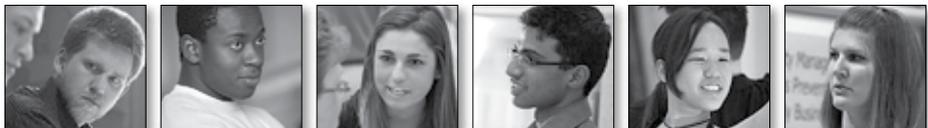
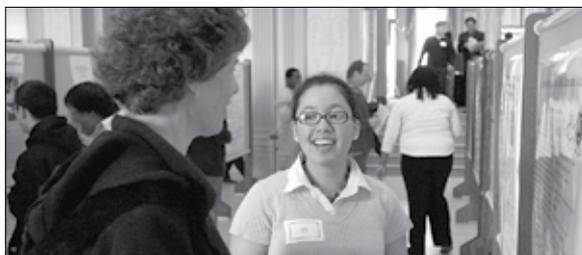


UNDERGRADUATE SYMPOSIUM ABSTRACTS 2010



Celebrating research, creative endeavor and service-learning



THE UNIVERSITY
of
WISCONSIN
MADISON

Undergraduate Symposium 2010

Celebrating Research, Creative Endeavor and Service-Learning

**University of Wisconsin–Madison
Great Hall, Memorial Union
April 15, 2010**

- 9:45 a.m. *Welcome to Student Participants*
Charles T. Snowdon, Hilldale Professor
of Psychology
Director, College of Letters and
Science Honors Program
- Noon *Celebrating Undergraduate Education at a
Research University*
Paul M. DeLuca, Jr., Provost and Vice
Chancellor for Academic Affairs

Undergraduate Research Awards Ceremony
Kelli Keclik, Academic Librarian
College Library
- Oral Presentations** See the following pages for exact locations.
10:00–11:30 a.m. Session I
12:30–2:00 p.m. Session II
2:15–3:45 p.m. Session III
- Poster Sessions** See the following pages for exact location.
10:00 a.m.–4:00 p.m. Posters will be on view in Great Hall, Class
of '24, Tripp Commons and Main Lounge.
- Art/ Research Presentations**
12:30 p.m. On view in Langdon Room
- Gallery of Artwork** Main Lounge

Refreshments will be available throughout the day in Tripp Commons.

A Special Thanks!

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

A special thanks is also extended to Ruthi Duval of The Wisconsin Union; Melissa Tedrowe of the Writing Center; Kent Hamele, Nancy Rinehart, and Linda Kietzer of University Communications; Jeff Crucius of the Division of Information Technology; Patricia Iaccarino at the College Library; and Karen Lederer and Jan Lucchesi of the College of Letters and Science, Student Academic Affairs.

2010 Undergraduate Symposium Organizing Committee

Matt Bobel, Jane Harris Cramer, Maya Holtzman, Noel Howlett (coordinator), Svetlana Karpe, Linda Kietzer, Anthony (AJ) Madsen, Laurie Mayberry, Janice Rice, Julie Stubbs, Beth Tryon, and Randy Wallar.

Cover photos provided by the Office of University Communications.

Undergraduate Symposium 2010

Celebrating Research, Creative Endeavor and Service-Learning

*University of Wisconsin–Madison
April 15, 2010*

The 12th annual Undergraduate Symposium is a celebration of undergraduate students' accomplishments across the many schools and colleges at UW–Madison. The Symposium includes presentations, posters, and displays by groups and individuals representing the arts and humanities, biological sciences, physical sciences, and social sciences. These original works showcase the vast range of talent and creativity within the university's undergraduate population.

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Writing Center*

Congratulations!

.....
The Undergraduate Symposium has become *the* premier campuswide event showcasing our students' incredible talents in research and scholarship, creative works, and community involvement. I want to congratulate you on your achievement, and I want to encourage you to explore the accomplishments of your colleagues. Leaf through this program booklet and take a look at others' work presented and displayed throughout the Union today.

We take great pride in what you've done and take every opportunity to brag about you. Former Symposium presenters have gone on to brilliant careers in academia, law, medicine, business, the arts, and the sciences. We look forward to hearing what you accomplish next.

Again, congratulations and enjoy the day!

Aaron M. Brower, Ph.D.
Vice Provost for Teaching and Learning
Professor, School of Social Work
Harold C. Bradley Faculty Fellow

List of Presenters / Location

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10:00–11:30 a.m.

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Egan, Katie
Dees, Cara
Wendorff, Timothy

Inn Wisconsin West

Abbs, Elizabeth
Saffold, Ashley
Bae, Jun
Barnard, Allison
Mao, Shifan

Old Madison East

Leugers, Cecilia
Luhn, Alec
Dong, Xintong
Miller, Shaun
Lang, Alex

Old Madison West

Procak, Alexandra,
Buck, Will
Wroblewski, Rachel
Stoltz, Dan
Pflum, Zach

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Kelley, Megan
Sauer, Megan

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 Stein, Kelsey
 Hasan, Neha
 Saphner, Elizabeth

Inn Wisconsin West

Ruiz, Michael
 Trzebiatowski, Josh
 Prouve, Lucas
 Kleman, Neil
 Lehrer-Brey, Gabrielle

Old Madison East

Rasmussen, Krista
 Meyer, Patrick
 Baures, Brittany
 Whitmarsh, Regina
 Mabrey, Danielle

Old Madison West

Chaplo, Shannon
 Newcomb, Kimberly
 Gordon, Robert
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Goldstein, Michael
Rozek, Rebecca
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Schroeder, Kristina
Cavanagh, Cate
Ho Wee Teck, William
Phillips, Sarah
Cheng, Cheng

Inn Wisconsin West

Abdl-Haleem, Marryam
Martin, Christopher
Polnaszek, Brock
Steeple, Douglas
Thapar, Nalin
Schmid, Leah

Old Madison East

Bentley, Janelle
Williams, Walter
Becker, Claire
Goodman, Katelyn
Gohlke, Brianne

Old Madison West

Pellatt, Brian
Pribbenow, Luke
Lembong, Josephine
Walton, Mary
Keuler, Megan

Profile

Sorensen, Emily
Horvath, Patricia
Winograd, Paul
Xiong, Lisa
Crandall, Ronald

Art Presentations

Renn, Lauralyn
Brewster, Signe

INTRINSICALLY GENERATED OPIOIDS AS A MOTIVATING FACTOR IN UNDIRECTED BIRDSONG OF MALE ZEBRA FINCHES

Elizabeth Abbs, Lauren Ritters (Mentor), Zoology

Songbirds often sing at high rates, suggesting that singing may be rewarding. Reward commonly involves opioid neurochemicals, thus opioids may play a role in birdsong. Opioids' role in birdsong in male zebra finches (*Taeniopygia guttata*) was examined via a conditioned place-preference (CPP) procedure. Subjects were injected with an opioid receptor antagonist (naloxone) or saline, and then placed in one side of a cage. Birds producing high rates of song not directed toward other individuals showed CPP for the side of the cage formerly paired with song. Naloxone did not affect CPP, suggesting opioids are not involved in song reward or methodological issues. Findings from this study provide a baseline for future investigation of birdsong motivation and possible neural mechanisms by which this behavior is generated.

GAZA: LITERARY REFLECTIONS

Marryam Abdl-Haleem, Mary Layoun (Mentor), Comparative Literature

My project centers around personal narrative responses to the latest Israeli occupation of the Gaza Strip, both the siege carried out by Israel as well as the recent air strikes (December 2008–January 2009). I spent two months last summer in Gaza. I gathered people's stories, experiences, and reflections on these turbulent times through interviews and casual conversations. I also kept a detailed learning journal, recording my personal experiences and observations. I am now in the process of producing a short book of literary pieces based on stories I collected, interweaving between the narratives the story of my sojourn. I hope to show the more human side of a highly politicized issue. Gaza is not a piece of news. It's a place where people live.

THE ROLE OF MGAT2 IN FAT ABSORPTION

Stieve Adela, Chi Liang Yen (Mentor), Nutritional Sciences

Dietary fat supplies essential nutrients and calories; however, excessive fat intake is linked to obesity. The absorption of dietary fat requires the resynthesis of triacylglycerol, a process catalyzed by MGAT. Among three identified genes encoding MGAT enzymes, MGAT2 is present in both human and mouse small intestine. Disabling the MGAT2 gene in mice protects them from weight gain on a high-fat diet. I hypothesize that the expression of intestinal MGAT2 determines the levels of dietary energy absorbed. To test this hypothesis, I will measure the energy content of feces from genetically engineered mice with different MGAT2 expression levels using bomb calorimetry. The results obtained will suggest the mechanism involved. This study will provide insights into the fundamental process of lipid absorption and obesity research.

ARTICULATING AN INDIGENOUS MODERNITY IN PROGRESSIVE ERA WISCONSIN

Anna Adler, Larry Nesper (Mentor), Anthropology

While Wisconsin Indian reservation communities during the middle nineteenth century were a social experiment by the government, off-reservation communities can be considered an experiment by the Indians. In particular, the off-reservation communities at McCord and Skunk Hill may serve as a representation of a social and cultural experiment in which the Indian people attempted to fashion an indigenous modernity. This undertaking on their part can be seen within the social, cultural and commercial interactions of the McCord Indians—as well as other off-reservation Indian settlements—with surrounding non-Indians. Using sources such as newspaper records and census data, we hope to locate historical evidence of these interactions. By conducting this project we also hope to add to Wisconsin Indian history by looking outside of reservation communities.

FREE NEMO IN CELLS AND NF- κ B ACTIVATION

Leah Alstad, Shigeki Miyamoto (Mentor), Pharmacology

The transcription factor NF- κ B regulates cellular responses to double stranded DNA breaks. I will show that NF- κ B essential modifier (NEMO), which is essential in activating NF-, exists freely in the cell, and also that the amount of free NEMO in the cell correlates with the ability of the cell to activate NF- κ B in response to genotoxic stress. This will lead to a deeper understanding of the cellular pathways that enable cells to survive when treated with agents that induce genotoxic stress, which are currently used in cancer treatment, and could lead to ways to make these cancer treatments more effective. This research has shown that determining this question is not possible using the proposed method of co-immunoprecipitation given commercially available antibodies, and the question is now being addressed using size exclusion chromatography.

INFLUENCES ON LISTENER JUDGMENTS OF CHILDREN'S CONSONANT PRODUCTIONS

Amy Andrzejewski, Jan Edwards (Mentor), Communicative Disorders

Researchers and clinicians rely primarily on phonetic transcription to describe phonological acquisition. However, listener judgments can be biased. This study investigates the effect of perceived age on listener judgments. First, two lists of familiar words produced by children were created: one contained correct productions, while the other contained at least one error in each word. Participants heard these lists and judged how old each speaker sounded. Listeners consistently rated the speakers as younger when the list contained phonological errors. Second, participants will judge productions of /d/ and /g/ presented following the carrier lists that were found to convey age. We predict that participants will be more lenient when judging productions following the inaccurate word lists.

FINAL DEVOICING ACROSS SOUTHERN WISCONSIN

Lucas Annear, Alicia Groh, Emily Joyce, Mary Simonsen,
Joseph Salmons (Mentor), German

Earlier research has shown that speakers in Wisconsin tend to devoice English consonants at the ends of words. For example, /z/ and /d/ as in *shoes* and *head* commonly devoice to [s] and [t]. This has been found in areas like Milwaukee where immigrants spoke a language that had final devoicing (such as German, Polish, Dutch). We expand this work to speakers across southern Wisconsin from Brookfield, Richland Center, and Platteville; these areas' heavier Anglo-American settlement patterns would not suggest final devoicing. We hypothesize that Milwaukee-area speakers will pattern like speakers in earlier studies due to heavy Polish and German immigration there, while the others will show less devoicing. Preliminary results to date support this hypothesis.

COMMERCIAL INFLUENCES

Melissa Annen, Dipesh Navsaria (Mentor), Pediatrics

My project focuses on how TV and commercials affect children. I am working with Dr. Dipesh Navsaria in the Children's Hospital. I started research on this subject through various articles in the UW-Madison database and by watching "Commercializing Childhood." What I found was that watching any TV before the age of two can result in attention issues once they reach school. We're going to conduct our research by having residents take a survey before we show them "Commercializing Childhood," and giving one after to see if their opinion had changed. About four to six months later we plan on giving out the same survey to see if what they saw in the movie made a difference. We're currently working on getting the survey back from the IRB, and then we will proceed to conduct the survey.

DETERMINING ATP HYDROLYSIS COORDINATION IN PSUEDOMONAS AERUGINOSA PILT

Kaitlin Annunzio, Katrina Forest (Mentor), Bacteriology

Type IV pili are structures found in Gram-negative bacteria which mediate cell motility on solid surfaces. A multi-protein complex that spans the bacterial inner and outer membranes is responsible for the assembly and disassembly of these structures. PilT, a motor protein in this complex, promotes the pilus to retract back into the cell membrane by disassembly of pilin monomers. X-ray crystallographic and biochemical studies have shown that PilT is a hexameric ATPase, with each subunit having a C-terminal and N-terminal domain. While the PilT structure has been determined, more studies are needed in order to understand how the monomers interact with each other and coordinate ATP hydrolysis. Traditional mutation studies coupled with a unique subunit linker design will allow for detailed analysis of these interactions.

FLUORESCENT VISUALIZATION OF MEMBRANE SIGNALING

Matti Asuma, De Ann Pillers (Mentor), Pediatrics

Phosphatidylinositol 4,5-bisphosphate (PIP₂) is a dynamic cell membrane phospholipid that regulates many cell functions such as opening and closing of membrane channels. Upon excitatory stimulation, PIP₂ is hydrolyzed to diacylglycerol (DAG) and inositol triphosphate (IP₃). DAG activates the enzyme Protein kinase C (PKC) and IP₃ (containing the PH domain of PIP₂) releases Ca²⁺ from cellular cytoplasmic stores. The goal of this research is to generate green and red fusion proteins with high affinity for DAG and PIP₂ to simultaneously study the dynamics of PIP₂ hydrolysis in cell function. Through gene cloning technique we constructed eukaryotic expression DsRed-fusion proteins and demonstrate live cell distribution of these probes. This will aid in the visualization of G-protein coupled receptor signaling.

WHAT ARE COLLEGE STUDENTS' MOTIVATORS FOR AND BARRIERS TO SEEKING STD TESTING?

Uba Backonja, Diane Lauver (Mentor), Nursing

Nearly half of all STDs are acquired by 15–24-year-old persons. Identifying and treating those infected can reduce the spread and complications of STDs. However, rates of STD testing are lower than recommended. My purpose was to examine college students' motivators and barriers regarding STD testing. Using a descriptive, cross-sectional design, 300 undergraduates aged 18–25 are being sampled anonymously in the midwest. From the Theory of Care Seeking Behavior, investigators developed an on-line survey to assess feelings, beliefs, norms, habits and external factors relevant to STD testing. We will examine correlations among these variables, demographic factors, and prior STD testing. Understanding motivator and barriers regarding STD testing is necessary to develop interventions to increase testing rates among college-age students.

“LOVE ME ONCE AGAIN,” THE ULTIMATE MODEL FOR KOREAN FEMALE SENTIMENTAL MELODRAMA

Jun Bae, Benjamin Singer (Mentor), Communication Arts

Melodramatic films tend to use plots that appeal to the heightened emotions of the audience, often dealing with crises of human emotion, failed romance or friendship, strained familial situations, emotional and physical hardship. Examining melodramatic films, so-called tearjerkers, provide better comprehension of human emotion, mainly sympathy, sadness and suffering. Jung So Young's film “Love Me Once Again” (1968) is the biggest box office hit of the 1960s and the first model for female sentimental melodrama in Korean cinema, and the ultimate tearjerker. This study will examine how this movie succeeds at generating audience's sympathy, translates human emotion and sets up an example for future Korean melodramas.

ACTIVATING OF TUMOR-ASSOCIATED MACROPHAGES WITH ANTI-CD40 MAB AND CPG-ODN

Mark Baldeshwiler, Alexander Rakhmilevich (Mentor), Human Oncology

We studied the effect of B16-F10 mouse melanoma growing intraperitoneally on the function and phenotype of tumor-associated macrophages (TAM). The ability of peritoneal macrophages to secrete nitric oxide (NO) was progressively diminishing with tumor growth. This suppression of macrophage activation directly correlated with the increased percentage of CD11b+ Gr1+ leukocytes in the peritoneal cavity. In addition, TAM suppressed function of naïve macrophages. Treatment of tumor-bearing mice with anti-CD40 mAb and CpG increased the ability of TAM to produce NO *in vitro*, and induced antitumor effects against B16 melanoma *in vivo*. Together, the results suggest that anti-CD40 mAb in combination with CpG can induce antitumor responses by reversing the macrophage functions within a tumor.

INTANGIBLE ASSETS OF A FAMILY BUSINESS

Andrew Baldinger, Ross Davister, Jamie Malczewski,
Debra Holschuh-Houden (Mentor), Family Business Center

Family firms make up the majority of all incorporated businesses in the United States. As such a powerful force in the American landscape, it is beneficial to examine some of the drivers behind family business success. Many of these drivers are intangible assets such as increased loyalty to the firm, presence of a definitive culture, and longevity of employment. We expect family businesses to have more of these intangible assets than non-family businesses. As a result, we believe family businesses will be more successful and better able to satisfy their employees. We will analyze the assets in family and non-family businesses by doing interviews and surveying employees to measure dedication to the firm, employee satisfaction, and employment longevity.

CHEMTEACHER

Gerad Bandos, John Moore (Mentor), Chemistry

There is a need for educational resources to be made accessible. Content was collected in subject matter and varying levels of education and curricula. The content was combined in a custom web site, using the Joomla content management system as a framework. The resources contained within ChemTeacher are available for teachers in secondary chemistry and are best suited for less-experienced teachers, including substitute teachers. The content can be adjusted for several levels of study, ranging from general science to Advanced Placement. The aim of this project is to facilitate the access of teachers to quality resources to positively enhance a student's learning experience and the general instruction of chemistry.

TANDEM RING OPENING METATHESIS AND NITROXIDE-MEDIATED POLYMERIZATION— A NEW ROUTE TO BLOCK COPOLYMERS

Steven Banik, Mahesh Mahanthappa (Mentor), Chemistry

Block copolymers are commodity materials that self-assemble into distinct morphologies resulting in unique mechanical properties. Although living polymerization strategies such as atom transfer radical polymerization (ATRP) and nitroxide-mediated polymerization (NMP) allow precise control over copolymer composition and architecture, the range of monomers that can successfully be polymerized by these methods is limited. Combining these strategies with ring opening metathesis polymerization with chain transfer (ROMP-CT) enables access to a wider range of monomer combinations. This research explores ROMP-NMP as an innovative method of producing ABA triblock copolymers using both known and unknown monomer combinations with potentially unique and interesting properties.

DIVORCE IN FAMILY BUSINESS

Kaitlin Bare, Debra Holschuh-Houden (Mentor), Family Business Center

When a married couple chooses to embark in a business venture together, they subject their marriage to stress and compromises that come with any business partnership. In some cases, the toll of running a business together is enough to lead a couple to divorce. The goal of this study is to evaluate the factors of running a business that cause challenges for married business partners. I plan to interview couples that have divorced, and couples that are married and still working together, as well as lawyers about the topic. My hypothesis is that the different groups will describe similar factors, but that the couples who prepared for the challenges are more likely to still be married.

ESTRADIOL TREATMENT INCREASES INFANT-DIRECTED ATTENTION IN CAPTIVE MALE COMMON MARMOSETS (CALLITHRIX)

Allison Barnard, Charles Snowdon (Mentor), Psychology

Hormonal regulation of paternal behavior is poorly understood in bi-parental primates. Previously, non-father common marmosets were less responsive to stimuli from distressed infants than fathers. We predicted hormonal priming with estradiol would increase responsiveness to infants in non-fathers. We primed eight non-father marmosets with three levels of estradiol. We tested males' responses to infant distress signals. Compared to the no-estradiol control treatment, non-fathers significantly decreased their frequency of long-call vocalizations when exposed to infant vocalizations under low and high estradiol treatment. Estradiol priming appears to elicit father-like behavior in non-fathers by focusing more attention toward infant stimuli.

ANALYSIS OF NATIONAL HURRICANE CENTER TRACK FORECAST ERRORS BASED UPON GEOGRAPHIC LOCATION OF ORIGIN

Hannah Barnes, Daniel Vimont (Mentor),
Atmospheric and Oceanic Sciences

The National Hurricane Center (NHC) has significantly reduced cumulative track forecast errors within the last decade. However, the behavior of a hurricane is significantly linked with its geographic region of origin. This study seeks to understand how the reduction in track forecast errors varies with respect to the hurricane's geographic region of origin. All hurricanes from 1970 to 2007 are classified into four clusters according to their geographic region of origin. Then, the mean absolute track forecast errors (MAE) associated with the 12, 24, 48, and 72 hour forecasts from 1970–97 is compared to the MAE from 1998–2007. While each cluster witnessed a decrease in MAE from 1998–2007, the reduction is most significant in the northern cluster where the influence of mid-latitude baroclinic systems is greater.

PHYTOCHEMICAL INDUCTION IN COTTONWOOD

Brian Batko, Kennedy Rubert (Mentor), Entomology

Phenolic glycosides (PGs) consist of a sugar conjugated to one or more phenolic moieties; many PGs are synthesized in plants, where they are associated with defense against herbivory. We will use our results to determine whether the fine root production of three known PGs (Salicin, HCH Salicortin, and Salicortin) is induced by insect damage to foliar tissue and to survey unknown phenolic glycoside compounds in cottonwood. Phenolic glycosides were extracted into methanol and quantified by high performance thin layer chromatography (HPTLC) or by high performance liquid chromatography (HPLC). Results will illustrate if and how insect damage to leaves induces PGs in roots and whether other phytochemical changes are induced in green leaves by insect damage.

EXPLORATION OF NASCENT PROTEIN FOLDING BY SINGLE MOLECULE FLUORESCENCE MICROSCOPY

Daniel Baum, Silvia Cavagnero (Mentor), Chemistry

The question of how proteins fold into their native three-dimensional state has been one of the most challenging problems of modern science since the 1960s. Single-molecule investigations are necessary to identify different populations of proteins as they are produced on the ribosome. This study tests the hypotheses that sperm whale apomyoglobin (apoMb) occupies a number of different populations while it is bound to the ribosome and that the presence of trigger factor, a molecular chaperone, significantly affects those populations through hydrophobic interactions. The system will be constructed on a quartz slide cushioned with polyethylene glycol (PEG) in order to prepare it for total internal reflection fluorescence (TIRF) microscopy and Förster resonance energy transfer (FRET) microscopy.

EVALUATING THE IMPACTS OF WIND FARMS ON BIRDS AND BATS IN SOUTHEASTERN WISCONSIN

Brittany Baures, David Drake (Mentor), Forest and Wildlife Ecology

Wind power is quickly becoming one of the leading U.S. industries in alternative energy. Because it is an emission-free, renewable resource, wind energy is an attractive alternative to fossil fuels. Although the benefits are unequivocal, recent research has generated concern for bat and avian mortality associated with wind turbines. To assess bird and bat mortality, carcass searches were conducted during peak migration periods at Forward Energy's wind farm in southeastern Wisconsin. Objectives of the study were to assess bird and bat mortality rates and evaluate factors contributing to high mortality including weather, farm location and turbine operation. The aim of the research is to provide useful information that may be used to mitigate the impacts of wind farms on flying wildlife.

EFFECTS OF ONLINE COLLABORATIVE LEARNING

Gabriel Bautista, Regina Nelson (Mentor), Biomedical Engineering

This project focuses on the impact of online collaboration on biomedical engineering students learning physiology. The students complete one of four different physiology modules and are then assigned another learning module dealing with an advanced BME topic. A pre-test is given out to assess their initial ideas on how to resolve the problem based on their newly acquired knowledge. Following a forum discussion on the project with other students who completed the same physiology module, the students are asked to write their final thoughts on the issue once again. Based on previous research done on group work and collaborative learning we expect our results to show an increase in the understanding of the physiology modules.

READER'S EMOTIONAL EXPERIENCE CONVEYED BY AUTHOR'S LITERARY STYLE: SPANGLISH, AUTHORITY, EXCLUSIVITY

Claire Becker, Guillermina De Ferrari (Mentor), Spanish and Portuguese

Immigrants live in an environment of constant creative negotiation between cultures, which yields shifting feelings of pride, shame, nostalgia, liberation, anxiety, and assurance. To better understand authors' emotional point of view, I have first analyzed the emotions conveyed to readers through Spanglish, which emphasizes sentiments through preservation and transformation of language. These literary choices, along with styles of exclusivity and authority are focal; by addressing the reader in a specific form, authors may reveal their feelings toward the subject matter: whether it is public, private, denied, embraced, misunderstood or well known. I will use Tato Laviera's poem "Esquina Dude" as an example of these language forms, the creative outlets that immigrants find in writing in Spanglish and how these constructions derive emotions in the reader.

CHARACTERIZATION OF THG-1 IN THYROID HORMONE-INDUCED CARDIAC HYPERTROPHY

Andrew Benjamin, Eugene Kaji (Mentor),
School of Medicine and Public Health

A yeast two-hybrid screen was previously performed using the DBD of Thyroid hormone receptor alpha (TR- α), a key component in thyroid hormone mediated hypertrophy. One molecule shown to interact with TR- α in yeast was TSC22 homologous gene-1 (THG-1). This protein has been studied to determine its role in thyroid hormone mediated hypertrophy. Initial transfection results indicate a decrease in TR- α -mediated transcription in the presence of THG-1. Transcriptional regulation of THG-1 in thyroid hormone treated mice is currently being studied using RT-PCR as well as confirming the TR- α -THG-1 interaction via GST-pPulldown.

SEEDBANK: ENCOURAGING ENVIRONMENTAL STEWARDSHIP AND ARTS AWARENESS THROUGH DANCE

Janelle Bentley, Katherine Corby (Mentor), Dance

This project is an exploration of site-specific choreography at the Olbrich Botanical Gardens. Site-specific choreography is movement tailored to a non-traditional performance space, using factors such as the location's history, structure, and function as the basis for movement inspiration. The research draws upon environmental concepts of sustainability and stewardship to develop movement at the Olbrich Gardens, culminating in a performance by Kate Corby and Dancers. The performance will incorporate principles of landscape architecture, historical concepts developed by early modern dance pioneers, and overarching ideals of the Green movement. The project aims to illuminate the possibilities of combining interdisciplinary research with contemporary dance while simultaneously engendering an appreciation for dance in the local community.

LARGE CARNIVORE CONSERVATION PROBLEMS AND SOLUTIONS IN DEVELOPING COUNTRIES

Mallory Berrey, Megan Evansen, Carl Hutter,
James Berkelman (Mentor), Forest and Wildlife Ecology

We examine the relationship between ecocentric and anthropogenic attitudes that lead to large carnivore conservation programs in Mexico and other developing countries. Large carnivores are facing sharp declines worldwide and effective solutions are needed to mitigate this loss and ensure that these ecologically valuable species recover. We visited Mexico with our Forest and Wildlife Ecology 375 course in January 2010 and researched case studies of large mammal conservation programs after our return to assess the success and the cultural or environmental consequences of each program. We find that these conservation problems are solved effectively when the solution takes the social and environmental implications into consideration and are applied to meet the specific set of challenges.

CAN PERCEIVED COMPETENCE HELP LEARNERS BENEFIT FROM SOCIOCOGNITIVE CONFLICT?

Brittany Bice, Judith Harackiewicz (Mentor), Psychology

In academic settings, students often experience uncertainty as they interact with peers and disagree about answers to problems. Previous research suggests that such conflict can create doubts about performance, especially when learners are under performance pressure. We hypothesize that this uncertainty can be reduced if an individual has confidence in their ability, which can help them learn from a peer's answers, leading to increased interest and performance on a task. This study examined whether a manipulation of perceived competence acts as a moderator of the effects of conflict on interest and performance.

COMPARISON OF ACCUMULIBACTER CLADES IA AND IIA KINETICS IN ENHANCED BIOLOGICAL PHOSPHORUS REMOVAL

Forrest Bishop, Katherine McMahon (Mentor),
Civil and Environmental Engineering

Enhanced biological phosphorus removal (EBPR) is a biological treatment process that employs polyphosphate accumulating organisms (PAOs) to remove phosphorus from wastewater. This study examines and compares the biological kinetics of *Candidatus Accumulibacter* clades IA and IIA, two groups of PAO in EBPR systems. Two EBPR lab-scale reactors were sampled over time to study the rate at which clade IA and clade IIA cycle phosphate and biodegradable organic matter. Fluorescence *in-situ* hybridization quantified the abundance of clades IA and IIA in the microbial community. Profiles of phosphate uptake and release, volatile fatty acid uptake, poly-hydroxyalkanoate production and degradation, and glycogen production and degradation were created to compare the kinetics of the two clades. This study will contribute to understanding implications of genotypic variability on EBPR performance.

THE BT GENE FAMILY OF ARABIDOPSIS THALIANA AND ITS ROLE IN VERNALIZATION

Jamie Blavat, Amanda Wollenberg (Mentor),
Molecular and Cellular Biology

Arabidopsis thaliana is a model organism for studying plant biology. Our lab studies vernalization, which is the subjection of plants to low temperatures in order to hasten flowering. Prior to vernalization there is a flowering repressor gene that is activated, but it is silenced by vernalization to allow rapid flowering. This inactivation may be related to increasing expression of BT family genes during cold treatment. To investigate this further, we identified bt mutants, vernalized them, and analyzed flowering time. Rapid flowering after vernalization would indicate that BT genes are not needed for vernalization, whereas late flowering would indicate that these genes are required for vernalization, prompting further research. Potentially, this research could impact agriculture by helping us understand how plants sense and respond to cold.

**UNCOVERING MORPHOLOGICAL CHARACTERS
THAT DEFINE BOTRYCHIUM
(FAMILY OPHIGLOSSACEAE) FERN SPECIES**

Crys Bochte, Donald Waller (Mentor), Botany

Scientists usually define species using quantified morphological characters. *Botrychium* subgenus *Botrychium* is a botanically interesting group of ferns with numerous poorly-defined species, several of which are threatened. *Botrychium* ferns often lack distinguishing characteristics due to their small stature (up to 20 cm) and reduced morphology. *Botrychium* ferns have a center of diversity in the Upper Peninsula (UP) of Michigan. Using specimens from the UP, I measured several morphological traits on 900+ individuals. I am using PCA ordination to detect and decipher those characters that most reliably distinguish species. These analyses combined with molecular genetic data will help us determine whether previously described species actually exist within other species groups.

**DEVELOPMENTAL INFLAMMATION MODEL
IN NEONATAL RATS AND RESPIRATORY PLASTICITY**

Corie Borchert, Tracy Herman (Mentor), Comparative Biosciences

Exposure to low oxygen or to certain infections before or after birth may trigger brain damage leading to developmental disorders such as cerebral palsy. Although patients with cerebral palsy often experience life-threatening breathing problems, little is known about the underlying causes or effective treatments. To better understand the impact of maternal infection and/or low oxygen on developing brain circuits that control breathing, rats will be exposed, prenatally, to a bacterial protein that simulates infection, followed by low oxygen exposure at birth. If abnormal breathing is observed in these rat pups, we will then test the hypothesis that evoking mechanisms of compensatory brain plasticity will improve breathing. These studies may provide the rationale for novel treatments for human conditions in which breathing is compromised.

HOW MANY FAMILY MEMBERS ARE TOO MANY?

Amanda Bowen, Stephanie Davis, Debra Holschuh-Houden (Mentor),
Family Business Center

Our research will address the problem of having too many stakeholders in a family business. With multiple family members influencing the company's direction, the result is a variety of opinions. We expect to find that this is a source of conflict in family businesses. Through primary and secondary research, we expect to find that having too many stakeholders leads to confusion, slow decisionmaking, and personal conflicts within the family firm. Lastly, we would like to research family businesses that have successfully operated with multiple stakeholders. We will compile recommendations on how to manage multiple family influences.

SUCCESSION DECISIONS FOR FAMILY BUSINESS OWNERS

Emma Brady, Sarah Midthun, Debra Holschuh-Houden (Mentor),
Family Business Center

Family businesses encompass a majority of the businesses worldwide, and every family business owner is faced with succession decisions. This research addresses the family business succession process from an emotional, financial, and strategic point of view. Other areas such as challenges, preparations, and after-thoughts will be addressed, and we will be creating a flow chart with these components. We will include two case studies: one case study will be a first-generation family business preparing for succession, and the other case study will be a multigenerational family firm preparing for succession. We will compare and contrast the processes between the two different family firm types and use our analysis in our flow chart. Our research is expected to bring together all the components of succession and put together a basic guide that succeeding family business owners could potentially follow.

**CAKRAS AND INDIVIDUATION:
THE PSYCHOANALYTIC PERSPECTIVE
OF CARL GUSTAV JUNG**

Nora Brand, Gudrun Buhnemann (Mentor),
Languages and Cultures of Asia

This research examines a presentation given by psychoanalyst Carl Jung in 1932 in regards to Tantric philosophy and cakra energy centers. By drawing on a transcript of the presentation as well as several publications on Tantrism and Jung's analytical theories, I examine the ways in which Jung strayed from Tantric philosophy and used the cakra system to frame his own theories about the individuation process. Although Jung's presentation marks an important historical development in the synthesis of yogic philosophies and depth psychology, his unfounded appropriation of the cakra system serves to illustrate the great divide that continues to exist between the two fields. This case study ultimately raises questions about the ways that ethnocentrism, misinformation, and misappropriation have affected the field of psychoanalysis in its relationship to meditative tradition.

**WOMAN'S DANCE DRUM: THE EVOLUTION OF
A TRADITIONAL NATIVE AMERICAN INSTRUMENT**

Bethany Brander, Jonathan Kenoyer (Mentor), Anthropology

This paper presents the results of an experimental archaeological study of dance drums among the Ojibwe. The use of drums among Native American pre-dates European contact, but with the introduction of European-made barrels, this material was rapidly adapted by drummakers. Because women were not included in the original drum dance, they created their drum using a smaller frame. This study examines the scarce archaeological evidence for drum use and how this important aspect of ritual and culture changed over time. I also examine the production technology and the ways in which drums were used to reinforce and legitimize cultural traditions. It is important to look at women's drums because they were once quite popular and are now almost forgotten.

AN END TO SLIM PICKINGS

Signe Brewster, Gregg Mitman (Mentor),
Nelson Institute for Environmental Studies

Madison is known for having the second-largest farmers market in North America and a love of all things local. But how local is our food really? Meet a community of gleaners who call Madison home and know just where to find apples, pears, grapes, raspberries and even kiwis in backyards, vacant lots, university walkways and gardens across the city. At the same time, go behind the scenes of one of the largest food pantries in Madison where fresh fruit is one of the most scarce and precious commodities. Developed from a trailer produced for the Tales from Planet Earth film festival, this short documentary is an example of the power of visual storytelling to expose issues and leverage a community.

OPTIMIZATION OF INORGANIC THIN-FILM DYE-SENSITIZED SOLAR CELLS

Lauren Brzozowski, Yukihiro Hara (Mentor), Materials Science Program

Environmental concerns and rising energy demand necessitate the development of alternative energy sources. Solar cells, especially dye-sensitized solar cells (DSSCs), which are photoelectrochemical cells, show much potential for innovation. This research sought to optimize thin-film DSSCs by study of electrode materials, film thickness and dye-loading. Films of TiO₂ and ZnO were fabricated through electrophoretic deposition and then dye-loaded, while film thickness, suspension and dye concentration were controlled from sample to sample. The efficiency of the films was measured through photoelectrochemical measurement and UV-Vis spectroscopy was used to determine the amount of adsorbed dye on film. We determined that the amount of adsorbed dye depends on the electrode materials, film thickness, and concentration of dye solution, and affects cell efficiencies.

RELEASE OF INDIVIDUALITY BY MATERIAL MEANS: PARADOXICAL BUDDHIST EVENTS IN A POST-INTERNET REALITY

Will Buck, Adam Kern (Mentor), Japanese Literature

A close reading of the images and dialogue in Japanese author Shirow Masamune's graphic novel (manga) *Ghost in the Shell* suggests this work argues that our communication-saturated technological society has bred a loss of an individual's identity and a movement toward a collective consciousness. In Buddhist terms, conceding the decay of individuality creates paradoxes in some notions of karma and nirvana in that it utilizes material technologies human beings are attached to in order to achieve a release of the Self and, in turn, to embrace the singularity of a fully connected world. Although technological advances outpace our comprehension of their effect on society, works like *Ghost* represent an imaginative effort to further explore and understand this phenomenon.

PURIFICATION OF THE HUMAN SWEET RECEPTOR PROTEIN FROM INCLUSION BODIES

Elizabeth Budnik, Fariba Assadi-Porter (Mentor), Biochemistry

The receptor in humans is a heterodimer G-protein coupled receptor, with two subunits, hT1R2 and hT1R3. The receptor binds to all known chemically and structurally diverse natural and synthetic compounds. The extracellular domains of the receptor had been cloned and expressed in *Escherichia coli* but a majority of the protein is insoluble. The objective of this work was optimizing a refolding protocol used for solubilizing the hT1R2 receptor from inclusion bodies. We altered cell solubilization and refolding conditions and quantified protein yield using the Bradford assay. The results of the assay and SDS-gel electrophoresis allowed us to determine optimal conditions for the protocol and improve the yield of purified protein. The results will greatly enhance yields required for the ongoing investigations regarding mechanism of sweet taste.

A TRANSCRIPTION FACTOR SURVEY OF β -1,3 GLUCAN LEVELS AND FLUCONAZOLE SUSCEPTIBILITY IN *C. ALBICANS*

Michael Cain, David Andes (Mentor),
Medical Microbiology and Immunology

The fungal pathogen *Candida albicans* is associated with persistent infections on a variety of medical implants, often requiring device removal. β -1,3 glucan has been implicated as a mediating factor in resistance to antifungals such as fluconazole. Genes of importance in the control of this pathway can be identified via transcription factor (TF) analysis. The current study aimed to determine: 1) the extracellular β -1,3 glucan production and 2) the drug susceptibility of 294 *C. albicans* TF mutants. It was hypothesized that one or more mutants will show both decreased β -1,3 glucan production and drug susceptibility. Preliminary data shows 13% of mutants with increased susceptibility and 3% with abnormal biofilms. Ongoing studies are focusing on characterizing these strains.

