHWAYS IN HEAD AND NECK CANCER

Aastha Pandey, Randy Kimple (Mentor), Human Oncology

We have identified an activating mutation in HRAS in the head and neck cancer cell line SCC22B. This mutation may render these cells resistant to therapy targeting upstream of this signaling node (i.e. EGFR). Using clonogenic survival assays and western blot we have studied the role of mutant HRAS and inhibition of downstream targets on sensitivity to radiation. Inhibition of MEK/ERK and Akt/mTOR which are located downstream of activated H-Ras radiosensitized SCC22B, but not cells with wild-type HRAS. siRNA knockdown of H-Ras 24, 48, and 72 hours prior to irradiation radiosensitized SCC22B, but not HRAS wild-type cell lines. Target inhibition and knockdown was confirmed by western blot analysis.

MICROSTRUCTURAL CHANGES IN ZIRCONIUM ALLOYS DUE TO LOCA AND THE CHROMIUM COLD SPRAY COATING PROCESS

Calvin Parkin, Kyle Blomstrand, Ryan Carroll, Jason Kuhn, Adrien Couet (Mentor), Engineering Physics

The loss-of-coolant-accident (LOCA) at the Fukushima Daiichi nuclear power plant in 2011 demonstrated dangerous conditions created by zirconium-alloy cladding failure at high temperatures. As temperature of the fuel element rises from nuclear decay heat, an autocatalytic reaction occurs, rapidly oxidizing the cladding. Hydrogen gas accumulation from this reaction risks compromising reactor containment from pressure buildup or explosion. A serious effort is underway to develop accident-tolerant fuels that are better able to withstand the high-temperature oxidizing environment of a LOCA. This work explores the post-LOCA microstructural changes in the cladding and the effects of a chromium cold spray coating technique, which is predicted to enhance corrosion resistance and increase safety margins but may induce microstructural changes due to the cold work process.

EFFECTS FROM ARGININE AND LYSINE ON STABILITY IN COILED COIL AND BETA HAIRPIN SYSTEMS

Alexander Passow, Naomi Biok (Mentor), Chemistry

Proteins are long sequences of amino acids, which fold into various secondary and tertiary structures. Hydrophobic interactions play a large role in governing protein folding, and help promote dimeric coiled coil systems. Arginine and lysine are cationic amino acids, with arginine containing a guanidium group and lysine an ammonium group. These two amino acids were chosen to be studied comparatively because guanidium and ammonium groups have both seen to have differing effects on hydrophobicity. The studies use dimeric coiled coil systems and beta hairpins and substitute arginine and lysine to observe denaturation temperature using circular dichroism. The denaturation temperature is used to analyze stability of these system. So far arginine has been observed to promote stability of a coiled coil over lysine.

ESTROGEN TREATMENT PREVENTS PULMONARY VASCULAR REMODELING IN A RAT MODEL OF PAH

Rohan Patnaik, Naomi Chesler (Mentor), Biomedical Engineering

Pulmonary Arterial Hypertension (PAH) is a rare, fatal cardiovascular disease that is characterized by elevated pulmonary arterial pressures and pulmonary artery (PA) remodeling, eventually leading to right ventricle (RV) failure. It has 2:1 female to male predominance. However, female patients have an improved prognosis compared to male patients and recent animal studies have demonstrated protective effects of estrogen in experimental models of PAH. Several studies have focused on the effects of estrogen within the RV, however, the role of estrogen in mediating PA remodeling, a key feature of PAH, has yet to be determined. We investigated the effect of estrogen on PA remodeling and the development of PAH through vascular pressure measurements and lung tissue histology analysis to identify a structural-functional relationship in the disease.

QUANTITATIVE PROTEOMICS OF PANCREATIC CANCER STROMAL SIGNALING USING N,N-DIMETHYL LEUCINE LABELING

Catherine Pearce, Lingjun Li (Mentor), Pharmacy

Pancreatic cancer has dismal survival rates, partly due to the limited effectiveness of chemotherapeutical drugs on cancer cells. We believe this phenomenon may be explained by pancreatic cancer cells' activation of surrounding cells in the pancreatic tumor microenvironment. To better understand the interactions between the tumor microenvironment and cancer cells, we employ a mass spectrometry-based approach, utilizing N,N-Dimethyl Leucine isobaric labeling to perform multiplex quantitative proteomics. This multiplex isobaric labeling strategy allows for analysis of 12 biological samples in one mass spectrometric run. We will compare in vitro co-cultured pancreatic cancer and pancreatic stellate cells with their corresponding monocultures. We expect to find that co-culturing microenvironment cells with cancer cells will result in changes in proteins involved in drug transport, drug resistance, and cell migration/metastasis.

NEURONAL REACTIVATION IN THE CA3 HIPPOCAMPAL REGION IN MEMORY FORMATION DUE TO PATTERN COMPLETION

Lauren Peretz, Marissa Korte, Peter Lipton (Mentor), Neuroscience

The purpose of our research is to discover the circuit-level mechanism in the CA3 hippocampal region of the brain used to recall an event from viewing a small portion of the event (a partial cue). There is support that a partial cue activates a subset of the cells in the CA3 region that were previously activated by an original stimulus. We used immediate early gene (IEG) expression in the cells of the CA3 region to determine whether recall from a partial cue is associated with activation of the original cellular representation of the event and, further, to determine whether the degree of recall is related to the degree of overlap between the cell patterns activated during recall and during the original stimulus.

PORPHYROMONAS GINGIVALIS STRAIN DEPENDENT EFFECTS ON PERIODONTAL DISEASE AND PREGNANCY COMPLICATIONS

Gonzalo Perez, Jr., Leticia Reyes (Mentor), Pathobiological Sciences

Porphyromonas gingivalis (Pg) is a naturally occurring bacterium in the human mouth that promotes inflammation of the gums and ligaments that supports the tooth, commonly known as periodontal disease. Pg is also linked to pregnancy complications such as miscarriage, lack of fetal growth, and abnormal placental development. Pg is difficult to analyze due to various strains of bacteria, some causing periodontal disease but not abnormal placental growth, while others do the opposite. A rat model with periodontal disease will be used to determine if Pg strain diversity is a factor in pregnancy complications. This study hopes to determine which strains are malignant, and develop an effective screening method to warn and potentially diminish pregnancy complications.

3D PRINTING FOR THE MANUFACTURING INDUSTRY

Sam Peters, Thomas Mulholland (Mentor), Mechanical Engineering

In the field of Additive Manufacturing, Fused Filament Fabrication(FFF) more commonly known as 3D printing is the fastest growing method. Although commonly used in rapid prototyping, the technology lacks certain mechanical properties that make it practical for manufacturing. This lab aims to bring 3D printing to the manufacturing world by optimizing printing techniques. With the precision of FFF, we are able to print heat exchangers with geometries much more complex than conventional methods. While these heat exchangers are not independently competitive, by using filament filled with copper and carbon fibers we are able to increase the thermal conductivity of the part. Ultimately, we hope to shift the standard of the heat exchanger industry to more efficient and cost effective FFF parts.

MING DYNASTY PLAGUE GODS AND DEMONS

Catherine Peterson, Rania Huntington (Mentor), Asian Languages & Cultures

By the Ming dynasty, China had experienced multiple endemic and epidemic diseases and, like many cultures did before modern medicine, used supernatural gods and demons to explain the seemingly invisible sources of these disasters. A collection of stories written down by Qian Xi Yan of the Ming dynasty, covering anything and everything supernatural, provided several stories of plague and illness showing the wide range of the influence and the perception of these beings at the time. The goal of this paper is to examine the conception of various roles, good and bad, that the supernatural played in both the cause and effect of illness.

ANTIBODY RESPONSE IN HUMANS WITH RHEUMATOID ARTHRITIS ASSOCIATED VARIANTS OF PADI4

Chloe Peyton, Miriam Shelef (Mentor), Rheumatology

Rheumatoid arthritis, an inflammatory arthritis, is associated with genetic variants in PADI4, but how PADI4 might be altered is unknown. In mice, PADI4 is required for a normal antibody response to immunization. However, it is not known if genetic variants in PADI4 correlate with a human antibody response. Because people with rheumatoid arthritis are more likely to make autoantibodies, I hypothesized that people homozygous for the rheumatoid arthritis susceptible genotypes of PADI4 would have higher antibody levels to an immunization compared to homozygotes for non-susceptible genotypes. Thus, I measured antibody titers for tetanus and pertussis in vaccinated subjects who were homozygous for the susceptible and non-susceptible PADI4 genotypes at two different single nucleotide polymorphisms. Initial findings indicate no difference in antibody response related to genotype.

WIND TURBINE FOUNDATION LOADINGS AND TOWER MOMENT

Briana Phibbs, Matthew Monette, James Tinjum (Mentor), Engineering Professional Development

Massive, gravity-based, octagonal wind turbine generator (WTG) foundations are designed based on many conservative assumptions, leading to over-designed (and more expensive) WTG foundations. The purpose of this research project is to field validate certain stress-transfer assumptions and, hopefully, lead to better-designed, mechanistically based, cost-effective foundations. Using the deformation data from the strain gauges under the WTG foundations and rotor speed data, we analyzed how soil strain changes with changing frequency of the blade-passing frequency. Using the tower strain gauge readings, the shear force and tower moment can be calculated. There is some correlation (proportionally or inversely correlated, depending on location) between plane of the rotor rotation and soil strain response. Both tower moment and shear moment correlate with wind speed depending on wind direction.

ANALYZING THE IMMUNE SYSTEM RECONSTITUTION FOLLOWING HEMATOPOIETIC STEM CELL TRANSPLANTATION

Nicole Philipps, Dana Baiu, Elaine Dandan, Mario Otto, Dana Baiu (Mentor), Pediatric Oncology

Favorable clinical outcomes following a hematopoietic stem cell (HSC) transplant depend critically on expedited reconstitution of the immune system and the absence of graft versus host disease. Using a clinical HSC graft technique that depletes TCR T cells, while preserving other immunoprotective cell populations (such as γ T cells), might accelerate the recovery of immune function. Immunocompromised mice, in which human thymic tissue has been implanted to allow the maturation of T cells, will be used to implement this HSC graft technique. These mice will be euthanized at different time points and tissues will be harvested. Upon evaluation of the histology and cell composition of lymphoid tissues, we can deduce how quickly and sufficiently the immune cell populations were reconstituted.

THE RELATIONSHIP BETWEEN BULLYING AND INTERNALIZING BEHAVIOR PROBLEMS IN CHILDREN WITH ASD

Katie Phillips, Sigan Hartley (Mentor), School of Human Ecology

The purpose of the current study is to understand bullying in children with Autism Spectrum Disorder (ASD). The specific aims were to determine: (1) the frequency of bullying in children with ASD; (2) the relation between bullying and child internalizing behavior problems (i.e., depressed and anxious affect), and (3) whether maternal depression moderates the link between bullying and child internalizing behavior problems. Analyses will be based on 182 mothers of children (aged 5–12 years) with ASD. We hypothesized that children with ASD will experience an elevated rate of bullying (relative to typically developing same-aged children), bullying will be positively associated with child internalizing behavior problems, and maternal depression will moderate this link. Findings have implications for supporting families with ASD.

RETHINKING SEVERE WILDFIRE: PYRODIVERSITY IN THE WESTERN U.S.

Nicole Pietrunti, Gavin Jones (Mentor), Forest & Wildlife Ecology

In recent decades, the frequency of large, severe fires has increased in the western United States as a result of human land use and anthropogenic climate change. However, the social and ecological effects of such fires likely depend, in part, on the spatial patterns of burn severity within a given fire. Here, we use the Monitoring Trends in Burn Severity (MTBS) database to characterize the statistical distribution of within-fire pyrodiversity—defined here as the standard deviation of fire severity—and potential trends in pyrodiversity across the western United States since 1984 using linear regression analysis. We hypothesize that severe fires are becoming simplified, a hypothesis that would be supported if a negative trend in pyrodiversity is identified. The variables used to describe the effects of fire on animal populations are often simple (e.g. area burned, burn severity), which contributes to an incomplete and potentially oversimplified understanding of fire effects on biodiversity. Our analysis seeks to highlight the importance of considering fire complexity (e.g. pyrodiversity) when estimating the effects of severe fire.

CHARACTERIZATION OF SALMONELLA SURVIVAL IN BEDDING SAND AND ABILITY TO INFECT BOVINE MACROPHAGES

Hannah Pilch, Charles Czuprynski (Mentor), Pathological Sciences

In Wisconsin most dairy cows are kept on sand bedding because it is comfortable and cost effective. Healthy cows can shed Salmonella in feces, thus contaminating bedding sand and serving as reservoir of Salmonella. This study tested the ability of Salmonella serotypes associated with dairy cattle to survive in bedding sand, and of Salmonella cells recovered from sand to invade bovine macrophages. Salmonella inoculated into barn sand at a concentration of 107 CFU/g survived at approximately 106 CFU/g for one month. After two months, numbers of Salmonella decreased further to 104 CFU/g. Salmonella cells recovered from sand after a one month incubation were able to invade bovine macrophages in vitro, but did not multiply intracellularly during a 24h incubation period.

EFFECTS OF TICK TUBES AND BUCKTHORN REMOVAL ON LYME DISEASE PREVALENCE

Rizza Pineda, Susan Paskewitz (Mentor), Entomology

The purpose of this research is to find effective methods to reduce the number of Ixodes scapularis, more commonly known as deer ticks, infected with Lyme disease. Deer ticks can be infected with the bacteria, Borrelia burgdorferi. If transmitted to humans, this bacteria can result to Lyme disease, which causes rashes and flu like symptoms. In the UW Arboretum, nymphs were collected from four environments: control, tick tube treatment, buckthorn removal treatment, and a double treatment which has both. Testing the nymph samples and determining the presence of B. burgdorferi in their DNA entails DNA extraction, DNA amplification through nested PCR, gel electrophoresis and UV imaging. The results showed 4 out of the 97 samples positive for B. burgdorferi.

MICROSCALE MODEL TO UNDERSTAND THE ROLE OF FALLOPIAN TUBE EPITHELIAL CELLS IN OVARIAN CANCER

Veronica Porubsky, Pam Kreeger (Mentor), Biomedical Engineering

Ovarian cancer is the fifth deadliest malignancy among women in the United States, and is often undetected before metastasis. It is hypothesized that fallopian tube epithelial (FTE) cells initiate tumors after incorporation in ovarian cortical inclusion cysts (CIC) during follicular rupture. By seeding cells in a microfluidic lumen composed of collagen to model a CIC, the role of FTE cells in ovarian cancer could be elucidated. Experiments demonstrate increased invasiveness of FTE cells when in co-culture with ovarian surface epithelial cells, suggesting that monolayer disruption may impact cellular signaling. Further investigation showed that follicular fluid, collagen concentration and content, and curvature also impact FTE behavior. We hope this model will provide insight into the early stages of ovarian cancer, prompting more effective detection and treatment.

ASSESSMENT OF OVITRAP SURVEY FOR ZIKA VECTORS IN WISCONSIN IN 2016

Sydney Potts, Susan Paskewitz (Mentor), Entomology

Zika virus (ZIKV) is a mosquito-borne flavivirus transmitted by Aedes aegypti and Aedes albopictus and can cause febrile illness and prenatal microcephaly. ZIKV began to spread to North America in 2015, prompting increased public health surveillance relating to the mosquito vector. In 2016, ovitraps attracting A. aegypti and A. albopictus were placed among Wisconsin counties in order to gather surveillance data. The purpose of this research is to assess the results of the ovitrap survey in Wisconsin in 2016 and compare surveillance data with Illinois and Minnesota. Furthermore, this work will determine new locations for trap deployment in 2017 and aid in public health awareness of the potential for ZIKV in Wisconsin.

5 X 5 FONT

Jacelyn Poventud, Helen Lee (Mentor), Art

The purpose of this project is to create a low resolution QWERTY keyboard using glass and digital typeface in murine format (an Italian term for images made in a glass rod that are revealed when cut in cross-sections) as opposed to just the alphabet in glass. During the glassblowing process, the alphabet isn't decipherable because of the length of the glass rod, so a tool called the equalizer is used to cut the rod in small pieces (ranging in width) and placed into a cube organizer. This project opens a new ground of what it means to use glass and graphic design.

CHANGING THE RULES: HOW RECENT U.S. LAW REGULATES GREENHOUSE GASES

Erika Pritchett, Richard Keyser (Mentor), Center for Law, Society & Justice

My presentation explores greenhouse gas regulation in the U.S., examining how pressure from various governments or organizations shaped regulations, who established regulations, and how effective these regulations have been. The United States government began regulating greenhouse gases only recently and only in response to a lawsuit brought by several states, in Massachusetts v EPA (2007). Federal initiatives like Obama's Climate Action Plan, and intergovernmental agreements like the Kyoto Protocol and the Paris Agreement, have supported and expanded these regulations. I argue that external pressures on the federal government have been critical in shaping greenhouse gas policies.

INCARCERATED PARENTS OF YOUNG CHILDREN: TYPE OF PARENTAL CRIME AND CHILDREN'S BEHAVIOR PROBLEMS

Kaitlyn Pritzl, Ashley Peterson, Julie Poehlmann-Tynan (Mentor), Family Studies

The goal of our research is to examine risk factors that may relate to children's behavioral outcomes in families with incarcerated parents. In this study, 77 families participated including jailed parents, their children (age 2–6), and the children's caregivers. Jailed parents were interviewed about their demographics, the nature of the crime that led to their incarceration, and their child's experiences in regards to their incarceration. Their children were assessed during a home visit. We hypothesized that children whose parents committed violent crimes would exhibit more behavioral problems than children whose parents committed nonviolent crimes.

IDENTIFYING YEAST SPECIES FROM BIOLOGICAL SAMPLES

Ritika Punathil, Quinn Langdon (Mentor), Genetics

The focus of the Hittinger Lab is to understand how yeasts' ability to ferment can be used to create biofuel, which society will become increasingly dependent on as our fossil fuel supply diminishes. As a researcher in the Wild Y.E.A.S.T Project, which focuses on identifying wild yeast species, I grow and identify yeasts from biological samples, like bark and soil. My work consists of four phases: field, enrichment, molecular, and computational work. This includes collecting biological samples, culturing yeasts, isolating and purifying the DNA, and using a genomic barcode to identify species. Currently, I have identified fourteen species and am conducting further tests to determine if two isolates could be new species.

EARLY STRANGER FEAR AS A PREDICTOR OF ADOLESCENT ANXIETY AND SOCIAL FUNCTIONING

Katrina Radi, Hill Goldsmith (Mentor), Psychology

Early stranger fear is associated with anxiety concurrently and in middle childhood (Kagan & Snidman, 1999; Van Hulle, in press), but longer term prediction is seldom successful (Rickman, 1997). We followed 126 twin children from infancy to mean age 16 years and examined whether early parent-reported stranger fear profiles (Brooker et al., 2013) predicted adolescent anxiety symptoms (self-report on the Diagnostic Interview Schedule for Children-IV). Contrary to a continuity hypothesis, infant stranger fear was not significantly related to adolescent anxiety symptoms (ps > .10). I will also examine whether infant stranger fear predicts adolescent social outcomes (self- and cotwin-report on the Health & Behavior Questionnaire social scales), and hypothesize that infants with steep increases in stranger fear will have negative social experiences in adolescence.

OTTER DEVASTATION? THE CASE FOR CONSERVATION OF LONTRA LONGICAUDIS IN MEXICO

Leanza Rakowski, James Berkelman (Mentor), Forest & Wildlife Ecology

Our research concerns the conservation of the neotropical otter (Lontra longicaudis) in Latin America. This otter is a carnivorous species found in riparian habitats of Mexico, Central America, South America. Though they are the most common otter species of Mexico, they are currently listed as near threatened by the IUCN. Improved detection techniques and conservation strategies are required to ensure the continued survival of this species, which is important in both cultural and ecological contexts. In particular, the otter serves as a keystone species because of its role in top-down dynamics of riparian ecosystems. Our goal is to describe and compare the conservation plans of this and other otter species, such as the giant otter (Pteronura brasiliensis) and the North American river otter (Lontra canadensis).

TESTING FOR LOCAL ADAPTATION IN DROSOPHILA MELANOGASTER POPULATIONS FOR OLFACTORY RECEPTOR GENES

Vedika Ramesh, John Pool (Mentor), Genetics

As the correlation between genetic variation and the extent it can lead to evolutionary change remains unknown, of interest is understanding the genetic architecture underlying olfactory variation between populations. This research tests for the presence of local adaptation in 11 populations of Drosophila melanogaster for olfactory receptor genes. Evidence was obtained by analyzing genomes via Window and Max SNP FST, accounting for hard and soft selective sweeps. The data collected was converted to quantiles distinguishing unusually high FST values to compare variance within versus between populations and to observe population differentiation from variance in genetic structure. Additionally, a new method was developed via Circos software to graphically depict genetic differentiation. Preliminary results located several candidate genes that are likely experiencing natural selection in select populations.

MICROBIOTA AND COGNITIVE DIFFERENCES BETWEEN BREAST-FED AND FORMULA FED INFANTS:PRELIMINARY INSIGHTS

Alysha Rameshk, Andrew Alexander (Mentor), Medical Physics

Human brain development is impacted by both genetic and environmental factors. Recently, overlap between microbiota colonization and cognitive development has been suggested and indicates interaction between these two processes. This research project aims to identify associations between the human microbiota colonization and cognitive development during infancy. Utilizing metagenomics and neurocognitive measures, information about subjects was collected to analyze interactions between microbiota and development. This study will delve into the connection by analyzing microbiota and cognitive differences in subjects who were breastfed vs formula-fed. We hypothesize that a breast-fed infant will exhibit a more diverse microbiota, which in turn, will correlate stronger with neurocognitive measures. Elucidation of these relationships throughout development is crucial in understanding how various environmental factors can affect an infant's development.

A NOVEL HIGH-THROUGHPUT METHOD TO QUANTIFY NETOSIS IN FLUORESCENT MICROSCOPE IMAGES

Ryan Rebernick, Miriam Shelef (Mentor), Rheumatology

Neutrophil extracellular traps (NETs) are masses of extracellular decondensed chromatin released by neutrophils that are important in multiple inflammatory diseases. Current methods of quantifying NETosis are often time-consuming or susceptible to bias. To address these issues, we designed a novel ImageJ/Java-based macro to provide a rapid, simple, and objective approach to analyze NETosis and quantify the average area of a single neutrophil's decondensed chromatin. To validate this program, over 2,000 neutrophils were analyzed with the macro calculating 27.4% NETosis compared to 29.1% determined by eye. Further, this macro calculated increased NETosis and chromatin area in rheumatoid arthritis subjects as compared to controls. Rheumatoid arthritis is associated with increased NETosis. Thus, this macro is an accurate new tool to objectively quantify NETosis.

ROLE OF MICROTUBULE ACETYLATION IN SENSORY DENDRITE DEVELOPMENT

Helena Record, Jill Wildonger (Mentor), Biochemistry

In neurons, a dynamic and coded microtubule cytoskeleton is essential for proper neuronal morphology and function. Microtubules form a cytoskeletal "highway" that mediates polarized transport of cellular components between the axon, dendrites, and cell body. Populations of axonal and dendritic microtubules are differently enriched in post-translational modifications (PTMs) such as acetylation, leading to the prediction that tubulin PTMs may act as "traffic signals" to regulate the direction and flow of microtubule motors. Studies have shown that axonal microtubules are more acetylated than dendritic microtubules; however, the precise role of acetylation in targeted transport and neuronal morphogenesis remains unknown. In this study, we explored the effects of acetylation-blocking and mimic mutations of -tubulin lysine 40 (K40) in mechanosensory neurons of developing fruit flies. Our results highlight a novel role for K40 and acetylation in neuronal structure and dendrite branch refinement.

THE EFFECTS OF FRAMING ON DECPETION

Peter Reinke, Lyn Van Swol (Mentor), Communication Arts

In this study participants took a 12-item trivia task designed so they would get seven questions correct. They earned money for their answers either through a gain or loss frame. In a gain frame, participants started with $0 and earned $1 for each correct answer. In a loss frame, participants started with $12 and lost a dollar for each incorrect answer. Once the participant received their seven dollars they were instructed to divide it with "player two" who didn't know how much the participant had received. Player two is a researcher in a different room communicating through text chat. The way the participant divides the money is coded as deceptive or not and compared to which frame they were assigned.

IMPACT OF ASIAN JUMPING WORMS (AMYNTHAS) ON SOIL AGGREGATE SIZE

Karly Remondino, Marie Johnston (Mentor), Soil Science

Most research on Amynthas tokioensis and A. agrestis earthworms addresses the life-cycle stages of mature worms with little known about the early growth stages. Amynthas are invasive earthworms that alter soil by making coarse aggregates. I hypothesize that larger worms create larger aggregates because they excrete more excrement. At the UW Arboretum, Amynthas hatchlings will be placed in soil previously ground to 53 microns. Three analyses will measure the growing worms and aggregate size at 20, 40, and 60 days respectively. Amynthas tokioensis will then be compared to the larger, related species Amynthas agrestis. I expect to find a positive correlation between worm size and aggregate size. With the results of this study, the impact of Amynthas earthworms on soil structure can be assessed.

LUCRATIVE OR LUNATIC: ASSESSING TESLA'S UTILITY-SCALE BATTERY SYSTEMS VIA BIDDING FRAMEWORK

Jose Renteria, Mahad Siad, Alex Dowling (Mentor), Chemical & Biological Engineering

In late January of 2017, Tesla announced the completion of a landmark 80 MWh battery system built for Southern California Edison. The feat, in accordance with Elon Musk's mission for cleaner energy, has drawn skepticism regarding its profitability. Beyond speculation, we propose a multi-scale optimization framework to quantify revenue opportunities from direct participation in day-ahead and real-time energy markets. Our approach analyzes over 1 trillion price data points from the California electricity market in the context of physics-based mathematical models for the Tesla battery systems. We find that revenue opportunities vary geographically by a factor of eight, indicating that battery economics heavily depend on location. For future work, we seek to investigate the policy implications of these results and to compare energy storage technologies.

STORY MAPS AS A TOOL TO PROMOTE DEEP TRAVEL OF MARITIME HERITAGE OF A GREAT LAKES COASTAL COMMUNITY

Edgar Reyes, David Hart (Mentor), Wisconsin Sea Grant Institute

The purpose of this qualitative research is to study the dynamics of "deep travel" as a means to promote stewardship of coastal resources along the Great Lakes. It leverages the proposed Wisconsin-Lake Michigan National Marine Sanctuary to evaluate how different types of interactive story maps can promote exploration of the maritime heritage of Manitowoc, WI. The story maps will include information about shipwrecks, historical landmarks and coastal public access in order to educate and inspire the public.

HOW PARENTAL STRESS INFLUENCES PARENTING BEHAVIORS AMONG YOUNG CHILDREN WITH AND WITHOUT ADHD

Alexandra Reynolds, James Li (Mentor), Psychology

Attention-deficit/hyperactivity disorder (ADHD) is a significant source of stress for many parents. In turn, parents of children with ADHD utilize more maladaptive parenting behaviors, but it is unclear whether they are largely in response to the child's ADHD, or from stress generated by external sources (e.g., relationship, work, social support problems). Using structural equation modeling, external sources of parental stress predicted negative parenting behaviors from a well-characterized sample of parents and their 5-year old children presenting with and without ADHD (n=98). Child ADHD exacerbated this association, even after controlling for the child's gender, pre-existing behavioral problems, IQ, and household income. The current findings suggest that parenting stress may be an important target for intervention, especially within existing ADHD treatments focusing on parenting skills and management.

A SEARCH FOR MOSQUITOES: USING COLLABORATIVE OVITRAPPING TO SURVEY WISCONSIN FOR VECTORS OF DISEASE

Thomas Richards, Susan Paskewitz (Mentor), Entomology

With mosquito-borne diseases like Zika springing up in new places, it is important to track and control populations of potential vectors. Last summer, we coordinated with the Wisconsin Department of Health Services and 20 local public health offices in Wisconsin to survey for eggs of Aedes albopictus, a potential vector of the Zika virus. Using a low-cost ovitrap system, 225 traps were set out and monitored for mosquito eggs over 12 weeks. Eggs were hatched in the lab and identified in the fourth instar larval stage. No Aedes albopictus were hatched, but two other species were identified in the survey. Aedes triseriatus and Aedes japonicus are both known vectors of arboviral disease. Their widespread abundance may represent a changing level of risk of mosquito-borne disease.

VALIDATION OF THE LIFETIME TOTAL PHYSICAL ACTIVITY QUESTIONNAIRE SELF-REPORT AND INTENSITIES

Carley Richards, Sarah Clapp, Elisa Torres (Mentor), Nursing

The Lifetime Total Physical Activity Questionnaire (LTPAQ) has not been validated in adults with a history of depression. One symptom of depression is difficulty concentrating, which could interfere with recalling information. The purpose of this study was to assess the validity of the LTPAQ in adults who were in remission for depression by comparing intensities with representative norms that show sedentary intensity is most common followed by light, moderate, and vigorous (Hawkins et al., 2009; Schuna, Johnson, & Tudor-Locke, 2013). We found more moderate than vigorous activity. Unlike representative norms, there was less sedentary than light and less light than moderate. Evidence of validity was obtained for moderate and vigorous intensities. The LTPAQ is an acceptable tool to use in adults in remission for depression.

VALIDATION OF THE DOMAINS IN THE LIFETIME TOTAL PHYSICAL ACTIVITY QUESTIONNAIRE (LTPAQ)

Carley Richards, Elisa Torres (Mentor), Nursing

We assessed the validity of the LTPAQ by comparing percentages of participation in physical activity domains with representative norms: occupation, household, leisure-time, and transportation account for 41%, 37%, 21% and 1% of activity, respectively. We found household was the most common domain (49%), followed by occupation (44%), leisure-time (6%) and transportation (1%). Posthoc analyses found women reported more household and men reported more occupational activity. In national surveys, women are more likely to spend time in unpaid housework, less likely to be employed, and more likely to work part-time compared to men (Krantz-Kent, 2009). Our sample comprised 73% women compared to the even split of sexes in representative norms. Future studies should stratify results by sex when examining physical activity across domains in the LTPAQ.

EFFECTS OF THE YJEP CHANNEL ON INDOLICIDIN'S PERMEABILIZATION ACTIVITY ON E. COLI

Sam Rider, Zhilin Yang (Mentor), Chemistry

As a solution to multi-drug resistant bacteria, antimicrobial peptides have grown in popularity and interest in many areas of scientific research. These peptides have been shown to arrest growth in bacteria through interaction with a variety of membrane components, and it is less likely to generate resistance. One peptide that shows promise in application is indolicidin. In vivo single-cell, real-time fluorescence microscopy was used to study the impact of the YjeP mini-mechanosensitive channel (MscM) on the membrane permeabilization sequences of E. coli caused by indolicidin. In WT cells, Indolicidin cause localized inner membrane permeabilization (IMP) soon after cell shrinkage. However, in the absence of yjeP , there is a slight delay in globalized IMP following cell shrinkage. Additionally, yjeP cells show a change in permeabilization behavior to GFP: either delayed IMP to GFP, or a increase of OMP to GFP. Overall, all of these findings suggest an importance of the MscM expressed by YjeP gene for indolicidin's attack on E. coli cells.

WISCONSIN HIGH SCHOOL TEACHERS: KNOWLEDGE OF CONCUSSION AND ACADEMIC EFFECTS

Zoe Ridgeway, Traci Snedden (Mentor), Nursing

Concussion is known to affect adolescents across a number of functional areas, including academic performance. However, knowledge about concussion and its' potential academic effects in Wisconsin high school teachers is unknown. In addition, differences between teachers who coach high school sports versus those who don't coach have not been investigated. The purpose of this study is to describe knowledge of concussion and its' potential academic effects in Wisconsin high school teachers, comparing findings of those who coach high school sports with those who don't coach, using a web-based cross-sectional survey. The survey is an adaptation of BAKPAC-TEACH, a survey that examines teachers' perceptions, experiences and academic support strategies with adolescent concussion. Data collection is ongoing. Results and conclusions will be summarized in this poster.

FILAMENT FORMATION ON DSDNA MEDIATES E38K RECA'S EHNAHCED ACTIVITY IN THE ABSENCE OF DNA DAMAGE

Matthew Ritger, Michael Cox (Mentor), Biochemistry

RecA is a protein implicated in DNA damage repair. The wild-type version forms a filament on damaged (single-stranded) DNA and activates steps in the bacterial SOS response. Such activity includes stimulating the auto-catalytic cleavage of the SOS gene repressor LexA and a subunit of the translesion DNA Polymerase V, UmuD. The E38K mutant variant of RecA is able to perform these functions in the absence of DNA damage, and its expression produces a constitutive SOS response in vivo. Using ATPase, cleavage, and pH shift bioassays, I found that the constitutive SOS response is mediated by E38K RecA's ability to form a filament on double-stranded DNA (dsDNA). In addition, dsDNA is completely competent as a cofactor for RecA-mediated LexA and UmuD cleavage.

EVALUATING THE ROLES OF ANTIBACTERIAL NYLON–3 POLYMER PROPERTIES AGAINST CLOSTRIDIUM DIFFICILE

Casey Ritts, Leslie Rank (Mentor), Chemistry

C. difficile bacterium causes gastrointestinal infections (CDI) that currently do not have a consistently used treatment option. This is due to the bacterium's antibiotic resistance and persistent spread within hospitals. A current research topic for CDI is nylon–3 polymers, which have shown antibacterial activity. These polymers are relatively easy to synthesize, and won't undergo proteolytic degradation in the body. Nylon-3 polymers are composed of β lactam monomers, which easily react with each other to form polymer chains. These monomers can be made with unique side chains that effectively give each polymer different properties. This project will provide insight into the roles of cationic charge density, hydrophobicity, and side chain length in nylon–3 polymer antibacterial activity.

THE ROLE OF ENHANCER OF ZESTE HOMOLOG 2 (EZH2) ON THE BREAKDOWN OF THE BLOOD-BRAIN-BARRIER

Genesis Rodriguez, Avtar Roopra (Mentor), Neuroscience

Epilepsy is a neurological disorder characterized by sporadic firing of neurons. Epileptogenesis, the process by which epilepsy develops, is not well understood. We utilized our own in-house bioinformatics program to identify gene targets to study this process and discovered that a histone methyltransferase, EZH2, was driving the most gene expression changes and hypothesized that it was pathological. We systemically injected an inhibitor of EZH2, UNC1999, into epileptic mice, and measured levels of albumin in the brain parenchyma by Western-Blot analysis to determine the integrity of the blood brain barrier (BBB) after treatment. At four days post treatment, albumin levels were significantly reduced, however, this effect could not be recapitulated at 10, 20 or 30 days, suggesting that EZH2 inhibition does not decrease BBB leakage long-term.

RHOR

Bradley Rogers, Rebecca Pozen, Melanie Rogers, Brendan Eagan (Mentor), Wisconsin Center for Education Research

Researchers in education and psychology often need to annotate qualitative data in order to analyze it. However, the approach that 97% of these researchers use to validate the annotation process, which relies on the agreement of two independent raters to control for bias, is statistically unsound. This process is unsound because, on average, it over estimates the level of agreement between the two raters over 20% of the time, and can be as high as six times the acceptable error rate. That is, it does not control for false positives when establishing acceptable agreement. We developed a statistical technique and an accompanying software package which solves this problem by statistically controlling for the false positive rate. Additionally, it can be used to perform power analyses.