ROLE OF PROTEIN KINASE C DELTA ON JNK AND ERK SIGNALING PATHWAYS DURING THE INFLAMMATORY RESPONSE

Harberg Calvin, Bo Liu (Mentor), Department of Surgery

An abundance of apoptotic makers have been reported in tissues of Abdominal Aortic Aneurysm (AAA). Investigators in my mentor's group reported the apoptosis mediator protein kinase C delta (PKCD) to be markedly up-regulated in both human and experimental AAAs, and to play a role in apoptosis and inflammatory responses. Using vascular smooth muscle cells (SMCs) isolated from PKCD^{+/+} and PKCD^{-/-} mice, my research is investigating how PKCD modulates the expression of pro-inflammatory cytokines in SMCs. We examined JNK and ERK signaling pathways during the inflammatory response and found PKCD gene deficiency to abolish activation of ERK but not JNK. We propose PKCD contributes to inflammation through an ERK-mediated cytokine production, suggesting PKCD could be an important target in pharmacological therapies designed to treat aneurysm.

ARTHRITIC MICE FED NATURAL CIS-9, TRANS-11 CONJUGATED LINOLEIC ACID HAVE REDUCED JOINT INFLAMMATION

James Campbell, Mark Cook (Mentor),
Animal Science, Food Microbiology and Toxicology

An experiment was conducted to determine which isomer of commercial conjugated linoleic acid (CLA, equal mixture of cis-9, trans-11 [c9t11] and trans-10, cis-12 [t10c12] isomers) was effective at reducing inflammation when fed to mice with established collagen-induced arthritis (CIA). Both CLA isomers, when fed individually, moderately reduced joint inflammation. Because c9t11-CLA can be enriched in dairy fat, it was hypothesized that feeding butter naturally enriched in c9t11-CLA to arthritic mice would be as effective as commercial synthetic sources of c9t11-CLA at reducing arthritic inflammation. Data collection currently underway include arthritic scores (severity), paw thicknesses, and plasma and synovial cytokines. Results from both trials will be presented and may provide evidence for reevaluating the current perspective on the relationship between dairy fat and inflammation.

THE ROLE OF SYMBIOTIC GUT BACTERIA IN THE UPTAKE OF NUTRIENTS IN GYPSY MOTH LARVAE

Zachary Cannizzo, Kenneth Raffa (Mentor), Entomology

Gypsy moth (*Lymantria dispar*) larvae are known to harbor gut bacteria, but whether these microbes contribute to digesting plant substrates has not been tested. We hypothesize that larvae harboring bacteria will be more efficient users of plant material. We will raise larvae on diet with or without antibiotics, then switch them to aspen leaves at the beginning of a molt. Larval mass at the beginning of, and time needed to reach the next molt will be compared between groups. This study will take two weeks to conclude allowing for multiple trials. We predict larvae feeding on antibiotic-free diet will grow more than those without gut bacteria. This study will help elucidate the role of bacteria in plant utilization by insects affecting forest and agricultural resources.

CAN WE TEACH CREATIVITY? DEVELOPING PLAY INTERVENTIONS FOR CHILDREN WITH AUTISM

Erica Carballo, Elizabeth Chavez, Rebecca Hall, Ayanna Rose,
Wendy Machalicek (Mentor), Education: Rehabilitation Psychology

Autism is a disorder characterized by impaired communication, excessive rigidity, and emotional detachment. For children, these symptoms may be specifically noted in play interactions. The aim of this research is to develop play interventions for children with autism that increase novel play, thus addressing their often restricted play repertoires. This study examines the effects of a play intervention on the functional and novel play skills of three children with autism. The play intervention consisted of following the child's lead, modeling, least to most prompting with time delay, and praising. During intervention, the children's limited play skills improved. However, there was significantly less improvement in novel play than in functional play. These results suggest that further research must be conducted to improve novel play in children with autism.

DISENTANGLING AGN EMISSION FROM STAR FORMATION ACTIVITY IN A DEEP RADIO CONTINUUM SURVEY

Rogério Fernando Cardoso, Peter Timbie (Mentor), Physics

Disentangling active galactic nuclei (AGN) from star formation (SF) activity as the powering mechanism of faint sources in deep radio surveys, and investigating the link between the two processes, are key steps in understanding galaxy evolution. Recently, an approach to this problem has been to complement radio data with multi-wavelength observations (UV, optical, NIR) probing the galaxy host stellar populations. However, X-ray and far-infrared observations may yield further, complementary insights in understanding the nature of faint radio sources. By stacking faint radio-selected sources from the VLA SWIRE Deep Field in X-ray images from the Chandra Lockman Area North Survey (CLANS), we attempt to probe SF- and AGN-dominated galaxies at intermediate redshifts. We discuss preliminary results of X-ray stacking.

INFANT-PARENT INTERACTION LAB: SIX-YEAR FOLLOWUP

Jessa Carey, Katelyn Zilles,
Julie Poehlmann (Mentor), General Administration

The Child Behavior Checklist and Teacher Report Forms have been developed to assess academic, social, and emotional functioning among children ages 6 to 18. The Conners 3rd Edition Parent and Teacher Forms are widely used assessments of Attention Deficit and Hyperactivity Disorder for children ages 6 to 18. These forms are being used in a study by Julie Poehlmann, PhD, that has followed 181 preterm or low birth-weight infants and their families from birth to 6 years of age. Preliminary analyses at the six-year time-point show discrepancies between maternal responses and the children's teacher's responses specifically in the areas of externalizing behaviors and behaviors related to ADHD. Of particular interest to us is analyzing the trends of these discrepancies and hypothesizing about reasons for their occurrence.

ENGINEERS WITHOUT BORDERS: UW-MADISON RWANDA AGRICULTURE DEMONSTRATION PROJECT

Matt Carlson, Emily Burris, V. Venkataramanan (Mentor),
Electrical and Computer Engineering

In 2009, two members of the UW-Madison Chapter of Engineers Without Borders, Emily Burris and Matt Carlson, organized and coordinated an Agricultural Demonstration Project in the parish of Muramba, Rwanda, to display how local Rwandans can increase crop yields and food security using low-cost agricultural techniques and knowledge of their local soil. During this first phase of the project, two students from the Institute of Agriculture and Animal Husbandry worked with the local Muramba agronomist, community members, government and church leaders to perform an experiment on different fertilizers, and hold two workshops on the demonstration site.

THE EXPRESSION OF VASCULAR GROWTH FACTORS IN DEVELOPMENT, POST-CASTRATION AND AFTER ANDROGEN RESCUE

Jason Carr, Wade Bushman (Mentor), Urology

The normal behavior of vasculogenic and angiogenic factors in the mouse prostate is unknown. To this point, our knowledge about vascular development is interpolated from the literature on other tissues, cancer, or in vitro experiments. We used immunohistochemical assays and whole mount staining to study gross vascular anatomy and RT-PCR analysis to quantify gene expression during mouse development at E16, P-1, 5, 10, 15, 30 and at 8 weeks. Additionally, our study seeks to understand the expression of these factors in response to castration and androgen rescue. Given the broad attention garnered by prostate cancer and, in particular, angiogenic processes, our results have the potential to productively inform a broad audience and serve as a basis for further study.

BREAST CANCER AND YFP-PIN1/PIN1-YFP FUSION PROTEINS AND THEIR INTERACTIONS WITH ESTROGEN RECEPTOR A

Cate Cavanagh, Kelley Kadunc (Mentor), Molecular Microbiology

Breast cancer is one of the most common cancers and causes for cancer-related death among women in the United States; therefore, it is important to determine the interactions in normal and abnormal bodily conditions to understand what goes on in cancer. Pin1 is an enzyme in the body that allows for normal changes of protein structure, however, the overexpression of Pin1 can be associated with uncontrolled cell growth and cancer. Our lab has been investigating if adding a fluorescent protein tag to Pin1 changes the function of it. We hypothesized and proved that the function of Pin1 doesn't change when it is tagged. This finding is important because we now know we can use fluorescent proteins in experiments in live cells without changing physiological function.

CANCER CHEMOPREVENTION WITH THE USE OF NATURALLY OR SYNTHESIZED ANTIOXIDANTS

Tara Centeno, Farrukh Afaq (Mentor), Dermatology

Chemoprevention is the use of natural or synthetic compounds to inhibit the development of cancer. Antioxidants protect cellular targets from free radicals that could damage or alter cells in our bodies. We hope that natural antioxidant compounds are able to prevent and destroy cancerous cells in the body with minimal effects on normal cells. To test this hypothesis, lung and prostate cancerous cells were allowed to grow *in vitro*. Then, we treated them with different concentrations of delphinidin and fisetin which are both non-toxic, naturally occurring antioxidant compounds. Once the compounds were tested on cancerous cells, the time came to test their effects on normal cells. If the effects were minimal, then further research can be done to turn antioxidant compounds into effective cancer treatments.

ISOLATION OF SKELETAL MUSCLE PROGENITOR CELLS (SMPCS) FROM HUMAN PLURIPOTENT STEM CELLS

Tso Chak Foon, Masatoshi Suzuki (Mentor), Comparative Biosciences

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease characterized by loss of both upper and lower motor neurons. We recently reported that growth factor delivery using mesenchymal stem cells into skeletal muscles can modulate motor neuron degeneration in an ALS rat model. However, the grafted cells failed to integrate well into the muscles. SMPCs can be isolated from hPSCs and possess high potential to differentiate into and fuse with myofibers. We now try to determine whether high concentration of growth factors can increase SMPCs in human embryonic stem cells; and subsequently whether SMPCs can be identified in human induced pluripotent stem cells. Results from the present study will provide a new application to treat muscle atrophy commonly observed in ALS and muscular dystrophy patients.

INHIBITING THE GROWTH OF PANCREATIC CANCER USING MAGOSTIN

Mayuran Chandrakanthan, Bilal Hafeez (Mentor), Human Oncology

Pancreatic cancer (PaC) is one of the most fatal cancers in the United States. Previous experiments have shown Magostin, which is a dietary agent from Mangosteen fruit, to be an effective multi-targeting non-toxic natural agent that combats various types of cancers. The main purpose of this study was to inhibit the growth of highly aggressive PaC cells in a xenograft mouse model by targeting known cancer-causing signaling molecules using Magostin treatment. Based on our preliminary results, we expect Mangostin to be a non-toxic agent that can reduce the rate of development and progression of PaC. We also believe that if proven effective, Mangostin could be used in the treatment of pancreatic cancer.

INTERNAL AND EXTERNAL CONTEXTS ALTER ODOR PERCEPTION

An-Chieh Chang, Wen Li (Mentor), Psychology

Our feelings toward odorants vary due to various internal and external factors. Nonolfactory information, such as odor names, can influence perceived pleasantness, intensity, and familiarity of an odor. Olfactory alliesthesia occurs when internal states modify an odor percept. We will examine the effects of verbal information (nonolfactory contexts) and the level of anxiety (internal context) on four qualities of odors: valence, familiarity, intensity, and pungency. Changes in ratings of the four qualities are expected to be observed.

INVESTIGATING THE LINK BETWEEN SELF CONTROL AND DISORDERED EATING: THE MEDIATING ROLE OF OBC

Shannon Chaplo, Janet Hyde (Mentor), Psychology

Temperament plays an important role in the development of eating disorders. One possible mediator of this relationship that has not been explored is OBC, the tendency to view oneself as an object to be looked at and evaluated by others. The present study proposes a developmental model that frames OBC as a mediator of the relationship between self control and disordered eating. Using longitudinal data from the Wisconsin Study of Families and Work, it was found that OBC does not mediate the relationship between self-control at age 4.5 and disordered eating at age 15. Results indicated that an inverse relationship exists between self-control and both OBC and disordered eating. The study suggests that self-control does play a role in the development of eating disorders and that further mediators of this relationship need to be investigated.

UNDERGRADUATE SCIENCE STUDENTS' PERCEPTIONS, VALUES AND EXPECTATIONS ABOUT RESEARCH CAREERS

Joseph Chase, Lori Bakken (Mentor), Medicine

Reports have shown that students' perceptions of research in the sciences have sometimes discouraged their pursuit of research careers. Unfortunately, a definitive analysis which examines the development of a personal research epistemology of undergraduate students is lacking. This qualitative research project will explore undergraduate students' thoughts, experiences and attitudes to gain a better understanding of their general perceptions of research within the sciences. Data will be gathered from three focus groups using six open-ended questions. Focus group transcripts will then be analyzed for major themes that describe students' perceptions. This study is expected to contribute to the development or improvement of programs which encourage research in the sciences by capturing the essence of how students develop a conceptualization of research.

**AGGRESSIVENESS OF CONTANS WG
AND NATIVE CONIOTHYRIUM MINITANS ISOLATES
ON SCLEROTINIA SCLEROTIORUM**

Yuli Chen, Angelique Peltier (Mentor), Plant Pathology

Sclerotinia sclerotiorum, a pathogen of soybean plants, is responsible for the disease known as white mold (WG). Fortunately, *Coniothyrium minitans*, a natural mycoparasite of *S. sclerotiorum*, has the potential to control this disease. Contans WG is a commercially fortified strain of *C. minitans*. It is not known how the efficacy of Contans WG may be affected by competition from native *C. minitans* populations in Wisconsin. We will evaluate the aggressiveness by inoculating sclerotia with spores of *C. minitans* and measuring fecundity. We hypothesize that the aggressiveness of Contans WG and *C. minitans* isolates vary. This has implications for the success of Contans WG for soybean white mold control in Wisconsin.

**BOOM AND BUST? MIGRATION FLOWS IN NATURAL
RESOURCE DEPENDENT COMMUNITIES**

Cheng Cheng, Richelle Winkler (Mentor), Sociology

This project examines the influence of migration selectivity by age and education on the population composition of rural natural resource dependent counties in the United States in the 1990s. It investigates how migration flows affect amenity destination counties and traditional resource dependent counties (farming and mining counties) differently. This study evaluates how selective migration contributes to demographic concerns facing rural communities (such as brain drain) and engenders structural opportunities (such as higher income) that new residents may bring. Based on data from Census 2000 on migration flows between 1995 and 2000, results indicate that destination counties disproportionately attract retirement-age and college-educated people. However, destination counties have out-migration rates of young adults as high as those in traditional resource dependent counties.

THE EFFECTS OF FOLIC ACID ON CNS REGENERATION

Anaita Chindhy, Michael Mendoza, Pascale Stiles, Bermans Iskandar
(Mentor), Neurological Surgery, Pediatrics

Our lab has shown that folic acid supplementation enhances central nervous system regeneration and repair in several rat models. A contusion injury model is physiological and can ascertain the effectiveness of folic acid in CNS repair using imaging and behavioral testing. *In vitro* cultures are used to analyze regeneration of DRG neurons after spinal cord injury. *In vitro* studies provide evidence for the cellular mechanism of regeneration: environmental or neuronal. Lastly, functional recovery trials and immunohistochemistry of animals with spinal cord transection can help demonstrate the positive effect of folic acid. With the combination of these studies, it is possible to further study the mechanism of folic acid in CNS injury and learn how to improve treatment of CNS injuries and disorders.

IMPACT OF CO₂ AND O₃ ON FIBER AND LIGNIN CONCENTRATION OF FOLIAGE IN A NORTHERN TEMPERATE FOREST

Eric Christenson, Richard Lindroth (Mentor), Entomology

Anthropogenic inputs have increased levels of carbon dioxide (CO₂) and tropospheric ozone (O₃). Both CO₂ and O₃ can alter leaf chemistry sufficiently to influence multiple ecosystem processes. Because they are difficult to break down, the leaf structural components fiber and lignin can alter patterns of herbivory and rates of leaf decomposition. We predict that elevated CO₂ and O₃ will increase foliar fiber and lignin concentrations. Additionally, we predict that the combination of elevated CO₂ and O₃ will increase concentrations of fiber and lignin more than CO₂ or O₃ alone. We determined fiber and lignin gravimetrically by sequential acid digestion using foliage collected from multiple tree species from 2006–08. Our research will increase understanding of how atmospheric change influences leaf structural composition in northern temperate forests.

THE SUCCESSION OF FAMILY BUSINESSES VS. NON-FAMILY BUSINESSES

Matthew Cleveland, Jamie Hoff, Debra Holschuh-Houden (Mentor),
Family Business Center

Family businesses are known for their excellent customer relationships and outstanding quality of business. Many of these prestigious family businesses have been around for countless generations. The downward sloping economy has made it increasingly difficult for the family business to compete with larger corporate non-family firms. Our research will focus on how family businesses under 50 million continue to strive and reach out to new customers. We want to find out the steps and extra efforts these small family businesses take in order to stay in business. While exploring family firms we studied how they leverage their existence as a family business in their marketing efforts to compete with larger non-family corporate firms along with their strengths, weaknesses, marketing tools, and techniques for staying competitive.

STEM CELL THERAPY FOR STROKE PATIENTS

Laura Cohen, Matthew Jensen (Mentor), Neurology

Stroke is a common cause of disability and death in the United States. Unfortunately, a very limited number of treatments have been developed to improve outcome for stroke victims. Our research team is exploring the possibility of induced pluripotent stem cells as a treatment for stroke. We are using a rat MCAO (middle cerebral artery occlusion) model with behavioral testing and histology to determine the effects of the stem cells as a treatment. The expected result of our ongoing research that the stem cell treatment will improve function and recovery after stroke. Hopefully this will lead to a treatment that could be administered to patients after stroke, greatly improving prognosis.

A LINGUISTIC ANALYSIS OF NIH GRANT REVIEWS

Kristin Cox, Mary Carnes (Mentor), Medicine/Psychiatry

One major determinant of scientific success is the ability to obtain research funding through competitive review processes. The National Institutes of Health (NIH) is the largest funding source for biomedical, behavioral, or clinical research primarily through its R01 grant mechanism. The success rate for women scientists who submit R01 proposals to the NIH is significantly less than their male counterparts, yet little is known about how the review process might differentially advantage men. To investigate its role in creating this advantage, we are using scientifically validated linguistics analysis software to analyze descriptors from more than 300 NIH grant reviews for the 2008–09 funding cycle. The goal of the project is to ensure that women have an equal chance to be funded and promote women's health research.

USE OF NUCLEAR EXCLUSION SIGNALS TO ADDRESS FUNCTIONAL LOCALIZATION OF DMI1 IN *MEDICAGO TRUNCATULA*

Ronald Crandall, Muthusubraman Venkateshwaran (Mentor),
Plant Pathology

Legumes establish symbiotic associations with rhizobia to meet their nitrogen demands. A novel cation channel DMI1 (does not make infections 1) in the model legume *Medicago truncatula* plays a crucial role in the symbiotic signaling cascade. Although DMI1 was localized to the nuclear envelope in the root epidermal cells of *M. truncatula*, its homologs in another model legume *Lotus japonicus* were localized to plastids. Here we utilize nuclear exclusion signals (NES) and nuclear localization signals (NLS) to investigate the functional localization of DMI1 in *M. truncatula*. Our results suggest that addition of foreign NES or NLS did not alter the nuclear envelope localization of DMI1, however foreign NLS renders DMI1 non-functional. This warrants further studies on precise localization of DMI1 at the nuclear membrane level.

CHARACTERIZATION OF MHC CLASS II ALLELES IN CYNOMOLGUS MACAQUES FROM THE SOUTHEAST ASIAN MAINLAND

Hannah Creager, Julie Karl (Mentor), Primate Research Center

Macaques are favored nonhuman primate models for a variety of human diseases. Unfortunately, despite the potential to influence pathogenesis and vaccine studies, the MHC class II genes of these animals are not well characterized. We performed full-length allele discovery at all six MHC class II loci in a group of twelve cynomolgus macaques (*Macaca fascicularis*; Mafa) from a breeding colony in China. We identified fifty novel full-length Mafa class II alleles, fifteen of which have not previously been reported in any form. Many of these are shared with Indonesian cynomolgus (sixteen) and Indian rhesus (twenty) macaques. These findings support previous hypotheses about macaque evolution.

ARPE-19 CELLS AND SENSITIVITY TO LIGHT

Megan Crowe, Leonard Levin (Mentor),
Ophthalmology and Visual Sciences

ARPE-19 (human retinal pigment epithelial) cells are used in many ophthalmology laboratories in order to understand and cure debilitating diseases like glaucoma. The purpose of this study is to conclude if ARPE-19 cells are photosensitive. Four plates of ARPE-19 cells were prepared, each with 1000, 2000, and 5000 cells per well. After culturing for twenty-four hours, one plate was exposed to light for one minute, another for five minutes, and a third for sixty minutes. The fourth was used as a control and not exposed to light at all. With the completion of this study, more experiments can follow, such as prevention of cell death using various compounds.

YOU’LL ALWAYS REMEMBER YOUR MOTHER

Alisha David, Melanie Dart, William Burlingham (Mentor),
Surgery/Transplant

For many transplant recipients, a lifetime of harmful drugs is needed in order to keep their transplant from being rejected. Our lab has been investigating a natural way for patients to accept their transplants by looking at “mother cells,” cells that are passed on maternally during fetal development. We hypothesize that these special cells are able to induce natural tolerance to specific transplants. To test this hypothesis, we will do a variety of skin transplants on mice and attempt to accurately predict their success based on what we know about these “mother cells.” If successful, doctors doing human organ transplantation would be able to predict the success of a transplant before surgery and the recipient could live a healthier life without immunosuppressive medication.

THEORETICAL IMPLICATIONS OF THE COOPERSTOCK—TIEU MODEL IN GALACTIC DYNAMICS

Alejandro de la Rosa, Amir Assadi (Mentor), Mathematics

The difference between the observed rotational speeds of matter in the disk portions of spiral galaxies and the theoretical predictions considering the visible mass are one of today’s biggest physics mysteries. The Cooperstock-Tieu model, presented in 2005, was an attempt to explain this discrepancy without including the effects of dark matter. In 2006, this model was refuted claiming that it did not solve the rotational curve problem, but it rather expanded the mass to a larger radius. However, there are really interesting features in this model as we take different limits of the radial component, which surprisingly do not betray but actually predict the existence of the dark matter halo.

WHEELZ

Gabriel De Los Reyes, Christopher Walker (Mentor), Dance

“Wheelz” is a twenty-minute one-man hip-hop theatre piece that tells the story of a young Chicano boy and his newfound love for hip hop music. Told by main character Gabo, a quietly fierce renaissance child of the arts behind the wheels of his heavily coveted DJ set, and by Gabo’s father behind the wheel of the car, the story touches on the dynamics of a father/son relationship halted by divorce and what it means to use hip hop to work through conflict. “Wheelz” is a journey that incorporates turntablism and beatboxing to make powerful progress with the Latino movement and hip hop movement. Issues such as Kennedy’s war on poverty and the tedious task of picking a DJ name are two of the many engaging contemplations presented. “Wheelz” is a locomotive of dreams and crazy cruises through old neighborhood tales and family stories.

CULTIVATING A SUPPORTIVE VOICE: THE ROLE OF CONFERENCING IN MOTIVATION

Natalie DeCheck, Amanda Godbee (Mentor), English

Although social change is often conceived as large-scale, this study examines change in small-scale, moment-to-moment interactions in the UW–Madison Writing Center through empirical research. My particular interest lies within the correlation among the writer-tutor relationship, their motivation, and their approaches to learning. I base my findings on the comparison of three writer-tutor pairs and the similar changes they experienced, such as increased interest and desire to write. This study helps us understand the effectiveness of writing conferences in teaching and their role in increasing motivation for both the tutor and writer.

**“KNOWING ALL ABOUT UNFOLDING”:
LOGOPOEIA AND SUBJECTIVITY IN THE POETRY
OF MINA LOY AND EZRA POUND**

Cara Dees, Cyrena Pondrom (Mentor), English

Modernist poet Ezra Pound’s critique of contemporary poet Mina Loy classifies her poetry as an example of *logopoeia*, or “poetry that is akin to nothing but language which is the dance of the intelligence among words.” The goal of my study is to investigate how logopoeia functions in Loy’s work and how it shaped Pound’s writing by encouraging an increasingly dynamic fluctuation of rhythm and subject matter—the trademark of what could be termed logopoeiac poetry. I will show how Loy’s language situates her exegesis of the female ego within a masculine social and linguistic tradition, while Pound’s version of logopoeia can explore the role of the heroized male poet, who does not have to battle so overtly against a highly gendered literary history.

**GENDER AND LANGUAGE INNOVATION:
DOCUMENTING LOCALITY THROUGH LANGUAGE**

Zachary Degregorio, Casey Olsen, Taylor Patton,
Thomas Purnell (Mentor), Linguistics

Labov (1994) argues for a relation between gender and innovation where males tend to lag behind females in language change. This predicts that younger speakers would adopt the innovative trends of older females, whereas older males would not. To test this, recordings of males over the age of 40 were compared to those of females of the same age and those of younger speakers from Edgerton, Appleton, and Wausau. We hypothesize that the acoustic patterns used by younger males will have similar innovative speech patterns to older females, but that older males will not. Also, vowel trends moving up from Milwaukee will be more prevalent in Edgerton speakers, while trends moving over from Minnesota will be more prevalent in Wausau.

ROLE OF MESENCHYMAL STEM CELLS IN TISSUE DEVELOPMENT

Ryan Denu, Peiman Hematti (Mentor), Hematology/Oncology

Mesenchymal stem cells (MSC) are characterized by their ability to express certain cell surface markers. MSC have been shown to modulate immune response and migrate to injured tissue. For this project, MSC from different sources have been characterized using flow cytometry. In flow cytometry, the cells are stained using fluorescent antibodies to detect their cell surface markers. Additionally, mixed lymphocyte reactions (MLR) have been performed to show how the rate of lymphocyte proliferation changes in response to MSC. MLR helps determine the immunosuppressive properties of MSC derived from different tissues or different conditions. Results have shown that MSC suppress lymphocyte proliferation. This suggests that MSC can be used clinically to inhibit immune response and prevent transplant rejection.

A BASKET CASE: REDISCOVERING YUOK AND KARUK BASKETRY IN THE DEPARTMENT OF ANTHROPOLOGY COLLECTIONS

Samantha DesRochers, Danielle Benden (Mentor), Anthropology

Since 2007, the Department of Anthropology at UW–Madison has undertaken a series of major rehousing projects to better care for archeological and ethnographic collections curated there. Throughout this process, many objects have been essentially rediscovered. Among these are a number of woven baskets made by indigenous Yurok and Karuk peoples who reside in northeastern California near the Klamath and Trinity rivers. This process of discovery, curation, and research includes condition-reporting the baskets, noting any physical, chemical, and biological deterioration and creating permanent mounts to protect the integrity of the baskets and ensure their care for many years to come. Following these preliminary steps, literature searches were conducted to gain knowledge of the makers, locations, dates, and background information of these unique baskets.

**‘THE WAY OF THE ELDERS’ AND
‘A PHILOSOPHY OF THE FUTURE’:
A NIETZSCHEAN CRITIQUE OF EARLY BUDDHISM**

Andrew Dibble, Gudrun Buhnemann (Mentor),
Languages and Cultures of Asia

This study attempts to reconcile Theravāda Buddhism and Nietzschean philosophy, two seemingly disparate thought systems. Both Nietzsche’s published works and his Nachlass are considered, and few assumptions about controversial aspects of his philosophy, such as his theory of truth and the eternal recurrence are made. Unlike some previous scholarship, such as that of Robert Morrison, the present study respects the significant differences between Nietzsche’s values and the Buddha’s ethics, which often are at odds. Although Nietzsche and the early Buddhists believed life should be lived very differently, they construed the world in surprisingly similar ways.

**3D MODELING PROCESSES IN HYPOXIA-INDUCED
PULMONARY HYPERTENSION DISTENSIBILITY STUDIES**

Somana Dominic Dharam, Alejandro Roldan (Mentor),
Biomedical Engineering

Pulmonary hypertension is a disease that is often induced by exposure to chronic hypoxia. One indicator of hypertensive pulmonary tissue is increased stiffness. In a study of control and hypertensive mice, computed tomography images were assembled in a 3-D modeling and segmenting program, MIMCS (Materialize, Ann Arbor, Mich.), and analyzed using a MATLAB (The MathWorks, Natick, Mass.) routine. This process yielded highly accurate and precise fitted curves for distensibility. We found that the process was fairly simple, and could be utilized over the varying vasculature of the many mice used in the study.

WHAT MAKES YOU LAUGH? ADULT AGE DIFFERENCES IN PREFERENCES FOR COMEDY

Michael Diesch, Marie-Louise Mares (Mentor) Communication Arts

This study explores why there are adult age differences in comedy preferences. We used online surveys to test hypotheses. More than 800 participants (ranging in age from 19–88) rated their interest in seeing six movies described in short scenarios. They were randomly assigned to different versions of each scenario. Four scenarios manipulated ages, genre, and story intricacy. Two manipulated the time period of the story. Our hypotheses are that older adults will be as interested as young adults in watching “sophisticated” and complex comedies but less interested in watching unsophisticated comedies. We also predict they will show more interest in watching movies that feature older characters and set in earlier times. These results would show that older adults like comedies just as much as younger adults, just different preferences.

CHAMBER-RELATED VARIATION IN PHOSPHORYLATION STATE OF CARDIAC TROPONIN REVEALED BY TOPDOWN MASS SPECTOMETRY

Xintong Dong, Ying Ge (Mentor), Physiology

Cardiac troponin (cTn) is a key regulator of cardiac muscle contraction and relaxation. Phosphorylation of cTnT and cTnI plays a central role in contractile modulation. However, whether there is chamber-related variation in cTn phosphorylation state is completely unknown. Herein we have employed high resolution top-down mass spectrometry to examine cTn purified from healthy swine and human myocardial tissues. Our data show different phosphorylation levels in both cTnI and cTnT extracted from different cardiac chambers, which is likely due to the functional and morphological differences of the four cardiac chambers.

**RELATIONSHIP BETWEEN GENES
AND THE REGULATION AND FORMATION
OF NEUROMUSCULAR JUNCTIONS IN DROSOPHILA**

Laura Donohue, Raymond Chou,
Kathaleen Oconnor-Giles (Mentor), Genetics

Defects in the regulation and formation of synapses can lead to neurological and developmental disorders, as well as motor, cognitive, and psychological impairments. Unfortunately, little is known about molecular regulation of synaptic growth. With the *Drosophila* neuromuscular junction (NMJ) model and the use of the UAS-GAL4 system, candidate genes were expressed in a gain-of-function genetic screen. Ten C155-GAL4;24B-GAL4 genotype female *Drosophila* were crossed with ten males containing a single UAS-tagged gene, and five of the resulting larvae dissected. The number of synapses of the muscle 4 NMJ were quantified by using antibody labeling and immunofluorescence. Genes resulting in over or undergrowth NMJs will be further examined as possible molecular regulators of synaptic growth. Future research may lead to cures for serious neurological disabilities.

**CRICKET IN THE WEST INDIES:
A POSTCOLONIAL ASSESSMENT OF STRUCTURE,
IDENTITY, AND THE ORIENTAL**

Douglas Steeples, Robert Ostergren (Mentor), Geography

My thesis seeks to explain how a distinct West Indian relationship to the game of cricket emerged in contrast to the ideal espoused by the occupying British, and the ramifications that these differing visions had upon West Indian society at large. By utilizing the frameworks of Structuration and Orientalism, a clear picture of the cultural processes that brought about the unique West Indian connection to the sport can come into focus. This study will show how cricket grounds, and the matches played upon them, served as areas for cultural expression and resistance to colonial authority for West Indian players and spectators alike. Essentially, I hope to bring a theoretical geographic perspective to a potentially useful Postcolonial case study.

THE EFFECTS OF THROMBOSPONDIN-1 ON CLAN FORMATION IN TRABECULAR MESHWORK CELLS

Molly Dowden, Donna Peters (Mentor),
Pathology and Laboratory Medicine

Glaucoma is the second leading cause of blindness in the world. Increased intraocular pressure is a known risk factor of glaucoma and can ultimately crush the optic nerve head causing vision loss. Cross-linked actin networks (CLANS) are found in glaucomatous trabecular meshwork cells within the eye. CLANS are believed to reduce cell contractile properties, therefore increasing intraocular pressure. Recent studies show that signaling from extracellular matrix proteins can cause CLAN formation. Thrombospondin-1 (TSP1) is a matrix protein thought to be involved in CLAN formation. To determine which peptide sites within TSP1 activate or inhibit CLAN formation, cells will be injected with various TSP1 recombinant peptides, incubated and stained with fluorescence. Counting the CLAN-positive cells will determine which TSP1 peptides lead to CLAN formation or inhibition.

EFFECT OF VOCODED SPEECH AND UNDERSTANDING IN CHILDREN AND ADULTS

Garrison Draves, Abbey Baus, Matthew Goupell (Mentor),
Communicative Disorders

Post-lingual deafness is loss of hearing due to trauma or disease after speech-language acquisition. A cochlear implant (CI) can partially restore hearing for those with hearing loss caused by damage or deterioration of the inner ear. It is possible to simulate information provided to a CI user in normal-hearing (NH) individuals by using a channel vocoder. The goal of this research is to study learning effects in NH children and adults listening to vocoded speech. We intend to measure speech understanding thresholds (the lowest level a target word is detectable) for single syllable words in quiet and with background talkers. We hypothesize that the rate of learning differs between children and adults. Information we gather will provide methodological guidance for future vocoder studies with children.

A PHYSICS-BASED MODEL FOR QUANTIFYING PHENOTYPIC TRAITS OF PLANT DEVELOPMENT AND GROWTH

James Driver, Amir Assadi (Mentor), Mathematics

A challenge of 21st century biology is to elicit the role of genes in an organism's form and function. We propose a classical physics model to characterize the development and growth of *Arabidopsis thaliana*'s root system. Since the dynamics of a plant's root growth are regulated through gene expression, we hypothesize the plant's physical characteristics encode these dependencies. Using algorithms from Dashti and Assadi, we compute differential equations of motion for a collection of seedlings to model the development and growth of *Arabidopsis thaliana*'s root system. We expect with more data, our model could be tested for strengths and limitations in detecting genetic mutations, the minimum amount of information necessary to detect mutation, and demonstrate its versatility by distinguishing wild and certain mutant genotypes.

SEARCHING FOR NAV2 INTERACTING PARTNERS: A MECHANISTIC ASSESSMENT OF NAV2 IN NEURONAL ELONGATION

Joseph Duratinsky, Margaret Clagett-Dame (Mentor), Biochemistry

Our group first described Neuron Navigator 2 (Nav2) as a gene that is regulated by all-trans retinoic acid (atRA), and we have also shown that NAV2 is essential for atRA to induce neurite outgrowth. However, the mechanism through which NAV2 modulates atRA-mediated axonal elongation remains unknown. To better understand the mechanism of action of NAV2 in neurite outgrowth, a high-throughput genetic screen was performed to identify potentially relevant interacting partner proteins. A yeast two-hybrid screen of several putative NAV2 functional domains yielded a host of possible interacting partners. Work is ongoing to confirm these interactions and explore the importance of NAV2 in atRA-induced neurite outgrowth.

ALCOHOL ON UNDERGRADUATE MALES' FACEBOOK PROFILES

Katie Egan, Megan Moreno (Mentor), Pediatrics

Perceived peer alcohol use is a predictor of consumption in college males; frequent references to alcohol on Facebook may encourage alcohol consumption. Content analysis of college males' Facebook profiles identified references to alcohol. The average age of 225 identified profiles was 19.9 years. Alcohol references were present on 85.3% of profiles; the prevalence of alcohol was similar across each undergraduate grade. The average number of alcohol references per profile was 8.5, but increased with undergraduate year ($p=.003$; CI:1.5–7.5). Students who were of legal drinking age referenced alcohol 4.5 times more than underage students. Our data showed similar prevalence of alcohol use to existing survey data.

INTERNET SAFETY EDUCATION

Katie Egan, Megan Moreno (Mentor), Pediatrics

Few resources are available for teaching Internet safety awareness to children, and it is unclear who is responsible for this education. Surveys were distributed to teachers and pediatricians regarding Internet safety education. Respondents were questioned about proposed content, instructors, and target age. Teachers ($n=77$) and pediatricians ($n=111$) overwhelmingly agreed that parents should teach Internet safety (97%). The reported age which teaching should begin was 7 years; top three items to include in curriculum were protection of personal information, protection against predators, and evaluation of websites. Age appropriate programs and resources should be developed to assist parents in educating their children about online safety.

LINEAR ALGEBRA-BASED SNOWFLAKE DATA ANALYSIS AND ALGORITHM CONSTRUCTION

Todd Eginton, Amir Assadi (Mentor), Mathematics

For my project I plan to collect data on a large number of snowflakes. The data will come from pictures of snowflakes. These pictures will then be converted into vectors and organized in a matrix. Data will be taken from the pictures until the matrix is over determined. Then the data set will be analyzed to determine how much of the collected data is necessary and how much is redundant. The goal of this analysis is to derive an algorithm/oracle for producing novel flakes from the collected data.

DETECTION OF LYMPHOCYTIC CHORIOMENINGITIS VIRUS IN MICE USING QUANTITATIVE PCR

Johanna Erstad, Suresh Marulasiddappa (Mentor), Pathobiological Sciences

Virus quantification is an essential technique in many laboratories. The conventional plaque assay is considered the gold standard for virus titration, but is extremely time consuming and has a detection limit of 200 infectious particles. Quantitative PCR (QPCR) is a new technique for measuring viral loads that is faster and more sensitive than plaque assay in certain systems. To investigate the specificity and sensitivity of QPCR for quantification of lymphocytic choriomeningitis virus (LCMV), tissue samples from mice infected with either the Armstrong or Clone 13 strain of LCMV were compared by plaque assay and QPCR. The relative sensitivities of the two methods were mostly comparable, but further optimization would be necessary to validate and improve the QPCR assay.

CHARACTERIZATION OF MESENCHYMAL STEM CELLS FROM ADULT TISSUES AND ORGANS

Leah Escalante, Peiman Hematti (Mentor), Hematology-Oncology

Mesenchymal stem cells (MSCs) are defined by their ability to differentiate into fat, bone, and cartilage cells, and by their expression of certain surface markers. MSCs are typically isolated from bone marrow, however, they are also present in other adult tissues. Due to their regenerative and anti-inflammatory properties, MSCs have generated interest for use in tissue repair, transplants, and immune modulation. We tested MSCs to characterize and prove their existence in adult tissues and organs. Samples were stained after differentiation for the presence of fat, bone, and cartilage cells. Flow cytometry was used to test for known surface markers, and RT-PCR to test for the presence and abundance of certain DNA sequences.

THE EXPLORATION OF THE CARTONERA PUBLISHERS ACROSS LATIN AMERICA

Genesis Estrada, Ksenija Bilbija (Mentor),
Latin American, Caribbean and Iberian Studies

The Cartonera publishing project explores the formation of non-profit publishing houses called Cartoneras throughout Latin America. They are special in that they use cardboard bought from street recyclers and subsequently make inexpensive book covers for poetry and stories written by well-known, mostly left-oriented writers as well as new, emerging authors. Our project focuses on the new writers and the aesthetic projects they propose. This research has led up to the International Cartonera Conference that was held in October of 2009, where many publishers came together for the first time to share ideas about their books.