TEXTILES + TECHSTYLES: CODE, ENTREPRENEURSHIP, AND DESIGN FOR ELEMENTARY SCHOOL GIRLS

Rita Roloff, Shirin Malekpour (Mentor), Mathematics

Although we are now living in a digital age, from 2000 to 2008, the number of young women interested in majoring in Computer Science dropped by 79 percent and the amount of Bachelor's Degrees earned by females in Engineering and Engineering technology was only 23 percent. Moreover, this number is significantly lower for African-American and Hispanic women. The project's purpose is to increase the amount girls identified as at-risk pursuing science, technology, engineering, and math (STEM). In collaboration with Pretty Brainy, a nonprofit that encourages teen and tween girls to pursue STEM through fashion design, the project implemented a Textiles + TechStyles curriculum, which will help 4th and 5th grade girls who are typically marginalized learn engineering, design, and entrepreneurial principles.

PRESCHOOL-AGED CHILDREN'S CATEGORIZATION OF FEATURE SPACE BETWEEN CATEGORIES

Dorie Ross, Paige Sprague, Haley Vlach (Mentor), Educational Psychology

Children must categorize new objects that they encounter in their world; they are not always explicitly taught about every new object that they encounter. In this experiment, we tested how preschool-aged children categorize unfamiliar objects that are in the feature space between previously learned categories. We first taught children two new alien categories. Children were then asked to categorize new aliens, which shared similar features to the two previously learned aliens, using one of four potential methods of categorization: equal extension, overlapping categories, single dominant categories, and conjunctive categories. We found that children used a combination of strategies as a method for categorization, suggesting there are individual differences in children's categorization of new objects in the feature space between learned categories.

ANALYSIS OF LONG TERM WATER QUALITY DATA IN FOUR COASTAL ECUADORIAN WATERSHEDS

Amelia Rossa, Joshua Kalman, Caden Lambie, Catherine Woodward (Mentor), Botany

Analysis of multi-year water quality data sets in four coastal Ecuadorian watersheds to reveal trends in water quality with increasing distance from headwaters of coastal rivers. Following Wisconsin Water Action Volunteers water quality methods adapted for Ecuadorian environments, four rivers were tested on seven water quality parameters. Overall habitat assessment score showed statistically significant decrease over time on all four rivers. Number of colony forming units (CFUs) of E. coli per 1 ml showed statistically significant increase from headwaters to mouth of all four rivers. Habitat quality degradation and increased level of E. coli contamination with greater distance from headwaters indicates overall degradation of riparian ecological health. This corroborates previous studies indicating upstream habitat quality and land use heavily affect downstream habitat and water quality.

PROTEIN MISFOLDING AND AGGREGATION ANALYSIS OF DISEASE-LINKED MUTATIONS IN THE LMNA IG-LIKE DOMAIN.

Timothy Routes, Corey Anderson (Mentor), Cardiology

The LMNA gene encodes the Lamin A/C protein; a major component of the nuclear lamina. Mutations in its immunoglobulin-like domain (IgD) are linked to dilated cardiomyopathy (DCM), Emery-Dreifuss muscular dystrophy (EDMD), Dunnigan-type familiar partial lipodystrophy (FPLD), and progeria with some overlap. A structure-based in silico study predicts IgD destabilization (EDMD>>DCM>FPLD) is an underlying mechanism. We tested these predictions by expressing 53 mutations in E.coli and HEK cells to assess IgD stability and Lamin A aggregation, respectively. We found that 76% of EDMD-linked mutations are destabilizing in contrast to 17% for DCM, 20% for FPLD and 0% for progeria. Similarly, 85% of EDMD-linked mutations showed increased aggregation in HEK cells in contrast to 15.3% for DCM, 36% for FPLD and 0% for progeria. These results support the in silico predictions and suggest that IgD misfolding is a major mechanism underlying EDMD.

ASSESSING MATERNAL IQ AND ASSOCIATION TO LANGUAGE USE IN PARENT-CHILD INTERACTIONS

Erin Rudbeck, Janean Dilworth-Bart (Mentor), School of Human Ecology

Previous literature has placed an emphasis on mean length of utterance and its relation to language proficiency in children. However, there has been limited research on the correlation between intelligence and linguist productivity in adults. The purpose of this ongoing study is to assess how maternal intelligence is associated with language use in parent-child interactions, using mean length of utterance. We will be coding five minute video clips of 49 mother-child dyads engaging in free play to determine the mean length of utterance of the mother's language. This will allow us to detect the level of language proficiency of mothers in relation to their IQ score. We hypothesize that a greater maternal intelligence score will result in higher linguistic productivity in mothers.

MY 21ST CENTURY ENCOUNTER WITH THE HOLOCAUST

Justin Ruder, Rachel Brenner (Mentor), Center for Jewish Studies

When studying the Holocaust, it is important to recognize that this historical event still draws parallels in today's world. The Holocaust was one of the most horrific examples of genocide the world has ever seen. The Nazi party did not just want to persecute the Jewish people, they wanted to dehumanize them, and turn their names into numbers. For those of us who didn't live through the Holocaust, we learn from stories and personal experiences. In late December of 2016, in the midst of a brutal winter, I took a ten-day trip throughout Poland. By visiting the remains of ghettos, transport stations, death camps, and the major concentration camps, I gained a powerful first-hand experience into the reality of evil. In this presentation, I will use my experience to argue why it's important to study the Holocaust, not just for the sake of history, but to understand the present.

COMPARISON OF STRESS LEVELS IN PRE-NURSING AND NURSING STUDENTS AND THE RELATION TO BURNOUT

Nicholas Sablich, Alexandra Jensen, Linsey Steege (Mentor), Nursing

This study seeks to describe stress levels in nursing students as the student transitions from the pre-nursing to nursing curriculum. The study utilized a mixed-methods approach with both a survey and individual interviews and is currently ongoing with current students at the University of Wisconsin–Madison. Preliminary analysis of data from the first round of data collection indicates that pre-nursing students tend to have higher stress levels on average than nursing students, with both groups tending to cope with stress in similar ways even though the sources of the stress may be different between the two groups. By better understanding the evolution of stress and coping within nursing students we can better design interventions to reduce stress and prevent burnout in the nursing workforce.

CHOLECYSTOKININ RECEPTOR SUBTYPE DISTRIBUTION PROFILE IN MIN6 AND INS1E CELL LINES

Steven Sacotte, Dawn Davis (Mentor), Endocrinology

Cholecystokinin (CCK), the most highly up regulated gene in mouse pancreatic islet following obesity, is a peptide hormone known for its role in modulation of satiety, anxiety, and memory. In addition, CCK plays an important role in protecting beta cell mass under diabetic stress. Recent studies demonstrated that CCK knockout obese mice show aggravated diabetes development and increased β-cell apoptosis, while Mouse insulin promoter CCK (MIP-CCK) expressing mice were protected from STZ induced diabetes. Also, overexpression or exposure of exogenous CCK peptide to INS–1 cells showed protection from cytokine-mediated apoptosis. There are two CCK receptor subtypes in mammals, CCK1R and CCK2R. Both receptor subtype are coupled to different types of G-protein that activate a signaling cascade which is mediated by series of phosphorylation events. One of the shared signaling pathway for both receptor subtypes is PI3K mediated signaling. PI3K activation subsequently phosphorylates AKT. Using CCK1R and CCK2R specific agonists (gastrin–17 and A–71623) we can deduct the presence/absence of CCKR subtypes present in our beta cell model system, namely INS1E and MIN6. Our study aims to profile the CCK receptor subtype distribution in MIN–6 and INS–1E cells lines. The outcome of this study will allow us to determine either if our model system is sufficient to test the receptor specific agonist actions for downstream gene regulation.

REGIOSPECIFICITY OF GALACTAN POLYMERIZATION BY DIVERGENT GLFT2 ORTHOLOGS

Patric Sadecki, Laura Kiessling (Mentor), Chemistry

Despite their ubiquity of polysaccharides, we lack detailed mechanistic understanding toward how carbohydrate polymers are assembled. Unlike the predictable linkage patterns used in other major molecules, polysaccharides can draw upon a large bevy of diverse glycosidic linkages to form complex polymers. To better understand polysaccharide assembly, our research group has turned toward using the mycobacterial galactan as a model. Composed of galactofuranose (Galf) residues, this essential polymer serves as a covalent connector between the mycolic acids and peptidoglycan of mycolated bacteria. The processive glycosyltransferase GlfT2 uses the activated form of galactofuranose, UDP-Galf, to continuously add residues onto the galactan until reaching a mature length. Our research group is keenly interested in gaining mechanistic insight toward what variation in the active site of GlfT2 leads to control over glycosidic linkage formation.

GRAPHIC NOVELS

Miranda Salazar, Jim Escalante (Mentor), Art

This project is an overview of the history, societal impacts, and political influence of graphic novels. It mentions the first graphic novel in history, the development of graphic novels throughout the years, how graphic novels were a media forum to express social injustices, and where to locate graphic novels on the University of Wisconsin–Madison campus. Graphic Novels are often a form of visual and creative art that is used to portray injustices in society dealing with race, identity, and sexuality. The visual aspect of graphic novels appeals to many people a way traditional books do not. This project will use graphic novels as an example to why art is a necessity in society to address many social issues that many people face. Graphic novels are a platform to educate and bring awareness to the public and future generations about social injustices within society.

CONCUSSION INJURY BY AGE AND SEX IN UNITED STATES YOUTH SOCCER: A NATIONAL SNAPSHOT

Cali Sanborn, Traci Snedden (Mentor), Nursing

While concussions are known to occur across sports, competition levels, ages and sex, there is a lack of information specific to concussion injuries in youth. Youth are especially at risk for post-concussion effects related to slower recovery and other potential neurobehavioral and cognitive changes. This retrospective survey study examined parent-reported concussion injuries for youth, aged 3–18 years. Data were obtained from GotSoccer, a provider of United States youth soccer registration software. Responses from 5161 parents from all 50 states were reviewed. Initial analyses indicated that 42.3% reported that their child was injured while playing soccer in 2016, and 9.5% of those injuries were concussions. The greatest proportion (79%) occurred in 12–17 year old age groups and 57% were female. Increased prevention efforts are needed.

DETERMINING THE REGENERABILITY AND TRANSFORMABILITY OF BRACHYPODIUM DISTACHYON GENOTYPES

Chiara Sanders, Jean-Michel Ane (Mentor), Bacteriology

To study crop genetics more easily, model plants are often used. One such model is the grass species Brachypodium distachyon, which serves as a model for wheat. This experiment was intended to determine the regenerability and transformability of genotypes 18–1 and TR2b within the species. The regenerability of embryogenic calli from each genotype was evaluated in pilot studies, while the transformability of the calli was examined by co-cultivation with Agrobacteria. Successful transformation was indicated by expression of either a fluorescent protein or histochemical staining. Support of the hypothesis that 18–1 and TR2b can be successfully regenerated and transformed provides valuable information which may lead to further experiments using these genotypes to determine gene function.

EXAMINING THE EFFECTS OF RESOURCE QUALITY ON REPRODUCTIVE SUCCESS OF AN INVASIVE BEETLE SPECIES

Will Sandvold, Claudio Gratton (Mentor), Entomology

Callosobruchus maculatus, or the Southern Cowpea Weevil, is an invasive insect that reproduces by laying eggs on (sub) tropical Asian and African bean crops. These insects are an agriculturally pertinent invasive species. Low maintenance and short generation times also make them an ideal model organism for studying pest insect population dynamics. In this study, we examined the effects of resource (bean) quality on the reproductive success of beetles that emerged after six generations, how resource type (mung beans, blackeye peas, mixtures of the two) influenced the ratios of emerging adults (male or female), and bean preference (number of eggs laid on each bean type). By investigating any possible reproductive tendencies, we can better understand the dynamics of invasive insect populations, such as velocity of expansion.

COLD-IN-PLACE RECYCLING: QUANTIFYING THE ENVIRONMENTAL BENEFITS IN WISCONSIN

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

The conventional highway resurfacing technique is mill and overlay (MOL) which partially removes the existing pavement and replaces it with asphalt derived from virgin materials. With increasing cost of virgin materials and pressure to build sustainably, the use of recycled materials in roads is increasingly prevalent. Cold-in-Place Recycling (CIR) is an alternative highway resurfacing method that partially mills the existing pavement and uses it beneath a thinner layer of asphalt. CIR has become widely used for convenience and cost benefits, but the environmental impacts are poorly quantified. This project quantifies and compares the energy, water, and carbon dioxide associated with CIR and MOL for nine projects in Wisconsin using a life-cycle assessment. The results will help predict environmental benefits of CIR in future highway construction.

MEMORY'S INFLUENCE ON CROSS-SITUATIONAL WORD LEARNING IN CHILDREN

Chloe Santiago, Hailey Scandin, Haley Vlach (Mentor), Educational Psychology

Word learning is a difficult task for children. Children learn the meaning of words by tracking co-occurrence probabilities across multiple moments in time, which is called cross-situational word learning (CSWL). This research examined the cognitive mechanisms underlying the retention and retrieval of words learned via CSWL. Children were tested using a CSWL task with a five minute delay and measures of visual attention, memory, and language abilities. It was previously thought that age would be the main predictor of word learning. However, the results of these tests show that memory and language abilities are the strongest predictor of CSWL performance. These findings suggest that targeting children's memory abilities may be the best methodology for supporting children's retention and retrieval of words.

HARNESSING COMMUNITY OWNERSHIP AND ENGAGEMENT TO REDUCE LOCAL POVERTY

Swetha Saseedhar, Jarjieh Fang, Pamela Herd (Mentor), La Follette School of Public Affairs

Our project seeks to strengthen the Community Action Coalition of South Central Wisconsin's programs and services to reduce poverty in Dane, Waukesha, and Jefferson counties. Using the outcomes of our student-driven Community Needs Assessment (CNA), we will develop and implement an action plan that addresses the underlying pathways and mechanisms of poverty, improves CACSW's ability to address community needs, and increases community engagement with and ownership of programs and services. This project will improve the CACSW's capacity to help communities better leverage their assets to nurture self-sufficiency and sustain a transition out of poverty. Furthermore, our team will develop a familiarity with innovative, community-driven, and non-traditional poverty alleviation strategies. This project will not only serve to augment CACSW's poverty reduction efforts, but will also develop robust relationships between the CACSW, the University of Wisconsin, and the communities within the CACSW's service area. This project will provide a model for other antipoverty organizations by demonstrating the benefits of community empowerment and identifying un-accessed populations and underserved need.

THE EFFECTS OF A FLOODING EVENT ON BIODIVERSITY OF WET-MESIC PRAIRIE VEGETATION IN CENTRAL WISCONSIN

Marissa Schatz, Paul Zedler (Mentor), Nelson Institute for Environmental Studies

This study surveys the effects of an extreme flooding event on the biodiversity of Sporobolus heterolepis and Silphium terebinthinaceum sampled at Faville Grove's mesic and wet-mesic prairie system by comparing the frequency of each species present today with data collections from 1946, 1978, 2007, 2011. It discusses predicting an overarching pattern in biota changes for future isolated mesic and wet-mesic prairie systems with climate change increasing flooding events, specifically the declining recurrence rate for common C4 prairie grass, prairie dropseed, Sporobolus heterolepis, and prairie dock, Silphium terebinthinaceum. Findings indicate frequency of occurrence for both species have not substantially increased following several years since the habitat disturbance event.

BIM EXPRESSION AFFECTS RETINAL ASTROCYTES ADHESION AND MIGRATION THROUGH PRODUCTION OF ECM PROTEINS

Katherine Schleck, Christine Sorenson (Mentor), Pediatrics

Neonates born premature are exposed to high oxygen for early respiratory support. However, exposure to high oxygen levels triggers hyperoxia-mediated retinal vessel loss due to immaturity, which can lead to ischemia and retinal neovascularization; namely retinopathy of prematurity (ROP). ROP often entails retinal neovascularization, scar formation, retinal detachment and loss of vision, if not treated. Previous studies have shown that the expression of the pro-cell death protein Bim aids in hyperoxia-mediated vessel loss such that in its absence the retinal vasculature are spared from hyperoxia effects. However, the detailed molecular and cellular mechanisms involved remain unknown. The purpose of this study was to examine how lack of Bim expression affects astrocyte function. Determining the effects of Bim expression on astrocyte function provides new insight into the role of Bim expression in retinal vascular development and neovascularization during oxygen-induced ischemic retinopathy. This knowledge may ultimately allow development of better treatments for ROP in preterm infants.

VARIATION IN STREAM SEDIMENT GRAIN SIZE AND ORGANIC MATTER MAY INFLUENCE STREAM NUTRIENT RETENTION

Natalie Schmer, Julia Hart (Mentor), Limnology

Eutrophication is an important water quality issue caused by increased nutrient loading to streams from the surrounding landscape. Variation in sediment characteristics such as grain size and organic matter content could mitigate nutrient loading to water bodies downstream by retaining nutrients. To explain variation in sediment organic matter, we collected sediment, water column nutrient, and land use data for four inflows and one outflow of Lake Mendota in Madison, WI. A simple linear regression determined that as the fine grain size increases, stream water nutrient concentrations decrease, suggesting nutrient retention by stream sediments. A multiple linear regression was used to determine that land use and water column POC controls sediment organic matter.

METABOLIC REMODELING DURING BIOFILM DEVELOPMENT OF BACILLUS SUBTILIS

Sophia Schmidt, Kevin Still, Zizi Pisithkul (Mentor), Bacteriology

Microbial communities in a self-produced extracellular matrix that allows attachment to surfaces and protects against environmental stressors are abundant in natural environments. Bacillus subtilis, a Gram-positive bacterium found in soil and human gastrointestinal tract, is a well-established model system for biofilm studies. Little is known about the roles of metabolic processes in biofilm development and the mechanisms by which environmental factors influence biofilm formation. We quantified biofilm growth of B. subtilis using sonication and microscopy in order to measure the levels of intracellular and extracellular metabolites from biofilm samples. As a result, we could generate metabolome profiles of biofilms at different stages in biofilm formation to see how metabolism is rewired during biofilm development.