PARENT-CHILD EARLY RELATIONAL ASSESSMENT IN PRETERM INFANTS AT THE TIME OF HOSPITAL DISCHARGE

Megan Falish, Lindsay Bowen, Julie Poehlmann (Mentor),
Human Development and Family Studies

The Parent-Child Early Relational Assessment (PCERA; Clark, 1985) was designed to measure the quality of affect and behavior in parent-child interactions. The present study focuses on applying the PCERA to preterm infants' interactions with their mothers. Mothers and infants are observed and evaluated over the course of five-minute intervals while the child is being fed. A total of 140 infant-mother dyads are currently being coded as part of the research conducted in the Parent-Infant Interaction Lab at the Waisman Center. We are examining how early feeding interactions predict later attachment relationships in the context of a high risk population.

THE RELATIVE CONTRIBUTIONS OF NOREPINEPHRINE AND DOPAMINE TRANSPORT INHIBITION ON SIGNAL DETECTION

Elizabeth Feit, Matthew Andrzejewski (Mentor), Waisman Center

Methylphenidate (MPH) is the most common and effective pharmacotherapy for improving attention in attention-deficit/hyperactivity disorder (ADHD)-affected individuals. Interestingly, the behavioral-enhancing MPH also extends to normal human and animal subjects. Previous research shows MPH affects attention in a biphasic, inverted U function, improving attention at low and impairing attention at high doses. MPH acts on both dopamine (DA) and norepinephrine (NE) systems. The goal of the current project was to determine the relative contributions of NE and DA transport inhibition. Surprisingly, both NE and DA transport inhibition, produced with the drugs Atomoxetine and GBR-12909, failed to improve attention. These data suggest that both NE and DA transport inhibition are required to improve attention in this model.

CULTURAL GROUNDING OF SLEEPER EFFECT IN PERSUASION: WHEN WHAT IS SAID MATTERS MORE THAN WHO SAID IT

John Fink, Yuri Miyamoto (Mentor), Psychology

One of the most well known phenomena in the field of persuasion is the Sleeper Effect (SE); a persuasive message presented by non-credible sources increases its effectiveness over time. Cross-cultural research suggests that Westerners attend more to focal objects, such as message content, whereas East Asians attend more to contextual cues, such as who is giving the message. The SE may reflect the Westerners' tendency to attend more to focal messages than to contextual cues and may be weaker in Eastern cultures. In our experiment, European-American and Asian-American undergraduates were given a persuasive message with or without a non-credible source followed by immediate and three week delayed attitudinal measures in order to investigate European-American's hypothesized greater propensity to the SE compared to Asian-Americans.

THE ICONIC WITCH: DRESS AND MORALITY

Treena Fischer, Gail Brassard (Mentor), Theatre and Drama

The witch has always been a mirror of society's fears, self-doubts and superstitions. Her visual composition is a rubric of recognized allusions to disorder and the inversion of moral order and civil peace. Her pointed hat, long slender dress, dark hose and pointy-heeled shoes, all midnight black, represent only one "self" in her tripartite social and cultural characterization. This project explores the fluxes of prejudice and virtue in the shifting state of costume history through the cyclical fashion constructs of the iconic witch.

BUILDING FAMILY-SCHOOL RELATIONSHIPS FOR ENHANCED ACADEMIC SUCCESS OF AFRICAN-AMERICAN CHILDREN

Timothy Fish, Sherri Bester, Celeste Hammer, Zina Knox, Celeste Lewis,
Boyd Rossing (Mentor), Interdisciplinary Studies

WI Fellowship students teamed up with the Family Voices program to address the achievement gap between black and white students in Midvale-Lincoln Elementary School. The objective and challenge is to build positive relationships and greater coordination of support efforts via four-way connections between the parent, teacher and fellow (also serving as tutor) to enhance academic success of individual children. Preliminary findings, with additional data expected, were that when all targeted participants were actively involved and educated on the child's needs and development, identifying and addressing academic deficiencies was improved. Through documented interaction with participants we have initially concluded that building and sustaining family-school connections for enhanced learning is affected by many factors and is very important and rewarding when done appropriately.

THE EFFECT OF ERYTHROPOIETIN AND IRON SUPPLEMENTATION ON BRAIN GROWTH

Karen Flores, Pamela Kling (Mentor), Pediatrics/ Neonatology

Iron deficiency (ID) definitively causes impaired growth and cognitive delays in newborns. The drug erythropoietin (Epo) has been clinically used to treat anemia and stimulate red cell production. With ID, Epo is less effective and may preferentially take iron from key tissues, such as brain. Our goal is to determine whether Epo worsens brain iron and brain structure in ID. Newborn rats were used as models of premature newborns and ID. Tissues were collected, brain and body iron measured, and microscopic photos of brains taken. The density of brain neurons and neuron myelination (insulating sheath formation) are being measured using digital morphological analysis in ID and iron-sufficient rats, Epo. Preliminary results show that Epo does not further worsen brain iron or structure.

GENE EXPRESSION WITHIN A DEVELOPING URINARY SYSTEM

Chelsea-Leigh Flucus, Chad Vezina (Mentor),
Comparative Biomedical Sciences

Every year about 70,000 people are diagnosed with diseases of the urinary system, including cancers of the bladder and prostate. Many prostate and bladder illnesses result from problems with growth, but little is known about the cell signals that lead to abnormal growth. We believe the genes involved urinary system growth have similar cell signals involved with the abnormal growth seen in prostate and bladder diseases. Using the fetal mouse urinary system as a model, we're identifying the expression patterns of genes that could contribute to growth. We have pinpointed two genes that show specific patterns of expression in the prostate or bladder prior to birth. In learning more about these genes, we're hoping to progress toward aiding the cure of prostate and bladder diseases.

MICROBIAL COMMUNITY DYNAMICS IN MUNICIPAL SOLID WASTE: A SCALE COMPARISON EXPERIMENT

Steven Fong, Georgia Wolfe (Mentor), Bacteriology

I propose to investigate the microbial community dynamics in municipal solid waste between a simulated bioreactor and a field scale lysimeter from a landfill. I will sample the microbial community on a weekly basis and determine differences in community structure with molecular fingerprinting techniques qPCR and ARISA. I expect to find significant differences between the two scales given that identical operational conditions are employed. My project will be the first to directly compare the spatial relationships in the microbial community between simulated bioreactors and landfills. This study will advance our understanding of the microbial community structure involved in methane production from municipal solid waste, which may ultimately lead to improving methane production rates suitable for practical energy use.

VELOCITY PROFILING WITHIN NYMPHAEA ODORATA COMMUNITIES UNDER HIGH FLOW CONDITIONS OF CHEROKEE MARSH

Kristi Freitag, Anita Thompson (Mentor), Biological Systems Engineering

The aquatic vegetation in Cherokee Marsh plays an important role in improving the water quality of the marsh and its downstream receiving waters. High flow conditions can have detrimental effects on plant populations. This project used a flume study and artificial plants mimicking *Nymphaea odorata*, a prominent plant in Cherokee Marsh, to measure velocity profiles under varying flow conditions. These profiles were quantified by constructing an artificial plant community and taking velocity measurements throughout the community using a pitot tube. Velocity profiles are the first step in flow resistance modeling, which is important for flood defense planning because they help predict how increased forces during high flow conditions damage *N. odorata* communities. They are also necessary in modeling nutrient and sediment transport.

EVIDENCE FOR RIBOSOME BIOGENESIS DURING MECHANICAL LOAD-INDUCED GROWTH OF SKELETAL MUSCLE

John Frey, Troy Hornberger (Mentor), Comparative Biosciences

Skeletal muscle is the largest organ in the body and the maintenance of muscle mass plays a critical role in health and issues associated with the quality of life. Skeletal muscle mass is regulated by a balance between the rates of protein synthesis and protein degradation, and when the rate of synthesis exceeds degradation, skeletal muscle mass increases (hypertrophy). One possible mechanism that could promote an increase in the rate of protein synthesis, or hypertrophy, is an increase the number of ribosomes (component of cell that synthesizes proteins) otherwise known as ribosome biogenesis. In this study we show that significant ribosome biogenesis occurs during mechanical load-induced growth of skeletal muscles and we provide insight into some of the molecular mechanisms that regulate this event.

NON-MENDELIAN INHERITANCE: RNAI INHERITANCE IN *C. ELEGANS*

Heidi Fritz, Scott Kennedy (Mentor), Genetics and Pharmacology

In the process called RNA interference (RNAi), small RNAs target and destroy foreign complementary single-stranded RNA in a cell. As a result associated genes are silenced. Although the RNAi process is highly conserved in most eukaryotes, this research focuses on the inheritance of RNAi in the model organism, *C. elegans*. Depending on the RNAi dose and other RNAi factors, genes silenced by RNAi in parent *C. elegans* can also be silenced in their progeny. However, a newfound class of mutants including *nrde* factors, *glh* mutants, and *ppw-1*, among others, do not receive or retain the RNAi signal from the parent worm. Besides implications in RNAi lab experiments and therapeutics, understanding these mutants could potentially explain epigenetic inheritance.

MOLECULAR REGULATION OF SIDEROPHORE BIOSYNTHESIS IN DIMORPHIC FUNGI

Sergio Gallardo, Gregory Gauthier (Mentor), Medicine

Worldwide, the dimorphic fungi are the most common cause of invasive fungal disease. In the soil, these fungi grow as mold that produce infectious spores, which convert into yeast following inhalation into the lungs. The uptake of iron by siderophores is important for spore production and survival in humans. The goal of my research was to identify genes that upregulate siderophore biosynthesis in *Blastomyces dermatitidis*. Using RNA interference (RNAi), we silenced two *B. dermatitidis* genes, *laeA* and *hapX*. We found that *laeA*, but not *hapX*, regulates the production of siderophores (dimerum acid, coprogren) that are secreted into the environment. *HapX*, but not *laeA*, affects the morphology, growth, and pigmentation of mycelia. Both *laeA* and *hapX* are important for the production of infectious particles or spores.

UNDERSTANDING THE EFFECTS ON LATINO MOTHERS WHO ARE RAISING A CHILD WITH AN AUTISM SPECTRUM DISORDER

Santiago Garcia, Daniela Moody, Sandra Magana (Mentor),
Ethnic Studies/Chican@ Studies

The focus of this study is on understanding the experience of Latino mothers who are raising a child with an autism spectrum disorder (ASD). Autism has been diagnosed at increasing rates while there has been a rise in service and support groups. There is very little research directed towards how Latino families cope with having a child with autism. Open-ended interviews were conducted with Latina mothers, transcribed and analyzed for results. After analyzing twenty interviews common trends were found. These mothers split into two different groups, positive adaptation and negative adaptation. Support programs have been developing, but with not enough exposure to Latino families. This research brings attention to the issue of making these services more accessible to low income Latino families.

RESEARCH ON VIRTUAL THINKING

Ariel Ghanayem, Lucas Prouve, Constance Squire (Mentor),
Education and Technology

The purpose of our research is to identify intellectual activity in the field of video games. Once we find these traces of intellectual activity, we document and analyze the process that goes into game play. After we analyze these processes, we observe how they align with the outside world. We are working in the field of MMOs (massively multiplayer online games). The MMO is called Runescape, which is known as the most popular MMO for teenagers. The reason for using this videogame is to have a wider array of potential intellectual activity to observe. As Undergraduate Research Scholar students we will place ourselves in the MMO as gamers and observe the activity.

INTEGRATING WISCONSIN GEOSPATIAL DATA ON THE SEMANTIC WEB

Wes Gillman, Nancy Wiegand (Mentor), Computer Science

Accessible online data is divided between a myriad of third-party applications with no practical connectivity. Resource Description Framework (RDF) acts as both syntax and a working representation of how data may be linked together via a single connecting attribute. Web Ontology Language (OWL) was created to organize and describe the semantics of these data triplets. Semantic data mash-ups with maps allows users to find integrated results using important linking attributes such as nearTo, adjacentTo, and partOf. Spatial components are not inherent to OWL and must be hand-integrated into the system by observing the relationships between objects and places. Our research focuses on integrating Wisconsin geospatial data with these technologies, and establishing an effective RDF storage system that will facilitate SPARQL queries.

ANALYSIS OF WATER LEECHED THROUGH ROADS BUILT WITH INDUSTRIAL BYPRODUCTS

Rebecca Gilsdorf, Tuncer Edil (Mentor), Civil and Environmental
Engineering

With a growing global trend toward environmental sustainability, methods of re-using materials previously labeled as waste are becoming increasingly popular for construction projects. Industrial byproducts from coal burning plants (fly ash, bottom ash) and foundries (foundry sand, slag) were used as construction materials in eight separate road sites in Wisconsin and Minnesota. The industrial byproducts are known to contain trace heavy metals therefore samples of water that percolate through the roads are collected regularly to test for the presence of these metals. This research seeks to determine whether or not water leached through roads constructed with industrial byproducts is safe as defined by EPA water standards.

UTILIZING THE SUN'S RAYS TO REDUCE ELECTRICAL ENERGY CONSUMPTION AND BOOST PRODUCTIVITY LEVELS

Anna Gimmer, Lana Bates, Jaime Denman, Christine Pearson,
Roberto Rengel (Mentor), Design Studies

With the increasing awareness of green design, lighting efficiency has become an important goal. According to the U.S. Department of Energy, global lighting costs approximate \$230 billion per year. This study explores strategies used by design firms to maximize natural lighting in the workplace. A case study of an architectural firm provided tangible evidence of how daylighting decreased their electrical energy consumption and had an overall positive effect on the psychology of its employees. Source: "A Literature Review of the Effects of Natural Light on Building Occupants." Edwards, L and Torcellini, P. National Renewable Energy Laboratory, July 2002.

DESICCATION TOLERANCE IN VARIOUS SALMONELLA ENTERICA SEROTYPES

Aaron Gnas, Charles Kaspar (Mentor), Bacteriology

Salmonella outbreaks associated with dry products (i.e. peanut butter, cereal, and almonds) have raised concerns with this pathogen's ability to survive in these products. In response, this project aims to evaluate the survival of Salmonella serotypes in conditions similar to these products. Four serotypes of *Salmonella enterica* were used; Typhimurium LT2, Tennessee, LT2, and Agona. Survival was examined through desiccation tests at A_w 0.92 at 15°C and 30°C with saline and sucrose solutions. This study will assess the survival of four serotypes under desiccation conditions allowing us to further understand why certain strains survive in low-moisture foods.

EFFECTS OF IKAROS GENE PHOSPHORYLATION-SITE MUTATIONS IN HUMAN B-CELL LEUKEMIA

Brianne Gohlke, Sinisa Dovat (Mentor), Pediatrics

Phosphorylation of the Ikaros gene plays a significant role in the degradation and inactivation of the Ikaros transcription factor in normal lymphocytes and in human B-cell leukemia. We hypothesize that mutations in the Ikaros gene on phosphorylation sites, when added to mammalian cells, will be present in B-cell differentiation, thus affecting the process. To test this hypothesis, I am creating mutations in the Ikaros gene on phosphorylation sites previously discovered. We expect to determine the effects of mutations on the binding capacity of Ikaros transcription factor to DNA, the activity of genes downstream, and B-cell differentiation. This experiment will lead to a better understanding of the regulation of Ikaros gene function that ultimately controls B-cell differentiation and the development of leukemia.

ANTI-DEPRESSANT EFFECTS OF SLOW-WAVE SLEEP DEPRIVATION IN MAJOR DEPRESSIVE DISORDER

Michael Goldstein, Eric Landsness, Ruth Benca (Mentor), Psychiatry

Previous research supports that a subset of individuals diagnosed with major depressive disorder (MDD) show an anti-depressant response to total sleep deprivation. In the current study, I directly examine the relationship between this anti-depressant response and a particular component of sleep, namely slow-wave sleep (SWS), by employing targeted sleep deprivation and 256-channel high density electroencephalography (hd-EEG) techniques. Individuals with MDD and a homeostatic SWS pattern improved in mood following the targeted sleep deprivation, which may be related to localized changes in EEG topography. Combined, these findings guide subsequent research in developing more selective and acute treatments for individuals with MDD than currently possible.

IDENTIFICATION OF THE MECHANISM FOR TCDD-MEDIATED DOWNREGULATION OF SOX9B IN ZEBRAFISH EMBRYOS

Alex Gooding, Warren Heideman (Mentor), Pharmaceutical Sciences

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) causes adverse effects in developing zebrafish that includes, but is not limited to, craniofacial malformations. Prior research has revealed that TCDD downregulates the gene *sox9b*, and this downregulation has been confirmed to be critical in producing jaw deformation. We are currently working to determine the mechanism by which decreased expression of *sox9b* causes jaw deformation. We hypothesize that TCDD-mediated downregulation of *sox9b* occurs by AHR induction of a *sox9b* repressor. To test this hypothesis we developed a reporter system in which we cloned a 4 kb fragment of the zebrafish *sox9b* promoter then constructed 5' deletions of various lengths of the *sox9b* promoter. These *sox9b* promoter deletion clones were inserted upstream of the *egfp* gene, and *egfp* expression was analyzed both quantitatively and qualitatively.

**DETERMINE CELLULAR PHENOTYPES
OF PROMYELOCYTIC LEUKEMIA CELLS
IN INDUCIBLE DIFFERENTIATION BY JMJD1A**

Katelyn Goodman, Sinisa Dovat (Mentor), Pediatrics

Aberrant changes in gene expression caused by chromatin modifications, such as histone demethylation, are associated with tumor growth and cancer development. The objective of this study is to explore the effects of the demethylase JMJD1A in inducible differentiation of human promyelocytic leukemia (HL-60) cells. A retrovirus containing JMJD1A will be generated and used to transduce HL-60 cells. The role of JMJD1A in the process of HL-60 cells differentiating into macrophages, granulocytes and monocytes in the presence of PMA, DMSO and vitamin D3, respectively will be explored. I expect that JMJD1A will facilitate the differentiation of HL-60 cells in the processes. This study will be helpful for understanding the molecular mechanism underlying the inducible differentiation of leukemia cells, and for developing potential strategies for leukemia therapy.

**“HOW NOT TO BE GOVERNED”:
READINGS AND INTERPRETATIONS
FROM A CRITICAL ANARCHIST LEFT**

Robert Gordon, May Erouart, James Klausen (Mentor), Political Science

The inspiration behind the volume *How Not to Be Governed* and larger research project is twofold. First, the theories and practices of classical anarchism invite critical revision in response to new forms of power in late modernity—globalization, neoliberalism, reactionary military sovereignty, terror, international order—and also in response to new understandings of power articulated by a group of theorists often called “poststructuralist.” Second, this research project is driven by the idea that critical forms of anarchism already exist, achieving temporary and sometimes fugitive forms of relative autonomy in the shadows of states. What does anarchism mean when state sovereignty no longer exhausts the field of power? Critical anarchism strives to rethink both the name and the concept “anarchy” by exploring these and related questions.

VITAMIN D CONCENTRATIONS IN EDIBLE WILD MUSHROOMS: CHANTERELLES AND MORELS

Brandon Gottung, Franco Milani (Mentor), Food Science

Mushrooms are the only significant non-animal dietary source of vitamin D, a critically important nutrient that is increasingly deficient in the diets of many Americans. It is known that some European wild mushrooms have significant vitamin D concentrations, however, there have been no comparable investigations of American mushrooms. In mushrooms, ergosterol is the biological precursor to vitamin D. The purpose of this study is to determine vitamin D₂, vitamin D₃ and ergosterol concentrations in popular wild mushrooms of Wisconsin, including chanterelles (*Cantharellus*) and morels (*Morchella*). European studies have shown chanterelles to be rich in vitamin D₂. Vitamin D content in morels has never been subject to scientific investigation. HPLC technology will be employed to determine concentrations of these compounds in more than 25 specimens.

BIOMASS ALLOCATION AND ROOT MORPHOLOGY OF PRAIRIE PLANTS GROWN IN COMPACTED SOIL

Anne Gottwald, Nicholas Balster (Mentor), Soil Science

Subsoil compaction within urban developments underlies environmental issues like decreased infiltration and increased runoff of stormwater. This study examines the assertion that prairie plant species may provide an ecological tool to ameliorate subsoil compaction because their rooting behavior is linked to beneficial soil characteristics in natural systems. We grew two native species of prairie in replicated soil columns that included a compacted layer typical of urban soil, as well as non-compacted controls. We expect that plants grown in compacted soil will have similar total biomass but different root morphology relative to the controls. The results of this study will provide quantitative data behind the use of native vegetation to improve the ecological function of urban systems.

SYNTHESIS OF COMBRETASTIN A-4 VIA THE PERKIN CONDENSATION

Alan Gunderson, Nicholas Hill (Mentor), Chemistry

Combretastins are antimitotic compounds that were first isolated from the bark of the South African tree *Combretum caffrum*. Combretastin A-4 has proven to be the most potent of the combretastin compounds. The cis isomer in particular is up to 1,000 times more active at inhibiting cancer cell growth than the trans isomer. The water soluble prodrug, CA4P, is currently in phase III of clinical trials. Due to the interest in the biological activity of CA-4 there has been much work done on different synthetic pathways due to the need for a high yield of the cis isomer. The Perkin Condensation of an aromatic aldehyde and a carboxylic acid offers a simple route to the key CA-4 propenoic acid precursor. A variety of different synthetic routes have been tested to find optimal reaction conditions.

MATHEMATICAL PERSPECTIVE: DOES THE BRAIN PERCEIVE BIOLOGICAL AND MACHINE MOTIONS IN THE SAME WAY?

Laura Hagemeyer, Hallie Houge, Amir Assadi (Mentor), Mathematics

There has been great interest in studying biological motion to gain insight into the human brain's perception of vision and mechanisms of information processing. We wish to explore vision through modeling motion as perceived by an intelligent observer, where dynamical laws are represented by the trajectory of idealized points whose motion will be determined by human observers reporting biological or inanimate motion. Using our model, we test two hypotheses suggesting certain mathematical features of motion could be discovered through classical mechanics, the reduction of objects to points, versus new phenomena requiring new mathematics/physics. These hypotheses would assert or refute aspects of motion being unreachable by classical mechanics through demonstrating the possible subjectivity of the intelligent observer and provide new information regarding motion and perception.

MOTHER'S DIVERSITY-RELATED SOCIALIZATION PRACTICES IN CHILDREN'S SCHOOL PREPARATION

Valerie Hagen, Janean Dilworth-Bart (Mentor),
Human Development and Family Studies

The purpose of this experiment was to explore diversity-related socialization practices among mothers with preschool-aged children. As part of a greater study on school readiness (Dilworth-Bart, PI) forty mothers participated in a semi-structured interview on preparing their children for school; of those, twelve mothers reporting engaging in diversity-related practices. Transcripts of these interviews were thematically analyzed to identify how and why these mothers support this type of socialization process. Our findings support previous research that African American families are often interested in building pride in children's heritage and White mothers address diversity to promote tolerance of others. We provide new insight that these practices begin before school entry for some families and are often linked to mothers' own experiences in school, regardless of race.

USE OF CATIONIC PEPTIDE EXPOSURE TO CREATE AN ELECTROPORATIVE RESPONSE IN CELL MEMBRANES

Adam Hahn, Kaytlyn Beres, Samantha Kamin, John Booske (Mentor),
Electrical and Computer Engineering

Electroporation is a process in which electric fields exert mechanical forces, creating pores in the lipid bilayer membranes that encase biological cells. These electrically induced pores in the normally impermeable membrane allow passage of foreign gene and drug molecules into the cell's interior. If the pores remain open too long, it will lead to cell death (necrosis), so the objective is to induce temporary pores that reseal before necrosis. The traditional method to generate these temporary pores is with an externally applied pulsed electric field. However, we have found that exposure to cationic peptides causes localized electromechanical forces on the nanoscale, leading to a similar electroporative response.

IMAGE VS TEXT: EXAMINING HOW INFORMATION FORMAT INFLUENCES HEALTH RISK BELIEFS AND BEHAVIOR INTENTIONS

Stephanie Halambeck, Dolores Severtson (Mentor),
Nursing/Gaylord Nelson Institute of Environmental Studies

We explored the influence of water test result format (graphic or alpha-numeric) on risk beliefs and protective behavior among 213 Wisconsin residents with a private well. A randomized 2x2 mailed survey was used to study the impact of test result format, test result amount (12 or 40 ppb arsenic), biased safety threshold beliefs, and gender on dependent variables of skepticism, distress, safety beliefs, and behavioral intentions at the time of viewing and one week later. A particular interest was the mediating role of skepticism. Females and participants assigned to a graphical test result were less skeptical. Participants with less skepticism judged water as less safe and were more distressed and more likely to mitigate risk. The graphic prompted more appropriate risk beliefs and behavioral intentions.

MATERNAL INFLUENCE ON LEAD-INDUCED NEUROLOGICAL DISORDERS

Patrick Halbach, Pamela Kling (Mentor), Pediatrics

Lead is a toxic metal that can cause severe neurological damage in a developing fetus. Despite the implementation of state leads laws, children continue to suffer from lead-induced neurological disorders, suggesting that fetal lead exposure is responsible for such disorders. This study will investigate maternal IDA (iron deficiency anemia) and maternal psychosocial stress as two potential factors that increase fetal lead exposure. I will compare measures of iron and lead in cord blood taken at birth from pregnancies with maternal IDA, high maternal psychosocial stress levels, and controls from the "IDA in Infancy Study" at Meriter Hospital. If lead exposure is linked to these maternal diagnoses, screening processes can be implemented during gestation to prevent fetal lead exposure, therefore preventing serious neurological damage in the developing fetus.

CREATING A CD4+ T-CELL LINE SPECIFIC TO MYELIN ANTIGEN

Sam Hall, Julie Olson (Mentor),
Rehabilitation Psychology and Special Education

Microglia are the resident immune cells in the central nervous system (CNS). When there is a virus induced demyelinating disease in the CNS, microglia act as the first defense by producing cytokines and presenting myelin antigen to T-cells. The goal of this project is to extract T-cells from the lymph nodes of myelin antigen primed mice and culture them as a myelin-specific T cell line. These T-cells will then be put into naïve mice to cause disease in the absence of priming. This will show that these auto-reactive T-cells contribute to demyelination in the CNS and the progression of disease. T-cells will also be cultured with microglia to observe the proliferation of T-cells and to assess the antigens being presented by the microglia.

THE EFFECTS OF BROWSING AND NUTRIENT LEVELS ON ASPEN TREES

Jillian Handley, Kenneth Keefover-Ring (Mentor), Entomology

The 2009 Aspen Browsing Experiment seeks to identify the effects of artificial browsing and different nutrient levels on young aspen trees (*Populus tremuloides*). The experiment was conducted by growing replicates of thirteen different aspen genotypes in a common garden on the University of Wisconsin campus. The aspen trees were subjected to high and low fertility treatments and either clipped with pliers to simulate mammal browsing or left as unclipped controls. The trees were then monitored for changes in tannins and phenolic glycosides (defensive compounds), and their ability to re-grow after being browsed. Results of the experiment are expected to reveal the relationship between plant defense and tolerance and, nutrient levels, and herbivory.

EFFECTS OF COGNITIVE-BEHAVIORAL STRATEGIES ON SYMPTOMS IN CANCER PATIENTS RECEIVING TREATMENT

Emily Hansen, Sara Slusarek, Jessica Witt, Kristine Kwekkeboom
(Mentor), Nursing

Patients undergoing treatment for cancer often experience pain, fatigue, and sleep disturbance. Cognitive-behavioral theory provides the rationale for using relaxation, imagery, and distraction in symptom management. The purpose of this project is to identify which strategies are used most frequently for pain, fatigue, and sleep disturbance and to describe their effects on each of the three symptoms. Patients use MP3 players to self-administer their preferred selection of twelve strategies over a two-week period and keep a diary recording the severity and distress of symptoms. Findings will be discussed by symptom to identify strategies used most frequently and that appear to be most helpful for each symptom. Clinicians may use this information in recommending specific strategies to patients with cancer-related pain, fatigue, or sleep disturbance.

ISOLATION OF DMI1 AND DMI1 MUTANTS IN MEDICAGO TRUNCATULA

Isaac Hanson, Arijit Mukherjee (Mentor), Agronomy

Inefficient acquisition of nitrogen from the soil by crops has caused over-dependence on nitrogen-based fertilizers. Such treatments pose economical, health and ecological hazards. Legumes can form symbiotic associations with nitrogen-fixing bacteria, rhizobia and overcome this problem. DMI1 and DMI2 are the earliest genes in the host plant required for the establishment of this symbiosis. Mutants in these genes are nodule-deficient and also cannot express an early nodulin gene, ENOD11. The aim of the study is to isolate genetic suppressors of *dmi1* and *dmi2* mutants by their ability to restore nodulation and ENOD11 expression. This will enable identification of new genetic components required for the establishment of legume nodulation. Transfer of this knowledge to other crops that cannot form these associations will help in efficient fertilizer management.

DISTRIBUTION AND CONCENTRATION ANALYSIS OF HEAVY METALS IN URBAN WETLANDS

Maggie Harings, Nicholas Balster (Mentor), Soil Science

The use of wetlands to mitigate stormwater runoff from urban settings has become a popular land-use practice. When constructed near a road, human-made wetlands could sequester contaminants from directed stormwater runoff within wetland flora and sediments. This study will quantify heavy metal (Cd, Cu, Pb, and Zn) concentrations in root biomass and sediments from soil cores extracted along transects through three wetlands integrated into a local suburban development. I hypothesize that heavy metal concentrations will decrease in both root biomass and rhizosphere sediments from the initial to the final wetland concurrent with the direction of water flow. If supported, the results will provide a significant first step in understanding the interaction between urban development and wetlands as an ecological tool to mitigate stormwater runoff.

PHOTOELECTROCATALYTIC OXIDATION (PECO) OF AMMONIA IN SEAWATER: EFFECTS OF PROTEIN

Anshita Harish Anand , Terence Barry (Mentor), Animal Sciences

Photoelectrocatalytic oxidation (PECO) is a novel water-treatment technology that uses UV light and a proprietary light-activated catalyst to generate powerful oxidants in situ. PECO has been shown to convert aqueous ammonia directly into nitrogen gas, and is a possible solution to the problem of nitrate accumulation in aquariums and recirculation aquaculture systems. The purpose of my investigation is to evaluate the effect of dissolved protein on ammonia oxidation by PECO in seawater. It was hypothesized that protein would compete for the oxidants produced by the PECO reactor and thereby diminish the rate of ammonia oxidation. It is also predicted that protein could cause a transient increase in ammonia levels as the proteins are oxidized.

NOVEL APPROACHES FOR STUDYING SPATIAL HEARING IN YOUNG BILATERAL COCHLEAR IMPLANT USERS

Samantha Harris, Ruth Litovsky (Mentor), Communicative Disorders

Cochlear Implants (CI) provide deaf individuals with the ability to hear. Young children typically receive CIs in both ears to improve sound localization. In previous studies benefits of one vs. two CIs were studied using a simple task in which eye gaze and subtle behaviors were used to estimate where young, deaf children localized sounds. Some children performed well, others did not, which led us to design a more ecologically valid method for measuring localization in this population. Two-year-old normal-hearing and CI users now identified where they heard sounds by reaching for unseen toys positioned behind a dark curtain. We hypothesize that with this task, CI users with more than one year of bilateral hearing experience will perform similarly to the normal hearing group.

INVESTIGATING THE EFFECT OF STATIN OF VALVE CALCIFICATION IN PORCINE HEARTS

Neha Hasan, Kristyn Masters (Mentor), Biomedical Engineering

Statins, a class of drugs widely used to lower cholesterol, might also slow aortic valve calcification for which no known pharmacological therapy currently exists. One phenotype of cells found in the valve leaflet is activated valve interstitial cells (aVICs). The etiology of valve calcification is still largely unknown however, aVICs seem to play a key role in dystrophic valve disease. I hypothesize that by adding statin *in vitro* to valve cells, the valve calcification will decrease. To test this hypothesis, I monitored a distinct marker for aVICs, the contractile protein-smooth muscle actin, (-SMA). Additionally, in a de-adhesion assay I measured the VICs' ability to detach from the culture surface, which I related to cell contractility. This study will observe the mechanism by which statins work and their influence on VIC calcification.

IMPACTS OF ECOTOURISM ON ECOSYSTEMS, SPECIES, AND LOCAL COMMUNITIES

Candice Haskin, Erica Knoebel, James Berkelman (Mentor),
Forest and Wildlife Ecology

The purpose of our research is to look at the impacts of the increasingly popular activity of ecotourism on ecosystems, individual species, and local communities. Ecotourism is tourism to pristine natural locations that strives to be low impact. Our research includes case studies from western Mexico, which we visited with our Forest and Wildlife Ecology 375 class in January 2010, and other examples from published literature. Ecotourism has had negative effects on ecosystems or individual species but also positive effects on public awareness, support, and appreciation of the value of undisturbed natural areas. We offer suggestions for more responsible ways to manage ecotourism so that it can benefit both visitors and local communities.

DEVELOPMENT OF A HIGH THROUGHPUT SCREEN FOR BACTERIAL PROTEIN SECRETION

James Heffernan, Miguel Dominguez (Mentor),
Great Lakes Bioenergy Research Center

We have developed an automated high-throughput screen (HTS) in collaboration with the DeLisa lab at Cornell to look for YebF secretion mutants in *E. coli*. YebF, a 10.8KDa protein of unknown function, is secreted to the periplasm similar to TypeII secretion systems but also undergoes extracellular secretion via an unknown pathway. A transposon Tn5-mediated mutagenesis library was screened to identify genetic elements crucial for YebF secretion. A primary screen of over 6,000 mutants has been carried out revealing increased and decreased YebF secretion via FIAsh fluorescence. Secondary screen development is currently underway to verify these candidates. We hope to reveal genetic elements responsible for YebF secretion. Future efforts include applying similar screening methodologies to Type II secretion system mutants in order to elucidate the mechanism of payload specificity.

SIZE AND SHAPE: INDICATORS OF SPECIATION AND SEXUAL DIMORPHISM IN THREE-SPINE STICKLEBACK FISH

Johanna Heineman-Pieper, Janette Boughman (Mentor), Zoology

Size and shape are key morphological differences between species and sexes of three-spine stickleback fish. Freshwater species pairs evolved multiple, independent times from a marine ancestor and are good examples of ecological species and foraging niche specialization. Head shape and overall size have been measured between the species, revealing that benthic fish are larger, have deeper bodies, smaller eyes, and larger jaws compared to limnetic fish. We extend these studies to measure full body shape differences using geometric morphometrics techniques to quantify size and shape. We compare body shape differences between populations in British Columbia, including two species pairs lakes, a marine population, and a solitary lake population. In addition to measuring species differences between species pairs, we also measure the degree of sexual dimorphism within these populations.

HISTOPHILUS SOMNII CAUSES NEUTROPHIL EXTRACELLULAR TRAP (NET) FORMATION IN BOVINE NEUTROPHILS

Katrina Hellenbrand, Nicole Aulik (Mentor), Microbiology

Histophilus somnii is a gram-negative coccobacillus that causes respiratory, reproductive, cardiac and neurological diseases in cattle. It has been reported that neutrophils are diminished in their capacity to kill *H. somnii*. It was discovered that neutrophils produce neutrophil extracellular traps (NETs) in response to bacteria. We want to examine the role that neutrophils play in the host defense against *H. somnii*. We hypothesize that *H. somnii* causes NET formation that can kill *H. somnii*. The first aim is to confirm that NET formation occurs in response to *H. somnii*. The second aim is to understand how *H. somnii* causes NET formation. We expect that this research will lead to a better understanding of the role NETs play in response to *H. somnii* infection in cattle.

OLFACTORY STIMULANTS EXPECTED TO IMPROVE HEART RATE RECOVERY OF FEMALES AFTER EPHEMERAL EXERCISE

Laura Hepokoski, Alicia Taff, Michelle Harris (Mentor), Biocore

Supporters of aromatherapy products claim that essential oil fragrances inhaled into the lungs offer psychological and physical benefits due to the relationship between the limbic and olfactory systems. We studied the relationship between the olfactory system and the physiological response as seen by changes in heart rate. We tracked the time it took for the elevated heart rates of female undergraduates to return to within 20% of their resting heart rate with aroma stimulation, during recovery time after physical stimulation. We hypothesized that the participants exposed to the aromatic conditions would take about 10% less time to fully recover from the exercise stimuli, as compared to subjects who were not exposed to aromatherapy.

SIAMESE CROCODILES—DOOMED FOR EXTINCTION?

Elicia Hildebrand, James Berkelman (Mentor), Forest and Wildlife Ecology

One of the world's most critically endangered crocodylians, the Siamese Crocodile, was once common in the wetlands of Southeast Asia. Populations have drastically declined in recent years and now occupy less than 1% of their former range. The focus of this project is to gain an understanding of the underlying causes, both cultural and economical, of this decline. I use two research strategies: 1) information gathered from sites in Southeast Asia; and 2) firsthand accounts of families raising crocodiles for money. I have found a disparity between cultural belief that crocodiles are sacred and the progression of society that threatens this species. Crocodiles are vital to maintaining wetland health as well as a means for indigenous people to uphold ancient beliefs.

UNCERTAINTY ANALYSIS FOR CLOUDSAT SNOWFALL RETRIEVALS

Michael Hiley, Ralf Bennartz (Mentor), Atmospheric and Oceanic Science

Data from the first year of NASA's CloudSat mission is used to investigate global snowfall patterns by converting near-surface radar reflectivities from CloudSat's space-borne radar into snowfall rates. The sensitivity of these results to the various approximations necessary to derive snowfall rates, such as assumptions about snowflake shape, is tested. In addition, the effects of various other methodology choices involved in this process are explored on a regional basis. Finally, the results are compared to conventional snowfall measurements at several Canadian observation stations in order to validate and improve the methodology used in this study.

EFFECT OF TIME ON RELIABLE ENZYME ACTIVITY ANALYSIS

Dylan Hill, Maria Marin-Spiotta (Mentor), Geography

Enzymatic content in soils is an important indicator of the microbial activity and in determining the rate at which elements cycle. However, the age of a sample and the act of transporting from the field to the lab can alter the microbial community and thus the enzymatic activity in soil. In this experiment, we will determine how much time in storage changes the enzymatic activity. The soil samples will be measured once a week for a period of one month using a fluorometric enzyme assay for six different enzymes. This data will tell us how much time in between sampling and measurement we have before measurements become unreliable, and the amount of variance to expect between *in situ* soil and the lab measurements.