LESSONS LEARNED FROM SCENIC EASEMENTS ALONG THE ST. CROIX NATIONAL SCENIC RIVERWAY

Colleen Schmit, Adena Rissman (Mentor), Forest & Wildlife Ecology

After its designation as a Wild and Scenic River in 1968, many scenic easements were established on private properties along the St. Croix River, but perspectives on their implementation are largely unknown. To examine the strengths and problems of scenic easements, I analyzed perspectives from individuals along the St. Croix River. I conducted interviews with twenty landowners and key stakeholders. I found that multiple landowners thought the government interferes far too much in their daily lives, but when it comes to protecting the scenic riverway, these same people were glad the scenic easements prevented development and maintained the scenic qualities of the St. Croix River. These findings have significant implications for easement implementation and environmental protection in a period of increasing public dissatisfaction with government.

DETECTING COSMIC-RAY PARTICLES WITH SMARTPHONES: THE DISTRIBUTED ELECTRONIC COSMIC-RAY OBSERVATORY

Cassidy Schneider, Justin Vandenbroucke (Mentor), Physics

The Distributed Electronic Cosmic-ray Observatory project (DECO) is a smartphone application that utilizes a phone's camera sensor as a particle detector. The app repeatedly takes and analyzes images, labeling images with a certain amount of bright pixels as events. The purpose of my research is to optimize event classification of images taken by the app. Using Python, I have created a program to automatically sort through new images in the app's central database, marking which events were most likely to be caused by cosmic rays rather than charged particle background. I will also present preliminary work on the development of an event triggering algorithm for our new iOS app. DECO is an excellent way to engage the public in learning more about particle physics.

THE LAWN AND WINDING ROAD: CHARACTERIZING TYROSINE BIOSYNTHETIC ENZYMES OF THE GRASS SORGHUM BICOLOR

Matthew Schneider, Hiroshi Maeda (Mentor), Botany

Production of the aromatic amino acid, tyrosine, is essential to the survival and growth of plants. In addition to being a building block of proteins, tyrosine is a precursor to a wide variety of agriculturally and industrially relevant specialized metabolites. Tyrosine biosynthesis in plants occurs via arogenate dehydrogenase (ADH) enzymes which are usually tightly regulated by feedback inhibition. Here we show the biochemical characterization of a unique set of ADH enzymes with relaxed sensitivity to feedback inhibition in the grass, Sorghum bicolor. Studying the properties of these recombinant enzymes will allow us to understand relaxed tyrosine sensitivity within grasses. We hope to use this understanding to explore how grasses have evolved this unique adaptation and how we might engineer increased production of tyrosine-derived metabolites.

THE BARABOO BRECCIA ZONE: A NEW APPROACH TO AN OLD QUESTION

Luke Schranz, John Valley (Mentor), Geoscience

At four locations in the north range of the Baraboo Hills in south-central Wisconsin are outcrops of a breccia or broken up and re-cemented rock. These breccia zones occur within the resistant Baraboo Quartzite and are composed of angular pieces of quartzite cemented together by white, prismatic quartz crystals. Field observations provide evidence for multiple episodes of brecciation. Plane light and scanning electron microscope imaging have revealed tree-ring-like growth zoning, dissolution features, and multiple generations of healed fractures which indicate changing conditions during and after the growth of the crystals. In situ analysis of oxygen isotopes and fluid inclusions along these features provide evidence of changing fluid sources that precipitated the quartz and are hypothesized to have been involved in forming the breccia zones.

ADVANCING SILVOPASTURE IN WISCONSIN

Mathew Sebastian, Diane Mayerfeld (Mentor), Center for Cooperatives

Silvopasture is an agricultural technique that integrates pasturing with forestry. This practice has been associated with reduced heat stress, higher dairy yields, and increased revenue in the Southern and Western U.S.A. This project seeks to evaluate the benefits of silvopasture for cattle, and the surrounding ecosystem, in Wisconsin. We also seek to understand the attitudes of area farmers towards silvopasture. We are comparing four treatments: a grazed pasture without any trees, a grazed woodland, a grazed, managed silvopasture, and an ungrazed forest. The forest and open pasture act as controls. Interviews with farmers and resource professionals indicated a willingness to pursue silvopasture. We hope that the findings from our study will influence land-management decisions among the Wisconsin agricultural community.

ENVIRONMENTAL AND HISTORICAL CONTROLS ON FAGUS GRANDIFOLIA SETTLEMENT-ERA DISTRIBUTIONS

Megan Seeley, Jack Williams (Mentor), Geography

Fagus grandifolia occurs throughout the eastern U.S. and reaches its western limit in eastern Wisconsin. While no theory fully answers why F. grandifolia does not expand across Wisconsin, leading theories propose environmental filtering and dispersal limitation as causal factors. This study uses new settlement-era datasets of F. grandifolia constructed from the Public Land Survey (PLS) to model environmental and dispersal controls on F. grandifolia distribution in Wisconsin and Michigan, a bordering state with comparatively widespread F. grandifolia populations. With this PLS dataset, Natural Resource and Conservation Service soil maps, and PRISM historical climate data (for 1895-1924), we created species distribution models. We ran several experiments with an SDM R package to test the transferability of models developed separately for Wisconsin and Michigan F. grandifolia populations.

ANALYZING TRANSCRIPTOME HETEROGENEITY OF MUC16 TO IDENTIFY ISOFORMS EXCLUSIVELY IN HGSOC

Ryan Serbin, Manish Patankar (Mentor), Obstetrics & Gynecology

MUC16, a transmembrane mucin, is overexpressed by high grade serous ovarian cancer (HGSOC) cells. This mucin contains CA125, a peptide epitope that is a biomarker for monitoring regression of ovarian cancer. Despite intense efforts, CA125 had not previously been shown to be useful as a screening modality for early detection of HGSOC. Failure in developing CA125 screening test was largely because this mucin is also expressed by benign pelvic masses resulting in many false positive readings. However, preliminary data has shown that ovarian tumors express a large diversity of MUC16 transcripts. Based on these observations the MUC16 mRNA transcripts were sequenced and mapped to allow the identification of MUC16 isoforms that are exclusively expressed by HGSOC tumors and not by the benign pelvic masses. These tumor-specific MUC16 transcripts have the potential to serve as novel biomarkers for HGSOC. These results could drive the development of a novel, sensitive and accurate test for early screening of HGSOC.

AN INTEGRATIVE APPROACH TO UNDERSTANDING THE DISJUNCT BIOGEOGRAPHY OF ACONITUM COLUMBIANUM

Christopher Setzke, Chloe Drummond (Mentor), Botany

Although the disjunct geographic distribution of Aconitum columbianum has been known for some time, the underlying evolutionary processes shaping this distribution are still largely unknown. Aconitum columbianum is disjunct between the western United States and the Great Lakes region. This study used phylogeography to test whether this species was once widespread and underwent vacariance or whether it was once western restricted followed by long-distance dispersal. We projected a climate niche model into the past to test whether the historical area of suitable climate space supported the vacariance or dispersal hypothesis. In addition, we conducted population genetic analyses to test for population differentiation within the species and assess levels of genetic diversity, particularly in the Great Lakes populations which tend to be small and isolated. Finally, we measured the extent of niche overlap between the regions, to test whether niche space evolution within the species could help explain the current maintenance of this distribution.

ROLE OF ROMK2 AS THE PUTATIVE PORE OF MITOCHONDRIAL ATP-SENSITIVE POTASSIUM CHANNELS

Rutvi Shah, Jonathan Makielski (Mentor), Cardiology

The heart has an innate ability to protect itself during times of metabolic stress. The brief cycles of ischemia and reperfusion involved in ischemic preconditioning (IPC) help to build resistance against prolonged ischemic episodes. ATP-sensitive potassium channels contribute to protective preconditioning in cardiomyocytes, yet the composition of mitoKATP remains controversial. A recent paper proposes that Kir1.1b (ROMK2) forms the pore-forming subunit of mitoKATP. We hypothesize that ROMK2 knockout mice (ROMK KO) would lack mitoKATP activity and mitochondrial membrane potential changes that are critical to cardioprotection. We assayed mitoKATP activity by measurement of membrane potential in response to ATP, calcium, and various ROMK and mitoKATP channel openers/blockers. Altered mitoKATP activity in KO mice would support the hypothesis that ROMK forms the pore.

FURAN FATTY ACID SYNTHESIS BY RHODOPSEUDOMONAS PALUSTRIS

Priya Shah, Rachelle Lemke (Mentor), Bacteriology

Our research involves determining whether a genetically engineered mutant of Rhodopseudomonas palustris can secrete furan fatty acids (F-acids), molecules which can act as a biofuel additive. We are attempting to characterize the pathway by which R. palustris synthesizes F- acids by deleting candidate genes in the pathway and analyzing pathway intermediates. We are also exploring possible mechanisms for R. palustris to overproduce and secrete these important molecules. When we deleted a transcriptional regulator, F-acid production in R. palustris was dramatically up-regulated. We are continuing to study genes responsible for F-acid production in R. palustris to decipher this important pathway and potential industrial roles for these fatty acid molecules.

THE REVOLUTIONARY WRITINGS AND FRIENDSHIP OF SHI PINGMEI, LU JINGQING, AND LU YIN

Alison Sharpless, Rania Huntington (Mentor), Asian Languages & Cultures

Chinese woman authors Shi Pingmei, Lu Jingqing, and Lu Yin, who rose to prominence after the nationalist 1919 May Fourth Movement, are regarded today as revolutionary icons. As part of the first generation of college-educated Chinese women, their writings on politics and changing gender roles in modern society were groundbreaking. Though hailing from different provinces, the three became close friends while studying in Beijing and chronicled their friendship through their writing. However, their unique friendship has not been thoroughly researched, and even English translations of their works are few and far between. This project aims to introduce the three to Western audiences, explore what place their writings had in the early development of modern China, and describe the significance of their relationship through text.

STEAROYL-COA DESATURASE 2 AND C/EBPA POSITIVELY REGULATE EACH OTHER DURING ADIPOGENESIS

Eva Shelton, James Ntambi (Mentor), Biochemistry

Adipogenesis is the differentiation of preadipocytes to adipocytes. Two critical regulators of adipogenesis are stearoyl-CoA desaturase 2 (SCD2) and C/EBPα, but the precise role of these proteins has been difficult to ascertain. Questions remain about whether these proteins operate in a unidirectional or bidirectional pathway. Previous studies have shown that C/EBPα positively regulates SCD2 expression. We have used an immortalized cell line of 3T3-L1 preadipocytes lacking SCD2 and show that C/EBPα expression decreases in the absence of SCD2, as compared with the control. These results indicate that a bidirectional relationship exists such that C/EBPα and SCD2 each positively regulates the expression of the other. This study will provide valuable information on the mechanism of adipogenesis and has implications in combating the obesity epidemic.

EDUCANDONOS; BREAST CANCER EDUCATION FOR HISPANICS/LATINOS

Eva Shelton, Andrea Nino De Guzman Ramirez, Patricia Tellez-giron (Mentor), Family Medicine

The rapid growth of the Latino community presents a challenge for providing this population with culturally and linguistically appropriate education about breast cancer. The goal of our project is to raise awareness about breast cancer prevention and early detection using a community-based method for the Latino community of Dane County, Wisconsin. Modeling after previous efforts by the Latino Health Council to educate the community through lay health promoters, we are proposing a similar approach involving hairdressers. This process involves training hairdressers about the basics of breast cancer prevention and community resources and then empowering them to engage in conversations about it with their clients. As an adjunctive to this main intervention and to launch the project, we will be offering an informational community dinner event.

PEPTIDYLARGININE DEIMINASE 2 IS NOT REQUIRED FOR THE FORMATION OF NEUTROPHIL EXTRACELLULAR TRAPS

Daeun Shim, Miriam Shelef (Mentor), Rheumatology

Neutrophil Extracellular Traps (NETs) are extracellular structures composed of DNA and antimicrobial proteins that are intended to trap and kill pathogens. Upon neutrophil activation, peptidylarginine deiminase 4 (PAD4) citrullinates histones to decondense chromatin and ultimately form NETs. PAD2 is also expressed in neutrophils, but its role in NETosis is unknown. To determine if PAD2 is required for NET formation, we purified and stimulated PAD2+/+ and PAD2-/- murine neutrophils, immunofluorsecently stained the cells, and counted NETs. Also, the killing of Candida by PAD2-/- neutrophils were measured using a modified XTT viability assay. We found no significant loss of NET formation or reduction in Candida killing in the absence of PAD2. Thus, PAD2 is not required for NET formation in mice.

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT STALIN (BUT WERE AFRAID TO ASK)

Yuka Shiotani, Charles Buza, Christina Gregis, Noah D. Johnson, Will Maher, Allison Martin, Katie Tompson, Francine Hirsch (Mentor), History

The History 419 Lab presents an original play that focuses on the rise and fall of the Communist leader of the Soviet Union: Joseph Stalin. Our goal was to make the play as historically accurate as possible through the usage of primary and secondary sources. Although the study of Stalin requires research on many heavy topics, we created a piece of work that also allowed us to explore Stalin outside of those dimensions. In some scenes, we employed humor in order to highlight the ridiculousness that shrouded the Stalin era. The play begins around the time of Lenin's death where Stalin consolidates power within the Communist Party, proceeds with daily life and culture under Stalinism and ends with Khrushchev's denunciation of Stalin at the 20th Party Congress.

REGIONAL HUMAN ASTROCYTES EXHIBIT DIFFERENTIAL MOLECULAR SIGNATURES AND FUNCTIONAL PROPERTIES

Jack Shireman, Su-chun Zhang (Mentor), Neuroscience

Astrocytes display diverse morphological and potentially functional heterogeneity in different parts of the brain. Whether and how the astrocyte diversity is attributed to developmental restriction is largely unknown. By generating astrocytes from regionally specified neural progenitors derived from human embryonic stem cells followed by RNA sequencing analysis, we found that these astrocyte types exhibited distinct transcript profiles. These profiles corroborated in induced pluripotent stem cell-derived as well as adult mouse astrocytes including the predicted homeodomain transcription factors and transcripts that suggest differential functional properties. Importantly, functional analyses revealed differential membrane properties and effects of the astrocyte subtypes on neurite growth, synaptogenesis, and blood brain barrier permeability. These results suggest that astrocyte subtypes and their functional properties are partly attributed to their developmental origins.

ALCOHOL'S EFFECTS ON PSYCHOPHYSIOLOGICAL RESPONSES TO UNPREDICTABLE AND UNCONTROLLABLE STRESSORS

Jack Shireman, John Curtin (Mentor), Psychology

15.1 million adults in the U.S. suffer from an alcohol use disorder (AUD). One of the most commonly cited uses for alcohol is stress reduction, however, how alcohol reduces stress remains poorly understood. To date, few studies have examined alcohol's impact on response to differential stressor types. We tested alcohol's effects on subcortically mediated defensive reactivity, cortically assessed attentional processing, and self-reported anxiety, during electric shock stressors that varied across predictability and controllability. Alcohol caused a significantly greater reduction of all our laboratory measures to stressors that were unpredictable compared to predictable in nature. Comparatively, the effects on uncontrollable and controllable stressors were not significantly different. These results provide precision in predicting alcohol's stress dampening effects which may inform more targeted interventions for AUD.

PEGYLATED ULTRA SMALL MESOPOROUS SILICA NANOPARTICLES AND THE ACCELERATED BLOOD CLEARANCE PHENOMENON

Cerise Siamof, Weibo Cai (Mentor), Radiology

The inability of nanoparticles to accumulate in tumor sites and the accelerated blood clearance (ABC) phenomenon, which removes nanoparticles quickly after their initial dosage, pose significant barriers to cancer treatments using PEG modified nanoparticles. We have three main objectives: (1) to synthesize ultra-small nanoparticles with a short PEG chain attached, (2) show that this increases nanoparticle accumulation in tumor sites and thus the ability to use the nanoparticles in cancer therapy, and (3) find whether these nanoparticles evade the ABC phenomenon when multiple therapeutic dosages are administered. If greater accumulation and successful evasion of the ABC phenomenon are possible, success of these nanoparticles in both cancer imaging and treatment would be greatly improved.

EXERCISES IN ARTISTIC EXPRESSION

Karen Singer, Elaine Scheer (Mentor), Art

Interesting or beautiful? To me those two words are values in strength or warmth. Art that is interesting can be scientific, attractive in its ugliness, strong, bold, exciting, fascinating, curious, noteworthy, but not something dear to the heart. Art seen as beautiful is good looking, gorgeous, delightful, wonderful, or exquisite which can be thought of as a jewel, something of value, and something worth keeping. Beautiful can be pleasing in a warm and loving way. However my art work measures up, interesting or beautiful, my hope is it gives an impression on the viewer. I plan to show examples of my work and explain how viewing contemporary art involves a debate about the emotional content (interesting, bad, ugly, confusing, surprising, beautiful, arousing) which in turn influences my style and expression.

THE ROLE OF TCF19, A NOVEL DIABETES GENE, IN PROTECTION FROM BETA-CELL APOPTOSIS

Gurkaranjot Singh, Jee Young Han (Mentor), Endocrinology

The transcription factor TCF19 has been identified as a novel diabetes gene in diabetes. TCF19 is expressed in pancreatic islets and is necessary to prevent beta-cell death. This project aims to determine the role of TCF19 in protecting the pancreatic beta cell from DNA damage and apoptosis. We developed a mouse that has a germline knockout of TCF19, resulting in the absence of TCF19. We will induce DNA damage and beta-cell apoptosis in the animal and in isolated pancreatic islets from control and knockout mice. We predict that the absence of TCF19 will make the pancreatic beta-cells more susceptible to apoptotic stress. These findings will provide insight into how TCF19 contributes to diabetes susceptibility, potentially providing new targets for therapeutic intervention.

ROLE OF AUTOPHAGY IN CETUXIMAB RESISTANCE IN HEAD AND NECK CANCERS

Justin Skiba, Randy Kimple (Mentor), Human Oncology

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

CRISPR/ CAS9 MEDIATED KNOCKOUT OF HOST RNAI DEFENSE ALLOWS FOR STUDY OF FLOCK HOUSE VIRUS PROTEIN B2

Kailey Slavik, Johan Den Boon (Mentor), Morgridge Institute for Research

The nodavirus Flock House Virus (FHV) is a positive strand RNA virus with a bipartite genome. RNA1 encodes replicase protein A and RNA 2 the viral capsid. Protein A invaginates host mitochondrial membranes to form spherules that retain an open connection to the cytoplasm and sequester the viral genome replication. RNA1 further templates a 3′ co-terminal subgenomic RNA3 that encodes protein B2, essential for suppression of host RNAi-mediated antiviral defense. We used the CRISPR/Cas9 system to knockout host protein Argonaute2, an essential actor in RNAi, to remove the necessity for B2. The resulting RNAi-deficient host cells will support B2-deficient or B2-mutant FHV needed to study additional functions of B2 in FHV replication.

CHARACTERIZATION OF A NOVEL PATHWAY THAT REGULATES EXOCYTOSIS

Jessica Smoko, Sarah Neuman (Mentor), Cellular & Molecular Biology

We have identified a novel, highly conserved gene that is essential for insulin secretion in Drosophila. Notably, this gene, named hobbit, has a small pupa mutant phenotype that can be rescued by ubiquitous overexpression of the human ortholog. We have found that dysfunction of the hobbit protein also leads to defects in other regulated secretion events. To further investigate how hobbit regulates these exocytosis events, I have examined other small pupa mutants for secretion defects and have worked to map the disrupted gene in the best candidates. This information will set the stage for future analysis of hobbit's molecular function in secretion and may strengthen genetic approaches to diabetes research.

SQUAMOSA-PROMOTER BINDING PROTEINS FUNCTION AS POSITIVE REGULATORS OF STRESS-INDUCED CELL DEATH

Nicholas Sorensen, Mehdi Kabbage (Mentor), Plant Pathology

SQUAMOSA promoter-binding protein (SBP) transcription factors are a highly conserved family of plant-specific transcription factors. Previous studies, and recent results from our lab, suggest that some SBP family members may be positive regulators of programmed cell death (PCD). To further characterize the role of SBPs in PCD, I am utilizing RNA interference in tobacco to silence a group of SBP homologs. Silenced plants are then subjected to heat stress or treatment with Fumonisin B1, two stresses known to induce PCD in plants. Early results indicate that silencing of two SBP homologs in tobacco, SBP8a and SBP8b may confer resistance to heat stress. This is significant because it provides additional insight into the mechanism through which programmed cell death occurs in plants.

INVESTIGATING ENGRAFTMENT OF REGIONALLY PATTERNED 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 neural stem cells and motor neurons (MNs) of different HOX profiles, which patterns the cell phenotypes to specific rostrocaudal regions of the hindbrain and spinal cord. Here, we used this protocol to derive cervical MNs of different developmental stages: neuromesodermal progenitors, motor neuron progenitors and mature motor neurons. We hypothesized that cervical MN progenitors injected into day 2 chick embryos would engraft the best out of the cell types meaning that the progenitors properly project their axons to form neuromuscular junctions (NMJs) with skeletal muscles. Investigating engraftment of human motor neurons along the axis of the chick spinal cord will create a humanized animal platform for investigating neurodegenerative disorders.

PROBING THE THERMODYNAMIC STABILITY OF THE RIBOSOME VIA FLUORESCENCE SPECTROSCOPY

Aniruddha Srivastava, Silvia Cavagnero (Mentor), Chemistry

The goal of this project is to analyze the thermodynamic stability of the 70S E. coli ribosome and the ribosome-bound nascent protein chain complex (RNC) through fluorescence spectroscopy. Purified empty 70S ribosomes and RNCs will be denatured by addition of increasing amounts of urea and the data will be analyzed to obtain the thermodynamic parameter of Gibbs free energy of unfolding. Differences in the thermodynamic stability of the empty 70S ribosome and the RNC will provide key insights to better understand the role of the ribosome in translation and cotranslational protein folding.

YSAŸE THE COMPOSER: AN INVESTIGATION OF HIS UNPUBLISHED MANUSCRIPTS

Elliot Stalter, Charles Dill (Mentor), Music

This Hilldale Fellowship project has sought to increase circulation of the compositions of Belgian violinist and composer Eugène Ysaÿe by making critical editions of two of his unpublished manuscripts. These manuscripts are housed in the Louis Persinger Collection of the Juilliard Manuscript Library. One is a cadenza Ysaÿa wrote for Tchaikovsky's famous Violin Concerto in D Major, Op. 35 (US-NYj 15 T22c Ys89 BxB042f05), the other consists of piano parts written for two etudes by Rodolphe Kreutzer (US-NYj ML225.Ys89 A4 v.2). In my presentation, I will discuss the process of making critical editions of music and will perform or play recordings of myself performing these compositions.

EXAMINING THE FORAGING ECOLOGY OF TWO SOCIAL BEES IN A SHARED HABITAT

Gabrielle Stamas, Danny Minahan (Mentor), Zoology

Honey bees (Apis mellifera) and bumble bees (Bombus impatiens) are two common social bees that are important pollinators of many crops and wildflowers. For a variety of reasons many bee populations are in decline, including the availability of resources during the foraging season. In this experiment we set out to understand the relationship between the identity of pollen resources bees collect, and the associated foraging effort, measured as the number of bees returning with pollen each day. To investigate this, we gathered data from three sites, and across five time periods for both species. By studying the strategies bees use to gather their resources, we hope to understand the foraging ecology of bees in a common suburban-agricultural habitat.

FIT FAMILIES SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM-EDUCATION

Lillian Stenz, Stephanie Lindsley (Mentor), Population Health Sciences

This program was developed to address the growing issue of childhood obesity in low-income families. It provides nutrition and physical activity counseling and monitoring over a one year period. Families focus on increasing daily physical activity, decreasing screen time, eating more fruits and vegetables, and/or drinking fewer sugary beverages as prevention against obesity and its complications. In 2016, all target areas showed positive significant changes and participants were highly satisfied with the program. After completing the program, families are equipped with the knowledge needed to live healthy lifestyles. Fit Families, or other interventions which incorporate family coaching and goal setting to improve child health, could be effective in reducing and/or preventing childhood obesity.

PARTICLE SIZE ANAYLYSIS OF MILWAUKEE SOILS

Jared Stieve, Carolyn Voter (Mentor), Civil & Environmental Engineering

The goal of this research project is to better classify soil texture in urban areas. Soil texture is important for hydrologic studies since it affects rates of infiltration. Soils with larger particles, like sand, have faster rates of infiltration when compared to soils with smaller particles, like clay. This research focuses specifically on understanding the texture of soils in Milwaukee because soil texture in urban areas is generally unknown. The soil texture will be found by particle size analysis tests on various sample of soils found throughout multiple neighborhoods. The test results will allow the soil samples to be classified based on the percentage of silt, sand, and clay, and will show a range of variability in urban soil types throughout Milwaukee neighborhoods.

NUTLIN–3 RESCUES NEUROGENIC AND COGNITIVE DEFICITS IN A MOUSE MODEL OF FRAGILE X SYNDROME

Michael Stockton, Xinyu Zhao (Mentor), Neuroscience

Fragile X Syndrome (FXS), the most common single gene contributor to autism spectrum disorders, is caused by the absence of the fragile X mental retardation protein (FMRP). FMRP plays an integral role in adult neurogenesis, which is the generation of new neurons. FMRP loss leads to over-activation of adult neural stem cells (NSCs) and a subsequent reduction in neuronal production. FMRP regulates Mdm2 mRNA stability and increased MDM2 levels lead to reduced P53 in NSCs, which alters NSC proliferation and differentiation. Nutlin–3 inhibits MDM2 and P53 interaction. Treatment in 8-week old FMRP deficient mice rescues neurogenic and cognitive deficits 4-weeks post-treatment. Our data reveals a novel regulatory role for FMRP and a potential new treatment for FXS.

IMPROVING ALLOGENEIC BONE MARROW TRANSPLANT FOR OSTEOSACRCOMA USING IMMUNOCYTOKINE

Keven Stonewall, Christian Capitini (Mentor), Pediatric Oncology

Osteosarcoma is the most common bone tumor usually diagnosed in children and young adults. It is found in areas of bone with rapid growth. Hu14.18-IL-2 is an immunocytokine that promotes anti-tumor activity due to its ability to recognize the disialoganglioside, GD2, on expressing tumors. The objective of this project is to investigate if hu14.18-IL-2 can safely be infused after an allogeneic bone marrow transplant. We expect that hu14.18-IL2 will be well tolerated and enhance graft-versus-tumor effects against osteosarcoma.

T4 PROGRAM

Maya Strauss, Rachel Brenner (Mentor), Center for Jewish Studies

Individuals often portray the Holocaust as a tragic point in history. This focus undermines the significance of specific programs underwent during these years designed to send those who are "inferior" to their death. Frequently overlooked when studying the Holocaust is the T4 program, a euthanasia initiative started in 1939 that was carried out in secrecy. This was one of Hitler's ways to eliminate those who had "life unworthy of life", in order to lift the burden these individuals placed on German society. Targeted in this program were adults and children with ranging disabilities. By studying the T4 program we can learn about privacy implications for today, as well as the ways in which health and medicine (concepts highly valued) could turn rotten during genocide.

THE EFFECTS OF CHONDROITIN SULFATE PROTEOGLYCANS ON THE SURVIVAL OF NEURAL STEM CELLS IN VITRO

Morgan Suhre, Lindsey Jager (Mentor), Waisman Center

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 effects of CSPGs are in vitro. This systematic review discusses the effects of different types of chondroitin sulfate proteoglycans on the survival and differentiation of neural stem cells in vitro.

DO PHTHALATES ALTER STEROIDOGENESIS IN PROSTATE CELLS?

Chongzhi Sun, Will Ricke (Mentor), Urology

Prostate cancer can become resistant to androgen deprivation therapy gradually and develop into castration resistant prostate cancer (CRPC). Intratumoral steroidogenesis is one mechanism of CRPC development. Phthalates are a class of chemicals widely used in plastic products. Phthalates induce androgen-dependent organ malformation and inhibit steroidogenesis during development. However, the impact of phthalates in prostate cancer is unknown. Our objective was to determine if phthalates alter steroidogenesis in prostate cancer. We hypothesized that phthalate treatment decreases enzymes that convert DHT into further metabolites. Various prostate cancer cell lines were treated with phthalate and the mRNA levels of candidate enzymes were analyzed through RT-qPCR. Our preliminary results showed a reduction AKR1C2 mRNA in MEHP treated prostate cancer cells. Presumably, phthalates can alter steroidogenesis and thus promote CRPC.

TARGETING TUMOR-ASSOCIATED MACROPHAGES VIA MICROSCALE MODELS OF THE PROSTATE TUMOR MICROENVIRONMENT

Vikram Suresh, David Kosoff (Mentor), Hematology/Oncology

Prostate cancer remains the 2nd leading cause of cancer related death in men. The growth, invasion, and survival of prostate cancer is dependent on an array of non-malignant cells, collectively known as the tumor microenvironment (TME). Together with the biomedical engineering lab of Dr. David Beebe we have developed a reconfigurable, open microfluidic platform to model and investigate the TME using patient-derived cells. Within this platform, we have focused on the investigation of tumor-associated macrophages (TAMs), which are involved in multiple facets of prostate cancer progression within the TME. Our studies have identified a potential role for TAM-mediated paracrine factors such as IL–1B and CCL18 in prostate cancer progression and therapeutic resistance. These represent promising therapeutic targets for prostate cancer treatment.

CORRELATIONS OF AGE AND GENDER IN THE HUMAN INFANT GUT MICROBIOME

Janna Swearingen, Andrew Alexander (Mentor), Medical Physics

Emerging research has indicated the gut microbiome to have an influential role in the normal development of humans, including the development of the central nervous system. However, few have studied the early developmental relationships of the gut microbiota during early infancy. The present research aims to make this connection clearer by examining age-relationships of microbiota colonies and comparing development between males and females. We used Pearson product moment correlations and two sample t-tests to assess investigated age relationships and differences between males and females. No significant age-relations or sex differences were observed here, however, longitudinal data from a second time point will be analyzed after completion. Similarly, infant neuroimaging data will also be included in future analyses in order to assess developmental gut-brain relationships.

FOOD INSECURITY IN MADISON, WI: USING COMMUNITY OUTREACH FOR A HEALTHIER FOOD PANTRY

Mallory Swenson, Jennifer Gaddis (Mentor), Civil Society & Community Studies

Nationwide, food pantries are a vital resource to those in need, yet they struggle to provide a healthy variety of foods. The food pantry at Lussier Community Education Center (LCEC) in Madison, WI is an important resource for food insecure families. Wisconsin Idea Fellowship (WIF) funding was used to help LCEC improve the nutritional profile of the food offered and the level of community involvement. I developed new outreach materials and a donation protocol to increase the number of high quality, nutritious donations. Secondly, I distributed recipe cards twice a month that included a featured ingredient from the pantry. Lastly, I organized a healthy monthly sample dish for shoppers. Through this approach, I have set the foundation for transforming the pantry into a healthy resource.

SPINAL CORD STIMULATOR FOR NEUROPATHIC PAIN DUE TO MULTIPLE SCLEROSIS

Omar Tarawneh, Alaa Abd-elsayed (Mentor), Anesthesiology

Pain is a common symptom in multiple sclerosis (MS), estimated to afflict up to 63% of patients with the disease. Pain in MS is classified into neuropathic, musculoskeletal, and nociceptive. Spinal cord stimulation (SCS) is thought to relieve chronic intractable pain by stimulating spinal cord nerve fibers with a continuous electrical current. The resulting impulses in the fibers may inhibit the conduction of pain signals to the brain. Use of SCS in MS chronic pain syndromes is not well studied. A SCS trial using an MRI safe system, followed by a permanent implant in a patient resulted in reduced pain and improved function in as early as two-weeks and persisted on further follow up. We present a case of MS with severe radicular and neuropathic pain resistant to conservative management treated by SCS implant. This case demonstrates a potential benefit of SCS in MS pain syndrome. This case lends support towards conducting a multi center trial to explore the benefit of SCS on this population.

OCCIPITAL NERVE STIMULATOR FOR BILATERAL OCCIPITAL NEURALGIA

Omar Tarawneh, Alaa Abd-elsayed (Mentor), Anesthesiology

Headache is a healthcare burden resulting in disability in 3–5% of the U.S. population. Occipital neuralgia is a neurogenic headache characterized by intermittent pain in the distribution of greater, lesser, or third occipital nerves. Conventional treatments include pharmacologic and non-pharmacologic interventions. Recent data suggest occipital nerve stimulators could improve headache and occipital neuralgia. Few reports exist about peripheral nerve stimulation (PNS) used to treat Occipital Neuralgia. We present a patient with Occipital Neuralgia resistant to conventional treatment, treated with PNS. Pain scores after implant placement and subsequent battery replacement resulted in improved pain scores from 7–9/10 to 1–4/10 at all times. Our findings should prompt controlled studies to confirm our observation on PNS use in chronic Occipital neuralgia and other headache conditions

THE PARENTAL EXPERIENCE OF THEIR CHILD'S NEW DIAGNOSIS: A SYSTEMATIC REVIEW OF THE LITERATURE

Samantha Tarnoff, Audrey Tluczek (Mentor), Nursing

A systematic review of the literature will be conducted to identify the concerns of parents during the first year following their child's diagnosis of a serious chronic health condition. A systematic review was conducted on peer-reviewed, data-based articles published between 2006–16 by a team of content and method experts. Of 74 articles screened, 38 met inclusion criteria; The qualitative and quantitative studies were conducted in the United States and internationally. Data extraction and quality appraisal has been completed. A synthesis of the findings of all studies is underway. Findings will provide valuable information to inform future interventions to address the specific issues parents struggle with during the acute phase following their child's diagnosis.

NUCLEAR ACCIDENT TOLLERANT FUEL: FECRAL ALLOY HEAT TREATMENTS

Carter Tesch, Aaron Guckenberger, Anthony Wolf, Adrien Couet (Mentor), Engineering Physics

After the incident at Fukushima, the nuclear community began to develop Accident Tolerant Fuels (ATFs). Incorporated in these ATFs are FeCrAl alloys, being proposed to replace current Zircaloy claddings. Unlike current Zircaloy cladding, FeCrAl does not exhibit a hydrogen producing exothermic reaction with steam at high temperatures, which is an important safety factor during loss of coolant accidents. The problem that arises while working with FeCrAl alloys is the weldability when fabricating the claddings. Unfavorable changes are produced in the microstructure around the weld and heat-affected-zone. Our research was to characterize the welds and heat-affected-zones of various compositions of FeCrAl alloys using different heat treatments. The characterization techniques used were micro-hardness testing and scanning electron microscopy.

EFFICACY OF COMMERCIAL RNA EXTRACTION KITS WITH CANINE BLOOD

Dahlia Tesfamichael, Michael Wood (Mentor), Medical Sciences

Reverse transcription-polymerase chain reaction (RT-PCR) is commonly used to study and diagnose disease. The process of isolating RNA lacks reliability between various commercial kits. This study's purpose is to identify the commercial RNA extraction kit that provides the highest RNA yield and RNA purity in dogs. RNA was extracted from canine blood stored in four different buffers (RNAlater, TriZOL, RNeasy Protect Reagent, and No Buffer) using three kits (Ribopure, RNeasy Protect Animal and TriZol). RNA yield and purity and DNA contamination were analyzed via Nanodrop and RT-PCR, respectively. Based on Nanodrop results, RNAlater/Ribopure samples yielded the purest RNA, while TriZOL/TriZOL yielded the highest concentration. These preliminary data have identified two potentially effective RNA extraction kits for canine blood.

THERMAL TOLERANCE LEVELS OF GRYLLOBLATTIDAE

Kelly Thao, Sean Schoville (Mentor), Entomology

Organisms with narrow thermal tolerance levels are threatened due to the effects of global warming on their environments. Insects in the family Grylloblattidae, more commonly known as ice crawlers, can only survive in temperature ranges between –4.0±0.8°C to 27.0±0.7°C. With global warming impacting natural habitats, it is important that organisms like ice crawlers evolve to cope with such change. In this research, the thermal tolerance levels of ice crawlers were compared among multiple species in different habitats. The results suggest that ice crawlers have an average thermal minimum of –3.84°C and a thermal maximum of 27.3°C. By testing the thermal limits of ice crawlers, we can determine how organisms with narrow thermal limits respond to climatic changes.