DYNAMIC SIMULATIONS OF ELECTRO- AND MAGNETORHEOLOGICAL FIBER SUSPENSIONS

Wee Teck William Ho, Daniel Klingenberg (Mentor),
Chemical and Biological Engineering

Electrorheological and magnetorheological (ER and MR) fluids are fluids which rheological properties can be dramatically altered by the application of an electric or magnetic field. These fluids have a wide range of applications ranging from automobile suspension systems to prosthetic devices. However, one major limitation to the commercialization of these fluids is their high cost. To overcome this limitation, better fluids, or fluids that exhibit higher field-induced stresses, have to be made. Previous experimental studies have shown that ER and MR suspensions composed of fibers give larger field-induced stresses compared to ER and MR suspensions composed of spherical particles. Our work aims to develop a simulation method to study and characterize these ER and MR fiber suspensions.

DESIGNING AN INTRACRANIAL PRESSURE SENSOR TO IMPROVE THE LIVES OF PATIENTS WITH SHUNTS

Mitchell Hobbins, Lori Bakken (Mentor), Medicine

The main objective of this project is to create an intracranial pressure sensor separate of a shunt system, that has an indirect and external power source called the phantom scanner. The research team's goal is to implant this device in the skull in the most efficient, cost conserving, way that will allow it to be stable and long-lasting once it has a firm foundation in the skull. The device will benefit patients with a long lasting, accurate device that can easily be replaced if it malfunctions and will not have inaccurate readings if a shunt system fails. This device will improve patient convenience, treatment approaches and accurate diagnostics.

EXAMINING THE ROLE OF PHOSPHOLIPASE A2-ACTIVATING PROTEIN IN TOXOPLASMA GONDII VIRULENCE

Kate Hokeness, Laura Knoll (Mentor),
Medical Microbiology and Immunology

Phospholipase A2 activity plays an important role in penetration of the host cell by the obligate intracellular parasite *Toxoplasma gondii*. *T. gondii* encodes a specific phospholipase A2 activating protein (PLAP), which may increase the activity of phospholipase A2 enzymes and be involved at critical steps during the infectious cycle. I hypothesize that a PLAP knockout will decrease the virulence of *T. gondii*, resulting in a decrease of tissue cysts and mortality in mice. To test this hypothesis I created and assayed a PLAP knockout in *T. gondii*. A more comprehensive understanding of the affects of PLAP will garner a greater understanding of the biology of *T. gondii* and also for other diseases caused by relative apicomplexans such as *Cryptosporidium*, which are more difficult to study.

FLYING IN FORMATION: START-UP TEAM EXPERIENCE CONFIGURATIONS IN THE AVIATION INDUSTRY

Lucy Hong, Phillip Kim (Mentor), Management and Human Resources

Entrepreneurship occurs at the intersection of individuals and organizations. Most founders transition into entrepreneurship while working for someone else. Thus, by starting businesses, founders potentially infuse their nascent entities with some knowledge, such as routines, rules, and competencies, gained through work experience (and possibly life experiences) in other settings. Successful start-up outcomes depend, in part, on how effectively founders apply their experience-based knowledge into their particular entrepreneurial contexts. Airline industry is studied as a context because experiences matter a great deal when entrepreneurs start an airline business. Examining start-up airlines profiles provides further insight on the issues discussed above.

IMMUNE CELL-OVARIAN TUMOR CELL ADHESION THROUGH MUC16 AND IMMUNOCYTOKINE

Sachi Horibata, Manish Patankar (Mentor), Obstetrics and Gynecology

Natural killer (NK) cells are immune cell types that function normally to eliminate tumor cells by forming an immune synapse. However, we have shown that the presence of mucin, MUC16, on the surface of epithelial ovarian tumor cells inhibits the function of NK cells in two ways: 1) steric barrier 2) inducing inhibitory signaling through Siglec-9. To increase recognition of tumors by NK cells, we utilized the immunocytokine, KSIL-2, which activates NK cells through IL-2 and mediates ADCC via the KS antibody. Using a plate adhesion assay, we demonstrate that KSIL-2 mediates increased NK-tumor cell interactions. Our data shows that KSIL-2 can overcome the immune evasion mediated by the large MUC16 molecule.

CAN WORKING MEMORY CAPACITY PREDICT ABILITY TO REGULATE EMOTIONS?

Patricia Horvath, Stacey Schaefer (Mentor), Psychology

High working memory capacity (WMC) has recently been linked to high performance on cognitive control tasks. In the current study, we aim to test whether high WMC leads to better emotion regulation. Subjects of different backgrounds were tested for WMC, and shown pictures of positive, negative or neutral content during psychophysiological recording of their responses. During separate tasks, subjects either responded naturally to each picture, or emotionally reappraised it by consciously maintaining, enhancing, or suppressing their response to the image. We predict that higher WMC will correlate with better ability to reappraise emotions.

CRYSTAL RELATIONSHIP BETWEEN GARNET AND RUTILE IN ECLOGITE

Kimberly Hoxie, Huifang Xu (Mentor), Geology

Rutile crystals are hosted in garnet from eclogite in the Sulu ultra-high pressure terrain, China. The crystal orientation between the host garnet and rutile inclusions has been previously determined (S.L. Hwang, et al. 2007 JMetPet), but the crystal interfaces and the effects thereof on surface energies have not been thoroughly examined. Crystal orientations at the interface between exsolved minerals and the host can result in either an increase or decrease of surface energy and are therefore important in determining the nucleation process and in interpreting the process of exsolution of rutile in garnet during the exhumation of the eclogite. We used Electron Backscatter Diffraction to determine the crystal orientation between rutile and garnet and this relationship can be used to model the surface interface.

GENDER DIFFERENCES IN FUNCTIONAL IMPAIRMENT RELATED TO EXTERNALIZING PROBLEMS: A LONGITUDINAL STUDY

Melissa Hudson, Matthew Vendlinski (Mentor), Psychology

Gender differences exist in the expression of externalizing problems across development. We sought to further understand these differences using questionnaire data collected during both middle childhood and early adolescence for the Wisconsin Twin Project. Using hierarchical linear regression, we tested the hypothesis that relational aggression would predict functional impairment after controlling for externalizing problems in girls but not boys. We also examined whether girls with high empathy and externalizing problems would show lower functional impairment than their male counterparts with both high empathy and externalizing problems. Preliminary results suggest that some gender differences may exist in these areas. Our findings have implications for the proper assessment and diagnosis of disruptive behavior disorders in girls.

DIFFERENCES IN HOW 6TH GRADERS COPE WITH PEER VICTIMIZATION

Maria Hughes, Amy Bellmore (Mentor), Educational Psychology

In this study I hope to establish the coping mechanisms that adolescents use in response to peer victimization. I plan to use data from approximately 400 sixth-grade students who completed self-report surveys containing open-ended questions concerning their experiences of both being victimized and witnessing peer victimization in their schools. Students described the circumstances of the event and reported how they responded to the event. Based on the students' descriptions, I plan to identify the main coping mechanisms that students who are frequently victimized use in real-life peer victimization events.

EMPOWERING UNDERREPRESENTED LOW-INCOME GIRLS FOR SUCCESS IN SOCCER AND LIFE

Jyun-Yi Hu, Cameron MacDonald (Mentor), Sociology

Our project's objective was to design and implement a summer soccer program for low-income underrepresented fourth and fifth grade girls from Lincoln Elementary. The inspiration for our program came from Millennium Soccer Club, created in order to address "the twin barriers of cost and transportation" for low income families in Madison. With funding from the Wisconsin Idea Undergraduate Fellowship and guidance from Assistant Professor of Sociology Cameron Macdonald and President of Millennium Soccer Club Tom Grogg, we will enact a soccer program that will not only rapidly develop soccer skills, but also link concepts players learn on the field to their success off the field. By empowering participants through soccer, we will address the need for more youth programs specifically targeting low-income underrepresented girls.

PREPARING CHILDREN FOR SCHOOL: MOTHERS' THOUGHTS ON ACADEMIC SOCIALIZATION AND PRESCHOOL RELIANCE

Karli Hurllebaus, Kyle Miller, Janean Dilworth-Bart (Mentor),
Human Development and Family Studies

The purpose of this project was to openly explore mothers' practices and beliefs about preparing their children for kindergarten entry. Forty mothers participated in a semi-structured interview as part of a larger study on school readiness (Dilworth-Bart, PI). Interview transcripts were analyzed to identify the most salient themes from responses. Data were organized for analysis using NVivo08. Five major themes emerged from how mothers academically socialize their children for school: academic skills, socialization, messages, providing opportunities, and preschool reliance. This study extends our knowledge on parents' conceptions of school readiness, and exposes how much parents rely on preschool programs for children's preparedness. It also further informs our schools and communities on how to better support this transition for families.

BUSINESS GOVERNANCE STUDY IN COOPERATIVES, CREDIT UNIONS, AND MUTUALS

Samuel Hutchins, Brent Hueth (Mentor),
Agricultural and Applied Economics

The UW–Madison Center for Cooperatives is conducting a study about governance in cooperative businesses. It is aimed at understanding the differences in how member-owned businesses (cooperatives, credit unions, ect.) manage their operations compared with other types of corporations. Much of what is known about how people, policies and practices operate in corporations come from studies of conventional businesses. Through research we wish to identify how cooperatives conduct governing these 'member-owned' businesses. By way of interviews with CEOs and board members from more than 300 cooperative businesses throughout the United States, we aim to better understand governance structures, practices and impacts of managing member-owned businesses. The findings of this study will expose university students to member-owned businesses and explain their distinctive role in the economy.

DEPRESSIVE SYMPTOMS AND COMMUNICATION PATTERNS OF DATING PARTNERS

Kaley Ingenito, Rachel Feyt, Brenna Finley, Donny Xiong,
Lauren Papp (Mentor), Human Development and Family Studies

This project draws from a larger research study of 101 dating couples designed to evaluate connections between intimate relationships and individual well-being. Specifically, we are interested in how depressive symptoms in either partner might be associated with levels of conflict and support in their communication. Each couple had a positive (enjoyable) and negative (disagreeable) discussion, and trained observers evaluated levels of conflict and support shown by each partner. We plan to correlate survey-rated depressive symptoms with observed levels of conflict and support demonstrated by male and female partners in both discussions. We predict systematic associations between higher depressive symptoms and more impaired relationship communication, as well as between lower depressive symptoms and better relationship communication.

SENSING THE CONCENTRATION OF PEPTIDOGLYCAN FRAGMENTS IN THE CYTOPLASM OF NEISSERIA GONORRHOEAE

Korey Jaminski, Joseph Dillard (Mentor),
Medical Microbiology and Immunology

Peptidoglycan (PG) fragments are a key contributor to the sexually transmitted diseases gonorrhea and pelvic inflammatory disease. Our focus is to investigate how these PG fragments are generated in the bacterium *N. gonorrhoeae*. By creating a reporter construct and monitoring the amount of LacZ produced from it under various conditions, we will quantify the concentrations of PG fragments, confirm the presence of PG recycling in the cytoplasm of various *N. gonorrhoeae* mutants, and investigate how much PG fragment release occurs in other bacteria. From these results we will be able to further our understanding of what drives the regulation of PG recycling and release in *N. gonorrhoeae* and similar bacteria.

CHARACTERIZING THE ROLE OF BACTERIA IN HOST TREE COLONIZATION BY THE MOUNTAIN PINE BEETLE

Momodou Jammeh, Cameron Currie (Mentor), Bacteriology

Mountain pine beetles secrete fungi carried in their mycangium into the phloem and xylem of pine trees. While these fungi impair tree chemical defense, the mechanisms for beetle and fungal tolerance of these defenses during early colonization are unknown. This study examines the effect of beetle-associated bacteria on fungal growth on media amended with a diterpene acid commonly found in resin acid, also known to be anti-fungal. Growth of bacteria was assessed when exposed to different concentrations of abietic acid. For those bacteria showing no adverse affects of the resin acid, the affects of the interaction between the bacteria and resin acid on fungal growth were assessed. Some bacteria associated with the mountain pine beetle will degrade resin acids; hence facilitate growth of beetle-associated fungi.

THEORY OF SENSIOTICS

Kayla Jenerson, Henry Drewal (Mentor), Art History

Individuals today do not take advantage of the use of sound/music when learning. Pre-existing knowledge tends to inform with words (semiotics, structuralism) and forget that reasoning, theorizing, and understanding all occur through our senses, a term coined “sensiotics” by Professor Henry Drewal. The outcome of this research will offer different viewpoints on learning. The research was mostly independent and narrowed to the brain and how it processes sound/music. Also, how can those in therapy benefit from using music? The information found can be applied to the general public. The technology used consisted of online databases and library literature. I consolidated the research into annotated bibliographies and short written papers. The intended findings are meant to be applied to my personal music experience and teaching experience.

ETHICS IN FAMILY BUSINESSES

Janelle Jensen, Debra Holschuh-Houden (Mentor), Family Business Center

This project will attempt to determine the average beliefs about ethics in family business. Using two types of methodologies, I will analyze consumer perceptions about what it means for a company to be ethical and whether they perceive family owned businesses to be more or less ethical than non-family businesses. Because there is little research in regards to the latter perception, I will use research on consumers' ethical perceptions and research on family businesses' performance in these areas to supplement specific research on perceptions of family businesses' ethics. I expect to find that consumers perceive family owned businesses to be more ethical and will then discuss the implications this has for family businesses.

LANGUAGE COMPREHENSION AND MIRROR NEURONS: CONCEIVING OF LANGUAGE AS AN EMBODIED, SOCIAL ACTION

Julia Jenvey, Katie Krol, Mitchell Nathan, Arbor Otalora-Fadner, Hayley Shilling, David Havas (Mentor), Psychology

Language comprehension is a socially coordinated activity, but the mechanisms of social coordination in language are poorly understood. Evidence from embodied cognition has shown a close link between action and language. For example, movement-induced fatigue of actions slows comprehension of language that refers to those actions. Research into the mirror neuron system (MNS) suggests that action systems of the brain are also involved in social understanding of similar actions performed by another, empathy, and possibly language. Here, we show that simultaneous performance and observation of complementary actions (versus imitative actions) produced a fatigue-like effect in sentence reading times (whereas imitative actions did not). The results suggest that MNS activation during social tasks influences language processing.

LOCALIZATION OF FIBROBLAST GROWTH FACTOR 8 (FGF8) AND ITS RECEPTOR, FGFR3, IN THE MURINE ALLANTOIS

Dexter Jin, Karen Downs (Mentor), Anatomy

The murine allantois becomes the umbilical component of the placenta, forming a system of blood vessels that mediate exchange between the fetus and its mother. The allantois contains a stem cell niche, called the allantoic core domain (ACD), which is required for allantoic elongation to the chorion, thereby forming the placenta. Here, I demonstrate that a member of the Fibroblast Growth Factor family, FGF-8 and its receptor, FGFR-3, were localized to the ACD during its establishment. These results suggest that FGFs play important roles in development of the umbilical cord.

NATURAL VARIATION: ANALYSIS OF SOLAR AND GEOMAGNETIC VARIATION ON UPPER ATMOSPHERIC HYDROGEN

Tiffany Jones, Susan Nossal (Mentor), Physics

The purpose of this study is to investigate natural variation through studying the effects of geomagnetic disturbances on upper atmospheric hydrogen. Hydrogen is a major constituent of the upper boundary of the Earth's atmosphere and is a byproduct of methane and water vapor, which are radiatively important species at lower altitudes. Information about natural variation is necessary for distinguishing human versus natural impact on the climate. A complete summary of data with high geomagnetic activity during the 11-year period of Northern hemisphere observations from the Wisconsin H-Alpha Mapper Fabry-Perot will be presented. This period corresponds to one solar cycle. We will also present preliminary steps towards the analysis of hydrogen emission observations during different levels of geomagnetic activity.

THE IMPORTANCE OF SUCCESSION FOR EUROPEAN AND AMERICAN FAMILY FIRMS

Kennedy Jordan, Zach Lieberthal, Joelle Rosen,
Debra Holschuh-Houden (Mentor), Family Business Center

Family firms make up a significant portion of the world's businesses and employment. Although a noteworthy amount of the world's firms are family businesses, there are many differences within these firms across the globe. We will look more into the differences/similarities between the European and American family firms. More specifically, we want to look deeper into the importance of succession planning both in the United States and abroad. Succession planning is vital to the longevity of family businesses; hence, it is important to find out what actions businesses around the world are taking to ensure successful planning. All in all, we hope to conclude that companies in the United States and Europe take steps to plan for succession and provide unique strategies to ensure their survival.

CELL SIGNAL LRP5 FOUND TO BE MALE HORMONE DEPENDENT AND MAY PLAY A MAJOR ROLE IN PROSTATE GROWTH

Pinak Joshi, Chad Vezina (Mentor), Comparative Biosciences

Most men will develop abnormal prostate growth in their lifetime. We know male hormones are responsible for prostate growth; however we don't know how they cause growth to occur. We study prostate growth using the fetal mouse as a model. We hypothesize the cell signals responsible for normal growth in the fetal mouse prostate are the same signals that stimulate growth in the human prostate, and when misregulated, are responsible for abnormal growth. We found that cell signal *Lrp5* is abundant in the developing prostate of male fetuses, and is not abundant in adjacent non-prostate tissues of males or the same tissue region of female fetuses. This finding shows *Lrp5* is dependent on male hormones and may be a major player in prostate growth.

GENDER DIFFERENCES IN STATUS UPDATES INDICATING DEPRESSION

Lauren Kacvinsky, Megan Moreno (Mentor), Pediatrics

Adolescents may use Facebook status updates to communicate depression, but it's not known if this differs with gender. The purpose of this study is to determine whether males or females with depression symptoms are more likely to have status updates indicating depression. The Facebook profiles of 18–20 year olds at the universities of Wisconsin and Washington were coded for references to depression. These students were sent a survey investigating the presence of depression symptoms. Of 80 respondents, 56% were male. Among males, an increasing depression score was associated with a 1.5 times higher trend ($p=0.1$) of reporting depression on Facebook. No association was found among females. Status updates of males may be an indicator of depression.

A SEARCH FOR MISSING DWARF GALAXIES

Jane Kaczmarek, Cody Gerhartz, Victoria Hartwick, Jacob Miller, Anthony Pavkovich, Capri Pearson, Snezana Stanimirovic (Mentor), Astronomy

We propose to analyze followup observations of several newly discovered dwarf galaxies. Current theoretical models of galaxy formation predict many more dwarf galaxies in the Universe; however, observations do not match simulations. The Milky Way galaxy has 25 confirmed satellite dwarf galaxies, roughly 1% of the expected value. Finding new galaxies surrounding the Milky Way is of particular importance because it will allow us to better understand the environment in which our galaxy formed. UW students have previously observed our sources with the Arecibo telescope, making our data readily available. We will reduce our spectral observations of neutral hydrogen in order to derive galactic dynamics, including total hydrogen mass, dynamical mass, dark matter content and redshift.

WORKPLACE ATTITUDES AND VALUES

Ashleigh Kahler, Caitlin Dupont, Kate Mills, Rebekah Spidle,
Roberto Rengel (Mentor), Design Studies

This study focuses on the effect of workplace design on the attitudes and values of employees. A review of recent studies by American Society of Interior Designers concerning employees' attitudes and values revealed the increasing role of good design on the attraction and retention of good workers. Studies suggest four principal areas of interior design impact: accessibility, comfort, privacy, and flexibility.

SUPPRESSIVE QUALITIES OF PSEUDOMONAS FLUORESCENS

Abigail Kalscheur, Sarah Schliemann (Mentor),
Forest and Wildlife Ecology

The bacterial species *Pseudomonas fluorescens* has been marketed as an organic suppressor of soilborne pathogens. The purpose of this study is to identify relationships between *P. fluorescens* concentration and its specific suppressive qualities in five cover types in the UW Arboretum: deciduous, conifer, wetland, turf, and prairie. In order to identify levels of suppression, we will assess *P. fluorescens* colony concentration by performing colony counts. We will then compare these counts to total microbial biomass identified through chloroform fumigation. This research will provide further information about the direct protection of plants through biological controls thus expanding current applications of biological control products.

DNA METHYLATION AS A CONTROL MECHANISM FOR LHRH GENE EXPRESSION DURING PUBERTY IN PRIMATES

Jordan Kapke, Ei Terasawa-Grilley (Mentor),
Pediatrics, Psychiatric Institute.

LHRH is the single most important molecule involved in the regulation of reproduction. In mammalian species LHRH is released from the hypothalamus in a pulsatile manner. Release of LHRH starts at the time of puberty, and is essential for puberty onset; however mechanisms underlying this increase are largely unknown. Previous work in the lab found that differences in LHRH expression between adult males and females were related to DNA methylation in the LHRH gene. Specifically, less DNA methylation was associated with higher levels of gene expression. We hypothesized that a similar mechanism is responsible for increased expression of LHRH genes at the time of puberty. The proposed project will provide new insights into the mechanism of puberty onset and the regulation of reproductive function.

DEMOCRACY IN IRAN: HOW IRANIANS ARE USING NEW MEDIA TECHNOLOGIES TO GAIN POLITICAL FREEDOM

Megan Kelley, Stephen Ward (Mentor),
Journalism and Mass Communication

One of the most surprising results from expanded access to the Internet has been its beneficial impact on establishing a political democracy, particularly within Iran. The use—and misuse—of the Internet is central to the ongoing fight for democracy in Iran. This paper argues that new media technologies, such as the Internet, text messages, blogs and social networking sites, are permitting greater political and democratic freedom in Iran. It examines how and why Iranian citizens utilize this new media technology and the impact this technology on the country's politics. Extensive academic research was combined with personal, in-depth interviews with native Iranian experts and students. The results favor the view that new media technology has enhanced citizens' political freedom in an overtly Islamic state.

LOCALIZATION OF CAV-3 AND A93T MUTATION IN CARDIOMYOCYTES

Luiza Kerstenetzky, Ravi Balijepalli (Mentor),
Cellular and Molecular Arrhythmia Research Program

Cardiac arrhythmias, disorders that affect the rate and rhythm of the heart, are a significant health concern. Arrhythmias can be inherited through genetic diseases or can be acquired through artery-clogging diets. Inherited arrhythmias are caused by mutations in certain genes such as Caveolin-3 in the heart. Mutations in Caveolin-3 are linked to arrhythmic Long QT Syndrome—a disease that causes episodes of dangerous irregular and fast heartbeats. The proposed study aims to investigate the mislocalization of a newly found Caveolin-3 mutation, A93T, in cultured HEK293 cells and mouse neonatal cardiac muscle cells. The results of these experiments will provide insight into the contribution of the A93T mutation in cardiac arrhythmias.

ASSESSING THE EFFICACY OF COMMUNITY OUTREACH IN ENGAGING STUDENTS IN SCIENCE

Megan Keuler, Robert Downing, Michelle Harris (Mentor),
Biology Core Curriculum

Biocore Outreach Ambassadors (BOA) are undergraduates in the honors Biology Core Curriculum who share their love for science with K-12 students and teachers. BOA's goal is to enhance the science curriculum of rural school districts by engaging the students in inquiry-based science lessons. One of the methods BOA uses to achieve this goal is by hosting Family Fun Science Nights in our partner school districts. At these events, students and parents explore a wide variety of science activities from magnets and electricity to DNA extraction. The goal of this study was to assess the impact and efficacy of these Science Nights on the community. We will share attendance data and exit interviews/surveys from our Science Nights over the last two years.

SENSORY PROCESSING DISORDER: PRENATAL IMPLICATIONS AND TEMPERAMENT CONTRIBUTIONS

Megan Keuler, H. Hill Goldsmith (Mentor), Psychology

Individual reactions to sensory stimuli vary greatly in the general public. A subset of the population is over-responsive to the sounds and textures of everyday stimulation. In children, over-responsivity can impair development, relationships, and daily tasks. Children with impairment due to sensory over-responsivity constitute a subcategory those with a putative new diagnosis known provisionally as Sensory Processing Disorder (SPD). Research on SPD is still in its infancy, and the gaps in our understanding of the disorder are wide. The current study explores some of these gaps, specifically: a) the effect of prenatal complications on SPD symptoms at age 2; and b) the effects of temperamental qualities such as negative affectivity and effortful control on symptoms at age 2. These questions will be examined using longitudinal data available from the Wisconsin Twin Project.

GROUP POLARIZATION AND THE EFFECT OF EXTREME GROUP MEMBERS

Emily Kief, Lyn Van-Swol (Mentor), Communication Arts

Whenever people meet together in a group, the behavior and opinions of different members affect the final group decision. In this experiment on group polarization we are attempting to discover how group members with extreme opinions affect the group discussion, if they cause the group to polarize to a more extreme opinion, and if group make-up and types of argument used have an effect on the group discussion and decision. Past research has explored the causes of group polarization and its relation to members, but little research has examined the influence of extreme members. The present study examines how extreme members affect the non-extreme members in the groups, and if non-extreme members contribute differently when there is an extreme member present.

SPINAL CORD INJURY AND REPAIR THROUGH SCIATIC NERVE GRAFTING WITH CHONDROITINASE APPLICATION

Junhwa Kim, Katherine Kaeppler, Gurwattan Miranpuri (Mentor),
Neurological Surgery

Spinal cord trauma is a devastating injury that disrupts motor and sensory nerve fiber pathways and interrupts communication with the brain. Recent studies have shown a plausible therapeutic strategy for spinal cord injury using peripheral nerve grafts. However, to date peripheral nerve graft transplantation is limited in the treatment of spinal cord injury due to adverse effects of chondroitinase sulfate proteoglycans in the glial scar. In this study we offer a novel approach using pre-degenerated sciatic nerve grafts and a sustained release of chondroitinase to create a permissive environment for the axons to regenerate through the glial scar.

FORMATION AND SURVIVAL OF STRESS-INDUCED FILAMENTOUS SALMONELLA

Alisa King, Amy Wong (Mentor), Bacteriology

Salmonella is one of the major foodborne bacterial pathogens worldwide. One peculiar behavior of Salmonella is the formation of filaments (elongated cells) under stress-induced conditions such as desiccation. However, when under favorable conditions, filaments can divide, increasing the number of viable cells in food. The goal of this research project is to see how different conditions affect the formation and survival of the filamentous Salmonella. To accomplish this, Salmonella will be exposed to different stresses to observe filament formation. Unstressed cells and filaments will be compared for their ability to grow and survive under favorable and other stress conditions. We expect the filaments to subsequently grow under favorable conditions. Future research will focus on the mechanism of filamentation and the survivability of filamentous Salmonella.

CREATING A MATCHING SYSTEM FOR COASTAL WISCONSIN LAND USE CODES

Charlotte Kissinger, Nancy Wiegand (Mentor),
Land Information and Computer Graphics Facility

The objective for this project is to create a Java applet that makes land use codes from one county in Wisconsin compatible with others. First I will observe various land use codes, including those provided by the Southeast Wisconsin Regional Planning Commission and the Bay Lakes Regional Planning Commission. An ontology-mapping program may be used to generate probable matches for zones from different areas based on words they have in common. From there, definitions of these land types may be written carefully so that similarly named codes with different functions do not get linked together. This will culminate in the creation of a code-matching system for a subset of counties in Wisconsin with a focus on coastal counties.

GUT CONTENTS AND FORAGING NICHE SPECIALIZATION BETWEEN SEX AND SPECIES OF STICKLEBACKS

Robert Kitsis, Jack Bolas, Idelle Cooper,
Janette Boughman (Mentor), Zoology

Niche specialization is important to speciation in threespine sticklebacks. When marine ancestors colonized freshwater lakes, adaptation to specialized foraging niches led to two species: benthics and limnetics. Benthics are bottom foragers feeding mainly on macroinvertebrates. Limnetics feed in the open-water on mainly zooplankton and surface macroinvertebrates. Niche specialization may differ between the sexes as well. To test this, we analyzed the gut contents of males and females of both species from three lakes in British Columbia. We compared this dietary data to findings of physical differences between species and sexes. We show diet differences between species in accordance with previous findings. Differences between the gut content between sexes of the same species indicate possible variation in foraging niches as well.

COMMONLY USED CHEMOTHERAPEUTIC AGENTS AFFECT OVARIAN CELLS THROUGH UNIQUE BIOMOLECULAR PATHWAYS

Will Klein, Sana Salih (Mentor), Obstetrics/Gynecology-Endocrinology

Although many chemotherapeutic agents effectively cure female cancer patients, long term consequences often involve reproductive dysfunction. In order to prevent these harmful effects it is necessary to study the biomolecular pathways through which commonly used chemotherapeutic agents affect ovarian function. We hypothesize that the concentration of these agents that is toxic and the signaling pathways acted upon are unique to the ovary. Using mice as models we are assessing the effects of these agents on ovarian cells via cell viability, messenger RNA, and protein assays. We hope to identify both the doses of chemotherapeutic agents that lead to death of 50 % of normal ovarian cells and the unique biomolecular mechanisms through which damage occurs. Future research could intercept these molecular mechanisms, protecting ovarian function.

NEUROPROTECTION OF ISCHEMIC HIPPOCAMPAL NEURON DAMAGE BY INHIBITION OF Na⁺/H⁺ EXCHANGER

Neil Kleman, Dandan Sun (Mentor), Neurological Surgery

We investigated whether selective inhibition of Na⁺/H⁺ exchanger (NHE) isoform 1 (NHE-1) was neuroprotective in CA1 hippocampal neurons after neonatal hypoxia ischemia (HI). HI was induced by unilateral ligation of the left common carotid artery in P9 mice, and subsequent exposure of animals to 8% O₂ for 55 min. HI caused neuronal degeneration of ipsilateral CA1 pyramidal neurons at 72 h detected by Fluoro-Jade C staining and loss of microtubule associated protein 2 (MAP2) expression. HI also increased NHE-1 protein expression in reactive astrocytes. Inhibition of NHE-1 protein preserved hippocampal structures with less neurodegeneration and increased MAP2 expression. These results suggest that activation of NHE-1 activity plays a role in hippocampal ischemic damage.

PATTERNS OF MICROBIAL DIVERSITY AMONG HUMANS, LIVESTOCK AND PRIMATES IN WESTERN UGANDA

Kelly Klotz, Aleia Mccord (Mentor), Ecology

Previous research shows that forest fragmentation is correlated with pathogen transmission between primates and humans. In my research, I hope to elaborate on this idea and show that anthropogenic disturbances can lead to increased interspecies interactions in the Kibale National Park. Because land use change is so prevalent along the perimeter of Kibale, humans and primates have an increased risk of interaction. I'm hoping to discover that this close proximity directly affects how similar microbial diversity is between these species. To accomplish this, I am extracting DNA from fecal samples and using Automated Intergenic Spacer Analysis (ARISA), a technique used for measuring microbial diversity. Through my research I hope to see that species living closest to each other will have the most similar microbial flora.

ASTROCYTES AND SYNAPTOGENESIS: IMPLICATIONS FOR FRAGILE X SYNDROME

Joshua Knackert, A Bhattacharyya (Mentor), Waisman Center

Fragile X (FX) syndrome, the most common inherited mental impairment disorder, is characterized by a large spectrum of physical, intellectual, and behavioral impairments. Symptoms of FX are caused by an increase in the network of synapses, the junctions by which neurons communicate, in the brain. Astrocytes use metabolites and voltage gated channels to affect neural synapse formation and action potential propagation; synapses form sooner and at a higher rate when neurons are in the presence of astrocytes. To test the hypothesis that FX astrocytes increased synapses, control human embryonic stem cell derived neurons were co-cultured with human neural progenitor cell derived control and FX astrocytes. A computer readout showing a higher density of synapses between the neurons co-cultured with FX astrocytes will confirm the hypothesis.

THE ROLE OF MATRIX METALLOPROTEINASE-2 IN NEUROPATHIC PAIN

Hanna Knurr, Gurwattan Miranpuri (Mentor), Neurological Surgery

Neuropathic pain (NP) is a chronic pain disorder caused by neural damage that significantly lowers quality of life, currently lacks an effective medical treatment and its mechanisms are currently unknown. This study is a part of an investigation of a possible mechanism for the expression of NP, specifically the role of a matrix-metalloproteinase (MMP-2) protein. We hypothesize that MMP-2 plays a vital role in the NP pathway, therefore animal models showing signs of NP will show up-regulated MMP-2 expression. Thus far, the study shows the presence of up-regulated MMP-2 in rats given a standardized spinal cord injury that show symptoms of NP. This supports the hypothesis in implicating that this up-regulation is unique to NP and, therefore, is likely to be involved in its mechanism.

PATTERNS OF MICROBIAL DIVERSITY AMONG HUMANS, LIVESTOCK AND PRIMATES IN WESTERN UGANDA

Avery Koblings, Tony Goldberg (Mentor), Pathobiological Sciences

In Kibale National Park, Uganda, encroachment of humans into forest habitats is increasing the likelihood of interspecies interactions among humans, livestock, and the forest's non-human primates, potentially increasing the risks of zoonotic disease transmission. One way to understand these interactions is to examine microbial diversity in relation to ecological overlap. I am examining relationships between fecal microbial community similarity and ecological overlap between hosts. I extracted DNA from fecal samples and analyzed the samples for microbial diversity using automated intergenic ribosomal spacer analysis. Through my research, I hope to test the hypothesis that microbial similarity is related to ecological overlap between hosts. This may help predict hotspots for new zoonotic disease emergence.

INDIGENOUS MEDICINE AND ITS RELATIONSHIP WITH MODERN HEALTH CARE IN OAXACA, MEXICO

Kristin Kopish, Kathryn Sanchez (Mentor), Spanish and Portuguese

The relationship between traditional indigenous medicine and biomedical health care is of special interest in Oaxaca, Mexico, due to the state's unusually large indigenous population. By means of an in-depth literature review and on-site interviews in rural and urban Oaxacan clinics, this project addresses several questions: What is included in Oaxacan ethnomedicine? What is the relationship between indigenous ethnomedicine and Western biomedicine in Oaxaca today, and what factors prevent or facilitate cross-cultural exchange? Finally, how has this relationship been affected by Mexico's recent national health care reforms? The results of this investigation will shine new light on the indigenous medical community of Oaxaca, and help broaden the understanding of Mexico's current position on its journey to bring modern health care to its diverse indigenous communities.

PARENTAL INFLUENCE ON LANGUAGE TRANSMISSION: DOCUMENTING LOCALITY THROUGH LANGUAGE

Heather Koski, Allen More, Christopher Spokes,
Thomas Purnell (Mentor), Linguistics

Labov claims that “children must learn to talk differently from their mothers, in a process known as vernacular re-organization” (2001:415). Thus, there should be significant differences in some aspect of speakers’ repertoire, for example, vowels, consonants or prosody. The present study addresses cross-generational transmission in related daughter-mother pairs. Vowels from conversations between researchers and younger female speakers are compared to those from conversations between researchers and each speakers’ mother to examine transmission of specific local linguistic variables. All speakers reported a dialect within Wisconsin (Eau Claire, Oconomowoc, Loyal). In addition to Labov’s vernacular re-organization hypothesis, we also test the hypothesis of cross-generational similarity, namely, the hypothesis that if speakers are becoming more alike, then differences across generations should be diminishing.

PARENTING STYLES AND CHILDHOOD OVERWEIGHT

Kelly Kotula, Susan Riesch (Mentor), Nursing

Childhood overweight continues to be a growing problem in the United States and strategies for families need to be available. The role of parenting style holds promise. We are analyzing the vast literature in nursing, medicine, psychology, nutrition, and other fields to examine trends, controversies, themes, and gaps. We inductively constructed five major themes: parenting style, measurement, family and environment characteristics, theory and behavioral interventions, and psychosocial factors. The key finding is that the authoritative parenting style of high warmth and high demandingness is associated with positive health outcomes while other styles authoritarian, permissive, and uninvolved styles are associated with negative outcomes such as childhood overweight. This literature needs synthesis to make recommendations and identify gaps for practice and research.

FOXM1 IS UPREGULATED IN RESPONSE TO OBESITY AND STIMULATES PROLIFERATION IN MOUSE AND HUMAN ISLETS

Kimberly Krautkramer, Dawn Davis (Mentor), Medicine/Endocrinology

Reduced functional pancreatic-cell mass has been identified in the pathogenesis of both type 1 and type 2 diabetes. We demonstrate that FoxM1 and its target genes are upregulated in response to obesity in non-diabetic mouse islets but not in diabetic mouse islets. Quantitative RT-PCR results show that FoxM1 stimulates cell cycle progression in both mouse and human islets by activating all stages of the cell cycle. We have generated a model of the FoxM1 transcriptional program in mouse and human islets that reveals correlations between expression of FoxM1, FoxM1 target gene expression, and body mass index. Lastly, tritiated thymidine incorporation assays and BrdU incorporation measurements in AdCMV-FoxM1b-treated islets reveal a significant increase in cell proliferation in both mouse and human islets.

TEACHING INNOVATIONS: HELPFUL OR HARMFUL TO STUDENTS?

Jocelyn Kressler, Jeffrey Henriques (Mentor), Psychology

Instructors assume that the innovations they add to their teaching will serve to improve or at the very least not hurt student performance. Performance data from more than 7,000 Introductory Psychology students over a ten-year period was used in a regression model examining the effects of a number of course innovations. While clicker questions, lecture outlines, and practice quizzes were all associated with increases in test scores, online lecture slides, podcasts, and out of class assignments were associated with declines in performance. It is hypothesized that such resources give students the idea that rigor is unimportant and can substitute for reading the textbook, attending class and taking notes. Future studies could investigate whether different types of students get different benefits from these innovations.

MODERATION IN AN ONLINE GROUP PROBLEM-SOLVING ENVIRONMENT FOR BIOMEDICAL ENGINEERING STUDENTS

Courtney Krueger, Regina Nelson (Mentor), Biomedical Engineering

Students in biomedical engineering who take physiology as part of their curriculum have different learning needs than those who are not in engineering, and are predicted to excel in a peer-moderated learning environment as opposed to an unmoderated learning environment. Using online modules and group problem-based learning in an online Second Life environment, their performance will be evaluated based on how completely the group has completed the given task. The two groups will be compared using a rubric that will be constructed after the groups have completed the group problem solving task. It is expected that a moderated learning environment will improve their problem solving skills in the online environment.

ECONOMIC DECISION-MAKING IN PSYCHOPATHY: A COMPARISON WITH VENTROMEDIAL PREFRONTAL PATIENTS

Michael Kruepke, Michael Koenigs, Joseph Newman (Mentor), Psychology

Psychopathy, a disorder characterized by antisocial-behavior and emotional dysfunction, may be subdivided by symptom clusters (Factor 1, Factor 2) or by etiology (primary-secondary psychopathy). Neurobiological theories regarding the mechanisms behind psychopathy have focused on the ventromedial prefrontal cortex (vmPFC); however, few studies have investigated the relationship between vmPFC function and psychopathic subtypes. Here, in administering two economic decision-making tasks (Ultimatum Game, Dictator Game) to a group of prisoners (n=47) we found distinct response patterns pertaining to the various subtypes of psychopathy. Moreover, we found that primary psychopaths' response patterns were quantitatively similar to those of patients with vmPFC lesions. These findings lend credence to speculation regarding vmPFC dysfunction in psychopathy and highlight the importance of distinguishing primary and secondary psychopathy when testing etiologically-relevant hypotheses.

PHYSICAL ACTIVITY AS A PREDICTOR OF ANEMIA AND QUALITY OF LIFE AMONG S TEM CELL TRANSPLANT RECIPIENTS

Caitlin Kuck, Erin Costanzo (Mentor), Psychiatry

Cancer patients recovering from hematopoietic stem cell transplantation (HSCT) have impaired quality of life, and re-engaging in physical activity may help to improve quality of life. We examined the amount and type of physical activity reported by 135 cancer patients at the UW Cancer Center during the 6 months following HSCT, and how physical activity affected fatigue, depression, and anemia. Results indicated that autologous transplant recipients reported low physical activity levels initially but increased so that 56% of patients met recommended exercise guidelines at 6 months post-transplant. However, physical activity remained low among allogeneic transplant recipients. Relationships between physical activity and health and quality of life outcomes were also analyzed. Results have implications for advising patients on the benefits of physical activity after HSCT.

MAPPING THE FUNDAMENTAL NICHE FOR THE EASTERN INDIGO SNAKE

Elizabeth Kuckuk, Warren Porter (Mentor), Zoology

The Eastern Indigo Snake, native to Florida and Georgia, is the longest snake in North America. They are non-venomous docile creatures, but fall under the U.S. Fish and Wildlife Service's Threatened Species list after years of illegal captures and environmental hazards. Right now, there is no field data on the Eastern Indigo snake relevant to how they function in their environments. We hope to change this with our research by using a computer program called the "Niche Mapper" which takes the animals' basic metabolic needs, behaviors, and body type to predict where the animal can live and reproduce. With this, the species' current environment could potentially be recreated in a place where they would no longer be threatened.

THE MEDICAL HOME: COMMUNICATION REGARDING THE CARE OF CHILDREN WITH SPECIAL HEALTH CARE NEEDS

Meghann Kuisle, Ana Schaper (Mentor), Nursing

The Medical Home model uses a shared plan to enhance care for children. Communication between the Medical Home team and school has provoked controversy. The purpose was to determine the perceived benefits and detriments of communication between the Medical Home team and school. Methods: The sample included parents of children with special health care needs. A qualitative design using focus group and interview data extended previous research. Results: Content analysis using NVivo software identified similar themes. Parents repeatedly expressed need for control of shared information. Conclusion: Emerging electronic modalities support health-care communication. Nurses need to engage parents in deciding what should be shared.

SATRA GRAPHICAL USER INTERFACE

Eric Kulcyk, Yael Landsman (Mentor), Physics

IceCube, a telescope under construction at the South Pole, will search for neutrinos from the most violent astrophysical sources: events like exploding stars, gamma ray bursts, and cataclysmic phenomena involving black holes and neutron stars. SATRA, an offshoot project of IceCube, uses radio antennas located at the South Pole to more efficiently search for neutrinos in a higher energy range. The goal of this project is to develop a graphical user interface (gui) to connect to, interact with, and perform monitoring and calibration tests on the SATRA sensor modules. The data from the South Pole can be collected using the gui and then analyzed using the data analysis program Root to look for sources of natural and artificial disturbances.

**PODCASTS AND CLICKERS ARE FINE,
BUT UNPREPARED STUDENTS DON'T SEE
THE USE OF LECTURES AND TEXTBOOKS**

LyriSSa Kusse, Jeffrey Henriques (Mentor), Psychology

Students in four sections of introductory psychology, n=1,170, were asked about the utility of traditional teaching tools (instructor, lectures and textbooks) versus nontraditional teaching tools (clickers, podcasts and online lecture slides). Students, who felt unprepared for college (24.8%), differed from their peers in their perceived utility of these tools. While there was no group difference in the usefulness of the novel tools, underprepared students found traditional teaching tools to be less helpful than did prepared students. Underprepared students also reported significantly smaller learning gains than their prepared peers. These results suggest that, rather than adding new approaches to their teaching, instructors could best assist their underprepared students by helping them learn to make better use of these traditional tools.

**MONOCYTE-DERIVED BOVINE MACROPHAGES
CLEAVE NETS PRODUCED BY LKT-ACTIVATED
BOVINE NEUTROPHILS**

Andrea Kutny, Nicole Aulik (Mentor), Microbiology

Mannheimia haemolytica is the causative agent of pleuropneumonia in cattle. The most important virulence factor is the leukotoxin that causes cell death to leukocytes. *M. haemolytica* infection is characterized by macrophage degranulation and chemokine production, neutrophil recruitment and activation, fibrin deposition, and consolidation of the lung. Here, we propose that bovine macrophages are capable of breaking down their own macrophage extracellular traps (METs) and neutrophil NETs. Our first aim will examine if macrophages break down their own METs. Our second aim will examine if macrophages are capable of breaking down NETs produced in response to *M. haemolytica*. In conclusion, we believe that macrophage clearance of extracellular DNA is important for the clearance of the pathogen and resolution of the inflammatory state of the lung.

CHARACTERIZATION OF LAEA, A GLOBAL REGULATOR OF SECONDARY METABOLITES IN ASPERGILLUS

Alex La Reau, Graeme Garvey (Mentor),
Medical Microbiology and Immunology

The members of the *Aspergillus* genus of fungi are ubiquitous throughout nature, and they present both a threat and a possible benefit to global human health. Several *Aspergillus* species produce aflatoxins—the most potent naturally-occurring carcinogens know—and are implicated in increased incidences of some cancers, especially in developing countries. Conversely, the *Aspergilli* also produce a wide array of compounds with current and potential benefits to human health. The discovery of *laeA*—a global regulator of secondary metabolism in *Aspergillus*—led to a slew of questions about the mechanism behind its function and its interaction with other regulatory proteins. My project focuses around the elucidation of *laeA* regulation in the cell. We present evidence for a possible region of regulation.

DETERMINING AND EVALUATING THE EFFECTS OF A POSSIBLE THERAPEUTIC DRUG FOR RETT SYNDROME

Maxine Lam, Qiang Chang (Mentor), Genetics

Mutations in the methyl-CpG binding protein 2 gene (*Mecp2* gene) lead to Rett Syndrome (RTT), a neurodevelopmental disease that predominantly affects girls (one in 10,000–15,000) with no current cure or effective treatment. Brain-derived neurotrophic factor (BDNF) is the only MeCP2 target gene whose role in RTT disease progression has been studied *in vivo*. MeCP2-null mice models for RTT express less BDNF and overexpression of exogenous BDNF in the brain delays pathogenesis. However, BDNF is a poor pharmacological agent as it cannot cross the blood-brain barrier, whereas 7,8-dihydroxyflavone (DHF) is a small molecule and mimics BDNF. The project tested subcutaneous and oral treatment of DHF on RTT mouse models and found it prolonged lifespan and normal locomotor activity. We also present preliminary findings on respiratory activity.

EXACT CALCULATIONS OF ENTANGLEMENT SUDDEN DEATH IN NON-INTERACTING AND INTERACTING QUBITS

Alex Lang, Robert Joynt (Mentor), Physics

Quantum computers, using quantum bits or qubits, are the next possible computing revolution. Entanglement is a property of qubits that is extremely sensitive to environmental noise and has non-intuitive properties like entanglement sudden death (ESD). Exact calculations describing qubits' interaction with noise were impossible until the recent invention of a transfer matrix method. I have used the new method to address two questions. First, what effect does environmental noise have on entanglement and specifically when can ESD occur? The second question is comparing how non-interacting and interacting qubits respond to noise. These answers provide insight into entanglement and entanglement sudden death, key aspects of quantum computers.

KINDLING, EPILEPSY, AND SEIZURE UNPREDICTABILITY

Tomer Langberg, Thomas Sutula (Mentor), Neurology

Kindling is a method of repetitive seizure inducement leading to the state of epilepsy. By kindling rats twice daily, they will eventually become epileptic. There are five classes of seizures that appear; these are ordered 1–5, five being the most severe. After roughly 100 Class V seizures, a rat may be epileptic. The class of seizure is determined through direct observation and by EEG analysis. Once a rat is epileptic, the hippocampal region of the brain is studied for its plasticity, development, and memory. Multiple methods are used to examine this: physiological, behavioral, anatomical, molecular, and genomic. This study is highly crucial because of the most feared factor of seizures and epilepsy: its unpredictability.

ANALYSIS OF UNDERGRADUATE PERCEPTIONS OF THE BIOLOGY EXPERIENCE AT UW–MADISON

Colin Laska, Sarah Miller (Mentor), Bacteriology

The field of biology is constantly growing and changing, and as a result, the methods used to teach biology also need to be evaluated and updated. To observe which areas of biological instruction need the most improvement, we interviewed and video recorded a diverse pool of forty undergraduate students who are majoring in or planning to major in biology. Interview questions covered elements such as instruction, curriculum, assessment, and context, all with the intent of answering the research question: “How do undergraduates perceive the undergraduate biology experience at UW–Madison?” Interview responses were analyzed to identify trends in the students’ perceptions about the learning experience and the relevance of the biology curriculum. In addition, students offered recommendations for teaching, such as their own preferences for test formats.

ENVIRONMENTAL AND TEMPORAL EFFECTS ON SOIL CARBON DIOXIDE EFFLUXES IN BIOENERGY CROPPING SYSTEMS

Brianna Laube, Christopher Kucharik (Mentor), Agronomy

Because atmospheric carbon dioxide (CO₂) contributes to global climate change, understanding carbon cycling in agroecosystems has become increasingly important. I addressed two major questions: 1) How does soil CO₂ efflux vary over diurnal and seasonal timescales in bioenergy crops; and 2) What effects do soil environmental conditions have on soil respiration? We used a portable infrared gas analyzer, portable soil moisture and temperature probes, and automated belowground temperature and moisture sensors to collect data in corn, hybrid poplar, prairie, and switch-grass systems at the Great Lakes Bioenergy Research Center biofuels site (Arlington, Wis.) from July 2009–January 2010. Understanding the relationship between CO₂ effluxes and environmental conditions is necessary for improved modeling of carbon cycling and in determining the sustainability of bioenergy crops.

CAN PARENTS PROMOTE THEIR TEENS' ACADEMIC MOTIVATION IN STEM COURSES?

Angwei Law, Judith Harackiewicz (Mentor), Psychology

Rapid technological advancements underscore the importance of a strong STEM education. Parents may be able to aid their teens in this regard, although their role has largely been unexamined. In the current research, we examine whether parents' education level and knowledge about the utility value of math and science courses predict the number of conversations they have with their teens about STEM courses, their teens' values and academic interest, and finally, if these effects are moderated by the quality of the parent-teen relationship. We will conduct multiple regression analyses to test predictors of conversations, teen values and interest. We predict that high parental utility value knowledge, coupled with high parent-child relationship quality, will be the most effective in augmenting teens' academic interest and motivation.

THE EFFECTS OF ANXIETY ON FEAR AND DISGUST PROCESSING

Greta Leemkuil, Wen Li (Mentor), Psychology

This research examines how fear and disgust stimuli are perceived by anxious individuals using electroencephalography (EEG). Anxious participants react with heightened fear levels to threatening stimuli, known as event-related potentials. The project also explores how individual levels of disgust sensitivity modulate responses to disgusting images. Using EEG to assess brain response, participants complete two tasks, first seeing if the emotional content of a black and white photograph affects a visual search task, and second looking at perceived distance of a fictional figure from the participant. This research hopes to gain insight into how individuals distinguish general fear-related processes from disgust-relevant emotional perceptions. Results may provide insight to better understand phobias, obsessive compulsive disorder, and other anxiety-driven disorders.

**RAPID ACTION OF ESTROGEN
ON CALCIUM OSCILLATIONS IN PRIMATE
GNRH NEURONS AND ERBB FAMILY RECEPTORS**

James Lehman, Ei Terasawa-Grilley (Mentor), Pediatrics

Estradiol (E2) rapidly increases $[Ca^{++}]$ oscillation frequency in primate gonadotropin releasing hormone (GnRH) neurons. Cancer cells studies suggest that E2 exerts its rapid effects through trans-activation of EGFR (ErbB1), a member of the ErbB family of receptors which bind EGF-like ligands. We found that EGF-induced stimulation of oscillations is similar to that of E2 and that the ErbB inhibitor AG1478 abrogates E2's effects, suggesting that this rapid stimulation of GnRH neurons by E2 is partially dependent on EGFR or other ErbB receptors. This is an immunohistochemical study of ErbB1 expression in the macaque hypothalamus and embryonic macaque brain. The results indicate that ErbB1 is not colocalized in GnRH neurons, but we are currently examining a possible role for ErbB4.

**DOES INDIVIDUALITY INCREASE SUCCESS
OF INVADERS? INDIVIDUAL DIET
SPECIALIZATION IN RUSTY CRAYFISH**

Gabrielle Lehrer-Brey, M. Jake Vander Zanden (Mentor), Zoology

Invasive species are a threat to the biodiversity of ecosystems. The rusty crayfish is an example of an invasive species that has negatively impacted freshwater ecosystems by reducing the densities of native species and their resources. In the presence of high competition from their own species, theory suggests that individuals should specialize to minimize competition. We hypothesized that individual rusty crayfish will have more specialized diets in lakes with higher population densities. To test this, rusty crayfish were collected and their gut contents were analyzed. Results support our hypothesis, indicating that individual diet specialization increases with crayfish density. This suggests that as population density increases and resources decrease individual crayfish become more specialized to decrease within-species competition. This may contribute to their success as invaders.

EFFECT OF DRAG-REDUCING ADDITIVES ON BLOOD FLOW

Josephine Lembong, Michael Graham (Mentor),
Chemical and Biological Engineering

Long-chain polymer molecules, known as drag-reducing additives, have been known to have beneficial effects on blood flow. To gain understanding of these observations, we studied the behavior of blood flow in glass microfluidic flow systems. Visualizations of red blood cells were done using phase contrast microscopy. The effect of polymer additives on blood flow was studied by monitoring depletion layer near the channel walls. An increase in this layer thickness was observed for flow without polymers as wall shear rate increases. Results for flow with and without polymers were compared. By understanding how polymer additives affect the depletion layer thickness during flow, our ultimate goal of this project is to develop a rationale for the design of new therapies for blood circulatory disorders.

POPULAR DISCOURSE ON HOMOSEXUALITY IN POST-SOVIET RUSSIAN FILM

Cecilia Leugers, Karen Evans-Romaine (Mentor),
Department of Slavic Languages

Post-Soviet Russian discourse on homosexuality through film often reflects changing political and social atmospheres and communicates a variety of messages to the public through accessible means. This research investigates LGBT themes in a selection of Russian films in an attempt to analyze the nature of the filmmakers' intended contributions to public discussion or social change. I will argue that these films elaborate on the myriad social issues surrounding homosexuality in Russia by depicting same-sex desire as a symbol of the experience of the 'other' in Russian society, determination of post-Soviet identities, crises of masculinity, and the conflict between Eastern and Western influences in modern day Russia.

OVER-EXPRESSION OF DIACYLGLYCEROL KINASE ZETA IS SUFFICIENT TO INDUCE SKELETAL MUSCLE HYPERTROPHY

Hannah Lincoln, Troy Hornberger (Mentor), Comparative Biosciences

Skeletal muscle atrophy, or loss of muscle mass, is of substantial concern in today's aging population. Research aimed at reversing atrophy is of increasing interest to pharmaceutical companies because atrophy is closely associated with many diseases common in today's society such as cancer, AIDS, and some forms of heart disease. Recent studies from our lab suggest that activation of signaling by the mammalian target of rapamycin (mTOR) can induce skeletal muscle growth. Furthermore, these studies suggest that phosphatidic acid (PA) could serve as a pharmacological target for activating mTOR in skeletal muscle. Thus, the purpose of this study is to test whether over expression of diacylglycerol kinase (an enzyme that synthesizes PA) is sufficient to drive skeletal muscle growth and prevent muscle atrophy.

SIMPLIFICATION OF DESCRIPTION OF DYNAMICS IN COMPLEX BIOMOLECULAR NETWORKS WITHOUT INFORMATION LOSS

Chengyu Liu, Dermot Haughey, Nader Sheibani, Hesam Torabi,
Amir Assadi (Mentor), Mathematics

Post-genomic biology is confronting the challenge of organization of massive data from experiments and extraction of the most relevant biological information within a 'reasonable time and cost.' Systems biology offers the prospect of major impact on biology provided it meets the challenge of 'data deluge.' This project explores novel methods for design of algorithms that could save research time and resources by means of 'Semantically Lossless Compression' (SLC) of molecular systems biology data. Preliminary results indicate the theoretical existence of accurate and effective SLC algorithms. Our preliminary empirical results approximate SLC algorithms by compromising a relatively small information loss in the description of patterns of dynamics in genomic-proteomic-metabolomic networks of endothelial cells.

APPLICATION OF MULTI-POTENT ADULT STEM CELLS IN ALS THERAPY

Melissa Lorenc, Masatoshi Suzuki (Mentor), Comparative Biosciences

Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease that causes the progressive loss of brain and spinal cord motor neurons and their connection to the muscle. The primary goal of the research is to provide growth factor delivery to neurons by transplanting stem cells into the skeletal muscle and spinal cord to prevent neuronal degeneration. In the present study, the hypothesis is that human multipotent adult progenitor cells (hMAPCs) could show myogenic potential *in vitro* and *in vivo*. To test this possibility, hMAPCs will be maintained in the differentiation medium for two weeks to determine whether these cells can differentiate into myotubes. Next, is to determine whether hMAPCs can survive and integrate into pre-injured rat muscles following transplantation.

COMPONENT OPTIMIZATION OF RUTHENIUM DYE-BASED SOLAR CELLS

David Lubin, Kyle Lara, Yukihiro Hara (Mentor), Materials Science

Solar energy is the key to sustainability of the future generations. Currently, solar light conversion devices are too expensive to be implemented on a large scale. Dye-sensitized solar cells (DSSCs) are a low-cost alternative to these expensive silicon based solar cells. Many problems exist with the current generation of DSSCs, most prominently, low efficiency. This study focuses on optimizing existing components of the DSSC stack including the vital ruthenium dye concentration and film thickness of metal oxide. The metal oxide films were deposited using electrophoretic deposition method—a novel approach. A 0.3 mM concentration of Ru dye and a film thickness of 15 nm yielded optimal results.

ROCK SAMIZDAT AND UNDERGROUND CULTURE IN SOVIET RUSSIA

Alec Luhn, Jo Fair (Mentor),
School of Journalism and Mass Communication

“Samizdat,” unofficial publishing and distribution of various material, was one of the most important manifestations of underground independent culture to emerge in the totalitarian Soviet Union. After the development of Soviet rock music in the 1970s, young rock fans began to publish rock magazines in samizdat. Why did they undertake such a painstaking, time-consuming endeavor that relatively few read? Research of Russian- and English-language sources, including oral interviews with rock-samizdat authors, shows that rock samizdat’s most important function was facilitating personal expression and youthful identity formation in an oppressive society. This project is intended to serve as a departure point for discussion, as only one Russian author has studied the history and culture of rock samizdat, and the subject is virtually absent from English-language literature.

PLANT CHARACTERISTICS THAT DETER SALMONELLA CONTAMINATION

James Luo, Jeri Barak-Cunningham (Mentor), Plant Pathology

Salmonella contaminated tomatoes has become a major health concern in the agricultural community. In recent years, tomato recalls due to Salmonella have been costly both to farmers as well as consumers. The Barak Lab has preliminary data from which we were able to conclude that Salmonella enterica has a tendency to colonize the trichomes of tomato plants. With this, we hypothesized that mutations in tomato plants, which cause the retardation of its trichomes, should result in lower colonization by *S. enterica*. In this experiment, we tested three mutants and the appropriate wildtypes for their resistance to *S. enterica* colonization. Knowing plant characteristics that can impact *S. enterica* colonization would allow industries to breed tomatoes that would diminish the likelihood of a Salmonella outbreak.

THE USE OF SUNSET AS A METHOD FOR MEASURING RATES OF PROTEIN SYNTHESIS IN WHOLE SKELETAL MUSCLE

Danielle Mabrey, Troy Hornberger (Mentor), Comparative Biosciences

SUnSET involves the immunological detection of puromycin in nascent peptides as a means for quantifying rates of protein synthesis (PS) in skeletal muscles. To validate SUnSET against an established technique, plantaris muscles were subjected to synergist ablation or sham surgery. After seven days, muscles were incubated *ex vivo* with a flooding dose of 3H-Phenylalanine or with puromycin. According to this established method, synergist ablation induced a 3.4-fold increase in protein synthesis while a western blot version of SUnSET revealed a 3.6-fold increase, indicating that both techniques produce quantitatively similar results. SUnSET revealed that synergist induces a 2.9-fold increase in PS when measurements were performed *in vivo*. SUnSET was also used to demonstrate that food deprivation induces a ~70% decrease in protein synthesis.

CUIDANDOME: A PROGRAM TO PROMOTE BREAST AND CERVICAL CANCER SCREENING AMONG LATINAS IN DANE COUNTY

Norma Magallanes, Janel Draxler, Lina Vera Cala, Ana Martinez-Donate
(Mentor), Department of Population Health Sciences

Breast and cervical cancer (BCC) are leading causes of cancer mortality among Latino women. Lay health advisors' (LHA) interventions are promising in addressing barriers to BCC screening among underserved populations. Cuidandome uses LHAs recruited from the Latino community to deliver culturally appropriate health education to Latinas in Dane County, Wisconsin. Since 2007, 1,186 women have participated in 150 workshops led by 25 LHAs. Preliminary data (n=274) indicate that most Cuidandome participants (mean=35 years) have not completed high school (65%), are monolingual Spanish (63%), and lack health insurance (73%). About 44% and 67% of them do not follow BCC screening recommendations, respectively. Cuidandome is effective to reach Latino women who, due to language or insurance barriers, may be out of reach for professional health care providers.

EXPLORING SENATAXIN-SEN1P HOMOLOGY

Elizabeth Malone, Karen Chinchilla (Mentor), Molecular Biology

Mutated SETX, a gene encoding the protein Senataxin, has been identified among patients with two different neurodegenerative disorders—ataxia ocular apraxia 2 and amyotrophic lateral sclerosis 4. *Saccharomyces cerevisiae* protein, Sen1p, was determined by cross-organism comparison to have two domains of homology with Senataxin: a helicase domain and a portion of the N-terminus that contains the interaction site for Rad2p, Rnt1p, and Rpb1p in yeast. We tested for similar protein networks for Senataxin and Sen1p, employing yeast two-hybrid tests that used Rad2p, Rnt1p, and Rpb1p as interaction candidates. We aim to confirm the homology of the two proteins, providing greater understanding of SETX mutation phenotypes.

“MODE LOCKING” IN THE DIII-D NUCLEAR FUSION DEVICE

Shifan Mao, Francesco Volpe (Mentor), Engineering Physics

DIII-D, located in San Diego, is a tokamak machine researching on nuclear fusion. The DIII-D device is studying fusion in high temperature, magnetically confined plasmas. The purpose of this project is to gain a better understanding of the plasma behavior in DIII-D. High pressure, necessary for fusion, has the drawback of developing a helical structure called “mode” in the plasma. If the rotation of the mode comes to a halt, the mode is said to be locked. Locked modes deteriorate confinement and often disrupt the plasma. Certainly such an event is not wanted. The goal of the project is to construct a database which correlates various plasma parameters along with the mode locking events, to find when the mode tends to lock. The result can be utilized to suppress or avoid locked modes in DIII-D and future devices such as the international ITER device under construction in France.

THE EFFECT OF LARVAL IMMUNE EXPERIENCE ON THE SUSCEPTIBILITY OF ADULT MOSQUITOES TO MALARIA PARASITE

Abigail Mapes, Susan Paskewitz (Mentor), Entomology

Understanding mosquito biology is key to understanding the transmission of a major disease agent, the malaria parasite. Research has shown that the immune experience of a larval mosquito changes its susceptibility to malaria parasite as an adult. Though the mechanism remains to be elucidated, researchers suggest that the change in susceptibility is due to immune priming by earlier infections. We are testing whether or not immune upregulation by heat-killed *E.coli* persists into the adult *Anopheles gambiae* mosquito. The persistence of immune gene upregulation from the larval to adult stage would lend support to the immune priming hypothesis. Conversely, the lack of persistence may suggest that other interactions between the infective agent and the mosquito are responsible for the decrease in the adult mosquito's susceptibility to malaria parasite.

GENETIC INFLUENCES ON SENSITIVITY TO AVERSIVE STIMULI

Craig Marquardt, Jack Nitschke (Mentor), Psychiatry

Mood and anxiety disorders are associated with heightened sensitivity to emotionally negative stimuli. Similarly, healthy individuals at high-risk for these disorders also exhibit heightened sensitivity. The present research explored whether common genetic variants previously associated with mood and anxiety disorders could explain variability in responses to emotional stimuli in healthy, non-psychiatric individuals. Participants viewed a series of aversive and neutral pictures preceded by anticipatory cues while skin conductance, heart rate, and behavioral responses were collected. The results add to the current understanding of biological risk factors for psychopathology.

MID-LIFE DEMENTIA RISK SCORES AS PREDICTOR OF CSF BIOMARKER RESPONSE TO SIMVASTATIN THERAPY

Alyce Marsh, Cynthia Carlsson (Mentor), Department of Medicine,
Geriatrics and Gerontology

Cardiovascular risk factors at mid-life are associated with an increased risk of developing Alzheimer's disease (AD). Recently developed risk score models quantify the risk of developing late-life dementia. We sought to determine whether dementia risk scores can predict CSF biomarker changes in response to nine months of simvastatin prevention therapy versus placebo in the ESPRIT trial. Conclusion: In middle aged, asymptomatic adults at risk for AD, high dementia risk correlates to higher levels of CSF A-40 ($p=0.02$) and A-38 ($p=0.084$), biomarkers for AD. Low dementia risk scores also predict a greater decrease in p-tau-181 levels on simvastatin compared to placebo. Further research is necessary to determine how quantified dementia risk predicts response to preventive therapies and its role in clinical trial recruitment.

OSTEOGENESIS OF MESENCHYMAL STEM CELLS REGULATED BY EXTRACELLULAR MATRIX MOLECULES ON 3-D NANOFIBERS

Christopher Martin, Wan-JU Li (Mentor), Orthopedics and Rehabilitation

Extracellular matrix (ECM) molecules interact with cells to regulate cell activities, such as proliferation and differentiation. Cell-matrix interaction is one of the key molecular mechanisms directing mesenchymal stem cell (MSC) activities in a stem cell niche. Biomaterial nanofibers, shown to structurally imitate collagen fibril, can be used to substitute ECM. To better understand how MSCs are regulated and induced toward osteogenesis, we hypothesize that nanofiber scaffolds enhance osteogenesis and when coated with different ECM molecules, regulate osteogenic differentiation of MSCs with different efficacies. We will seed MSCs in 3-D nanofibers coated with collagen type I, fibronectin, laminin or vitronectin. Osteogenesis will be examined using alkaline phosphatase, alizarin red and gene analysis to identify the effective ECM coating for osteogenic induction on the 3-D surface.

ELEMENTAL ANALYSIS OF METAL ARTIFACTS FROM ANCIENT TROY WITH X-RAY FLUORESCENCE

William Marx, William Aylward (Mentor), Classics

This study assessed the value of elemental analysis with x-ray fluorescence for revealing patterns of composition in metal artifacts at ancient Troy. I focused on copper-alloy, iron, and lead artifacts from the Greek, Roman and Byzantine periods (c. 600BC to AD1300). Artifacts were studied in summer 2009 at Troy with a Bruker Tracer IV portable x-ray fluorescence scanner. Data was processed using Bruker software to allow for relative comparison of artifact composition. Visual representations of the processed data reveal general trends in elemental composition over time and across artifact function. This research shows that x-ray fluorescence technology contributes useful qualitative data to the study of material culture.

METHYLATION/DEMETHYLATION RATES IN AQUACULTURE FACILITIES THROUGH THE STUDY OF TROUT AND PERCH

Jessica Masterman, Christopher Babiarz (Mentor),
Environmental Chemistry and Technology

No data are currently available concerning mercury concentrations in rainbow trout and yellow perch farmed in the Great Lakes region. This study focuses on methylmercury because it bioaccumulates up the food chain and is a known neurotoxin. Samples of fish, fish feed, and fish detritus material from two regional aquaculture facilities were incubated for a period of up to one month to study methylation/demethylation rates as a function of decay. This presentation focuses on results for the fish material. Additionally, four targeted time points were analyzed for temperature, oxygen, pH, and conductivity. ¹⁴C acetate assays provided estimates of overall bacterial activity per sample. A Perkin Elmer 4300 DV ICP-OES was used for major ion analysis and a Perkin-Elmer lan 6100 ICP-MS for mercury analysis.

AMERICAN INDIAN LANGUAGES IN WISCONSIN

Marissa Mastrangeli, Monica Macaulay (Mentor), Linguistics

The objective of this research project was to create a database of existing manuscripts, documents, books, and other sources written in American Indian languages. Archives at the Wisconsin State Historical Society and related libraries were examined page-by-page. More than 250 documents were found resulting in data of at least 20 American Indian languages. This informational database will be distributed to linguists, historians, tribal members, and anyone else interested in its contents.

ECONOMIC IMPORTANCE OF MANGROVE ECOSYSTEMS IN WESTERN MEXICO

William Mattrisch, Eric Brown, James Berkelman (Mentor),
Forest and Wildlife Ecology

Mangroves are one of the most biologically important ecosystems in coastal areas. They contribute to energy flow between land and sea and provide vital ecosystem services, including waste processing, habitat for many species, food production, and recreation. These services have been estimated to have an annual value of US \$1.648 trillion. Despite their biologic and economic importance, mangroves are disappearing at alarming rates owing to anthropogenic causes. Following a Wildlife Ecology study abroad experience in western Mexico in January 2010, we compared the economic value of different animal species (birds, invertebrates, fishes, reptiles) that are dependent on mangroves. Intact mangrove forests have a high economic value to local communities and are especially important in western Mexico due to rising demand for coastal development.

BILLION-BODY GRANULAR DYNAMICS SIMULATION USING MASSIVELY PARALLEL COMPUTERS

Hammad Mazhar, Dan Negrut (Mentor), Mechanical Engineering

The research goal of this project is to investigate computational methods capable of predicting the dynamics of billion-body granular systems through simulation. In one cubic meter of sand, there is an average of 1.5 billion bodies. The proposed research is motivated by the desire to use direct simulation to predict the dynamics of billion-body granular systems when operated on in real-life industrial applications. Examples include the mixing of pharmaceuticals, Mars Rover mobility and pebble bed nuclear reactor simulations. The project will draw on a 5,760 core supercomputer assembled by the student investigator in the Simulation-Based Engineering Lab to provide up to 21 trillion operations per second that will be used to tackle in a spatial division approach billion body granular dynamics problems.

DOPAMINE REGULATES SCENT MARKING BEHAVIOR IN TWO CLOSELY RELATED SPECIES OF PEROMYSCUS MICE

Jeanne McCormack, Catherine Marler (Mentor), Psychology

Scent marking is important for individual recognition, and spatial distributions of urine deposits have been shown to reflect competitive ability. Highly territorial *Peromyscus californicus* and less aggressive *Peromyscus leucopus* show distinct patterns of scent marking in different social contexts with marking increases shown by *P. californicus* in response to conspecific marked arenas. Previous research indicates that dopamine is involved with regulation of physical aggression. Here we examine dopamine's effects on the non-contact competitive behavior, scent marking, in the two closely related species. Preliminary analyses suggest that dopamine alters scent marking in *P. californicus*. While in the early stages of data collection with *P. leucopus*, we hypothesize that *P. leucopus* may not experience change in scent marking because they normally do not form territories to defend.

HIGH INCIDENCE OF SLEEP DISORDERED BREATHING IN PEDIATRIC PATIENTS UNDERGOING TONSILLECTOMY

Chelsea McMorrow, Jenna Hanson, Ana Schaper (Mentor), Nursing

Since 1983, laryngeal mask airway (LMA) anesthesia has been described and utilized for tonsillectomy as an alternative to tracheal intubation. Because the LMA is not placed in the larynx, a number of complications do not occur. While several studies demonstrate the safety of the LMA, its use remains controversial. This study is being conducted to describe the safety for using the LMA by documenting 8–24 hour and 30-day patient complication rates, in particular, late bleeding and infection. We conducted a retrospective chart review of 100 children who had undergone a tonsillectomy. Results found that 75% of pediatric patients undergoing tonsillectomy have sleep disordered breathing. The results of this study will influence a proactive approach to instituting a more widespread use of the LMA within the system.

EXTRACELLULAR MATRIX COMPONENTS EXPRESSED DURING THE DIFFERENTIATION OF MOUSE EMBRYONIC STEM CELLS

Rituparna Medda, Jayne Squirrell (Mentor),
Molecular Biology and Biomedical Engineering

Embryonic stem cells (ESC) have the potential to treat a variety of medical disorders but the variability of ESC differentiation makes reaching this goal difficult. There is evidence that the extracellular matrix (ECM) plays a role in directing differentiation. To determine the ECM proteins expressed during the differentiation of mouse ESCs, I used PCR to assess the expression of ECM proteins collagen III, laminin, and collagen I. Collagen III expression begins on day 6 of differentiation and increases from that time point. In contrast, laminin and collagen I expression was observed from day 0, decreased until day 4, and then increased from day 5 through day 11. Understanding which ECM proteins are expressed during differentiation could be used to direct the differentiation of ESCs.

THE EFFECTS OF FOLIC ACID ON SPINAL CORD REGENERATION IN RATS USING THE CONTUSION MODEL

Michael Mendoza, Bermans Iskandar (Mentor), Neurosurgery

Folic acid has been shown to enhance central nervous system regeneration and repair in rat models, such as have been shown in several models that have been done in our lab. The contusion model is one such model that is used because of its similarity to real-life spinal injuries. This is important because it can ascertain the actual effectiveness and relevancy of folic acid. Functional recovery data and immunohistochemistry can help quantify the positive effect of folic acid actually and empirically prove the cogency of furthering this research into human clinical trials. It would then be possible to further study the mechanism of folic acid in CNS injury and understand how we can better heal damaged CNS tissue.

ICECUBE

Patrick Meyer, Paolo Desiati (Mentor), Physics

The IceCube project is involved with tracking the movements of subatomic particles, neutrinos, in Antarctica and using them to map the sky along with a wide variety of other projects. I specifically write programs that plot histograms from a wide array of data points such as time, zenith and azimuth angles of direction, and number of hits. This data is then used to interpret what is relevant and what has too large of an error to use. From here the data will eventually be compiled and used like a telescope to map the sky. The extent to what can all be accomplished when this project is completed is limitless. It will expand our knowledge of astronomical physics and our knowledge of quantum and subatomic physics.

TUMOR GROWTH CORRESPONDING WITH CANCER-INDUCED IMMUNE SUPPRESSION

Justin Meyers, Clifford Cho (Mentor), General Surgery

The mechanisms by which cancer may suppress the immune system are poorly defined. We have established an animal model that confirms the presence of weaker T cell responses to viral infection (LCMV) in cancer-bearing mice. To explore the mechanisms underlying this cancer-induced T cell suppression, we performed adoptive transfer experiments of resting LCMV-specific T cells into control and cancer-bearing mice at various time points. We also performed resection experiments in which established tumors were excised at various time points. We observed that a period of in vivo exposure of resting T cells to tumor resulted in the induced of suppressed expansion in response to viral infection. These findings suggest that the immune suppressive influence of cancer may be exerted early and globally.

METABOLIC ENGINEERING OF FREE FATTY ACID PRODUCTION IN ESCHERICHIA COLI

Anna Mielke, Brian Pflieger (Mentor),
Chemical and Biological Engineering

Biodiesel is an attractive alternative to traditional transportation fuels. Additionally, biodiesel is commonly derived from fatty acids produced in commercial, oilseed crops. However, fatty acids can be synthesized by bacteria, as well. In my research, I engineered a common laboratory bacterium, *Escherichia coli*, to express genes needed for the production of free fatty acids. In particular, I focused on the effects of a plant thioesterase, BTE, which produced medium chain fatty acids when induced, as well as *Escherichia coli*'s native thioesterase, TesA. I analyzed which strain produced the optimal level of protein and maximized fatty acid yields. Preliminary GC-MS data suggested the insertion of the plant thioesterase increased fatty acid yields nearly 17-fold. Comparable results were found for TesA and BTE/TesA combinations.

EFFECT OF PGC-1A OVER-EXPRESSION ON INVASIVE CAPACITY IN CANCER CELL LINES

Karl Miller, Hannah Barbian, Josef Clark, Michael Polewski,
Richard Weindruch, Rozalyn Anderson (Mentor),
Medicine, Geriatrics and Adult Development

One characteristic aspect of cancer cells is a shift in metabolism that favors alternate metabolic pathways over normal cellular metabolism. One strategy that shifts cancer metabolism back toward normal metabolism is regulation of the gene PGC-1. This shift in metabolism may be deleterious to cancer cells. Therefore, we hypothesize that increasing PGC-1 levels in cancer cells will decrease their ability to invade body tissues. Four cancer cell lines with varying levels of PGC-1 will be tested on their invasive capacity using a commercially available assay. We expect that lines with higher PGC-1 levels will be less capable of invasion. This experiment will advance our understanding of cancer cell metabolism, and with this understanding, we can contribute to new methods of both regulating and combating cancer.

SYMBIOTIC INTERACTION BETWEEN SALMONELLA ENTERICA AND PSEUDOMONAS SYRINGAE PV. TOMATO

Morgan Miller, Jeri Barak-Cunningham (Mentor), Plant Pathology

Salmonellosis has been linked to the consumption of contaminated tomatoes. Direct contamination of tomato plants with *Salmonella enterica* can result in gastroenteritis outbreaks. Previous research has shown that when *S. enterica* is introduced onto a tomato plant, the bacteria can survive but does not grow. However, it can grow on a plant co-colonized with the plant pathogen *Xanthomonas vesicatoria*, causal agent of bacterial spot of tomato and pepper. The current research will determine if *S. enterica* would grow on tomato plants in the presence of *Pseudomonas syringae pv. tomato*, causal agent of bacterial speck. Leaf samples show that *Salmonella* can survive on plants infected with *P. syringae pv. tomato*, which suggests that there is a commensal relationship between the plant and human pathogens.