SEDENTARY AWARENESS: DESCRIPTIVE EPIDEMIOLOGY AND EFFECTS ON WELLBEING

Jaylene Thompson, Jacob Meyer (Mentor), Family Medicine

Excessive sedentary time is related to negative wellbeing and is difficult to accurately report. The purpose of this study was to determine if being aware of one's sedentary behavior is related to wellbeing. Forty-nine participants self-reported sedentary min/day on the GPAQ and wore an accelerometer for 7-days to objectively monitor their sedentary min/day. Participants were divided into groups based on ability to predict their sedentary time (good: <3 hours; bad: >3 hours diff). Groups were compared on perceived stress, positive affect, negative affect, and depressive symptoms. The majority of participants (31) were classified as bad predictors, indicating that most people do not recognize their daily time spent sedentary. Increasing sedentary awareness could assist individuals in decreasing excessive sedentary time, resulting in increased wellbeing.

MODELLING X-RAY EMISSION OF GALACTIC WINDS

Teague Tomesh, Ellen Zweibel (Mentor), Astronomy

Galactic winds are an important component of galaxy evolution and the mechanisms which drive these outflows have yet to be explained. We have incorporated x-ray production into a preexisting model of galactic outflows in order to generate predictions of x-ray luminosity to test current wind theories against observations. We created models that matched the parameters of several cool galactic outflows previously studied. We then searched the relevant literature for observations of these galaxies that we could use to compare with our predicted luminosities. Our models consistently predicted luminosities within a factor of two of the observed values. This led to the conclusion that if the hot and cool gas are coupled then thermal energy may play a role in the driving of these winds.

CAMP BAYVIEW: COLLEGE/CAREER ADVANCEMENT MENTORSHIP PROGRAM AT THE BAYVIEW FOUNDATION

Michelle Tong, Oona-ife Olaiya, Yanng Sao Xiong (Mentor), Social Work

The goal of our College/Career Advancement Mentorship Program (CAMP) at the Bayview Foundation is to provide high school students from marginalized backgrounds with tools to achieve academic and personal success. In recent years, an influx of middle and high school students aging into Bayview's current after-school program has created a shift in planning and use of space. While Bayview currently has tutoring support, arts therapy, and healthy snacks for registered youth, no program exists for older students who seek guidance in the pursuit of higher education and career development. With funding from the Wisconsin Idea Undergraduate Fellowship, CAMP will be piloted as a blueprint for Bayview to reduce this income disparity in student success. The program includes weekly academic workshops (e.g. ACT tutoring and application support) and monthly motivational workshops (e.g. guest speakers and mental wellness sessions). Program success will be monitored by distributing pre- and post- "college preparedness" surveys, as well as recording ACT scores and the number of college/job/scholarship application acceptances. At the year's end, we will compile a comprehensive written curriculum and list of contacts for Bayview's continuation of CAMP in future years.

PHIM-TYPING: INDIVIDUAL DIFFERENCES IN PERSONAL HEALTH INFORMATION MANAGEMENT (PHIM) IN THE HOME

Michelle Tong, Nicole Werner (Mentor), Industrial & Systems Engineering

The majority of health care occurs in the home, but this setting has not been extensively studied. Consumer health IT (CHIT) has the potential to support personal health information management (PHIM) required of patients managing chronic diseases. For CHIT to be successful for already over-burdened patients, it must be designed to account for the sociotechnical system in which it will be used. In particular, the interaction between PHIM, the cognitive work performed, and the home may affect PHIM. We applied a sociotechnical theory of cognitive work to identify individual differences in PHIM strategies. We found seven overarching strategies that patients used to support PHIM in the home. Individualized PHIM strategies can be used to improve the design of CHIT to support PHIM in the home.

TARGETING FIBRONECTIN AS ANTI-FIBROSIS THERAPY FOR KIDNEY DISEASE

Inger Toraason, Bianca Tomasini-Johansson (Mentor), Transplant Surgery

The surplus accumulation of extracellular matrix (ECM) proteins, such as collagen and fibronectin, is a common pathological step in kidney fibrosis, as excess ECM proteins are associated with organ dysfunction. A previous study on liver fibrosis found that the recombinant peptide pUR4 (FUD) inhibited fibronectin assembly and decreased excessive accumulation of ECM proteins without directly affecting hepatic cells, effectively reducing liver fibrosis in both in vitro and in vivo experiments. We hypothesized the application of FUD would also diminish fibrosis in a murine kidney injury model through the reduction of fibronectin deposition. Preliminary results indicate that pegylated FUD reaches the kidney and reduces fibronectin more effectively as compared to non-pegylated FUD and saline. Continued analysis is necessary to determine if FUD decreases overall kidney fibrosis.

THE EFFECT OF BETA-CATENIN LOSS ON IRX3 AND IRX5 EXPRESSION IN OOCYTES OF THE POSTNATAL OVARY

Ann Turcotte, Megan Hornung (Mentor), Comparative Biosciences

Cell signaling between somatic cells and oocytes in female gonads is critical for development and survival of the ovarian follicle. Irx3 and Irx5 are expressed in somatic cells during development and then expand into oocytes in new follicles. Double knockout of Irx3 and Irx5 disrupts oocyte-somatic cell signaling, leading to oocyte death after the new follicles form. Previously our lab established that canonical Wnt/beta-catenin signaling regulates Irx3 and Irx5 in the somatic cells during development. We also detected nuclear beta-catenin expression within oocytes of new follicles. We hypothesize that targeted loss of beta-catenin in the oocyte will decrease Irx3 and Irx5 expression. We plan to evaluate Irx3 and Irx5 transcripts, follicle morphology, and proliferation or apoptosis changes in oocytes within these transgenic mice.

FOOD FOR FIT FAMILIES: WEIGHT MANAGEMENT FOR FAMILIES WITH CHILDREN WITH DEVELOPMENTAL DISABILITIES

Sara Twadell, Patricia Novak, Karla Ausderau (Mentor), Kinesiology

Pediatric obesity is a growing problem for children with developmental disorders. The Food for Fit Families (F3) program was developed to address obesity in children with developmental disabilities by focusing on family interaction and targeted nutrition interventions. Overweight (BMI> 85th percentile, n=6) and obese (BMI> 95th percentile, n=23) children and their parent(s) engaged in a 12-week program emphasizing nutrition, fitness, and mealtime strategies to promote healthy lifestyles. Pre- and Post-anthropometrics were measured to calculate body mass index (BMI). Surveys containing standard Likert scales regarding food behaviors and physical activity were also collected. A decrease in BMI (p=.009) and other behavioral changes (e.g., increase fruits/vegetable consumption, decrease screen time, and decrease sugary beverages) were reported post F3 intervention.

KINETIC SURVEY OF HINMT POLYMORPHISMS ASSOCIATED WITH DISEASE

James Tyler, Arnold Ruoho (Mentor), Neuroscience

Polymorphisms of human Indoethylamine-N-methyltransferase (hINMT) have been implicated in various diseases ranging from cancers to anxiety disorders. In this study, we characterised the enzyme kinetics of single nucleotide polymorphisms (SNP's) to better understand their role in disease. The production of DMT and TMSe by hINMT was assessed in G219E, N245S, C254F, and wild type with the use of discontinuous radiometric assays. The preliminary data suggests that the production of DMT and DMSe is significantly reduced in N245S relative to the other polymorphisms. Additionally, positive cooperativity for TMSe production was observed in G219E and the wild type, but not C254F which displayed michaelis menten kinetics. The unique kinetic profile observed in these SNP's suggest that altered hINMT function could contribute to disease, and thus hINMT could hold promise as a potential drug target.

ANALYSIS OF BIOMIMETIC VASCULATURE IN DYNAMIC MICROENVIRONMENTS USING CONFOCAL MICROSCOPY.

Peyton Uhl, William Daly (Mentor), Orthopedics & Rehabilitation/Biomedical Engineering

Engineered tissues in hydrogels can be used as biomimetic systems resembling extra-cellular matrix components. Generally thicker than 100μm, the lack of nutritional access within the core of the engineered tissues limit their application. Using degradable poly(ethylene glycol) (PEG) hydrogel, induced pluripotent stem cell (iPSC) derived endothelial cells, and a custom made bioreactor, a stable and perfusable three dimensional vascular network for testing of potential vascular disrupting compounds was created. Two specialized bioreactors were used which created fluid flow underneath the hydrogels. Using confocal microscopy, vascular network formation was analyzed and quantified. The culture in the bioreactors resulted in a thicker vascular network when compared to static culture and showed endothelial cells (CD31+) were co-localized with pericyte-like cells (PDGFR-β+).

OPTIMIZING MRNA UNTRANSLATED REGIONS FOR IMPROVED RNA-MEDIATED ASTROCYTE REPROGRAMMING TO NEURONS

Jennifer Umhoefer, William Murphy (Mentor), Biomedical Engineering

Direct reprogramming of astrocytes to neurons is an emerging therapeutic strategy for spinal cord injury and neurodegenerative disorders. Reprogramming can be accomplished through the delivery of transcription factors to astrocytes using viral or non-viral methods. Though highly efficient, viral delivery has intrinsic limitations due to safety concerns about capsid immunogenicity and risks of insertional mutagenesis. Non-viral DNA delivery is less efficient and also has risks of mutagenesis. In contrast, non-viral RNA delivery is both safe and efficient. However, lack of cell-type specificity in delivery and short-lived protein expression are existing limitations. We hypothesized that optimization of the mRNA 5′ and 3′ untranslated regions would overcome these limitations. Here, we demonstrate the feasibility of non-viral Sox2 mRNA delivery for astrocyte-specific reprogramming to neurons.

EXAMINING DEBRIEFING IN TRAUMA RESUSCITATION SIMULATIONS

Alyson Underwood, Sarah Sullivan (Mentor), Surgery

In medical education learning by simulation is becoming more utilized. An important part of simulation learning is debriefing after simulation. The UW Joint Trauma Simulation Program allows nurses and physician trainees to participate in simulated trauma resuscitation scenarios followed by debriefing sessions focused on non-technical skills. This project qualitatively analyzes, based on existing debriefing frameworks, how the debriefings are being facilitated by course faculty, the effect of a debriefing tool on the outcomes of debriefing, and students' perceptions of the debriefing experience. A debriefing tool has been created to guide the facilitator in how to approach review of the simulation, and we are examining the impact of this tool on facilitators' debriefing approaches, learners' responses to debriefing, and students' satisfaction with the learning environment.

IMPACT OF HEALTH PROMOTING ACTIVITIES IN ADULTS WITH INTELLECTUAL DISABILITIES

Rachel Usdin, Katelyn Dorrance, Selin Gok, Nilvio Alexander Punguil Bravo, Karla Ausderau (Mentor), Kinesiology

Health disparities exist between adults with intellectual disabilities and their peers, specifically related to physical health, mental health, and nutritional health. In addition, their access to health promoting activities is limited. Special Olympics athletes (n=25) and caregivers of athletes (n=15) participated in individual and group interviews to discuss the outcome of athlete engagement in health promoting activities. Interviews were transcribed and a thematic analysis was conducted to identify preliminary themes. An interdisciplinary team identified 5 themes; empowerment, health literacy, acquisition of skills, physical health goal achievement, and network access. Special Olympics and other health promoting activities were noted to have an impact not only on athletes' physical goals but also their social, emotional, and personal wellbeing.

TEMPERATURE PREFERENCE AND ACTIVITY OF COLD-SPECIALIZED INSECTS

Glenda Valdez, Rachel Slatyer (Mentor), Entomology

Alpine insects occupy a narrow temperature range at high elevations. With climate change it's important to understand their physiological constraints to better quantify their potential response. Activity and temperature preference reflect the amount of energy used and optimal conditions for a species. In this experiment both of these variables were measured for five alpine beetle species (genus Nebria) and one ice crawler species (genus Grylloblatta). Grylloblatta tended to move less while two species of Nebria were significantly more active. Grylloblatta tended to prefer lower temperatures (–1.1°C) than Nebria (1.7–2.1°C), but there was no difference in temperature preference between the Nebria species. Overall, these results show that all the species tested prefer colder temperatures and suggest that Grylloblatta could be the most sensitive to warming temperatures.

BEETLES AS A MODEL FOR SPECIES COLONIZATION IN GLACIATED ENVIRONMENTS

Troy Valle, Sean Schoville (Mentor), Entomology

Glaciated landscapes are harsh environments that are depauperate in terms of species richness. Nebria lituyae is a species of ground beetle, endemic to the state of Alaska, that lives in close proximity to glaciers on nunataks, or rocky habitats exposed in the ice fields. It is unclear how they have colonized nunataks and whether they are recent colonists. Patterns of genetic variation can be used to reconstruct the colonization history of populations found within nunatak habitats. Minimal genetic variation and a lack of differences among the nunatak populations would indicate that the beetles have recently colonized these habitats from a single source. To test this idea, we compare genetic variation from beetle populations within and surrounding the ice fields. Increasing our understanding of the colonization of ice fields will help biologists understand how populations respond to climate change in natural ecosystems.

COOPERATION OF THE MICROBIOTA AND ONCOGENIC MUTATIONS LEADING TO THE DEVELOPMENT OF COLON CANCER

Dana Van De Hey, Dustin Deming (Mentor), Hematology/Oncology

The microbiome of the colon has been shown to play a role in colon cancer tumorigenesis. Inflammation is fundamental in tumor formation, and it is possible that microbiota induce this inflammation, further stimulating tumor growth. Antibiotics can eradicate bacteria; thus, their use in genetically predisposed organisms may potentially hinder or prevent tumorigenesis. Investigating antibiotic response using murine models may allow new understandings of colon tumor growth and may facilitate the development of novel treatments for clinical trials. Vancomycin introduction in FC3K and FCAK3K models was analyzed to determine if treatment enabled longevity in comparison to control. The compiled results express cooperation between bacteria and oncogenic mutations aids in cancer development in the FC3K model but is ineffective in the FCAK3K model.

ANALYZING THE RELATIONSHIP BETWEEN LIVE HIP-HOP SHOWS AND VIOLENCE

Theodora Varelis, Cody Fearing-Kabler, Taylor Konkle, Jacquelyn Laitsch, Hannah Pierce, Claire Rater, Karen Reece, Randy Stoecker (Mentor), Community & Environmental Sociology

Confronting the racialized barriers local Hip-Hop artists face, the Urban Community Arts Network (UCAN) builds sustainable and safe performance opportunities for all local Hip-Hop artists. In collaboration with Dr. Karen Reece, director of UCAN, our research group identified correlations between music genres and instances of violence. Using data from the Madison Police Department (2008-2016), we coded and analyzed 4,350 police calls made from live music venues in Madison. We then determined whether there was a live music performance during the time of a police call by using archives from local publications, venue websites, and direct correspondence with venues. When compared with all other genres, our preliminary analysis questions whether a significant relationship exists between live Hip-Hop performances and higher instances of violence.

YOUTH PARTICIPATORY ACTION RESEARCH AS A TOOL FOR SCHOOL CHANGE

Josue Velazquez, Taucia Gonzalez (Mentor), Rehabilitation Psychology & Special Education

During the fall semester, I participated on a research team examining Youth Participatory Action Research (YPAR) as a tool for equity and inclusion. YPAR is being used in schools to allow students to conduct their own research and bring change to their communities. This semester I am continuing work with the research team to publish a practitioner brief on YPAR for educators and school principals. A practitioner brief is a document that presents research findings for non-researchers. The brief was based on data collected from a research team made up of professors and students at the University of Wisconsin–Madison and Arizona State University. This practitioner brief will be available to advocate youth participatory action research as a student-centered method of school change.

ARBUSCULAR MYCORRHIZAL FUNGI (AMF) AQUAPORIN EXPRESSION IN DROUGHT STRESSED HOSTS

Kelly Verhaalen, Michelle Pearson (Mentor), Plant Pathology

Arbuscular mycorrhizal fungi (AMF) are symbionts that interact with most plants, including major crops. AMF aid plants during drought conditions and in low nutrient environments by exchanging water and nutrients for sugars. Carrots, like other crops, are physically limited by water and nutrient availability and can benefit from AMF association. For plants to obtain water from AMF they rely on aquaporins embedded in the periarbuscular membrane, but it is unknown how dependent the aquaporin expression is on host species or cultivar. Using carrot cultivars grown as root organ cultures in association with the model fungus Rhizophagus irregularis under simulated drought conditions, the relationship between the host genetic background and aquaporin gene expression can be determined. For this work, aquaporin expression is evaluated using qRT-PCR.

PHYLOGENETIC INFERENCE USING IMPORTANCE SAMPLING

Jordan Vonderwell, Bret Larget (Mentor), Botany

Phylogenetic trees are one of the most important models in studying evolution and the relationships between species but these models are highly difficult to compose. Bayesian phylogenetic inference using MCMC samples is the most widely used statistical method for constructing trees. While MCMC modeling is quite accurate, when dealing with large numbers of species the time required to analyze huge numbers of potential trees increases exponentially. Our project attempts to do the same task in a fraction of the time by relying on importance sampling as our core statistical method in place of MCMC, potentially transforming bayesian phylogenetic inference calculations for biological researchers.

ULTRA-PRECISION MACHINING IN MANUFACTURING FOR DESIGN AND SUSTAINABLE SMART MANUFACTURING

Taylor Waddell, Sangkee Min (Mentor), Mechanical Engineering

Energy consumption in modern manufacturing plays a large role in environmental impacts. Minimizing energy consumption is key to reducing its impact on the environment but also for lowering manufacturing costs. The project's goal is to achieve smart sustainable manufacturing by developing simplified and generalized data-driven energy consumption models, using a simplified method applicable to various types of machine tools, monitoring and projecting their energy consumption through the industrial internet of things, and developing an adaptive energy saving algorithm from machine design level to corporate level operation management.

EFFECTS OF SAMPLING RATE ON SPEECH WAVEFORM ACOUSTIC MEASUREMENTS

Madison Wagner, Houri Vorperian (Mentor), Waisman Center

Introduction: Acoustic analysis software packages commonly used to analyze speech waveforms automatically downsample the signal, in part to aid processing speed. This project investigates if downsampling affects measurement of formant frequencies (vocal tract resonances). Methods: Four words, with the vowels ē, ū, ā, ŏ as in "eat, hoot, hat, hot" were selected from recordings of three speaker groups: men, women, and children under six years of age. These words, originally recorded at 48 kHz, were analyzed at 48 kHz, and, after downsampling them to 16 kHz and 10 kHz in MATLAB using both a "Foldover" filter, "Gap" filter and no filter. Results: The accuracy of the higher formant frequencies in children was compromised by the lowest sampling rate irrespective of filter used. Conclusions: For accurate results, the analysis of children's speech measuring all formant frequencies should use recordings with higher sampling rates.

EFFECT OF AGE AND CALORIE RESTRICTION ON VOLUNTARY MOVEMENT DURING ADULTHOOD OF RHESUS MONKEYS

Lindsey Waite, Joseph Kemnitz (Mentor), Cellular & Regenerative Biology

Studies show that calorie restriction (CR) increases both healthspan and lifespan in animals. This research demonstrated that movement declines with advancing age, and CR slows this decline. Ultrasound motion detectors (U) and accelerometers (A) were used to measure movement of rhesus monkeys undergoing calorie restriction (R, n=38) or eating ad libitum (C, n=38). Overall, the animals were most active during morning and mid-afternoon and inactive overnight. The total percentage of time spent moving as measured by U decreased during the first several years. Females were less active than males (by U). Movement measured by A continued to decrease in later adulthood and rate of decline was significantly faster for C than R in both sexes. These findings provide further insight on how CR affects aging.

THE ROLE OF ESTROGEN IN THE PROSTATE: GENES REGULATED BY ESTROGEN RECEPTORS A AND B

Izak Walker, Will Ricke (Mentor), Urology

Two common urological clinical problems among aging men are benign prostatic hyperplasia (BPH) and Prostate Cancer (CaP). Estrogen plays a role in BPH and CaP progression. Estrogen receptor (ER) subtypes have opposing roles in the prostate; ERα is linked to prostate growth, while ERβ induces apoptosis. The identification of ERα and ERβ specific genes in the prostate will aid in the assessment of ER compounds for treatment. Human prostate epithelial cells were treated with selective estrogen receptor modulators (SERMs) for 24 hours then a stranded total RNA library construction was performed on RNA from those cells. Genes specific to both ER-subtypes were identified and validated. Results show SERMs ER-subtype specificity, which supports the examination of clinically relevant SERMs in the treatment of BPH and CaP.

CRANBERRY (VACCINIUM MACROCARPON) AS A LIKELY HOST OF BROWN MARMORATED STINK BUG (HALYOMORPHA HALYS)

Makaila Wallin, Benjamin Jaffe (Mentor), Entomology

I examined whether cranberry (Vaccinium macrocarpon) is a suitable host for the brown marmorated stink bug (Halyomorpha halys (Stål)). H. halys is a pest on many agricultural crops, yet it is unknown if H. halys exploits cranberries. Cranberries are an important crop in Wisconsin, contributing over $300 million dollars to local revenue. I measured the development and feeding pressure of H. halys on cranberries relative to a closely related known H. halys host (blueberries (Vaccinium corymbosum)). Preliminary results indicate cranberry is a suitable host of H. halys. As H. halys populations expand, it is important to understand which crops are at risk for damage and the early identification of suitable H. halys hosts allows us to develop more effective management practices.

QUANTIFYING THE DYNAMICS OF VIRUS INFECTIONS IN MICROCHANNELS

Jason Wan, John Yin (Mentor), Chemical and Biologican Engineering

Quantitative assessments of virus spread from cell to cell are crucial for understanding roles biological and environmental factors play in the dynamics of infection and disease. Here, we used single- and multi-channel microsystems to track the growth and spread of recombinant virus expressing fluorescent protein, revealing both real-time viral behavior and the ability to study parallel runs from a single virus inoculum. We demonstrated the characterization of infection spread dynamics of recombinant vesicular stomatitis virus carrying red fluorescent protein (VSV-dsRed-Ex) on two different cell types, BHK and PC3 cell monolayers with minimal and intact antiviral responses, respectively. Compared to plaque assays based on agar-overlays, our stagnant liquid micro assay required less reagents and established a more controlled and predictable culture environment. The more reliable and reproducible measures of infection spread provided by static micro-culture environments will enable better validation of systems biology models of virus growth and infection spread. These systems offer a more physiologically relevant model where drugs and other treatments may be tested for minimal costs.

RANDOM WALK APPROXIMATIONS FOR DIFFUSIONS ON STAR TREES

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

In this project, I will explore various random walk models and use them to approximate diffusions. The project is largely based on modeling, programming and simulations and it has great applications in various subjects such as math, finance and engineering. I will start with constructing my simple random walks and then scale it to model Brownian motions. I will test the Donsker's invariance principle by checking the mean and variance of this scaled random walk. After that, I will introduce the alpha function to the random walk model and test how the mean and variance is close to the Stochastic Differential Equation simulation results. Then I will extend the study to a more general model by releasing the zero origin to a small interval to observe how the model changes and analyze the mean and variance. Finally, I will explore the three branches random walk trees model. I will also analyze errors in some of the cases.

THE MARAGHA SCHOOL: ITS ROLE IN THE HISTORY OF ASTRONOMY

Ruojun Wang, Michael Shank (Mentor), History of Science

The astronomers of Maragha, a Persian astronomical observatory established in 1259 CE, developed astronomical models different from the ones they inherited from Ptolemy's Almagest (2nd c.). This research examines the role of the "Maragha school" in the history of astronomy. I first analyze the diagrams made by Ptolemy, the Maragha scholars, and Copernicus, and present the big picture of the history of astronomy: Maragha scholars advanced the Greek and Babylonian astronomical findings. Second, I discuss the strong similarities between Maragha scholars' astronomical models and those of Copernicus and the problem this poses for the big picture: Did transmission occur between Maragha and Copernicus? What kind of evidence can be provided to prove the existence of a transmission?

EXPLORING THE BEST WAY TO COMMUNICATE UTILITY VALUE FOR FIRST-GENERATION COLLEGE STUDENTS

Cory Washington, Judith Harackiewicz (Mentor), Psychology

First-generation (FG) college students underperform compared to their continuing-generation peers. Despite recent efforts to increase participation in science, technology, engineering, and math (STEM) careers, many FG students lose interest in pursuing a STEM career. A potential reason may be that FG students tend to have more communal (helping-oriented) goals, whereas STEM professions are often perceived as non-communal. Utility value (UV) interventions, which involve connecting the material to students' own lives and goals, could help FG students via use of both direct and indirect methods of communicating communal UV. Study 1 & 2 results suggest that communally-framed messages of benefitting society may benefit FG students more than a benefitting family or community message. Study 3 tested which combination (general or society UV) messages benefit FG's more.

EFFECTS OF RACIAL STRESS ON THE WORKPLACE FUNCTIONING OF BLACK ADULTS

Noah Weatherton, Natalie Kustner, Elisa Torres, Linda Oakley (Mentor), Nursing

For Black adults, the harmful health effects of racism do not stop at work. Population health studies of racial inequities in Black communities show associations between racial stress and poor health. Current literature has not addressed the relationship between these factors and work functioning. Our research seeks to identify health promotion strategies that reduce the risk of poor health by promoting healthy self-management of racial stress. As a preliminary step towards this goal, we explored impaired work functioning as a complex psychosocial response to racial stress. Regression analyses found an interactive effect of racial stress and depression on work functioning. These findings suggest that complex psychosocial interactions between health and racial stress can have harmful effects on major areas of psychosocial functioning for Black adults.

EFFECTS OF HEAT ON SOIL AGGREGATE STABILITY IN THE PRESENCE OF AMYNTHAS EARTHWORMS

Jenelle Wempner, Marie Johnston (Mentor), Soil Science

This study looks at the effect of heat on aggregate stability on soil worked by two invasive earthworms, Amynthas agrestis and Amynthas tokioensis in the UW Arboretum. The worms increase aggregation in forest topsoil, decrease soil nutrient availability, and increase soil permeability. I hypothesize that invaded soil will break down at lower temperatures than uninvaded soil, due to the high organic matter content in the soil aggregates. Samples of similar texture will be taken from invaded and uninvaded sites to determine geometric mean diameters of the aggregates after high temperature treatments. My purpose is to gauge feasibility of solarization or heat treatments as methods for soil remediation, and ultimately species removal.

DEPRESSIVE SYMPTOMATOLOGY IN PARENTS WITH VERSUS WITHOUT A CHILD WITH AUTISM SPECTRUM DISORDER

Lisa Wendt, Shannon Jean, Sigan Hartley (Mentor), Human Development & Family Studies

Parents of children with autism spectrum disorder (ASD) encounter unique parenting challenges, which may put them at risk for stressful experiences and poor psychological well-being. The purpose of this study was to examine depressive symptomatology in parents of children with ASD versus a comparison group of parents of typically developing children. Analyses were based on self-reported measures from 184 couples with a child with ASD and 187 comparison couples from Wisconsin. Findings indicated that parents of children with ASD reported significantly more depressive symptomatology than comparison group parents. Additionally, mothers of children with ASD reported significantly more symptoms of depression than fathers of children with ASD; however this difference was not found in comparison group parents. Results have implications for supporting parents of children with ASD.

HISTORICAL TRAUMA AND THE ROOTS OF ANTISEMITISM

Heidi Weston, Rachel Brenner (Mentor), Center for Jewish Studies

When we examine contemporary antisemitic political movements, it becomes evident that historical traumas such as the Holocaust have living roots that shape the long term health and wellbeing of our society. Even generations after the fact, the oppressive doctrine of modern day political parties such as those from the National Front of France and the Alt-Right of the United States are materially linked to the Holocaust. In some cases, such as the National Revival of Poland, the new rise of white nationalist fervor should be interrogated in part as a reaction to the post-Holocaust rhetorics of Polish cultural resentment and shame. I believe that it is imperative that we study the Holocaust in order to understand and critique modern antisemitic ideology, and how historically traumatic events like the Holocaust are very much present in our everyday lives and experiences of oppression and discrimination.

ANGULAR DEPENDENCE OF OCEAN INFRARED EMISSIVITY DERIVED FROM MARINE-AERI OBSERVATIONS

Matthew Westphall, Jonathan Gero (Mentor), Space Science

The Marine Atmospheric Emitted Radiance Interferometer (M-AERI) is a Fourier-transform spectrometer that measures atmospheric infrared radiation, which is used to derive various environmental variables. The M-AERI was originally designed by the UW–Madison Space Science and Engineering Center and is used in the Department of Energy's Atmospheric Radiation Measurement (ARM) program for studies of atmospheric processes. In early 2015, a M-AERI was deployed near the coast of California on the NOAA Ship Ronald Brown for the ARM Cloud Aerosol Precipitation Experiment (ACAPEX). In order to analyze the M-AERI observations from ACAPEX, we developed an algorithm to derive sea surface temperature and emissivity for various observing geometries. These results are used to validate existing models of sea surface emissivity. Accurate emissivity models are necessary for reliable satellite-based global earth observations.

MEASURING ORGANIZATIONAL GROWTH THROUGH SURVEY RESEARCH

Mariel White, Amy Hilgendorf (Mentor), Center for Nonprofits

Public health work requires interdisciplinary collaboration that engages a variety of actors. Wisconsin's healthTIDE is an organization that provides infrastructure to connects stakeholders and support their work on health. healthTIDE has administered its biennial survey for the third time this Spring. The current research documents the development of the new survey, drawing from qualitative and quantitative data. Specifically, I demonstrate that the survey is informed by 1) Survey results from 2013 and 2015 that determine organizational growth, capacity, and delineate areas of improvement; 2) Collective impact community partner protocols taken from healthTIDE teams; and 3) The input and collaboration with healthTIDE staff. These results will contribute to the understanding of research partnerships between academia and community organizations that work under a framework of collective impact.

CONDITIONING OF SUSTAINED ATTENTIONAL STATES THOUGH ASSOCIATIVE LEARNING

Payden White, C. Shawn Green (Mentor), Psychology

The ability to sustain attention on task relevant material plays a critical role in academics, employment, and social situations. Unfortunately, some individuals have clear difficulties in maintaining attention. In the current proposal, we seek to explore whether sustained long-term attention can be improved via training. Specifically, we plan to investigate the effectiveness of repeatedly pairing music with mindfulness activities with the goal of inducing a sustained attentional state in the presence of the music alone. Participants will complete a set of tasks designed to measure attention and cognitive control both before and after undergoing such an intervention to test its effectiveness. The data collected here has the potential to build the foundation for future research surrounding induced attentional states. Ultimately, these data could produce reliable interventions to remedy the deleterious effects of attentional lapses in today's often over-stimulating society.

EFFECTS OF TELMISARTAN ON OCULAR PERFUSION PRESSURE

Colton Wickland, Gillian Mclellan (Mentor), Surgical Sciences

Glaucoma is a degenerative eye disease that affects a significant number of humans and animals. Telmisartan has the potential to protect against vision loss. The purpose of this study is to examine the effect of telmisartan on ocular perfusion pressure (OPP) in cats with feline congenital glaucoma (FCG). Telmisartan (1mg/kg) or placebo was administered orally, 1x/day to 11 (3 female; 8 male) cats with FCG. Cats were also treated 3x/day with 1 drop 2% dorzolamide to 1 eye and vehicle to the opposite eye. Intraocular pressure (IOP) and blood pressure (BP) were measured 1x/week. T-tests are used to analyze differences in IOP, BP and OPP between telmisartan-treated and control cats, as well as dorzolamide- and vehicle-treated eyes. Results will be presented.

HOW WWII AND THE HOLOCAUST AFFECTED U.S. IMMIGRATION AND REFUGEE POLICY

Sydney Widell, Teryl Dobbs (Mentor), Music

In the years preceding WWII, economic downturn and systemic racism contributed to strong anti-immigrant sentiment in the U.S., which arguably culminated in 1939 when when it refused entry to the refugees on board the Saint Louis, a ship traveling from Eastern Europe. Of the 937 on board, 254 were killed in the Holocaust when they returned to Europe. Following WWII, the U.S. revised its immigration policy so that anyone seeking asylum would be ensured fair, if not prioritized, treatment. Much of this legislation WWII still influences U.S. immigration policy today. My research will show how these policies were used during subsequent refugee crises, to what extent they were successful and how the Holocaust influenced the U.S.'s approach to immigration.

EVALUATING THE QUALITY OF SCHOOL POLICIES THAT SHAPE NUTRITION AND PHYSICAL ACTIVITY FOR WI CHILDREN

Emma Wiessner, Avery Cotter, Kellyn Engstrom, Laura Gregor, Erin Skalitzky,
Lindsay Weymouth (Mentor), Population Health Sciences

The majority of U.S. children attend school for six hours a day and consume as much as half of their daily caloric intake at school. However, there is a dearth of literature examining the quality of policies that govern nutrition and physical activity in schools. The Wisconsin Obesity Prevention Initiative takes a multi-faceted approach to ameliorate childhood obesity through community-based research, including policy surveillance. Using an adapted version of the WellSAT 2.0, a quantitative coding scheme, we evaluated 95% of Wisconsin public school district wellness policies. We will report a descriptive analysis of policy quality and discuss our plans for statewide dissemination. By providing districts with their individual policy evaluations, our goal is to promote health awareness and stimulate positive policy change.

HOW DO CHILDREN WITH FRAGILE X SYNDROME EXPRESS EMOTIONAL LANGUAGE?

Kellie Willis, Audra Sterling (Mentor), Communicative Sciences & Disorders

Expressing emotions allows us to communicate with others and it influences self-understanding. Previous research has found a notable impairment in emotional language usage in children with autism spectrum disorder (ASD). Emotional language is expressed through the usage of mental state terms, which include the understanding of emotion-laden words, talking about emotions, and perception or production of emotional intonation in speech. Given that fragile X syndrome (FXS) is the leading genetic cause of ASD, we expected similar difficulties with the expression of mental state terms as it has not been explored in this population prior to this study. Preliminary data analyses indicate that the boys with FXS produced similar amounts of mental state terms compared to the boys with ASD and that IQ is not correlated to the usage of mental state terms. Clinically, these results will inform development of future therapy techniques and a more refined knowledge of the co-diagnosis of ASD on FXS.

INFLUENCE OF SOCIAL INFORMATION ON CHILDREN'S STATISTICAL LEARNING

Cassandra Windau, Seth Pollak (Mentor), Psychology

Children must use input from others and individual strategies (e.g., tracking statistics) for successful learning. How do children combine these learning approaches? Participants (N=101, ages 4–9) searched for rewards among locations rewarded at different rates, and received suggestions from a confederate regarding reward location. Suggestions varied in helpfulness across conditions, and influenced children's ability to find the reward ($F(2,100)=22.45$, $p<.001$). When the suggestions were clearly helpful, children excelled. When the suggestions were clearly unhelpful, children ignored the suggestions, relied on individual strategies, and improved over time. When the suggestions were ambiguously helpful, children followed the suggestions, performed poorly and showed little change in over time. Children are adept at weighing input from others against individual strategies, combining these learning approaches based on their dependability.

SKILL LOSS AND MAINTENANCE FOR RESEARCH RESIDENTS: A LONGITUDINAL STUDY

Anna Witt, Shannon Dimarco (Mentor), Surgery

This study used a simulated subclavian central venous catheter (CVC) to assess general surgery resident's skill progression during dedicated research time. We hypothesize that a longitudinal simulated central line assessment will reveal no progression in surgical skills in junior research residents. Data collection occurred in the first or twelfth month of research followed by a twelve month follow up. Twenty-eight residents (PGY 2–4, 39.3% Female) participated. 14.3% of participants made the same error twice. 53.4% of participants made new errors in their second year. The large portion of residents making the same or new errors in their second year is suggestive that adequate skill maintenance is not occurring. These findings support the use of assessments and feedback to promote skill maintenance during residents' laboratory years.