PHOTOGRAPHS OF HO-CHUNK
BY CHARLES J. VAN SCHAICK IN WISCONSIN

Shaun Miller, Thomas Jones (Mentor), Art Department

This is the first book to examine Charles Van Schaick's historic photographs of the Ho-Chunk community in Black River Falls, Wisconsin (1880s–1930s). The Ho-Chunk people commissioned these studio portraits for their private use. This self-representation is notable in a period when the majority of photographs taken of American Indians were done as ethnographic studies or as a marketable commodity for tourists. The book also features essays, which provide a historical context and a cultural interpretation specific to Ho-Chunk realities. The book will reach audiences interested in history, American Indian peoples and the art of photography, in addition to serving as an excellent teaching tool.

THE POLITICS OF PARTITION

Laurel Mills, Nadav Shelef (Mentor), Political Science

One potential solution to civil wars is to partition the country experiencing conflict into two separate states. This project seeks to explain why some territorial partitions are able to end the conflict, while others are not. We believe the key differences between successful and failed partitions are related to domestic rather than interstate factors. The purpose of the project is to determine what those factors are, and how they can be applied to future cases of territorial dispute in order to minimize the risk of renewed violence. Our methods consist primarily of searching in the literature on partition for information about the domestic politics surrounding past partitions. We expect to find common factors within the circumstances affecting peaceful and violent partitions, and to draw our conclusions based on this.

PERILS OF GREEN-WASHING

Courtney Minor, Hannah Dorsky, Elisa Gassner, Erin Hamilton,
Roberto Rengel (Mentor), Interior Design

When is a product really green? While many products claim to be environmentally friendly, it is difficult to ascertain which products are legitimately green and which ones are being “green-washed,” a term used when companies deceitfully advertise their product as being environmentally sustainable. Evaluating sustainability claims requires looking at where the product came from, how it was transported and where does it go after it’s used, in short the life cycle of a product. The research our team evaluated is about the many labeling agencies in the design industry and acknowledgment of the most reliable ones.

ANTI-CD40 AND CPG-ODN ENHANCE THE ANTI-MELANOMA RESPONSE OF HU14.18K322A IN VIVO

Luangrath Mitchell, Kory Alderson, Alexander Rakhmievich,
Paul Sondel (Mentor), Human Oncology

Targeted monoclonal antibody (mAb) therapy has been beneficial for tumors with identifiable antigens. One such antigen, human ganglioside-D2 (GD2), is highly expressed in adult melanoma and pediatric neuroblastoma but has limited expression in normal tissues. We previously demonstrated that an immunotherapy regimen comprised of anti-CD40 and TLR 9 stimulation with a class B CpG-containing oligonucleotide sequence (CpG) potently activates macrophages and other cells that mediate an important mechanism of mAb therapy—antibody dependent cellular cytotoxicity. Therefore, we used a mouse model of melanoma that expresses human GD2, B78-D14, to determine if anti-tumor responses elicited by anti-GD2 mAb, hu14.18K322A, would be enhanced by the co-administration of anti-CD40 and CpG. These studies demonstrated significantly improved anti-tumor responses by the combination treatment than either single regimen.

THE EFFECTS OF EARLY VOTING ON CAMPAIGN SPENDING

Patrick Moran, Barry Burden (Mentor), Political Science

The purpose of this research is to understand the effect of early voting policies on campaign spending. Early voting is a policy adopted by several states that permits voters to cast their ballots prior to Election Day. This project aims to examine the effect of early voting on campaign spending by comparing campaign spending in states with wide access to early voting with states with limited access. Since campaign spending is difficult to measure at the state level because media markets spread across state lines, the Federal Election Commission's data on party transfers are used to quantify state-level spending. By illuminating the connection between early voting policies and campaign spending, the results will provide further understanding of the effects of early voting on the democratic process.

DISPARITIES IN TREATMENT AND SERVICES FOR AUTISM

Holly Morton, Sandra Magana (Mentor), Social Work

This research investigates disparities in access to services and treatment between Latino and white children with Autism Spectrum Disorders (ASDs). Early diagnosis is crucial for successful treatment of people with ASDs, yet research suggests that diagnosis is significantly delayed for Latino children as compared to white children. This study uses survey data to compare the timeliness of diagnosis, treatment, and services received by white and Latino children in Wisconsin, and seeks to identify barriers to accessing services. The Latino sample data was gathered in structured, in-person interviews as part of my advisor's research. A similar version of the questionnaire used with the Latino sample was mailed to the non-Latino sample. The study's findings will be valuable for creating solutions that provide a more equitable system of care for children with ASDs.

EPILEPSY: MECHANISMS OF PROGRESSION AND THE FUTURE OF SYMPTOM MANAGEMENT

Bernard Mulvey, Thomas Sutula (Mentor), Pharmacology/Toxicology

Epilepsy is a chronic illness characterized by spontaneous seizures. Studying the progression of the disease and its neurological mechanisms are crucial to developing management methods for patients. Rats have seizures induced twice daily, which rewires their brains into being more prone to future seizures. After a significant number of induced seizures, the rat becomes clinically epileptic. These rats are then used in drug tests and studies of changes in brain structure. This project produces a steady stream of specimens for physiological, behavioral, molecular, and anatomical study. This project recently revealed that a sugar, 2DG, slows harmful brain rewiring while making the brain resistant to the explosive electrical activity characteristic of seizures. We hope to examine 2DG's pharmaceutical potential in the future.

CONTROL OF WEIGHT LOSS ERROR DURING MOISTURE ANALYSIS OF CHEESE DUE TO SPLATTER WITHIN VACUUM OVENS

Jan Murray, Franco Milani (Mentor), Food Science

Bulk pricing for cheese sales is based on the moisture content of the cheese. Production facilities use NIR spectroscopy to determine cheese moisture content. NIR models are based on vacuum oven moisture analysis. Vacuum oven moisture analysis methods promote weight loss caused by product splattering out of analysis pans. This error results in excess water determination. Moisture analysis of cheese is conducted using the standard method described by the AOAC manual and an alternate method that uses foil to contain the splatter. Significant difference in moisture content between the AOAC method and foil covered pan method is determined. Possible future research into splatter loss and the resulting error during cheese moisture analysis is discussed.

MORE JAM, MORE JOBS

Jesse Mursky-Fuller, Gregg Mitman (Mentor),
Nelson Institute for Environmental Studies

When Chi Omega sorority sister Jessica Halpern finds out that buying high quality, locally produced products can help create jobs for homeless people in her town, she takes matters into her own hands. Follow Jessica and her tray of crackers as she tries to change sorority consumption patterns, and the local commodity food chain, one sister at a time—by buying Porchlight jam.

PILOT BLOOD PRESSURE SCREENING OF VILLAGERS IN RURAL KENYA

Geoffrey Mwangi, Ana Schaper (Mentor), Nursing

Hypertension is the number one cause of cardiovascular disease. If left unscreened, farmers in rural Kenya will suffer health complications leading to loss of productivity and a decrease in quality of life. The purpose was to initiate a database of vital information for building future intervention programs for hypertension management. Methods: Field study with concurrent data collection. Results: Mean blood pressure readings were acceptable. However, 67% of readings were elevated. Nutrition assessment indicated a consistent diet high in fats and salt. Overall, 60% rated their health as fair or poor. Interventions included education on hypertension (n=9) and lifestyle changes (n=11). Conclusions: Raising awareness of high blood pressure, nutritional changes and less salt intake may decrease overall hypertension in this population.

MOLECULAR IMAGING OF CANCER

Duane Myklejord, Weibo Cai (Mentor), Radiology

Cancer is the second leading cause of death (after heart disease) in the United States. The field of molecular imaging, the visualization, characterization and measurement of biological processes at the molecular and cellular levels in humans and other living systems, has flourished over the last decade. In general, molecular imaging modalities include molecular MRI (mMRI), magnetic resonance spectroscopy, optical bioluminescence, optical fluorescence, targeted ultrasound, single photon emission computed tomography, and positron emission tomography.

**FLUID SELVES, FLUID GENRES:
THE USE OF GENRE IN AUTOBIOGRAPHICAL TEXTS
BY THREE FEMALE MODERNISTS**

Sarah Nance, Cyrena Pondrom (Mentor), English

Working with three modernist writers—H.D., Djuna Barnes, and Mina Loy—I compare their autobiographical novels and memoir writings in order to explore their use of the genre. Formerly regarded as non-academic, female autobiography is now understood to be a crucial part of the feminist canon. Within this selection of modernist writing, genre evolves as lines blur between poetry and prose, fiction and non-fiction. My work explores how genre comes into play in comparing texts that an author considers memoir with a work she calls fiction (autobiographical as it may be). Furthermore, I examine how an author makes use of genre characteristics in order to confront and inscribe her conception of self, and how these genre characteristics differ between her autobiographical novels and memoirs.

**THE IMAGE OF SOUND:
THE SYNAESTHETIC EFFECTS OF MANGA**

Kimberly Newcomb, Adam Kern (Mentor),
East Asian Languages and Literature

This paper examines how visual and verbal aspects of *manga* (Japanese comic books) can be used to provide a special synaesthetic experience. By discussing the nature of sound, synaesthesia, sound effects, and Japanese onomatopoeias in comic books, it is argued that these often overlooked features of manga serve a way of communicating feelings and sounds to the reader that cannot be easily accomplished by other media, such as literature or film. This helps to demonstrate that the manga form is not “childish” or “simple” as is often maintained.

ELUCIDATING REGULATORS OF MSN2P/MSN4P TRANSCRIPTION FACTORS IN ACQUIRED STRESS RESISTANCE

Songdet Nillasithanukroh, Audrey Gasch (Mentor), Genetics

When *Saccharomyces cerevisiae*, the budding yeast, are exposed to a mild dose of one stress, they can subsequently survive much higher dose of the same or different stress. This phenomenon is termed acquired stress resistance and is known to be partly regulated by two paralogous transcription factors Msn2p/Msn4p. However, the details behind their regulation are not known in detail. We have previously identified two candidate phosphatases, PPH3 and WHI2, that may upregulate Msn2p/Msn4p in the presence of stress. To test this hypothesis, we compared gene expression patterns of single gene deletion mutants lacking either PPH3 or WHI2 to gene expression patterns of MSN2/MSN4 double deletion mutant. The result has allowed us to suggest the role PPH3 and WHI2 may play in regulation under stressful conditions.

APPLYING THE “ONE HEALTH” PARADIGM TO WESTERN MEXICO

Yushi Oguchi, Wandscheiska Torres Figueroa,
James Berkelman (Mentor), Forest and Wildlife Ecology

Zoonotic diseases are recognized as important threats to biodiversity. In Western Mexico, areas of high biodiversity often overlap with impoverished communities that rely on livestock. Common livestock practices results in close interactions between people and wildlife, which increases transmission risk of diseases such as brucellosis and rabies. We visited Western Mexico with our Forest and Wildlife Ecology 375 course in January 2010 and researched zoonotic disease control methods that could be applied to the region after our return. The One Health paradigm is an integrated approach to control diseases in the interface of humans, domestic animals, and wildlife with a goal to promote conservation of biodiversity and quality of life for people. We will discuss ways that One Health can be applied in Western Mexico.

SYNTHESIS AND ISOLATION OF ORGANOSULFATES FOUND IN SECONDARY ORGANIC AEROSOL BYPRODUCTS

Corey Olson, Frank Keutsch (Mentor), Chemistry

Secondary organic aerosol (SOA) formation is a result of the atmospheric oxidation of various volatile organic compounds and reaction of these compounds in existing aerosol. Current understanding of SOA formation is limited and improvements are necessary as aerosol has substantial health and climate effects. Numerous organosulfates have been observed in SOA, but until recently none were identified or quantified, i.e. comparison by laboratory standard. Glycolic acid sulfate has been identified in ambient aerosol via comparison with a laboratory synthesized sample by the Keutsch Group. A repeatable separation method to isolate synthesized glycolic acid sulfate and similar organosulfates will allow for use as standards for quantification and identification, providing insight into the chemical characteristics of SOA and their formation, evolution and influence on the atmosphere.

GENE SILENCING IN *C. ELEGANS*

Jose Orihuela, Scott Kennedy (Mentor), Pharmacology

The question being investigated is “How do *C. Elegans* pass information of gene silencing, independent from DNA, onto their progeny?” The phenotype being followed is the RNAi mediated suppression of Dpy-11, which passes through generations despite removal from a dsRNA source. RNA interference (RNAi) is a gene-silencing phenomenon occurring in living cells that helps control which genes are active and their level of activity. This experiment studies the inheritance of RNAi in *C. Elegans*. We have found that a number of factors, such as NRDE-3, affect the inheritance of RNAi. NRDE-3 is an Argonaute protein which serves as a catalyst for RNAi. The process of RNAi is possibly a fundamental genetic phenomenon.

COMPARATIVE EFFECTIVENESS OF DIFFERENT HIV/AIDS TREATMENTS

Erick Olson, Michelle Gooch (Mentor), Zoology

Human immunodeficiency virus (HIV) is a devastating retrovirus affecting millions of people worldwide. HIV is a highly infectious, sexually transmitted disease that attacks a cell's genetic material; specifically it's RNA. HIV can spread and mutate rapidly, thus leading to an infected person being diagnosed with acquired immunodeficiency syndrome (AIDS), the most serious stage of infection. There are three main drug classes that treat HIV/AIDS: reverse transcriptase inhibitors, protease inhibitors and fusion (entry) inhibitors. Each is used to treat a different stage of infection. HAART (high active antiretroviral therapy) is a common strategy which combines a "cocktail" of drugs. Using a comparative analysis, scholarly articles are examined to determine the effectiveness of each drug type. Results indicate the most effective treatment to prevent AIDS is HAART.

ANALYSIS OF SUCCESSION IN FAMILY BUSINESSES

Samantha Orringer, Lauren Miller, Debra Holschuh-Houden (Mentor),
Family Business Center

Seventy to ninety percent of all businesses in America are family owned. Our research will compare how family businesses operated by married couples, siblings, and family members of different generations deal with succession. Furthermore, we will analyze the complex relationships among family members and how they work together in business. We will conduct our research through surveys of various family businesses that are operated by married couples, siblings, and family members of different generations. In our research we expect to find that those companies controlled by married couples have more effective succession transitions.

THE ROLE OF PKC DELTA IN COLLAGEN TRAFFICKING

Gregory Oudheusden, Justin Lengfeld (Mentor), Surgery

Collagen plays an important role in vascular pathology, yet a detailed mapping of mechanisms involved in collagen trafficking is incomplete. High collagen content has been found to contribute to vascular disease. Protein kinase C delta (PKC δ), a serine-threonine kinase, plays a role in cellular proliferation and apoptosis within vascular smooth muscle cells. PKC δ 's role in collagen trafficking was investigated using KO mice missing the PKC δ gene, as well as WT mice. Various biochemical techniques were used, including chemical inhibition of the PKC δ gene in WT and adenovirus rescue of the PKC δ gene in KO. Experiments demonstrated that PKC δ plays an essential role in collagen trafficking, as inhibition or KO of the PKC δ resulted in the loss of the ability of vSMCs to traffic collagen to the extracellular matrix.

NECTAR REMOVAL AND ARTIFICIAL POLLINATION OF BIOCORE PRAIRIE P. DIGITALIS PROMPTS NECTAR RENEWAL

Mollie Overby, Liliana Palencia,
Janet Batzli (Mentor), Biology Core Curriculum

Pollinators perform nectar removal and pollination. Though research shows that pollinator visits prompt nectar replenishment, it is unclear whether nectar replenishment is differentially affected by nectar removal and/or pollination. We hypothesized that *Penstemon digitalis* exposed to nectar extraction would replenish nectar volumes equal to controls. We hypothesized that combinations of artificial pollination and nectar removal would stop nectar production. We exposed *P. digitalis* to four treatments to evaluate the effects of repeated nectar removal and artificial pollination. While the efficacy of artificial pollination was uncertain, results indicate that *P. digitalis* replenishes nectar after extraction and produces nectar progressively.

VERTICAL TRANSPORTATION AS HABITABLE SPACE

Michelle Oyen, Sarah Burnett, Kate Manley, Rebecca Rosenberg,
Roberto Rengel (Mentor), Design Studies

Vertical transportation elements (elevators, escalators, and stairs) are an often overlooked aspect of building design. When properly designed, they can increase productivity, appeal, and experiences while reducing mental stress. A review of literature and a few case studies provided evidence of how vertical transportation components (such as stairway landing niches) can be designed to increase social interaction, provide spaces for meditation, and allow for better overall wayfinding, which can lead to a less stressful environment.

CHARACTERIZING THE GROWTH OF A MOLD AND ITS PROKARYOTIC SYMBIONT AT EXTREME PH CONDITIONS

Daniel Parrell, Jihun Kang, Charles Kaspar (Mentor), Bacteriology

The Richmond Mine in Redding, California, is a source of diverse life. A mold that lives symbiotically with a prokaryotic partner(s) is one example. These organisms grow in a wide range of pH from 1 to 9. The goal of this research is to characterize the growth of these microbes and to define the role each member plays in the relationship. The symbiotic prokaryote(s) will be identified by 16s rRNA gene sequencing. Growth of the mold has excelled in acidic conditions using H₂SO₄ as the acidulate. The symbiont numbers appear to correlate positively with mold growth under all conditions. This study provides an example of the diversity of microbial life in extreme environments.

EOSINOPHIL GENERATION OF PROFIBROTIC GROWTH FACTOR ACTIVIN A: A CONTRIBUTOR TO ASTHMA

Roshni Patel, Elizabeth Kelly (Mentor), Pulmonary Medicine

Eosinophils contribute to asthma pathogenesis through secretion of profibrotic growth factors that cause structural changes in the airway. The goal of this study was to identify specific cytokines that stimulate eosinophil secretion of activin A, the signaling mechanisms through which these cytokines operate, and to confirm the profibrotic nature of activin A. The following methods were employed to achieve these goals: eosinophil and fibroblast cell culture, ELISA, flow cytometry, and survival assays. Results indicated that the combination of IL-3 and TNF α stimulation was the most potent activator of eosinophil-derived activin A and the MAPK/ERK pathway was the major signaling mechanism. Activin A was shown to stimulate fibroblast production of extracellular matrix proteins. Thus, eosinophils may contribute to asthma pathogenesis through IL-3/TNF-induced activin A generation.

EFFECTS OF PROGESTERONE EXPOSURE ON THE FATHEAD MINNOW (*PIMEPHALES PROMELAS*)

Evan Peissig, Terence Barry (Mentor), Animal Sciences

Concentrated animal feeding operations (CAFOs) are possible point sources of endocrine disrupting compounds. In a comprehensive survey of steroid hormones associated with CAFOs in southern Wisconsin, progesterone was consistently found at high levels (~ 300 ng/L) in water samples downstream from a cattle CAFO. To investigate the effects of progesterone on the reproduction of fathead minnows, groups of spawning fish were continuously exposed for three weeks to nominal concentrations of 0, 10, 100 and 1,000 ng/L P4, and various reproductive endpoints were measured. Other experiments were conducted to evaluate the effects of P4 on embryonic development, the cortisol stress response of juveniles, and sexual differentiation. Progesterone exposure caused a dose-dependent decrease in total egg production, number of spawns, and number of fertilized eggs.

USING CHLOROPLAST DNA (PSBJ-PETA) TO INFER THE PHYLOGENY OF OXALIS (OXALIDACEAE)

Brian Pellatt, Eve Emshwiller (Mentor), Botany

Oxalis is a genus of approximately 800 species in the wood-sorrel family, *Oxalidaceae*. Its specific diversity is highest in South America and southern Africa, though several groups have much broader temperate ranges. Previous phylogenetic research has focused on the Andean tuber crop oca (*Oxalis tuberosa*) and on the genus' radiation in southern Africa. To further understand the biogeographic and morphological evolution of the entire *Oxalis* genus, a broader array of specimens must be sampled and analyzed. Since earlier genetic analyses have shown *Oxalis* to be of South American origin, our sampling of the cpDNA locus psbJ-petA focuses on species from this region to produce a more extensive phylogenetic tree to further untangle *Oxalis*' evolutionary history.

MIDLIFE IN THE UNITED STATES II: RELATIONS BETWEEN HIPPOCAMPAL VOLUME, HEALTH, AND WELL-BEING

Lara Peschke, Stacey Schaefer (Mentor), Psychology

Researchers agree that aging is associated with atrophy in the human hippocampus, a brain structure implicated in both memory and the stress response. In our study we will examine a number of health, social, and environmental factors in terms of how they predict hippocampal volume. Some factors of interest include age, affective style, emotion regulation, stress, exercise, and memory. Our participants are adults between 35–85 years of age. The data are part of a cross-sectional, multi-site study: Midlife in the United States II. We collected magnetic resonance images of the participants, and identified each participant's hippocampal volumes using a hand-tracing technique. The volumetric data will be analyzed in combination with data from the other MIDUS sites to obtain a better understanding of how health and well-being interact with hippocampal pathology at midlife.

**NASCENT PROTEIN INTERACTIONS
WITH THE RIBOSOMAL SURFACE:
DATA FROM A NATIVELY UNFOLDED PROTEIN**

Culviner Peter, Silvia Cavagnero (Mentor), Chemistry

A full understanding of the events or conditions that separate protein folding and misfolding *in vivo* is vital to both basic and biomedical science. A crucial part of understanding the folding pathways of nascent proteins is exploring the various interactions they experience while being synthesized. Studies have implicated a wide array of molecules that interact with and encourage proper folding of nascent proteins both on and off the ribosome. Using an array of pI mutants of the natively unfolded protein domain PIR, this study explores the possible role of ribosomal surface in interacting with nascent proteins.

**THE EFFECTS OF DEMINERALIZED
BONE MATRIX ON THE DIFFERENTIATION OF HUMAN
MESENCHYMAL STEM CELLS**

Zach Pflum, Wan-Ju Li (Mentor), Orthopedics and Rehabilitation

Used clinically to regenerate bone, demineralized bone matrix (DBM) has been proven to induce osteogenesis *in vivo*. However, the mechanism through which DBM facilitates human mesenchymal stem cell (hMSC) differentiation is unknown. Further understanding of the osteogenic properties and processes of DBM *in vitro* may provide insight to the performance *in vivo*. Examining the effects of the soluble factors of DBM and the mechanism by which these factors mediate differentiation of hMSCs is essential. The specific aims of this study include classifying the differentiated cell type, identifying the soluble factors and ions that mediate the effects, and determining the role of the soluble factors in the DBM-promoted differentiation of hMSCs. We hypothesize the soluble factors of DBM modulates the differentiation of hMSCs.

S. ENTERICA FUNCTION UNKNOWN GENES INVOLVED IN PLANT SURVIVAL

Chau Phan, Jeri Barak-Cunnngnam (Mentor), Plant Pathology

Plants have become the vector for many human pathogens such as *Salmonella enterica*. *S. enterica* causes one of the most common foodborne illnesses in America, salmonellosis. These human pathogens are able to colonize plants due to specific genes. However, how many of these genes operate is unknown. The research project proposed is to screen *S. enteric* mutants of unknown function and identify those with a plant survival phenotype. Following gene identification, gene function will be characterized. Understanding the functions of the genes that optimize plant colonization will answer many questions about the genetics and physiology of the human pathogen outside a warm-blooded host. Without knowledge of how Salmonella has adapted to survive in this environment, it will be impossible to reduce human illness.

INCIDENCE OF ESOPHAGEAL ADENOCARCINOMA IN AFRICAN AMERICAN MALES IN WISCONSIN: TRENDS FROM 1996–2008

Sarah Phillips, Anai Kothari (Mentor), Medical School

Adenocarcinoma has replaced squamous cell carcinoma as the most common type of esophageal cancer (EC) in the United States. In African Americans, squamous cell carcinoma continues to be predominant, yet rates of incidence are rapidly declining. From 1996–2008 in the state of Wisconsin, the overall incidence of EC in the African American population has fallen over 50%, however the incidence of adenocarcinoma has slowly been growing. The purpose of this study is to observe the changing pattern of esophageal adenocarcinoma in black males in Wisconsin with the goal of identifying risk factors pertaining to this increase. We hypothesize that a decrease in smoking and alcohol consumption, combined with a rise in obesity in this population are contributing to these trends.

GOING GREEN: STRATEGIES FOR ACHIEVING LEED PLATINUM IN THE SCHOOL OF HUMAN ECOLOGY

Jane Pickell, Ashley Carmichael, Melody Ginther, Jenna Mattison,
Roberto Rengel (Mentor), Design Studies

This poster addresses strategies used by UW's School of Human Ecology to incorporate sustainable design practices in its addition and renovation. The Leadership in Energy and Environmental Design (LEED) rating system was used as a guideline for design development. Specific design strategies aimed at achieving LEED Platinum status are presented and discussed. Focused interviews with project users and the project's design architects provide documentation and insights. Findings show how the preservation of the natural environment and the drastic reduction the school's carbon footprint improve quality of the resulting built environment.

ENVIRONMENTAL EDUCATION'S IMPACT ON WILDLIFE CONSERVATION THROUGHOUT THE AMERICAS

Brittany Pietrantonio-Davis, Jacklyn Millenbah, James Berkelman
(Mentor), Forest and Wildlife Ecology

Environmental education is believed to be important in the conservation of wildlife and their habitats, but its effect on the environment is not well documented. We visited Mexico with our Forest and Wildlife Ecology 375 course in January 2010 and researched literature on environmental education programs throughout Mexico and the southwestern United States after our return. We examined the relationship between environmental education and public support for wildlife conservation. We predict that there will be a positive correlation between the number of environmental educational programs and the amount of wildlife habitat conserved in any given area. Better documentation of this relationship will allow governments to allocate funds to environmental education more appropriately.

NEURAL CORRELATES OF SOCIAL FEEDBACK PROCESSING IN CHILDREN

Rista Plate, Seth Pollak (Mentor), Psychology

Understanding how children process feedback may highlight methods for giving effective and constructive feedback. This study's purpose was to examine if the domain of feedback (social or non-social) relates to differences in children's behavior and physiology. Twenty-four 8–9 year old children performed a rule switch task and received feedback indicating the accuracy of their responses. We measured electroencephalogram and children's behavioral responses. Event-related potentials time-locked to the feedback onset will be examined. The P3, an attention-related component, is of particular interest. We expect children will have larger P3 amplitudes to negative versus positive feedback, particularly following social stimuli. The results of this investigation may have implications for understanding the impact of social feedback on children.

AN INVESTIGATION OF THE ROLE OF INTEGRINS IN THE OSTEOGENESIS OF HUMAN MESENCHYMAL STEM CELLS

Brock Polnaszek, Wan-Ju Li (Mentor), Orthopedics and Rehabilitation

Extracellular matrix proteins have been found to regulate osteogenesis (OG) in human mesenchymal stem cells (hMSCs). Our preliminary study showed that the expression of integrins decreased as OG progressed. This suggests the regulation of integrins may play an important role at the early stage of OG. However, the molecular mechanism and the role of the integrins in OG are not yet understood. In this study, the role of integrins will be examined through blocking the activity of the integrins and the downstream signaling pathways. By blocking this pathway, the role of the integrins in regulating OG will be established. Understanding of this mechanism will strengthen the potential of hMSCs in regenerative medicine for treatments of various bone diseases.

CONFLICTING FEMININITIES: PORTRAYALS OF WOMEN WORKERS IN WWII ADVERTISEMENTS

Nicole Powers, Nan Enstad (Mentor), History

The purpose of this investigation is to determine why private advertisers during WWII portrayed women workers differently in national magazines aimed only at women compared to those aimed at both genders. Using visual culture analyses and comparing these evaluations with booklets from government information programs, it is clear women's magazines addressed realistic concerns, promoted equality with men, portrayed working in a cheerful light, and spoke to complex identities of women. On the other hand, magazines aimed at both men and women addressed stereotypical concerns, displayed men as superiors, portrayed working as a dutiful sacrifice, and used generic conventions of feminine identity. The inclusion of men as readers significantly changed the portrayal of women workers because private advertisers could not risk alienating male consumers by challenging traditional gender roles.

PHYSICIAN BARRIERS TO EFFECTIVE GESTATIONAL WEIGHT MANAGEMENT COUNSELING IN LOW-INCOME, OBESE WOMEN

Kristin Prewitt, Gloria Sarto (Mentor), Obstetrics and Gynecology

There has been an increase in the incidence of overweight and obese women of childbearing age. Fifty-seven to seventy percent of overweight and obese pregnant women exceed gestational weight gain guidelines. Little has been done, however, to identify the barriers to healthy diet and lifestyle behaviors in those at highest risk for excessive weight gain (low-income obese women) or the barriers to effective weight management counseling by their obstetric providers. Identifying and eliminating the perceived barriers of effective nutritional and behavioral counseling by the obstetric providers is essential to decreasing maternal and fetal complications in low-income, obese and overweight women.

THE DUALITY OF ACHIEVEMENT

Luke Pribbenow, Amanda Godbee (Mentor), English

Achievement can be defined as attaining a desired end or level of performance or, alternatively, as striving or making an effort. This duality of definition inspires an examination of what constitutes achievement in the writing process, particularly when writers collaborate. Based on three case studies of writer-tutor pairs, I find achievement can be reached when writers form close relationships, thus eliminating anxieties that limit self-confidence. My findings emerge from empirical research based on interviews, observations, and videotaped instruction. I have identified themes such as collaboration, anxieties, and confidence that allow for understanding of how relationships improve writing and social skills. Findings from this study show different ways writers experience the duality of achievement and how writers and tutors can help each other achieve.

COSMIC RAY ANISOTROPY IN SOLAR TIME

Craig Price, Paolo Desiati (Mentor), IceCube Research Center

Using IceCube, a large particle detector located under the surface of the South Pole, we studied the cosmic ray plasma that surrounds the earth. Specifically, we observed the change in frequency of incoming cosmic rays depending on the relative motion of the earth. With respect to the motion of the earth around the sun, we observed an excess of cosmic ray events in the direction of the earth's motion and similarly a deficit of cosmic rays in the direction that was pointed away from the movement of the earth.

DIRECTING THE FATE OF NEURAL STEM CELLS WITH ENGINEERED GRADIENTS OF FGF-2

Alexandra Procak, Thomas Keenan (Mentor), Neurology

Our research consists of examining FGF-2 gradients created in microfluidic devices to see if proliferation, differentiation and migration of human neural stem cells will lead to the layered architecture of the early cerebral cortex. The research involves creating and seeding microfluidic devices, staining cells, and taking and analyzing images to observe the proliferation, differentiation and migration of the cells. These images allow for viewing of the graphical position of developing cells within the microfluidic devices, as well as viewing the tissue architecture within the devices in order to recreate this environment *in vitro*. By analyzing the images we hope to better understand the relationship between gradients and early cortex development.

THE USE OF GLYCOLYSIS INHIBITING DRUGS TO PREVENT THE DEVELOPMENT OF POSTTRAUMATIC EPILEPSY

Alexandra Puk, Thomas Sutula (Mentor), Neurology

Severe head injuries often result in posttraumatic epilepsy. A ketogenic diet (isocaloric replacement of carbohydrates with fat and protein) has been shown to have an anticonvulsive effect, which the drug 2-deoxy-D-glucose (2DG) mimics. We hypothesize that 2DG will prevent development of post-traumatic epilepsy after severe head injuries. To test this hypothesis, one group of rats will receive a dose of 2DG immediately before a head injury and then doses for fourteen days following, while a control group receives saline over the same interval. The rats will be observed for six months using videos and EEGs simultaneously to record brain waves and signs of seizures. We expect the control group will develop epilepsy, while the 2DG groups will not—suggesting possible use of 2DG for injured soldiers.

ADOLESCENT'S DISPLAY OF DEPRESSION ON FACEBOOK: THE KEY TO DIAGNOSIS?

Megan Pumper, Megan Moreno (Mentor), Pediatrics

This study focuses on depression in adolescents because it is a common issue that is rarely treated, especially in this age group. Depression was examined by coding publicly displayed profiles on Facebook from a sample of college students ages 18–20. Facebook profiles were looked at for depression, a status update count was done, and the mean number of status updates was then examined by comparing depression displayers and non-depression displayers. Of 252 profiles evaluated, 59.9% male and 49.2% whom are from Wisconsin, 25% displayed depression. The mean number of status updates for displayers was 19.1 (+/-17.9) and for non-displayers 9.2 (+/-12.5) ($p=0.00$). In conclusion, college students who display depression may be using Facebook as a way to express depression.

WELFARE EFFECTS OF MERGERS IN THE AIRLINE INDUSTRY: A QUANTATIVE ANALYSIS

Richard Qian, Raymond Deneckere (Mentor), Economics

The U.S. airline industry has experienced a number of significant shocks including four major bankruptcies and two major mergers in this century. This paper studies the welfare effects of merger in this industry by building a structural industry model. We adopt a discrete choice model on the demand side in which markets are defined as a unique origin and destination pair and products are defined as the combination of the route and the carrier. On the supply side we introduce a variable for regional capital to account for long-run effects of mergers. We estimate the model using several quarterly U.S. domestic flight data and simulate the effects of potential mergers.

EFFECTS OF GAP SIZE AND AGE ON CARBON AND NITROGEN CYCLING IN HARDWOOD-HEMLOCK ECOSYSTEMS

Ravin Raatz-Robinson, Sarah Schliemann (Mentor),
Forest and Wildlife Ecology

Forest gaps in old-grown northern hardwood-hemlock forests lead to higher solar radiation, soil temperatures and soil moisture which causes dramatic fluctuations in the bio-geochemical cycle, particularly in the case of carbon and nitrogen. However, it is unclear as to what extent gap size and age affect these nutrient cycles. In this project we set out to explore how the increased decomposition and mineralization in forest gaps of different maturities and sizes impact these processes through the analysis of carbon and nitrogen in vegetation, coarse woody debris, and forest floor organic matter.

THREE INCARNATIONS OF THE “MAGICAL GIRL” OF MANGA

Stacy Raddatz, Adam Kern (Mentor), East Asian Languages and Literature

My project explores the ways in which femininity is constructed in Japanese manga (comic books) that have been translated and widely published in America. Specifically, I examine how “magical girl” works were adapted for American audiences. To accomplish this, I analyzed and contrasted three different translated works that contain female heroes as main characters. Due to the relative newness of the field, there were few scholarly resources to draw on. Therefore, while a small number of academic resources were used, much of the analysis rests on my interpretation of the primary works themselves. I found changing perceptions of femininity in Japanese and American societies, and a growing extent to which American audiences are receptive to culturally different works.

THE DEVELOPMENT RELIEF AND EDUCATION FOR ALIEN MINORS ACT

Joshua Rae, Gregg Mittman (Mentor), History of Science

On September 23, 2009, I filmed a celebration intended to get the word out about a new bill entitled the Dream Act. I interviewed both adults and kids to find the story behind this bill that, if passed, would allow undocumented students who attend college or enlist in the service for two years, the opportunity to gain citizenship. The footage I got became part of a short film aimed to teach viewers on what the Dream Act entails. I felt a personal relationship to the project: I interviewed my Mexican grandmother who had to endure similar obstacles as the kids that I interviewed. My hope is that this documentary can be screened in the Madison schools so other undocumented students can become aware of this bill.

GLOBAL CLIMATE CHANGE AND HINDUISM: THE RELIGIOUS ENVIRONMENTAL REPOSE IN INDIA

Krista Rasmussen, Gudrun Buhnemann (Mentor),
Languages and Cultures of Asia

This research evaluates the capacity to use Hindu religious practices within India to increase national awareness and action to slow anthropogenic climate change. The goal of this study is to provide a more comprehensive examination of modern Hinduism in the context of global climate change and to examine the ability of Hinduism to be both helpful and harmful to national environmental movements. This is achieved through analyzing various Hindu religious texts and the role the texts play in modern society, various Hindu worldviews, and current environmental movements within India. This study particularly focuses on the Ganges River who Hindus believe is a deity. With changing global climate, the glaciers that feed the sacred river are believed to be diminishing. This has negative implications both physically and religiously for India.

AN ANALYSIS OF CLIMATE CHANGE'S IMPACTS ON FUTURE WIND ENERGY PRODUCTION IN CALIFORNIA

David Rasmussen, Jr., Teresa Holloway (Mentor),
Atmospheric and Oceanic Science

A changing climate due to anthropogenic forcings is expected to spatially and temporally alter several meteorological variables across the planet, including winds. The recent surge in the production of and investment in wind-generated electricity in California is vulnerable to these changes. This study uses the North American Climate Change Assessment Program's climate model output to quantitatively and qualitatively gauge the changes in winds expected to occur in the mid-21st century due to anthropogenically induced climate change at the locations of three Californian wind farms. Modifications to wind speeds on diurnal and monthly timescales are expected to occur as well as shifts in the frequencies of wind speeds themselves at all of the wind farm locations in focus.

PROVIDING SUSTAINABLE SELF-EMPOWERED POVERTY ALLEVIATION: MICROFINANCE AND ITS SOCIAL IMPACT

Caroline Reddy, Bradford Barham (Mentor),
Agricultural and Applied Economics

Microfinance provides a pathway out of poverty for people around the world through access to credit. Based in Madison, WCCN connects socially responsible investors to Nicaraguan microfinance organizations, building partnerships that empower small business owners to improve themselves and their communities. One of the principal challenges is quantitatively measuring the social impacts at the borrower level. This research aims to analyze the social impact, using data from a large-scale household survey of loan recipients that WCCN undertook in 2006. Primary emphasis is on identifying the impacts of WCCN loans on investment, earnings and employment. Special attention is paid to the impacts on women entrepreneurs and rural households. This undertaking will provide valuable input to a local NGO as well as the emerging field of microfinance.

DUALITY: LINES OF COLLABORATION

Lauralyn Renn, Carolyn Kallenborn (Mentor), Design Studies

The fall 2010 Duality Collection is the product of a joint collaboration between myself and my instructor, and artisans in Oaxaca, Mexico. Behind the collection is the idea of duality. Despite appearances, no object has just one source of origin. The garments reflect my cultural background and aesthetic living in the United States combined with inspiration taken from the Mexican culture. Working with a Oaxacan weaver and incorporating his design expertise, I designed the collection from the fabric to the end-product garments. Stripes, and the unifying element of line throughout the collection represent borders crossed, and levels of mutual understanding and admiration developed between people of different cultures to make an eclectic fall collection that embraces this relationship and these differences.

PREVENTION OF OXIDATIVE STRESS IN PROSTATE CANCER CELLS VIA THE SMALL MOLECULE INHIBITORS OF AR-JUND

Quentin Reuter, Hirak Basu, Dawn Church, Stacey Kegel, Farideh Mehraein, George Wilding (Mentor), Comprehensive Cancer Center

The goal of the Wilding lab has been to stop the progression of early stage prostate cancer due to oxidative stress (OS). Our previous studies show that the activated androgen receptor (AR)-JunD complex activates the production of SSAT, the enzyme responsible for polyamine catabolism and a rise in Reactive Oxygen Species (ROS). To study this interaction, a Gaussia luciferase (GL) enzyme reconstitution assay was standardized in co-transfected cells with vectors expressing N-terminal-GL-AR and JunD-C-terminal-GL. We will use this assay to conduct a high throughput screen on 25,000 compounds to look for small molecule inhibitors of the AR-JunD interaction. An initial screen of 2,000 compounds yielded 13 promising inhibitors that we are further testing to determine their efficacy at reducing OS in prostate cancer cells.