TRAJECTORIES OF SUPPORT ACTIVITIES OF INFORMAL LUNG CANCER CAREGIVERS

Allison Woldt, Kristin Litzelman (Mentor), Human Development & Family Studies

The social environment is an important element supporting informal cancer caregivers. We sought to understand caregivers' social resource utilization over the cancer trajectory. We conducted a literature review using Google Scholar and PubMed. Search terms included "social resources," "support group", "social activities," "caregiver," and "cancer." Relevant articles were forward-searched. This was part of a larger empirical project. Few studies systematically examined social resource utilization among caregivers and most examined support groups. Approximately 25% of caregivers attended support groups. Reasons for non-attendance included lack of respite care, timing of meetings, and lack of interest. Studies had conflicting findings about support groups' impacts on caregiver outcomes. Future research is needed to further examine social resource utilization among informal caregivers and guide support services.

WISCONSIN MINIATURE SWINE AS A MODEL FOR HUMAN SPINE AND DEVELOPMENT OF THERAPEUTIC DELIVERY

Aleksandar Wood, Seah Buttar, Ravinderjit Singh, Patricia Stan, Gurwattan Miranpuri (Mentor), Neurosurgery

Spinal pathologies from back pain to severe spinal cord injuries are among the most complex medical issues to treat and are costing over $100 billion annually. Rat models, although useful for biochemical research, lack clinical translation. The swine model can best translate to human clinical trials. This study shows that Wisconsin Miniature Swine (WMS) is especially relevant as a model for human spinal cord pathology and is also practical for testing developing therapeutic delivery technologies, like convection enhanced delivery (CED). Our results show WMS thoracic spine compare favorably with the human spine especially with respect to overall length, vertebral body height, pedicle size, and overall shape. These results suggest WMS are useful for chronic longitudinal studies, acute pathologies such as trauma, and platform device development.

A SURVEY OF TWO SPECTACULAR HIGH VELOCITY CLOUDS IN THE MILKY WAY

Skylyn Worzalla, Snezana Stanimirovic (Mentor), Astronomy

High Velocity Clouds (HVCs) are clouds of hydrogen travelling over 100 km/s relative to the Milky Way. Understanding the properties and origins of HVCs is key to understanding how the Milky Way developed. The Galactic Arecibo L-band Feed Array HI survey (GALFA-HI) is among the highest-resolution data sets available to study HVCs. GALFA-HI was obtained by the Arecibo radio telescope in Puerto Rico, the largest single-dish radio telescope in the world. Using newly-processed GALFA-HI data, we created a catalog of HVCs, where two clouds (Fish and Cigar) stood out. Fish moves 400 kilometers-per-second faster than the Milky Way, and Cigar is perpendicular to the Milky Way disk. Since these features are unique, we selected them for a detailed study of their HI mass and kinematics.

INVESTIGATION OF ANGIOGENIC MECHANISMS INVOLVED IN OMENTUM 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, initial experiments first determined that the omentum remains viable as a free graft. In doing so, robust vascular ingrowths to the omental graft were observed from adjacent pelvic structures, prompting questions about the mechanisms of their genesis. Consequently, this study looked to characterize this neo-vascularization by examining endothelial cell, growth factor, and proliferation markers following omentum transplantation between transgenic Red Fluorescent Protein (RFP) and Green Fluorescent Protein (GFP) mice.

GENDER INEQUALITY IN PARENTAL LEAVE POLICIES

Pazee Xiong, Leann Tigges (Mentor), Community & Environmental Sociology

Although companies like Facebook are implementing parental leave policies, paid time off work to care for a new child, these policies maintain gender inequality by giving men shorter leave time than women. This research shows how parental leave policies promote the breadwinner-caregiver model by analyzing 66 parental leave policies in large firms. The lengths of maternity and paternity leave were recorded and compared to each other. The results show that on average, the amount of maternity leave is almost double to paternity leave. We conclude that although companies are creating more generous paid leave policies, these policies unintentionally encourage gender inequality by promoting the idea that a women's primary role is the caregiver in families where as the men's primary role is the breadwinner.

UNRAVELING THE FUNCTION OF THE TCH2 INTERACTOME

Touyeng Xiong, Richard Barker (Mentor), Botany

Plants exhibit many mechanical stresses that are present in everyday biological processes such as the impact of wind, touch and gravity. Calcium (Ca2+) signaling ion fluxes are one of the most important mechanisms when it comes to rapid, long-distance response signaling, including in response to these mechanical stimuli. Ca2+ binding proteins within the cell senses the Ca2+ signals. In the model plant Arabidopsis thaliana, there exist seven calmodulin (CAM) and fifty CAM-like (CML) genes, which encode potential calcium sensors (McCormack et al., 2005). One of these genes, CML24 (also known as TOUCH2, or TCH2) is rapidly switched on by touch. This project is to test if 8 other genes predicted to interact with TCH2 are also involved in touch sensing. This will be tested through the use of mutants in these genes and analysis of their growth responses and gene expression patterns using quantitative PCR. The results from this work should help understand the poorly studied plant touch-sensing network.

EXPLORING CHILDREN'S SENSITIVITY TO NON-SYMBOLIC RATIOS

Sai Xiong, Percival Matthews (Mentor), Educational Psychology

Fractions knowledge provides a core foundation for algebra and more advanced mathematics. Unfortunately, children find fractions difficult to learn. In an attempt to aid learning, we explored whether children have a natural sensitivity to non-symbolic ratios (non-numerical ratios composed of shapes or lines). Such non-symbolic intuitions might help children better understand symbolic fractions. We tested elementary school students with matching games using different non-symbolic ratios and found that students can finish these games quickly and accurately. Our result is important because it shows that children are sensitive to non-symbolic ratio.

STUDY OF THE INFLUENCE OF BAND BENDING ON PHOTOELECTROCHEMICAL ACTIVITY OF DIAMOND

Claudia Yan, Robert Hamers (Mentor), Chemistry

Diamond is a semiconductor with a unique property called negative electron affinity, which makes it an ideal solid-state electron source. When illuminated with above bandgap light, diamond is able to emit electrons into water to form solvated electrons, which can induce reduction of N2 to NH3 or other reactions. Here we study the influence of the applied voltage on the photocatalytic property of diamond to understand the relationship between band bending and electron emission ability of diamond. The role of ions in the solution is also investigated to understand the effect that metal ions are reacting with the solvated electrons from diamond.

CONDENSED TANNIN COMPOSITION VARIES WITHIN THE ASPEN SPECIES POPULUS TREMULOIDES

Phia Yang, Kennedy Rubert-Nason (Mentor), Entomology

Condensed tannins (CTs) are long chains of polyphenolic hydrocarbons that are found in many plants. CTs can influence soil nutrient availability and plant defense against herbivores. The ecological effects of CTs likely depend on molecular-level differences in polymer composition, which are hypothesized to exist within and among species. We examined qualitative differences in leaf CTs among 13 genotypes within the aspen species Populus tremuloides. We extracted and thiolyzed CTs, and separated constituent monomers (catechin, epicatechin, gallocatechin, epigallocatechin) by UHPLC and quantified each monomer by mass spectrometry. CT polymer composition and chain length varied among genotypes. These findings suggest that differences in tannin quality within individual tree species may influence soil processes and herbivory at the forest scale.

TRANSCRIPTION WITHIN THE RESEARCH OF IMMIGRANT FAMILIES: LITERACY AND IDENTITY

Sodie Yang, Catherine Compton-Lilly (Mentor), Curriculum & Instruction

This is a long-term research project that keeps track of eight children from immigrant families in hopes to understand how they make sense of relocation to the U.S.A. and how these experiences interface with children's experiences at school. More specifically we focus on how they change in literacy and identity over a period of time as they progress. Our role in this project is transcription of interviews between Professor Compton-Lilly and the student, family members or teachers. It allows for formal documentation of conversations and concrete evidence of observations. Findings are in hopes to help teachers better understand immigrant students and the different styles of learning they have.

DO HMONG ELDERS UNDERSTAND YES/NO SURVEY QUESTIONS?

Aylee Yang, Maichou Lor (Mentor), Nursing

This study's purposes were to determine: (1) if Yes/No questions were a problem for Hmong elders and (2) what strategies Hmong helpers used to improve their elders' response from an uncodable response to a codable response while taking a 13-item online oral survey. Thirty dyads (n=30 Hmong elders; n=30 helpers) participated and were video recorded. Dyad interactions during the survey process were coded in Noldus Observer. Of the 30 elders, 12 (40%) were unable to provide a codable answer in their first initial response, displaying comprehension problems. Helpers used two strategies: (a) classifying the description of elders' response to a codable answer (n=11, 92%) and (b) asking for clarification of elder's exact response (n=7; 58%) to help the elders. Findings have implications for cross-cultural survey research.

VIRTUAL DRIVING ENVIRONMENTS FOR DRIVER-LESS VEHICLE INTERACTIONS

Bennett Yeo, David Noyce (Mentor), Civil & Environmental Engineering

This research project is focused on the development of a portable platform that can be used as a component for studying the interactions between drivers and the road environment. The flexibility of the platform under development opens the door for studying interactions between human drivers (HD) and the artificial intelligence (AI) that controls autonomous vehicles. Interactions between HD and AI-controlled vehicles will be possible by using the platform under development as a player that receives and sends data to an external entity capable of providing an advanced physics engine. Testing driver performance on a virtual platform is needed to expose HD subjects to controlled environments that are unfeasible or unethical to achieve in the real world. The project timing is aligned with current research trends where, especially in the current environment, vehicles manufacturers are racing towards the development of autonomous vehicles. The proposed vehicle simulation environment will help increase the amount of ethical options available for testing complex scenarios and refine the algorithms used by autonomous vehicles without endangering the safety of the public.

OPTIMIZATION OF THE GP2 MINI-PROTEIN SCAFFOLD

Boyu Yin, Geoffrey Eddinger (Mentor), Chemistry

Molecules that specifically bind targets with high affinity are widely used in therapeutic and diagnostic applications. Current treatments are relying more on antibodies. However, these macromolecules are large, potentially immunogenic and costly to make. As an alternative, we aim to optimize the shorter Gp2 mini-protein scaffold to optimize its structure while maintaining its binding ability. We hope to accomplish these goals by inserting unnatural amino acids throughout the sequence or by shortening and cyclically constraining the scaffold. A successful design would precisely bind to targets, be amenable to lab-scale synthesis and would be highly resistant to degradation.

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

Noemi Yutuc, Alexandra Radzin, Gurwattan Miranpuri (Mentor), Neurosurgery

Neuropathic pain (NP) is a tremendous clinical challenge. Various biological changes have been implicated in producing these pain states, including cellular interactions, extracellular proteins, ion channel expression and epigenetic influences. Developing therapies that effectively address the cause of these symptoms require a deeper knowledge of alterations in the molecular pathways. MMPs and TIMPs have been shown to interact with and influence many studied pain pathways. Inhibiting MMP–9 and MMP–2 significantly decreases NP in rat that have undergone a spinal nerve ligation. Folic Acid (FA) is the key methyl donor in the CNS and induces regeneration and repair of the injured CNS in part via methylation and is mediated by the high-affinity folate receptor. We hypothesize that folic acid, a natural supplement, can alleviate SCI pain.

CRISPR/CAS9 ACTIVATION OF OTX2 REPORTER GENE

Trevor Zarecki, Krishanu Saha (Mentor), Biomedical Engineering

OTX2 is a master transcription factor that plays an important role in differentiation of retinal pigment epithelium (RPE). A pluripotent stem cell line that uses GFP to report expression of OTX2 is currently being developed. This project proposes to use CRISPR/Cas9-linked transcriptional machinery to induce expression of the OTX2 gene and verify proper creation of the GFP reporter line. A dCas9-p300 core fusion protein will be used to target the promoter region of OTX2, activating the gene and causing the cell line to express OTX2 and GFP.

STOCHASTIC SPATIAL MODELS FOR VIRUS-DIP INTERACTIONS

Zhanpeng Zeng, Wai-Tong Fan (Mentor), Mathematics

Infected cells make not only virus progeny, but also virus-like defective interfering particles (DIPs), which lack essential genes needed for replication, packaging and release. However, during a co-infection with intact viruses, DIPs compete for essential resources at the expense of virus growth. To investigate the spatial-temporal evolution of virus and DIP co-infecting spatially structured biological cells, we developed a stochastic cellular automaton (CA), which captures the overall spread patterns observed in co-infection experiments and offers insight about underlying mechanisms. We further connect this stochastic model to a system reaction-diffusion equations which offers concise statistical information to the collective behavior of the stochastic CA.

ANALYZING INFORMAL CAREGIVING: A WORKLOAD PERSPECTIVE

Rachel Zenker, Nicole Werner (Mentor), Industrial & Systems Engineering

Informal caregiving (unpaid, nonprofessional) for patients with Alzheimer's Disease or related dementias (PwD) totals approximately 17 billion hours of work per year and costs up to $140 billion per year in caregiving costs, lost productivity, and medical and institutional care. Informal caregiving for PwD is associated with increased risk for negative psychological and physical outcomes including higher levels of stress and burden, burnout, and high rates of depression for both the PwD and caregiver. Understanding what factors assist and inhibit the negative outcomes catalyzed by these stressors is unclear. We analyzed informal caregiving from a workload perspective using a Human Factors Engineering approach to determine the physical and physiological triggers embedded within stressors that contribute to negative personal and social outcomes for informal caregivers.

EFFECT OF METHIONINE RESTRICTION ON EXPRESSION OF THE SMALL HEAT SHOCK PROTEIN AB-CRYSTALLIN

Ashley Zenner, Vincent Cryns (Mentor), Endocrinology

Methionine is an essential amino acid for cell metabolism because it functions as the initiating amino acid for eukaryotic protein synthesis, it is one of the necessary amino acids for polyamine synthesis, and it generates S-adenosylmethionine (SAM), a widely used methyl-donor. Many human tumors, including those of the breast, colon, ovary, prostate, and melanoma, are methionine dependent. Tumor Necrosis Factor (TNF)-related apoptosis ligand (TRAIL), which is an extrinsic regulator of apoptosis, activates cell death by binding to its death receptors TRAIL-R1 and TRAIL-R2 mRNA. TRAIL-R2 protein levels are upregulated on the surface of cancer cells when methionine is restricted. αB-crystallin, a small heat shock protein, enhances survival of cancer cells, because it is an inhibitor of TRAIL-induced caspase–3 activation and apoptosis. αB-crystallin is induced by many different types of stress, preliminary results suggest that levels of αB-crystallin are down-regulated after exposure to methionine depleted media. If it can be proven that αB-crystallin levels are down-regulated, it may be therapeutically beneficial to patients undergoing chemotherapy, because studies have shown patients expressing αB-crystallin are more likely to resist neoadjuvant chemotherapy and have shorter survival rates.

INTERPLAY OF SELF-ASSEMBLED DEFECT CORES AND DYNAMICS OF ANNIHILATION OF TOPOLOGICAL DEFECTS

Bo Zhang, Nicholas Abbott (Mentor), Chemical and Biologican Engineering

Topological defects underlie phase transitions in many condensed matter systems, yet how the local structure and dynamics of defect cores influence the motion, interactions and annihilation of topological defects remains to be elucidated. In this project, we manipulate the structure of cores of topological defects of nematic liquid crystals via formation of reversible assemblies from molecular amphiphiles, and reveal an interplay between local core structure and defect motion and annihilation.

KINETIC STUDY OF KHARASH-SOSNOVSKY ALLYLIC OXIDATION OF OLEFINS

Jingyi Zhao, Scott Mccann (Mentor), Chemistry

The oxidation of α-H of alkenes has attracted the interest of synthetic chemistry. One such oxidation method known as the Kharasch-Sosnovsky has attracted people's attention. The reaction successfully transformed the starting material into an allylic ester that is suitable for further modification. However, this reaction's condition is not well defined, and people have not reached consent on the best catalyst and ligand to be used. The performance of the reaction varies and the mechanism remained unknown. In an attempt to understand the reaction, a kinetic study of the Kharasch-Sosnovsky based on a mild reaction condition is carried out. The current objective aimed to find the rate limiting step of the reaction and the rate law dependency on the reactants.

ESTIMATING THE ROLE OF EDUCATIONAL ASSORTATIVE MATING IN INCOME MOBILITY AND INCOME INEQUALITY

Sidong Zhong, Steven Durlauf (Mentor), Economics

Although it is believed that the educational background of a child's family plays a large role in determining the future success of the child, very limited study has been done to estimate their empirical association focusing on the marital sorting process. This proposal examines how educational assortative mating can be an indicator of social differentiation by presenting how parent's educational assortative mating level determines the income mobility of children and its effect on the upward trend of income inequality. Based on the data spanning 1996–2012 from the American Community Survey (ACS), we could observe if assortative mating is stronger in areas with more income inequality and less social mobility. In addition, this proposal will enable me to examine the effects of existing educational policies on income mobility and inequality, such as raising compulsory school age which intends to create a more heterogeneous peer group, leading to a lower degree of assortative mating.

FOLATE-INDUCED FUNCTIONAL AND ELECTROMYOGRAPHIC RECOVERY OF SCIATIC NERVE INJURY

Kyle Zielinski, Albert Hu, Bermans Iskandar (Mentor), Neurosurgery

Our laboratory has shown that folate supplementation increases regeneration of axons as well as partial recovery of neuronal function in the rodent central nervous system after injury. We will determine whether the beneficial effects of folate extend to the peripheral nerve system as well. Specifically, we will study the effect of folic acid supplementation on axon regeneration and functional and electromyographic nerve recovery in a traumatic model of sciatic nerve injury in vivo and in vitro. Human applications include traumatic injury such as peripheral nerve damage from war, surgery, and motor vehicle accidents, but also congenital and acquired neuropathies and radiculopathies.