THE DEVELOPMENT OF A VIDEO GAME COURSE AT THE UW-MADISON

Daniel Rivera, Alec Schwartz, Michael Connors (Mentor), Art

The research we currently partake in involves the development and experimentation with a new course here at the university. The course is called an "Introduction to the Art of Gaming." We have worked with our mentor throughout the semester to develop and brainstorm new ideas for the creation of the course. It currently involves three branches of gaming; the social, technological, and business aspects. The course uses a Moodle Education page to allow students to share their ideas with one another. The development is a work in progress that is being aided by curriculum at other universities.

THE EFFECT OF JOINT ATTENTION ON EARLY VOCABULARY IN CHILDREN WITH AUTISM AND LATE TALKERS

Emily Robin, Susan Ellis Weismer (Mentor), Communicative Disorders

The potential association between joint attention (JA) skills and early vocabulary development was examined in twenty toddlers with autism spectrum disorders (ASD) and twenty late talkers (LTs) matched on nonverbal cognition. Two measurements of JA—response to JA and initiation of JA—were coded from a play sample and total vocabulary was calculated. It was hypothesized that ASD children would illustrate weaker JA than LTs and that there would be a correlation between vocabulary and Response to JA. Results indicated that matching on nonverbal cognition resulted in nearly identical groups in terms of vocabulary level and that no group differences in JA were found. A particularly unexpected finding was that response to JA was not correlated with vocabulary level for either group.

THE EFFECTS OF MATERNAL CHARACTERISTICS ON PARENTING AND EARLY LITERACY AND MATH SKILLS

Chavon Robinson, Laura Perez,
Janean Dilworth-Bart (Mentor), Waisman Center

It has been suggested that a child's development is not impacted by merely one force, but instead an array of forces that interact with one another to create the final product (Ceci 2006). This study further examines this idea, exploring correlations between maternal and household characteristics, parenting behaviors and children's early literacy and mathematical skills. The children's ages range from 4–5 ($n = 43$). This study will address a mother's education level, age, employment status, income, and home environment, interacting with parenting to affect early literacy and mathematical skills. I hypothesize: 1) mothers with higher income and more education will share higher quality parenting behaviors; and 2) higher quality parenting behaviors will correlate with children's early literacy and math skills.

SEASONAL VARIATIONS IN ATMOSPHERIC MUON RATE WITH ICECUBE

Dominick R Rocco, Paolo Desiati (Mentor), IceCube Research Center

The IceCube Observatory is a kilometer scale neutrino telescope under construction in the deep ice at the geographic South Pole. Once fully deployed, it will consist of 4,800 optical sensors to detect Cherenkov radiation from charged leptons. The data acquired thus far is mostly triggered by muon bundles created in the Earth's atmosphere. The muon production rate is sensitive to the atmospheric density, which varies throughout the year due to temperature modulation. Variations in muon production induce an annual modulation of about 20% in detector muon flux. The data was analyzed and a strong day-to-day correlation with the measured temperature across the antarctic atmosphere was observed, with a corresponding temperature coefficient = $(T / R) * (dR/dT) = 0.70 \pm 0.01$.

NAV2 AND THE DEVELOPING CEREBELLUM

Elizabeth Roesler, Margaret Clagett-Dame (Mentor), Biochemistry

Nav2 is a gene discovered by our lab which has been shown to be important in neurite outgrowth. Nav2 is highly expressed in the brain during development. Nav2 mutant mice have defects in sensory systems and are ataxic, which may be due to cerebellar dysfunction. We have data indicating malformations of the Nav2 mutant's cerebellum and believe that abnormal migration of the external granular-cell layer (EGL) may be involved. We show that Nav2 is normally expressed in the EGL during cerebellar development and evaluate the EGL cells in more detail in Nav2 mutants by evaluating genes associated with cell differentiation, maturation and proliferation. Characterizing the development of the cerebellum in the mouse is likely to be instructive in the study of human cerebellar malformations.

SEROPROTECTION MAINTAINED THROUGHOUT THE INFLUENZA SEASON FOR LUNG TRANSPLANT PATIENTS

Kalynn Rohde, Mary Hayney (Mentor), Pharmacy

There are recommendations that lung transplant patients should not receive the influenza vaccine early in order to avoid waning of antibody concentrations prior to the peak of the influenza season. We hypothesized that lung transplant patients are able to maintain protective antibody levels throughout the season. Sera were drawn 2–3 weeks after the 2008–09 influenza vaccine was administered and again during the first two weeks of April (peak of influenza activity) from lung transplant patients and healthy individuals. The sera were analyzed using a hemagglutination inhibition assay, which measures the antibody concentration. Seroprotection was maintained by lung transplant patients. They are able to receive the influenza vaccine when it becomes available and be protected throughout the season.

HEALTH INEQUALITIES IN ARGENTINA

Gabe Rosen, Maria Muniagurria (Mentor), Economics

Access to health services, health status and engagement in preventative practices have previously been linked to socioeconomic, demographic, and geographical variables. We plan to explore the nature and significance of that relationship in Argentina. To that goal, we will examine overlapping variables in two surveys: the 2005 Encuesta Nacional de Factores de Riesgo and the 2007 Encuesta de Acceso a la Salud en Jujuy. We will characterize the available data emphasizing gender differences, employment type, household composition, and geographical location. In addition, we will conduct a logistic regression analysis to identify the significance of these different factors on particular health indicators. We hope to present a picture of health inequalities of women from different geographical areas and socioeconomic segments.

THE EFFECT OF SIGN LANGUAGE AS AN AUGMENTATIVE COMMUNICATION SYSTEM FOR YOUNG CHILDREN WITH ASD

Stefanie Rosenfeld, Susan Ellis Weismer (Mentor),
Communication and Cognitive Sciences

This study compared a group of 32 toddlers with autism spectrum disorders (ASD) who were reported by their parents to use signs, and 32 age-matched toddlers with ASD who were reported not to use signs. The objective was to measure whether or not the use of signs facilitated communication in toddlers with ASD by comparing the number of initiations and requests the child used when interacting with a clinician. Contrary to expectations, toddlers with ASD who had been exposed to signing did not display significantly more initiations or requests than those who were not using signs to communicate. This finding has important clinical implications and raises an additional question regarding the level of intensity required to obtain treatment effects with young children with ASD.

SECOND SKIN DANCE PROJECT

Ella Rosewood, Li Chiao-Ping (Mentor), Kinesiology/Dance

Second Skin Dance Project combines performance and educational outreach. I commissioned five nationally/internationally acclaimed choreographers to create a new solo for me; a theme of change emerged. “Second Skin: A One Woman Show Danced by Ella Rosewood” (Dec. 10–12 at Music Hall) provides me with a platform to examine solo performance deeply. Danced under one roof at one time by one person, this concert model is not typically shown in Madison. Interactive performance workshops will tour to seven Dane County schools this May, impacting more than 500 pre-K through 8th graders. I endeavor to remain myself while wearing the second skin, or the choreographed solo of another, and hope to teach children that they, too, can remain themselves while investing in their education.

A “NATURAL” ACTIVIST: RECOGNIZING GEORGE ELIOT’S MEDIUM AND ITS INFLUENCE ON EDUCATIONAL REFORM

Rebecca Rozek, Susan Bernstein (Mentor), English

During George Eliot’s lifetime, activists like Barbara Bodichon, Emily Davies, and Lydia Becker questioned the relationship between education, biology, and gender. Charles Darwin’s *On the Origin of Species* complicated ongoing curricular debates, reinforcing the importance of biology in constructing gender. Eliot and Becker had direct contact with Darwin and, as members of the same intellectual community, questioned the utility of available educational opportunities for women. Instead of restricting women’s intellectual abilities, Eliot and Becker argued for a flexible education, moving beyond the boundaries of gender roles and supposed biological mental distinctions. I argue that Eliot’s novels are a form of activism that complements Becker’s more public work, advocating for an “adaptable” education that uses sympathy to create a unique space for reform within the home.

INVESTIGATING CHRONIC PAIN DERIVED FROM SPINAL CORD INJURY AND MMP-2

Michael Ruiz, Gurwattan Miranpuri (Mentor), Neurological Surgery

The expression of the protein matrix metalloproteinase-2 (MMP-2) results in an inflammatory response in the spinal cord. This may be a key factor in the development of Neuropathic Pain (NP) as inflammation is capable of causing increased damage to central nervous tissue following traumatic spinal cord injury (SCI). The research focuses on understanding the relationship between MMP-2 and chronic pain, in the hope of finding explanation of NP. The hypothesis follows the baseline idea that after a laminectomy and contusion model which inflicts traumatic SCI, conclusions may be drawn about the amount of MMP-2 expression and on which drugs may reduce the expression of MMP-2.

WORKPLACE COLLABORATIONS: A MODERN GOAL FOR OFFICE DESIGN

Ann Rummelhoff, Sarah Jurek, Trisha Picard,
Roberto Rengel (Mentor), Interior Design

This paper examines the ways in which collaboration in the workplace increases productivity and how this is fostered by workplace design. Literature review of recent studies by industry leading workplace design companies Herman Miller (2008) and Steelcase (2008) have shown that fostering collaboration in the workplace has enhanced innovation, productivity and overall competitiveness in the marketplace. Interior design contributes to this in a variety of ways including, integration of technology, ease of communication and promoting organization. This study looks further into current thinking on cutting-edge spatial arrangements aimed at improving collaboration in the 21st-century workplace.

EFFECTS OF EU ON RURAL FAMILY FARMS: A CASE STUDY OF SUCCESS AND WHAT WE CAN LEARN

Alicia Saddoris, Debra Holschuh-Houden (Mentor),
Family Business Center

Many sectors of a society benefit from a market economy; however, for those in agriculture, these benefits come with a number of challenges that must be overcome for the business to run and thrive as it once had. A case study of how one Finnish family successfully adapted to the new market structure and the changes caused by free price competition. An exploration of the effects of European Union membership on rural farmers, offers great insight into this global phenomenon. Further analysis offers family firms, struggling or successful, suggestions as how to better adapt to changing markets and family dynamics. To conclude, a look at what may be done by governments across the globe to help ease this transition for their family farmers in the future.

REDUCING INFANT MORTALITY DISPARITIES IN WISCONSIN

Ashley Saffold, Stephanie Robert (Mentor), Social Work

The purpose of this study is to examine the effects of public programs on birth outcomes. Data will be compared between Dane and Racine counties to draw inferences about what succeeded in improving infant mortality rates and disparities in Dane County, but not in Racine County, over the last decade. All African-American women and a random sample of white women who gave birth between 2005–06 in Dane and Racine counties are invited to participate in a survey. Data are currently being collected. Preliminary results indicate that African American and white women in Dane County use many infant services, such as parenting classes (79.5% African American, 80.7% white) and counseling and/or support services (88.4%African American, 95.0% white), at nearly the same rate.

DEPRESSION'S EFFECTS ON SLEEP AND LEARNING

Joshua Sanchez, Eric Landsness (Mentor), Neuroscience Training Program

People afflicted with major depression have both impaired sleep and impaired learning. Though increasing evidence suggests that sleep is necessary to improve performance on newly learned tasks, the connection between sleep, learning, and depression hasn't been investigated. Using EEG scalp recordings, we measured specific sleep features called slow waves, which play a role in consolidating motor memory. Using a visual-motor adaptation videogame, we tested depressed subjects at night, in the morning, and measured their slow waves while they slept. We hypothesize that the amount of performance improvement will correlate with the amount of slow waves during sleep. This would suggest that slow waves may be indicative of depression's effects on learning, and interventions targeting slow waves could be an effective treatment for depression.

OCEAN FUEL: INCREASED SALT TOLERANCE THROUGH GLYCINE BETAINE PRODUCTION

Sarah Sandock, Nathaniel Cira, Xintong Dong, Viraj Kamat, Sean McMaster, Nathaniel Pantalone, Christopher Schultz, Ting Zhang, Brian Pflieger (Mentor), Center for Biology Education

Biofuels represent a potential solution to world energy demands. Total crude oil replacement based on a 20% fuel titer and current fuel demands would require 5.6 trillion gallons of fresh water per year. Current fresh water supplies may not support this added demand. Alternatively, a sustainable approach may use Earth's 3.5×10^{20} gallons of ocean water. However, current fuel-producing organisms are unable to thrive in ocean-level osmolarities. Glycine betaine, a powerful osmoprotectant, shields organisms from salt-induced stress. Two enzymes, GSMT and SDMT, catalyze three successive methylations of glycine for de novo synthesis of glycine betaine. We demonstrate an engineered *E. coli* with an increased growth rate under salt induced stress.

EXAMINING THE POTENCY OF EZ SPHERES: A POTENTIAL SOURCE OF MULTIPOTENT CELLS

Elizabeth Saphner, Jered Mc Givern (Mentor), Neurology

New technologies have allowed researchers to generate pluripotent cells from somatic tissue. These induced pluripotent stem (iPS) cells could lead to the improved production of specific cell types for research or clinical applications. Currently, somatic cells are generated from embryoid bodies (EBs), which are difficult to generate from iPS cells. This study aims to make somatic cells through floating multipotent stem cells (EZ spheres), which are less expensive to maintain than typically cultured iPS cells. In this study, a new growth medium will be evaluated to determine its efficiency at maintaining EZ spheres in a multipotent state. The ability of these EZ spheres to differentiate into all three primary germ layers will be examined by testing for specific markers after addition of differentiation media. This simple technique may make stem cell research more accessible for laboratory research.

REVOLUTIONARY PUBLISHING PRACTICES IN LATIN AMERICA

Sapir Sasson, Ksenija Bilbija (Mentor), Latin American,
Iberian, and Caribbean Studies

This project investigates the formation of non-profit publishing houses (Cartoneras) in Latin America; they are unique in that they use cardboard bought from street recyclers to make affordable book covers. Our project raises awareness about this literary revolution and develops a better appreciation of published literature and literacy. We have compiled all information pertaining to the Cartoneras into one online archive that is available to the public. We also held a conference that united all Cartoneras for the first time in October 2009 and published a book of Cartonera manifestos and academic articles. Our research highlights the importance of affordable, avant-garde literature and will contribute to this movement by inspiring future studies about the Cartonera publishing houses.

EXERCISE AND NUTRITION INTERVENTION IN A LOW-INCOME COMMUNITY

Megan Sauer, Irem Duyar, Kathleen Terry,
Sharon Younkin (Mentor), Family Medicine

In the United States, two-thirds of the population are considered overweight or obese. Minority and low income groups are disproportionately affected, facing more obstacles to make healthy life changes. This project offered educational and group activities to Madison's Allied Drive Community, a low income area with a self-identified need to address fitness and nutrition. Community input was used to design a culturally relevant, health-focused program. The first of two phases focused on exercise and neighborhood capacity-building through a walk-and-talk program, combining low-impact exercise, community interaction and monthly dance workshops. The second phase continued with additional monthly educational sessions and social dialogues focusing on relevant topics such as healthy budget snacking and meal-planning, weight loss and body image.

LEARNING TO LEAD: STATE-BASED POLITICAL LEADERSHIP PROGRAMS AND POLITICAL PARTICIPATION

Lauren Savstrom, Valerie Hennings (Mentor), Political Science

This research is designed to investigate the value of political training programs and their effects on the level of women's political participation in the United States. Since the 1990s, the number of women participating in politics has hit a plateau, however, the number of political training programs has increased, especially those provided for females only. These programs are designed to prepare future politicians to run a successful campaign. This research seeks to study the value of their teachings and whether or not they ultimately improve the level of women's political participation. Through examination and participation in many programs around the United States, as well as statistically analyzing factors affecting women in politics, the research may help to improve existing programs and empower more women to participate in government.

GAMES AND SIMULATIONS FOR HEALTHCARE: BUILDING A LIBRARY FOR CLINICIANS AND EDUCATORS

Emily Schaefer, Lindsay Young, Eric Bauman (Mentor), Anesthesiology

The development of simulation and game-based learning technology is redefining health sciences education. Simulation and game-based learning allow students, educators and existing clinicians to enrich their educational experiences to support clinical care and positive patient outcome. The goal of this project is to generate a database of information about existing products and technologies related to games and simulation for healthcare education. The current database allows students, clinicians and patients to access and review products, and scholarly information that support simulation and game-based learning. Recent additions to the database and library include a blog, which contains a multimedia area. The aim of this project is to provide a collaborative relationship among stakeholders in the games and simulation movement in healthcare—a library and its patrons.

THE EFFECT OF TCF-19 ON BETA CELL PROLIFERATION IN MICE AND RATS

Gregory Schleis, Dawn Davis (Mentor), Endocrinology

Type two diabetes is a disease which can be caused by the lack of beta cell proliferation. Beta cell proliferation is effected by transcription factors which regulate the cell cycle. It is expected that transcription factor 19 is a vital transcription factor for beta cell proliferation. MIN-6 cells and INS-1 cells were used for experimentation. MIN-6 cells are beta cells from mice while INS-1 cells are beta cells from rats. SiRNA is used to block transcription. Using siRNA specific to the TCF-19 site, it is expected to see a decrease in beta cell proliferation. Three sets of cells were treated with a different siRNA and harvested. The RNA was isolated and cDNA was synthesized. The results were compared to find the change in the number of cycles of PCR to reach a threshold number.

ESTATE PLANNING WITHIN A FAMILY BUSINESS

David Schlotthauer, Debra Holschuh-Houden (Mentor),
Family Business Center

Family businesses are passed down from generation to generation. Many family businesses do not properly prepare for this transition. This project will outline an estate plan that can be applied to many family businesses. The plan will center around a small family business with multiple siblings, although only one sibling wants to take over the business. Research will be conducted by interviewing estate planners, as well as those from a family business. The plan will focus on financial considerations of estate planning but will also touch on emotional issues as well.

EPITOPE MAPPING OF STREPTOCOCCUS SUIS TYPE 2 GLUTAMATE DEHYDROGENASE

Sarah Schmid, Ogi Okwumabua (Mentor), Pathobiological Sciences

In 2005, a *Streptococcus suis* outbreak swept across China killing 219 swine and 38 humans. A rapid and reliable serologic assay to detect *S. suis* infection is unavailable due to the lack of antigenic conservation among strains. Constructing overlapping polypeptides of the conserved glutamate dehydrogenase (GDH) protein of *S. suis* type 2, we have mapped the epitopes defined by GDH-specific polyclonal antibodies. Results show that a 154 amino acid polypeptide at the carbonyl terminus of the *S. suis* GDH protein elicits a positive reaction with serum from experimentally infected rabbits. Ultimately, a small antigenic polypeptide derived from the GDH protein will be isolated, and this antigen will be applied in an ELISA based assay to quantify the antibody circulating in the serum of potential hosts.

ALL THE WORLD'S A CLASSROOM: SHAKESPEARE'S FOOLS AND EARLY MODERN HUMANISM

Leah Schmid, Michael Witmore (Mentor), English

The marriage plots of Shakespeare's early comedies "Love's Labour's Lost" and "As You Like It" veil a powerful subtext regarding the relationship between education, wisdom and folly. Through the juxtaposed characterization of authority figures and "rustics" or fools, as well as copious dialogue on folly and study, Shakespeare interrogates the nature and value of established modes of education, specifically the university system contemporary to his writing. Through literary analysis of Shakespeare's plays, as well as research on the historical and philosophical setting in which Shakespeare created these works, a resistance to the prestige system of education is revealed. The Bard's argument about the failure of the university system is resonant even today, as many contemporary universities re-evaluate the structure and implementation of their academic programs.

POSSIBLE DOMINANT NEGATIVE EFFECT OF KIR7.1 MUTANT PROTEIN IN SNOWFLAKE VITREORETINAL DEGENERATION?

Tyler Schroeder, De-Ann Pillers (Mentor), Pediatrics

Snowflake vitreoretinal degeneration is a genetically inherited disease of the retinal pigment epithelium (RPE). It is characterized by chronic loss of retinal function due to retinal breaks, detachments, or neovascularization. This anomaly is caused by a mutation resulting in a dysfunctional non-selective potassium ion channel, Kir7.1 (Potassium-inward rectifying), in the cellular membrane of RPE cells. The reported mutation lies away from the selectivity filter sequence in the tetrameric Kir7.1 channel; hence, a dominant negative effect due to a mutation in even one of these four subunits would result in the complete inhibition of channel function. Other mutant proteins have demonstrated a similar effect on other ion channels, which has led us to speculate that a similar scenario could be occurring with Kir7.1 channels.

DO I BELONG? LESBIAN WOMEN'S EXPERIENCES OF COMMUNITY

Kelsey Schroeder, Erin Doolin (Mentor), Counseling Psychology

Much research has been done to see what factors help minority individuals overcome stereotypes and judgments. Belonging to and being involved in a community is one factor some suggest can help minority members persevere over hardships but how does an individual know they belong? What do individuals look for when searching for a community to belong to? This project strives to understand what lesbians, in particular, look for in their communities to feel they belong and how they define their communities. Using phenomenology, qualitative survey responses are gathered, coded, and analyzed for common themes. Due to volume of response and careful analysis, responses are still being coded. Once the data is coded, themes of belongingness can be identified and implications can further this research.

WETLAND CARBON DIOXIDE FLUX RESIDUALS: AN IMPACT OF HYDROLOGY?

Nicole Schroeder, Ankur Desai (Mentor),
Atmospheric and Oceanic Sciences

Measuring ecosystem-atmosphere carbon dioxide fluxes at wetland sites helps show the net effect between how much carbon the wetlands are able to take in versus how much they are releasing into the atmosphere, though significant uncertainty exists in modeling these fluxes. As regions like temperate wetlands become wetter and warmer due to anthropogenic climate change, factors like changing hydrology and nutrient cycling may further complicate predictions of carbon dioxide fluxes and subsequent inferences regarding climate change. To determine whether a significant correlation between wetland hydrology and model error exists, residuals between high-frequency multi-year carbon dioxide flux measurements from three mid-latitude temperate wetland sites and the corresponding predictions from nearly one dozen independent ecosystem models are compared to observed water table and precipitation data.

DOES AGE MATTER? AGE OF PARENTS AND QUALITY OF THE PARENT-ADOLESCENT RELATIONSHIP

Kristina Schroeder, Janet Hyde (Mentor), Psychology

Previous studies have found that the quality of interactions between parents and infants increases linearly with parents' age, but very little is known about the correlations between parents' age and parent-adolescent relationship quality. The study used longitudinal data collected from parents and adolescents through the Wisconsin Study of Families and Work. Other variables included parents' partner status, partner-role quality, work-role quality, and authoritativeness of parenting style. Results revealed a significantly negative correlation between relationship quality and age of fathers and no significant correlation between relationship quality and age of mothers. Work and partner-role quality of parents were also important factors in the parent-adolescent relationship.

UTILIZATION OF PHOSPHONATE COMPOUNDS BY CYANOBACTERIA-MICROCYSTIS, ANABAENA, AND CYLINDROSPERMOPSIS

Brint Schwerbel, Katherine McMahon (Mentor), Civil and Environmental Engineering

Cyanobacteria blooms degrade water quality and can affect public health through the production of cyanotoxins. Phosphorus (P) is widely thought to be the limiting nutrient controlling primary production in aquatic ecosystems. While it is generally believed that inorganic P is the preferred P substrate, cyanobacteria may utilize organic P during times of P-stress. Through a series of batch culture experiments, I determined that three cyanobacteria strains—microcystis, anabaena, and cylindrospermopsis—were able to utilize specific organophosphonate compounds as the sole source of P. Growth was supported by spectrophotometry, cell counts, and changes in phosphorus concentration. Organophosphonate compounds (e.g. common herbicides) may be an important source of P in bodies of water that receive agricultural run-off, and could contribute to cyanobacteria blooms and toxin production.

EFFECTS ON EXPRESSION OF THE ALPHA-MHC GENE FROM THE INTERACTION OF HNRNPR AND TR

Namratta Sehgal, Eugene Kaji (Mentor), Cardiology

The alpha-MHC gene, a protein expressed in cardiac muscle which is regulated by thyroid hormone (TR), has been found to affect hypertrophy. TR binds to the thyroid hormone response element of a gene and affects expression. Heterogeneous nuclear ribonucleoprotein (hnRNP) is a popular family of twenty RNA-binding proteins found in the nucleus. This group is known for involvement in gene expression, transcription and translation. While many hnRNPs have been studied, the role of hnRNP-R is still unclear. We found hnRNP-R was, pulled down with TR-alpha in a yeast 2-hybrid screen. Through transfections involving TR-alpha, hnRNP-R and alpha-MHC-luc, and by measuring luciferase activity, we are aiming to establish what effect the interaction of hnRNP-R with TR has on expression of TRE.

SIMULATION-BASED TRAINING TO TEACH PARAMEDICS HOW TO INTUBATE THROUGH THE SINGLE USE LMA-FASTRACH™

Sam Seider, Eric Bauman (Mentor), Anesthesiology

The University of Wisconsin departments of Anesthesiology and Emergency Medicine independently developed and administered training to teach paramedics how to secure a patient's airway using an intubating laryngeal mask airway (iLMA). Thirty-five paramedics were evaluated using a task-training airway mannequin on their ability to correctly place the iLMA and endotracheal tube after training had been provided. The results of this study indicated that paramedics were able to effectively place an iLMA without regard to type of training (anesthesiology or emergency medicine). This research is consistent with limited existing literature focusing on novice use of LMAs. This study supports the continued implementation of the LMA in the pre-hospital environment. Future research should include examination of paramedics success rate deploying the LMA in actual clinical environments.

EVALUATION OF BAG-VALVE-MASK VENTILATION USING AN ERGONOMICALLY DESIGNED FACEMASK AMONG NOVICE USERS

Sam Seider, Eric Bauman (Mentor), Anesthesiology

This study compared the ability of novice clinicians (EMS/RT students) to provide artificial ventilation using a standard facemask (SM) and a new ergonomically designed facemask (EM) in a simulation-based study. Results indicated that tidal volume was higher when participants used the EM compared to the SM (361.0 mL_{104.1} vs. 264.1 mL_{163.2}; adjusted p-value=0.040). The repeated-measures ANOVA indicated that use of the EM resulted in higher tidal volumes compared to the SM, and that a linear decrease in tidal volume of -10.12 mL/breath occurred with the SM. The researchers concluded that novices were better able to provide facemask ventilation using an ergonomically designed mask and believe these results support continued research and use of the EM in clinical practice.

DYE-SENSITIZED SOLAR CELLS WITH THIN FILMS OF TiO₂ AND Nb-TiO₂ BY ELECTROPHORETIC DEPOSITION

David Severseike, Yukihiro Hara (Mentor), Materials Science

With commercialized solar cells being out of touch with today's economical requirements, there is an urgent need for a more economical cell to replace the current Silicon-based cells. Dye-sensitized solar cells (DSSCs) can offer this low-cost form of renewable energy, but currently do not compete with traditional Si-based cells because of the low efficiency. This research focuses on fabricating DSSCs by utilizing films of TiO₂ or Nb-TiO₂ colloids (sols). These colloids were deposited on a conductive glass by the electrophoretic deposition (EPD) method that allows us to control a film thickness by adjusting applied potential and time. DSSCs with different thicknesses and morphologies of films were fabricated and tested. The efficiencies obtained depended on the conditions of the DSSCs.

TRANSFORMING UROPATHOGENIC ESCHERICHIA COLI TO EXPRESS GREEN FLUORESCENT PROTEIN

Michael Shea, Jess Reed (Mentor), Animal Sciences

Urinary tract infections (UTI's) affect millions of individuals every year. Recent studies show that uropathogenic *Escherichia coli* colonize the gastrointestinal tract (GI) and increase the chance of UTI. We transformed a strain of uropathogenic *E. coli* with green fluorescent protein (GFP) to study bacterial adhesion to the gut. GFP along with ampicillin resistance allows the determination of persistence and prevalence of a specific uropathogenic strain in the GI tract over time and in response to treatments. A plasmid providing a vector for GFP and an ampicillin resistance gene was incorporated into the bacteria by heat-shock transformation. The transformed bacteria were grown on agar plates containing ampicillin and expressed GFP. The presence of the plasmid GFP DNA in the transformed *E. coli* was verified by southern blot analysis.

CORRELATION BETWEEN BODYWEIGHT AND PUBERTY: AN ANALYSIS OF COLONY RECORDS OVER 35 YEARS AT THE WNPRC

Nicholas Shiel, Ei Terasawa-Grilley (Mentor), Pediatrics

The age of puberty onset in humans is decreasing. We have seen a similar trend in our animals at the Wisconsin National Primate Research Center (WNPRC). Because bodyweights at menarche appeared to be constant in our studies, we hypothesized this phenomenon is due to higher caloric intake and accelerated weight gain. Using the WNPRC database from 1973 to date, I analyzed bodyweight and age of menarche to understand this trend. The results indicate that there is a secular movement towards accelerated weight gain during maturation with higher adult bodyweight. Collectively, our findings suggest that an increased growth rate is the link to a younger menarcheal age.

EFFECTS OF AGING ON LARYNGEAL SENSORIMOTOR NEURONS

Jaime Shier, Michelle Ciucci (Mentor), Communicative Disorders

Declines in vocal quality are prevalent in the aging population, however the etiology is unknown. Using an established aging rat model, we evaluated if changes in the ultrasonic vocalizations between young (n=8) and old (n=7) rats showed comparable changes to humans. Injections of the retrograde tracer cholera toxin allowed us to determine if motoneuron loss in the nucleus ambiguus was associated with the vocal changes. Preliminary data shows that older rats had reduced bandwidth and intensity. However, we did not find significant motoneuron loss in the nucleus ambiguus of aged rats. Our findings suggest that there may be a biologically significant change in the ultrasonic vocalizations between young and old rats; however, it is not caused by neurodegenerative changes within the nucleus ambiguus.

OPTIMIZING THE BINDING CAPACITY OF CARBOHYDRATE BINDING MODULE WITH AMMONIA TREATED SWITCH GRASS

Isha Shrestha, Allison Riederer (Mentor),
Great Lakes Bioenergy Research Center

Cellulosic ethanol is a biofuel produced from lignocellulose that is found in wood, grasses or other non-edible parts of plants. The purpose of this research is to improve methods of producing cellulosic ethanol by performing binding assays. The assays will measure amount of binding that occurs between ammonia treated switch grass and a Carbohydrate Binding Module (CBM), a protein complex derived from *Clostridium thermocellum*, a naturally cellulose-degrading organism. Previous research suggests that as more protein binds to the substrate, more cellulose can be extracted from the biomass, which can ultimately maximize the production of ethanol. By varying the pretreatment, incubation time and incubation temperature, our goal is to optimize the binding capacity of the CBM to the ammonia treated substrate.

ASSESSING TRANSFER OF PERCEPTUAL LEARNING IN RAT AUDITORY CORTEX IN A BEHAVIORAL DISCRIMINATION TASK

Sneha Shrestha, Matthew Banks (Mentor), Anesthesiology

A type of neural plasticity termed perceptual learning has been shown to be specific to the stimulus in which animals have been trained. The visual and somatosensory cortex show a lack of transfer of learning along their respective topographic axes, indicating that plasticity occurs in cells finely tuned to presented stimuli, such as those in primary sensory cortical areas. We hypothesize that there will be a lack of transfer of perceptual learning along the tonotopic axis in A1. To investigate this hypothesis we trained rats on a perceptual learning task involving the discrimination of an upward or downward sweeping stimulus, and compared the performance on the trained stimulus to untrained stimulus, testing for global transfer of learning across A1.

QUANTIFICATION OF THE EPIDERMAL GROWTH FACTOR RECEPTOR FROM SINGLE CELL LYSATES IN PDMS MICROWELLS

Timothy Sita, Nicholas Abbott (Mentor),
Chemical and Biological Engineering

The ability to analyze biomolecular profiles from individual cells would be an invaluable tool in both clinical and basic research. By reducing the amount of cells that need to be extracted from patients, single-cell analysis opens up the possibility of a less invasive surgical biopsy. Furthermore, data on the single-cell level allows for the study of the heterogeneity of cell samples. To demonstrate a model system for single-cell analysis, PDMS microwells are fabricated for capture and lysis of individual cells expressing high levels of the epidermal growth factor receptor (EGFR). EGFR, which is implicated in many cancers, is then specifically captured from cell lysates with anti-EGFR antibodies linked to an opposing surface of PDMS.

LONG-TERM TOXICITIES OF CONCOMITANT CHEMORADIOTHERAPY FOR CERVICAL CANCER

Kathryn Sklenar, Vinai Gondi (Mentor), Radiotherapy

Concomitant chemoradiotherapy, including external-beam radiotherapy, brachytherapy, and platinum-based chemotherapy, is the standard of care for locally advanced cervical cancer. Long-term toxicities of chemoradiotherapy in this setting remain ill-defined. The purpose of this research is to quantify long-term toxicities of chemoradiotherapy and identify clinical and treatment-related factors that are predictive. We are conducting a 20-year inter-era retrospective analysis of patients treated with definitive radiotherapy with or without concomitant chemotherapy at the University of Wisconsin Hospital. Long-term toxicities are graded using the Common Terminology Criteria for Adverse Events (CTCAE) version 4.0. A case-control analysis is being performed, with a multivariable logistic regression model used to identify predictive factors. This analysis is ongoing, and statistical results as well as conclusions will be presented at the forum.

HYBRID VARIANCE REDUCTION FOR DAG-MCNP5

Stuart Slattery, Paul Wilson (Mentor), Engineering Physics

Development is currently underway in the Engineering Physics department on the Monte Carlo radiation transport code DAG-MCNP5 (Directly Accelerated Geometry—Monte Carlo N-Particle transport code). For many complex radiation transport problems, Monte Carlo calculations can take considerable time to converge to a precise solution. To accelerate the convergence time by reducing the calculation variance, it is possible to couple deterministic radiation transport calculations to Monte Carlo calculations in a hybrid method. This work will outline a basic framework for implementing hybrid variance reduction for the code DAG-MCNP5 using the deterministic radiation transport code Denovo and the iTaps data structure.

A PORTABLE ULTRASENSITIVE ATOMIC MAGNETOMETER ARRAY FOR BIOMAGNETIC MEASUREMENTS

Gregory Smetana, Thad Walker (Mentor), Physics

The performance of spin exchange relaxation free (SERF) magnetometers competes with existing superconducting quantum interface devices (SQUIDs), and the operation of SERF magnetometers does not require cryogenic refrigeration. A portable Rubidium cell atomic magnetometer has been developed for clinical use to detect fetal magnetocardiograms and diagnose arrhythmia in fetal heartbeats. Previous work has presented a sensitivity of $10 \text{ fT/Hz}^{1/2}$ and demonstrated the feasibility of detecting fetal MCG. We have developed a smaller magnetometer suitable for use in a magnetometer array. The array will improve noise discrimination and provide the ability isolate fetal heart signals from the much larger pregnant adult signal.

**IDENTIFYING DRIVERS OF MICROCYSTIS
BLOOM DYNAMICS AND CYANOTOXIN
POTENTIAL IN LAKE MENDOTA**

Abigail Solom, Georgia Wolfe (Mentor), Bacteriology

This project's goal is to identify the environmental drivers controlling dynamics of toxic and non-toxic microcystis in Lake Mendota in Madison, Wisconsin. To accomplish this goal, I will use quantitative PCR to measure the abundance of total microcystis as well as potentially toxic microcystis in lake water samples collected twice monthly over the past ten years. The results will be used in multivariate regressions with physical and chemical lake data to determine the water conditions that have the most profound impact on potentially toxic microcystis population dynamics. Significant correlations will be used to assist public health officials make decisions about managing public use of the lake for recreation as well as to improve the Global Lake Ecological Observatory Network ad hoc Mendota Modeling Researchers' project.

**AN OBSERVATIONAL STUDY OF CHILDREN'S
EXPOSURE TO MEDIA IN HEALTH CARE SETTINGS**

Scott Sordahl, Dipesh Navsaria (Mentor), Pediatrics

We are evaluating the exposure of children to media of various types (television, print, etc.) in waiting rooms and/or public areas of health care facilities devoted to children (pediatric clinics/children's hospitals). American Academy of Pediatrics guidelines and an increasing body of research regarding the impact of both inappropriate and commercial media exposure to children make consideration of waiting room environment important. To date, no one has examined the role of children's hospitals and clinics in upholding standards of good media use. Observations will occur in two to three two-hour blocks (per location) over a period of six weeks. Three clinics and three children's hospital locations will be observation sites. Statistical analysis of types of media, incidence, and quality of media will then be performed.

**WHY IS THAT CRATER MOVING?
MEASURING ERRORS IN MARS SATELLITE
IMAGES DUE TO CAMERA LENS DISTORTION**

Emily Sorensen, David Santek (Mentor),
Space Science and Engineering Center

In trying to measure the speed of clouds on Mars, one must first correct for the geometric distortion introduced by the optical properties of the camera lens. The first step in correcting this error was to locate several surface features, such as craters, appearing in a select few images and create small templates. These templates were then compared to the remaining images using a cross-correlation technique to determine a match and calculate the offset. These offset values were then used to correct the images that will be used for wind speed tracking. By correcting this error, we will get more accurate wind speed results.

POLLS AND VOTES

Elizabeth Soto, Charles Franklin (Mentor), Political Science

This project deals with two different aspects that help determine how President Obama is performing in office. One measures the likely outcome of congressional races and the other helps to explain movements of political opinion in regards to different parts of Obama's administration. This data is collected by asking simple generic questions to determine if people will vote Republican or Democratic, and looking at polling websites to see the approval and disapproval ratings of President Obama. It can be difficult to monitor everyone's opinions. Collected data goes into spreadsheets and then are turned into graphs. Thus, it is easier to track public opinion using this visual representation. This project tracks voting trends, Obama's performance as president, and how people will vote in the future.

WASTE MANAGEMENT AND ITS IMPACT ON THE ENVIRONMENT

Emily St. Aubin, Breann Bender, Amy Towell,
James Berkelman (Mentor), Forest and Wildlife Ecology

Waste management has an immense effect on environmental health, and unfortunately, many developing countries have inferior waste management funding and facilities. A lack of waste management can lead to pollution and degradation of rivers, lakes, watersheds, and terrestrial environments. It can also contribute to human and animal diseases. We will use Autlan, Mexico, which we visited with our Forest and Wildlife Ecology 375 class in January 2010, as a case study of how a municipality can overcome a lack of institutional initiative and provide proper waste disposal for a city of 40,000 people. We examine the environmental benefits of increased management along with the viability of implementation of a management plan similar to that in Autlan for cities in Mexico and other developing countries.

DIVERSIFICATION OF THE N-ACETYL-L-CYSTEINE DRUG SCAFFOLD USING NOVEL SILICON-CONTAINING AMINES

Daryl Staveness, Robert West (Mentor), Chemistry

A diverse library of sila-amines were synthesized for integration into the N-acetyl-L-cysteine (NAC) scaffold in an attempt to create more potent anticancer drugs. Synthesizing novel compounds that take advantage of the already inherent antioxidative and anticarcinogenic properties of NAC by using it as a foundation for the introduction of organosilicon side chains provides a low-risk and potentially highly beneficial method for drug diversification. It is anticipated that the addition of silicon will increase the compound's lipophilicity and slightly alter its electronic distribution. This should aid in *in vivo* distribution and intracellular accumulation, enhancing the drug's physiological activity.

REVERSAL OF FRAGILE X PHENOTYPES BY MANIPULATION OF APP/BETA AMYLOID LEVELS

Kelsey Stein, James Malter (Mentor), Pathology and Laboratory Medicine

Fragile X Syndrome (FXS) is the most common form of inherited mental retardation. Research has shown that symptoms of FXS are a result of increased amyloid precursor protein (APP) and beta-amyloid. Our objective was to reverse FXS symptoms by means of genetic modification. We established a population of control mice that had normal APP levels and knockout (KO) mice that had high APP levels. These mice were crossed to establish a population containing heterozygotes that expressed half as much APP. The mice were tested in behavioral assays that tested cognitive functioning and seizure rate. Preliminary results show that by reducing APP levels by 50% in heterozygotes, seizures and death rates were reduced. These results indicate that APP and/or beta-amyloid play a causative role in seizure induction.

CONTINUOUSLY VARIABLE INERTANCE TUBES

Ted Steiner, John Pfothauer (Mentor), Mechanical Engineering

Pulse tube cryocoolers offer a means to improve efficiency of a variety of diverse technologies, such as MRI scanners. An oscillating pressure wave and the associated mass flow wave traveling through a regenerative heat exchanger and pulse tube produce its refrigeration power. System efficiency is dependent on the phase angle between these waves, and inertance tubes are used to set this phase angle. However, due to variations in fabrication, it is frequently unclear whether installed inertance tubes, with their fixed dimensions, produce the desired phase shift. A variable inertance tube allowing continuous adjustments to its geometry during operation has been constructed and mounted on a pulse tube, along with instrumentation to measure the pressure and mass flow oscillations and their relative phase in real time.

THE FUNCTION OF IL-1 IN A MURINE MODEL OF LIGAMENT HEALING

David Sterken, Ray Vanderby (Mentor), Orthopedics and Rehabilitation

Remodeling of tissue during the last stage of ligament healing results in a disorganized and mechanically inferior structure. Our laboratory has been investigating the processes involved in ligament healing in hopes of ascertaining the initiators of this detrimental process. IL-1 is a pro-inflammatory cytokine that is involved in the healing process and has been indicated in inflammatory diseases such as arthritis. We hypothesize that inhibition of IL-1 will reduce scar formation after ligament injury. Preliminary results using administration of IL-1Ra have shown altered gene expression and improvement of healing. To further test this hypothesis, I am comparing IL-1R knockout mice to wild-type mice after MCL injury by analyzing harvested tissue with IHC/IF and qPCR at day 7 post-injury and biomechanically testing tissue at day 14.

CARBON AND NITROGEN ANALYSIS OF THE BRADY SOIL IN THE GREAT PLAINS AREA

Zachary Stewart, Maria Marin-Spiotta (Mentor), Geography

The Brady Soil is a buried soil horizon located at about five to four meters depth in the central Great Plains. While it has a dark color characteristic of a carbon rich soil, it is low in carbon. Erosion and global warming are increasing concerns, and because of this soil's geographic extent, it could prove to be a major source of carbon despite its low carbon concentration. We separated samples of Brady Soil from Nebraska into different density and size fractions for carbon and nitrogen analysis. The purpose of this research is to find out where the carbon and nitrogen is stored in the soil, and then determine whether or not it is chemically stable and how it could affect the future climate.

SENSITIZATION TO SPECIFIC AEROALLERGENS IN EARLY CHILDHOOD ALTERS ASTHMA RISK

Dan Stoltz, Robert Lemanske (Mentor), Pediatrics

Sensitization to allergens in early childhood, producing an antibody called immunoglobulin E (IgE), is associated with increased asthma risk. The objectives of this study were to determine if sensitization to specific aeroallergens in early life differentially impacts asthma risk and if the level of allergen-specific IgE production alters asthma risk. Allergen-specific IgE was assessed in high-risk children at age 1, 3, and 6 years using fluoroenzyme immunoassay. We determined that sensitization to perennial compared to seasonal allergens was more strongly associated with asthma risk and greater levels of IgE were associated with asthma risk ($p < 0.05$). While exposure to dog from birth may be protective, sensitization to dog in early childhood dramatically increased asthma risk ($p < 0.0001$).

SIVMAC239 Δ NEF ESCAPES AT CD8+ T LYMPHOCYTE EPITOPES IN VACCINATED MACACA MULATTA

Benjamin Sudolcan, David O'Connor (Mentor),
Pathology and Laboratory Medicine

The problems encountered in finding a solution to the HIV epidemic are numerous. Studying primates infected with simian immunodeficiency virus (SIV) provides a controlled setting within which researchers can model the effects of HIV on the human immune system. Vaccination with a live attenuated form of SIV, SIVmac239 Δ nef, provides protection against pathogenic SIV infection in the non-human primate model. However, an analogous vaccine cannot be used in humans due to safety concerns. Studying the mechanism by which SIVmac239 Δ nef confers protective immunity can illuminate the path to a viable HIV vaccine option. Our study examines whether SIVmac239 Δ nef viral epitopes mutate *in vivo* post-vaccination to escape host CD8 T-cell immune response. Mutations were found in at least one viral epitope for each MHC class I allele investigated.

HIPPOCAMPAL PLASTICITY IN DEVELOPMENT, MEMORY, AND EPILEPSY

Ashley Stoeckel, Thomas Sutula (Mentor), Neurology

The purpose of the research is to observe the damage reoccurring seizures do to the hippocampus. The damage done to rats through lab experiment is comparable to that observed in patients with epilepsy. To observe the harm done upon the hippocampus, the neuroplastic process of kindling, in which seizures are induced in test rats by electrical impulses sent to the brain, is conducted. When approximately 100 Class V seizures have occurred, epilepsy has successfully been induced and randomly occurring seizures will be observed. The experimental data will help to develop an accurate model of the cumulative effects of epilepsy in humans. Other studies in which seizures are induced at different ages also contribute to the study of the lasting effects of seizures during development.

PROBING THE FUNCTION OF DELAY-PERIOD ALPHA-BAND OSCILLATIONS IN VISUAL WORKING MEMORY

David Sutterer, Bradley Postle (Mentor), Psychology

Working memory (WM) can be defined as the retention and manipulation of information in conscious awareness when this information is not present in the environment. Sustained alpha-band oscillations, which correspond to 8–13 Hz oscillations in the electroencephalogram (EEG), have been observed during the delay period of spatial WM tests. These oscillations have been suggested to reflect either the active suppression of irrelevant information or the binding of information from distant cortical areas. We investigated sustained alpha-band activity during spatial delayed recognition through manipulations of stimulus identity and behavioral context. Participants completed five variants of visual delayed recognition while 60-channel EEG was recorded. In each condition we varied object-identity salience to test between these two hypotheses of alpha-band function.

BOOKS TO THE PEOPLE: A COMPARATIVE STUDY OF BOLIVIA'S CARTONERAS

Rebecca Sweeney, Ksenija Bilbija (Mentor),
Latin American, Caribbean and Iberian Studies

A challenge to the current neo-liberal editorial market, Cartonera publishers have worked to revitalize and reinvent literature throughout Latin America. Thanks to a Hilldale Grant, I was able to visit Bolivia to study the Yerba Mala Cartonera (El Alto) and its partner projects: the mARTadero Cultural Center in Cochabamba, the Nicotina Cartonera in Santa Cruz, and the Canita Cartonera in Iquique. The Mandragora Cartonera (Cochabamba) served as a point of comparison; although it employs the same model, its vision is quite different. Because very little is written on the subject, the majority of my research was conducted through interviews with Cartonera members, writers, and other book publishers; through observations mainly at the Feria del Libro where their books were sold; and through participation in Cartonera book-making.

HOSPITAL READMISSION WITHIN FIVE YEARS FOLLOWING INITIAL PRESENTATION OF CHEST PAIN

Jonathan Tang, Ana Schaper (Mentor), Nursing

A previous study indicated that carotid vessel thickness was predictive of a heart attack on initial presentation of chest pain. The purpose of this study was to determine if carotid vessel thickness predicts hospital readmission related to cardiovascular disease. Method: Retrospective chart review using electronic medical records. Results: Data include hospital readmissions, emergency visits and diagnostic tests. Conclusions: Current system has a limited capacity for data retrieval. Holistic view of the patient is not available; rates of readmission appear low, supporting quality care during initial hospital stay. Improvement to the electronic medical records system could help streamline future research.

IDENTIFYING PROMISING AFRICAN AMERICAN STUDENTS: A VOCABULARY PROFILE STUDY

Mai Thao, Monique Mills (Mentor), Communicative Disorders

There are many gifted African American students who are unidentified as such. This investigation seeks to identify promising young African American children from low income backgrounds through a comparison of their vocabulary profiles by gender, grade, and community. Using pre-existing data that was collected through a narrative elicitation task, language transcripts will be coded to determine how children's vocabulary varies from a standard narrative script. Additionally, performance on criterion-referenced and standardized measures of vocabulary will be compared. By demonstrating the ranging abilities in the vocabulary profiles, this research will contribute to the growing knowledge of language development in African American students.

THE EVALUATION OF STUDENT LEARNING STYLES AND ITS IMPACT ON PERFORMANCE IN MEDICAL ANATOMY

Nalin Thapar, Lonie Salkowski (Mentor), Radiology

The basis of this research study is to evaluate student-preferred learning styles with implementation of the VARK questionnaire. VARK is a 16-question inventory designed to assess a student's preference in learning style that reflects their strength in absorbing and learning information. The four sensory learning styles of this questionnaire are visual, aural (auditory), reading/writing, and kinesthetic. A student may show uni-modal predominance or multi-modal predominance (preference for 2, 3 or 4 learning styles). One hundred and fifty-two graduate students in the Integrated Medical Anatomy course at UW–Madison completed the VARK questionnaire online. The goal of this project is to determine if student-proclaimed learning preferences have a correlation with performance in this particular course.

MAILLARD BROWNING REACTION'S EFFECT ON BIOACTIVE COMPOUNDS IN ONION TISSUE

Elizabeth Thomas, Kirk Parkin (Mentor), Food Science

There are many documented health benefits of eating allium vegetables, such as onions, but the effects of heat treatment on any beneficial properties have not been closely investigated. The goal of this research was to determine: 1) if caramelization (Maillard browning) of onion yielded agents that could upregulate antioxidant defenses in cells using quinone reductase (QR) as a biomarker; 2) determine the structure of any QR inducing compounds using HRESI-MS, ¹H NMR, ¹³C NMR, HMQC and HMBC NMR; 3) establish an extraction and analytical procedure to quantify the level of inducer(s) in caramelized tissue; and 4) determine the comparative potential for other edible allium vegetables to yield the same or similar QR inducing agents.

GRAPHICAL USER INTERFACE FOR NEOCORTEX SIMULATOR

James Thomas, Mikko Lipasti (Mentor),
Electrical and Computer Engineering

Technology constraints have stretched computing capabilities towards limits of speed and efficiency. To push these limits, computer architects in the PHARM research group are creating a new computing model based on processing strategies used in the neocortex of the human brain. These models simulate the millions of functional units of the neocortex, each of which perform specific calculations. Challenges associated with these models include managing the massive amounts of data calculated, view pertinent data and modifying the models to adapt to new experimental conditions. This research project is focused on the creation of a graphical user interface with which to manage data with greater ease, view behavior of the data, and modify the structure of the model.

RADIOPROTECTIVE EFFECTS OF A CELL-PERMEABLE REDOX AGENT ON RETINAL ENDOTHELIAL CELLS

Alex Thompson, Leonard Levin (Mentor),
Ophthalmology and Visual Sciences

Radiation treatment of tumors can damage retinal endothelial cells, possibly by altering oxidative signaling. We hypothesized that phosphine-borane complexes would protect retinal endothelial cells from irradiation. Cells were subjected to radiation, and treated with PB1 or PB2 at concentrations from 100 pM to 100 uM 18 hours before, immediately preceding, or 18 hours after irradiation. Cell viability was reduced to $56.1 \pm 6.3\%$ and $37.1 \pm 3.5\%$ of control following 10 and 30 Gy irradiation ($p < 0.004$). Treatment with 10 nM or 100 nM PB1 before, concurrent with, or after 10 Gy irradiation significantly increased numbers of viable cells ($p < 0.05$). PB1 and PB2 have a radioprotective and radiomitigative effect in irradiated retinal endothelial cells, possibly related to interruption of oxidative signaling pathways.

ATOMIC AND MOLECULAR ADSORPTION ON PD(111) AND RU(0001)

Scott Tonelli, Emmanouil Mavrikakis (Mentor), Chemical and Biological Engineering

The goal of this research is to elucidate some of the catalytic properties of the palladium (111) and ruthenium (0001) crystal facets. Palladium is important for the clean-up of automotive emissions and ruthenium is used for Fischer-Tropsch synthesis of hydrocarbon fuels. The adsorption of several atomic and molecular species and molecular fragments in each of the high-symmetry sites on the facets was studied using self-consistent First-principles Density Functional Theory. The preferred adsorption site, energy, and geometry, in addition to the estimated diffusion barrier, were determined for each species. With this information it is possible to theorize why a specific metal may act as a superior catalyst, as well as optimize the catalyst surface to obtain selective and cost-effective reactivity.

DETERMINATION OF *E. COLI* FLAGELLAR GENES REQUIRED FOR SURFACE SENSING

Sonia Trevino-Dopatka, Douglas Weibel (Mentor), Biochemistry

Bacterial filamentation, or elongation, has been observed as a survival response to stressful conditions and linked to increased virulence in human bacterial infection. Evidence supports the role of the flagellum in this survival response. The objective of this study is to determine the specific flagellar components necessary for filamentation of *E. coli* on the hydrogel polyacrylamide by comparing the strong filamentation response of wild-type *E. coli* (BW25113) with that of single-gene flagellar mutants. An initial qualitative screen has shown only a fraction of mutants exhibiting the wildtype filamentation response. Next, we will use flow cytometry to obtain a quantitative distribution of bacterial cell lengths. Understanding the role of the flagellum in the differentiation response has implications for drug development against bacterial infection.

EXPLORING THE LINK BETWEEN FATHER ABSENCE AND PARENTAL DIVORCE AND ADOLESCENT GIRLS' DEVELOPMENT

Sonya Troller-Renfree, John Delamater (Mentor), Sociology

There is a substantial literature on biological father absence and divorce that documents effect on sexual initiation. However, this body of literature has neglected to look at the impact of the timing of father absence and the increased prevalence of internalizing and externalizing behavioral problems that may affect teens who have experienced divorce. To address these concerns, I will use data from The National Longitudinal Study of Adolescent Health (Add Health). I predict that my results will indicate that the timing of father absence and the experience of divorce will both make a difference in whether adolescents girls engage in early (age 15 or younger) sexual debut, whether they experience teenage pregnancy, and if these girls' exhibit increased amounts of internalizing and externalizing problems.

**DEVELOPMENT OF IRX4 REPORTER
MOUSE EMBRYONIC STEM CELL LINE
TO MARK VENTRICULAR DIFFERENTIATION**

Josh Trzebiatowski, Daryl Nelson (Mentor), Anatomy

Myocardial infarction (MI), or heart attack, continues to be a major health-care concern, affecting over one million Americans each year with 40 percent of reported cases resulting in fatality. MI is an ischemic condition that damages viable myocardium. Embryonic stem cell-derived progenitors are being considered as alternative treatments of MI due to their ability to spawn diverse cell lineages necessary to repopulate depleted myocardium. Because effects of MI primarily manifest in the ventricular myocardium, we will focus on the identification of a ventricle-specific progenitor, using *Irx4* as a genetic marker. Employing a homologous recombineering methodology, we are engineering a cell line that will report *Irx4* gene expression via co-localization of fluorescent and bioluminescent reporter genes. Purified *Irx4*⁺ cells will be assessed for therapeutic potential post MI.

TWO WOMEN

Danielle Valdez, Elaine Scheer (Mentor), Art

This project will represent the two main strong women characters in the books *Sense and Sensibility* by Jane Austin and *Housekeeping* by Marilyn Robinson. Current research entails finding line drawings of significant objects in the books. My mentor will then use these images to create a collage of the character that will be printed using traditional artistic printing methods onto a 5.5 x 8.5-inch card. Each woman has one card containing objects that represent her on one side and a texture of the other, which represents a theme of the book. As a final result, the cards will be stacked in a handmade fabric satin box.

EFFECT OF STRAIN AND MEDIUM ON ATTACHED BIOMASS OF CLADOPHORA

Kathryn Van Gheem, Katherine McMahon (Mentor),
Civil and Environmental Engineering

Treated municipal wastewater typically has high concentrations of phosphorus that can alter the environment into which it is discharged. I examined relationships between phosphorus concentration and attachment responses of the filamentous alga *Cladophora* growing in Madison MMSD effluent or SD11 media to determine whether *Cladophora* can be used to lower nutrient concentrations while also generating a source of biofuel. In cultures grown on effluent, phosphorus concentrations decreased quickly and then leveled off near the end of the experiment. Effluent-grown cultures containing the wild strain exhibited the highest attachment percentages. Results suggest that attachment is a function of the type of medium and strain used, with implications for the design of algal-cultivation systems attached to wastewater treatment facilities.

EFFECTS OF LEARNING METHOD ON CHILDREN'S VOCABULARY ACQUISITION IN A SECOND LANGUAGE

Stephanie Van Hecke, Margarita Kaushanskaya (Mentor),
Communicative Disorders

The current study examined the effects of two learning methods on children's ability to acquire new vocabulary. Children were taught new words in association with written English translations or in association with pictures. Analyses revealed that children acquired novel words better in association with pictures. In addition, the effect of learning modality on word-learning depended on children's reading skills. We also found that high-ability readers outperformed low-ability readers when learning new words in association with English translations. These findings suggest that word-learning in childhood is facilitated by visual presentation of the material, and may help educators create a more effective language curriculum.

SOLUTIONS TO POOR INDOOR AIR QUALITY

Sarah Vander Wegen, Kelly Leary, Mitchell Moe, Augusta Ripple,
Roberto Rengel (Mentor), Design Studies

This poster explores the causes of poor indoor air quality in buildings and the strategies being developed by the design industry to reduce the problem. Ironically, efforts to make buildings more energy efficient since the 1973 oil crisis have made the condition worse, resulting in more cases of sick building syndrome, building-related illnesses, and billions of dollars of lost revenue. A literature review plus interviews with leading designers in the field indicate that although differences of opinion between the design community and agencies such as LEED exist, they are being worked out and progress is being made in the areas of air filtration, carbon dioxide monitoring, and fresh air intake in buildings.

UNIVERSAL DESIGN IN THE WORKPLACE

Marina Vasiljevic, Sarah Gunnink, Lauren Miller,
Roberto Rengel (Mentor), Design Studies

The practice of universal design has become a critical component of new interior environments. This concept falls hand-in-hand with sustainability, as environments designed to accommodate all users equally require less change and have longer life cycles. This research looks at the application of universal design principles in the corporate workplace. The seven basic universal design principles developed by The Center for Universal Design were analyzed critically and guidelines have been developed for their application in the workplace. These were then further examined in relation to current research by Haworth Inc. about organizational cultures in the workplace. Findings suggest that aesthetic solutions for unobtrusive design strategies are both desirable and achievable when designing environments accessible to all users.

LAKE SUPERIOR'S JOHN HANCOCK: UNIQUE ATMOSPHERIC SIGNATURE IN TALL TOWER CO₂

Victoria Vasys, Ankur Desai (Mentor), Atmospheric and Oceanic Sciences

The Great Lakes have a large impact on regional climate, yet their carbon cycles are under-studied. This investigation attempts to determine whether the atmosphere can depict a carbon signature from Lake Superior and further, whether it can be used to calculate accurate fluxes from the lake. Particle influences on the tower are resolved from an atmospheric transport model and particles that have traveled over Lake Superior are identified. Lake fluxes extracted from a novel coupled 3D lake ecosystem and circulation model are applied to the transport model and the expected CO₂ measurements at the tall tower are calculated and compared. Seasonal patterns of lake fluxes are evident in the atmospheric observations, however, further research is needed to identify the accuracy of the methodology.

MAIN-DEC: MOST AND IOPI NORMATIVE DATA EXERCISE COLLECTION

Nicole Velez, Jacqueline Hind (Mentor), Medicine, Gastroenterology

Dysphagia, difficulty swallowing, affects millions of adults and children who suffer from traumatic brain injury, diseases of the nervous system or a variety of other head/neck disorders. Dysphagia puts people at risk for malnutrition and pneumonia. The MAIN-Dec Project (MOST and IOPI Normative Data Exercise Collection) will gather data from non-dysphagic adults, to guide dysphagia therapy. Two standard oral strengthening devices will be used to collect tongue pressures during pressing and swallowing. This normative database, to which dysphagic patients may be compared, will aid in the diagnosis and management of dysphagia and serve as a reference for dysphagia rehabilitative exercise.

ASSOCIATION BETWEEN DISPLAY OF DEPRESSION AND ALCOHOL USE IN COLLEGE STUDENTS

Hope Villiard, Megan Moreno (Mentor), Pediatrics

College students with mental health concerns are at increased risk for problem alcohol use. References to both mental health and alcohol are frequently present on college students' Facebook profiles; gender differences in these displays are not well understood. Facebook profiles from college students who displayed references to depression were examined for concurrent display of alcohol use. Of 80 profiles, 56% were male and 25% displayed depression. Of the profiles that displayed depression, males were nine times as likely to display alcohol (CI 1–79, $p=0.05$). There was no significant association among females. Future study may be done on males who display depression, to determine if they may be using alcohol as a form of self-medication.

EFFECT OF INUNDATING TOPSOIL ON THE RELEASE OF NITROGEN AND PHOSPHORUS AND THE GROWTH OF A WEED

Carla Virlee, Joy Zedler (Mentor), Botany

Stormwater wetlands serve numerous ecosystem services such as nitrogen and phosphorus sequestration. This experiment investigated how nutrient retention in transplant topsoil covering the UW Arboretum's Pond 2 Stormwater Facility was affected by various inundation durations and the presence of *Phalaris arundinacea*. Nitrate, nitrite, ammonium and phosphate concentrations were measured with a Hach spectrophotometer and average height, number of leaves, stomatal conductance, and dry root and shoot biomasses were recorded. Preliminary findings indicate that hypoxic conditions in the beakers subjected to the longest inundation duration resulted in the increased availability of nitrogen and phosphorus for plant growth. Possible implications are that the DNR's policy of covering wetland stormwater facilities with six inches of topsoil should be reconsidered.

WATER PURIFIERS PROJECT: ADDRESSING THE NEED FOR CLEAN WATER TO ENHANCE LIVING CONDITIONS IN VIETNAM

Tuyetnga Vo, David Nguyen, Michael Cullinane (Mentor),
Southeast Asia Studies

The Vietnam Health Project (VHP) is a non-profit student organization dedicated to bring about positive changes to the living standards of the underserved population in Vietnam. In the summer of 2009, with the assistance of Dr. Michael Cullinane and the Catalyst Foundation (CF), seven VHP members journeyed to Vietnam to improve the health conditions of the impoverished people living on landfills in southern provinces. VHP's goal for this project was to ameliorate the living standards of more than 100 families by supplying them with water purifiers. Moreover, VHP members held community-wide sessions to educate the families about disease prevention and the importance of personal hygiene. After the trip, VHP maintained communication with the CF to monitor the long-term effects of the project.

ANALYSIS OF NEUROLOGICAL DEFICITS AND LANGUAGE LATERALIZATION USING FUNCTIONAL MRI

Jed Voss, Vivek Prabhakaran (Mentor), Radiology

Functional MRI (fMRI) has become an established technique for noninvasive pre-operative mapping of brain function in brain tumor patients through the use of memory, language, and motor paradigms. In this study, multiple regression analyses were conducted on brain tumor patients to examine the influence of age, gender, and handedness on lateralization of language activation (LI) in Broca's and Wernicke's area (n=61 patients), as well as pre-operative and post-operative motor and language deficits (n=85 patients). LI was computed on the basis of fMRI pre-operative scans. Age was found to have no statistical significance upon LI or to the presence of deficits. Gender showed a trend towards significance in influencing motor deficits. Handedness was found to significantly influence LI in Wernicke's area as well as language deficits.

MEDICAL HOME: MORE THAN A PRIMARY CARE PROVIDER

Heather Voves, Ana Schaper (Mentor), Nursing

The Medical Home model utilizes a shared plan to enhance care for children. Communication between the Medical Home team and school has provoked controversy. The purpose was to determine the perceived benefits and detriments of communication between the Medical Home team and school. Methods: The sample included pediatric staff members. A qualitative design used focus groups and individual interviews. Results: No written shared plan of care exists at this time. Problems arise as a result of a lack of direct communication between health care providers and schools. Conclusion: Nurses can engage parents as partners in creating a written shared plan of care.

DEGRADATION OF PRION PROTEIN BY SOLUBLE SOIL PROTEASES

Tyler Wadzinski, Joel Pedersen (Mentor), Soil Science

Transmissible spongiform encephalopathies (TSEs), or prion diseases, are fatal neurodegenerative diseases caused by the misfolded pathogenic prion protein (PrPTSE). We hypothesize that microbial proteases in biologically stimulated soils and compost may degrade PrPTSE, reducing or eliminating infectivity. Procedures to extract extracellular proteases from stimulated soil, compost, and manure samples were optimized. Immunoblotting measured the extent of PrPTSE degradation in samples exposed to protease extracts. Preliminary results suggest partial degradation of PrPTSE following short incubation periods in a manure extract. Future work includes optimizing protease treatment conditions and assessing potential reductions in TSE infectivity.

**DETERMINING THE ROLES
OF PROENKEPHALIN-LIKE GENE IN ZEBRAFISH
NEURONAL AXON FORMATION AND GUIDANCE**

Mary Walton, Mary Halloran (Mentor), Zoology

During development, neurons extend an axon to a specific target. Regulation of genes within the neuron may control the behavior of the axon. We are investigating the process of axon guidance in neurons using zebrafish embryos. I am studying the role of the gene proenkephalin-like (*penkl*). I first detected *penkl* mRNA expression patterns *in situ* and showed that *penkl* is expressed in a small subset of neurons. I am characterizing *penkl*'s function by injecting a morpholino oligomer (MO) into young embryos, which interferes with pre-mRNA processing and consequently knock down the function of the targeted gene. I am determining the effect of *penkl* knock-down by labeling axons and quantifying defects in their pathways. This study will add to our knowledge of how the nervous system develops.

**TESTING THE ASSOCIATION OF A GENE
WITH COW INFERTILITY**

Bryanna Ward, Rachael Wooten, Hasan Khatib (Mentor), Dairy Science

Within the last 50 years, there has been a decrease in the fertility in cattle worldwide. Previous studies in our lab have shown that several genes were found to be associated with fertility using *in vitro* fertilization systems. The purpose of my research is to determine if there is an association between the FHIT gene and cow fertility. The basic design for this experiment is to run a polymerase chain reaction (PCR) on a sample of cows to amplify the DNA, and then perform an enzyme digestion that determines where along the DNA strand there is a combination of alleles that identifies the genotype of each cow. Lastly, we perform an association analysis between the genotype of the cow and fertility.

THE MOVEMENT OF THE LOW-BACK MERGER IN WESTERN WISCONSIN: DOCUMENTING LOCALITY THROUGH LANGUAGE

Kassandra Weber, Danica Rockney, Thomas Purnell (Mentor), Linguistics

The Atlas of North American English (Labov et al. 2006) shows that the Wisconsin-Minnesota border delineates a definite low-back merger (“caught”=“cot”), incomplete in Wisconsin. Contrasting conversational recordings from twelve participants age 18–24 (six from Ashland; six from Black River Falls) with a few older speakers from both regions, we investigate whether, in fact, this merger has progressed further east. The atlas suggests that Ashland is further along in the merger. Yet, the increase in data detail may reveal external relations between Black River Falls and the twin cities such as employment patterns. We expect the low-back merger to be similar in both cities, showing that the merger will be more frequent in Black River Falls than originally suggested.

THE EFFECTS OF VARYING PRAIRIE PLANT CONCENTRATION ON SOIL AGGREGATE FORMATION

William Weggel, Nicholas Balster (Mentor), Soil Science

High-quality plant residues indexed by the ratio of carbon (C) to nitrogen (N) may enhance the formation and stability of soil aggregates. Typically, prairie plants have large C:N ratios compared to invasive species. I hypothesize that there will be greater stable macroaggregates in soil supporting a greater percentage of prairie vegetation relative to invasive species. To test this hypothesis I will separate soil aggregates in dewatered sediments obtained from a larger study examining the effects of seeding density on prairie restoration. I expect that plots containing a higher proportion of prairie to invasive vegetation will have larger and more stable aggregates than plots with a lower proportion. This study will help elucidate the mechanistic relationship between species composition and soil aggregation.

THE ROLE OF THE ARYL HYDROCARBON RECEPTOR NUCLEAR TRANSLOCATOR IN OXYGEN HOMEOSTASIS.

Sam Weinberg, Christopher Bradfield (Mentor), Oncology

For many years, it has been known that Hypoxia Inducible Factor 1 and 2 alpha (HIF-1,2) play a key role in oxygen homeostasis. What is less clear is the function of their binding partner, the Aryl hydrocarbon receptor nuclear translocator (ARNT), in the regulation of the system. In this study, an ARNT hypermorphic mouse which produces only 5–10% the level of ARNT compared to a wild type animal was employed. By using an acute anemia model, we attempted to elucidate the function of ARNT in oxygen homeostasis; especially, its role in maintaining normal hematocrit levels. From the study it is obvious that ARNT's role in oxygen homeostasis is considerably more complicated than initially expected, and goes way beyond erythropoietin regulation.

INTERGENERATIONAL DIFFERENCES IN FAMILY BUSINESSES

Jessica Weis, Jessica Megna, Meghan Monahan, Debra Holschuh-Houden
(Mentor), Family Business Center

Family business statistics suggest that only 33% of first-generation family businesses make it to the second generation, and even fewer make it to the third. Our research will explain the difficulties family businesses are going through today with generational transitions, focusing on adaptations to growth in technology. We plan to interview several employees in family businesses from multiple generations. Younger generations, more specifically Gen Y, can help to transition businesses more fluidly into today's technological world while also educating older generation members within family businesses. Older generations have difficulty keeping up with current technological standards of businesses today. We also hope to show that it is possible for workers from older generations to pick up on technological advances.

HERITABILITY OF SOCIAL INHIBITION IN MIDDLE CHILDHOOD AND EARLY ADOLESCENCE

Shauna Weiskotten, H. Hill Goldsmith (Mentor), Psychology

Previous research on the temperamental trait of social inhibition (SI) has suggested that, in infants and young children, SI is moderately to highly stable and has moderately high heritability (the extent to which individual differences are associated with genetic differences). This study extends the investigation of stability and heritability to older children with more diverse assessment (parent-report, observational, and behavioral data) of SI than previous studies. We expect to confirm significant, but perhaps lower, stability across the pubertal transition (from 7–8 to 12–17 years). We also predict that females will be higher in mean SI and less stable from age to age. Potential gender differences in heritability will be explored.

THE INFLUENCE OF STRESS ON INTEREST AND TASK PERFORMANCE

Deena Weiss, Judith Harackiewicz (Mentor), Psychology

Socio-cognitive conflict refers to the psychological processes underlying a confrontation between individuals with different points of view. This conflict can be stressful because it creates uncertainty about competence, but individuals who have confidence about their ability may actually respond positively to conflict. Dickerson and Kemeny (2004) demonstrated that the threat of being evaluated in a social comparative context could raise cortisol levels, a physiological indicator of the stress response. In the current study, we manipulated conflict and measured salivary cortisol levels to examine whether stress responses to conflict depend on confidence levels, and whether they influence task performance and interest.

QUANTIFYING THERMODYNAMIC EFFECTS OF HOFFMEISTER SALTS ON THE MELTING OF A SHORT DNA DOUBLE HELIX

Timothy Wendorff, M. Thomas Record, Jr. (Mentor), Biochemistry

Salt concentration has a large effect upon protein folding, nucleic acid melting, micelle formation, and other relevant biochemical phenomenon. Salts contribute a coulombic effect arising from charge interactions and an osmotic effect from hydration of the biomolecular surface. Both effects are equivalent for all 1:1 salts. A third effect, the Hofmeister effect, is ion specific which allows ions to be ordered from stabilizing to destabilizing. We recently submitted a paper describing Hofmeister effects on free energy of protein folding and DNA melting via the Solute Partitioning Model which explains these effects through accumulation and exclusion of ions at certain surface types. We have also begun determining the enthalpic contribution to the observed free energy Hofmeister effects on DNA using Isothermal Titration Calorimetry.

THE FEASIBILITY OF A PEER SUPPORT NETWORK FOR DIABETES IN UGANDA

Benjamin Werner, Dory Blobner, Richard Kinyanjui,
Linda Baumann (Mentor), Nursing

Our study was designed to test the feasibility of establishing a network of peer support among patients with diabetes in Uganda. Forty-six adults with type 2 diabetes, all from the same clinic, were given education on diabetes self-care. They were then matched with another participant of the same gender and for accountability and support. Data collected pre- and post-intervention included A1c, height, weight, and blood pressure. A questionnaire contained items about self-care behaviors, barriers to diabetes care, and demographic information. Data showed that we successfully recruited and retained participants and engaged their involvement in study activities reaching out to peers. Outcomes of glycemic control and diastolic blood pressure showed significant improvement in four months; other measures showed mixed results.

TRAINING'S EFFECT ON SOFTWARE USAGE

Ben West, Amir Assadi (Mentor), Mathematics

Training is not in and of itself good, but only good so far as it improves outcomes. Therefore, we wish to investigate what effect training has on usage of Epic's software and overall user performance. This is a form of "last mile" research which focuses not so much on creating useful tools, but rather on ensuring that existing tools are used to their full potential. This project was done in cooperation with Epic Systems Corp.

INVESTIGATION OF THE ROLE OF NILB, A HOST-ASSOCIATION FACTOR, IN A MODEL ANIMAL-BACTERIAL MUTUALISM

Regina Whitemarsh, Heidi Goodrich-Blair (Mentor), Bacteriology

NilB and NilC (nematode intestine localization) are bacterial factors that are required for the mutualistic bacterium, *Xenorhabdus nematophila*, to associate with its nematode host, *Steinernema carpocapsae*. Both NilB, an integral outer membrane protein, and its homolog found in the sheep pathogen, *Dichelobacter nodosus*, have nine predicted surface-exposed loops. It is predicted that loop substitutions from NilB to Dno will lead to an increase in nematode colonization, and therefore a greater insight into what regions of NilB are most important for colonization. We are interested in identifying whether specific regions of NilB interact with NilC or are dependent upon NilC for expression for maintenance at wild-type levels within the cell.

BERGMAN CYCLIZATION OF ETHYNYLCYCLOBUTADIENES

Andrew Wiederhold, Brian Esselman (Mentor), Chemistry

The mechanism of carbon condensation is a fundamental chemical process which is not fully understood. In an attempt to shed light on the mechanism of carbon condensation, I will computationally evaluate the Bergman Cyclization of di- and tetra-ethynylcyclobutadienes as model compounds for soot formation in the absence of a hydrogen trapping source. Computations will be carried out by employing both density functional theory (B3LYP or M06) and coupled cluster theory (CCSD or CCSD(T)) using Gaussian 09. The geometries and IR frequencies of all reactants, intermediates, and products associated with the hypothesized reactions will be studied computationally. The goal of the study is to obtain relative energies for all relevant structures and provide insight into the mechanism of carbon condensation.

EFFECTS OF NICOTINE DEPRIVATION AND THREAT PREDICTABILITY ON FEAR-POTENTIATED STARTLE RESPONSE

Walter Williams, John Curtin (Mentor), Psychology

Addiction to alcohol and other drugs (AOD) is highly comorbid with preexisting anxiety disorders, implicating dysfunction of anxiety systems in the development of AOD addiction. Reduced anxiety as indexed by fear-potentiated startle response has been demonstrated as a reinforcing consequence of alcohol consumption. Conversely, nicotine deprivation has been associated with increased anxiety and heightened fear-potentiated startle response in nicotine dependent individuals. However, additional research is necessary to verify that this enhanced startle response reflects dysregulation of anxiety rather than fear systems. This project manipulates threat predictability to assess the effects of nicotine deprivation on fear and anxiety systems.

MAKA PAD PROJECT: PROMOTING EQUAL ACCESS TO EDUCATION

Tracy Wilson, Liz Chadwick, Kylee Hintz, Hope Houle,
James Ntambi (Mentor), Biochemistry

The price of sanitary pads is more than many Ugandan families can afford. Without pads, there are low attendance rates among female students as they miss about one week of school per month due to their menstrual periods. The frequent absenteeism hinders their future education and employment opportunities. Village Health Project (VHP) has partnered with CoBIN (Community Based Integrated Nutrition) to address this issue by providing Maka Pads and health workshops to female students at four primary schools in the Kiruhura District. Maka Pads are low-cost sanitary pads that work similarly to name-brand pads and are biodegradable and locally-made by Ugandan women. Pads were distributed in the winter of 2009–10 and we received positive feedback from participants indicating the impact and potential of the project.

EXPLORATION OF THE RELATIONSHIP BETWEEN GRAIL AND CBL-B

Paul Winograd, Christine Seroogy (Mentor), Pediatrics

The E3 ligases, GRAIL and Cbl-b, are necessary for the induction CD4+ T-cell anergy. Using CD4+ T-cells from wildtype (WT) and Cbl-b knockout (Cbl-b^{-/-}) mice, we investigated the relationship between GRAIL and Cbl-b. Induction of anergy led to an 8-fold increase in GRAIL mRNA expression in WT T-cells compared to the Cbl-b^{-/-} T-cells. In contrast, ectopic expression of GRAIL in WT and Cbl-b^{-/-} CD4+ T-cells led to a 30% decrease in proliferation in both groups relative to their respective GFP-transduced control, providing evidence that GRAIL functions independently of Cbl-b for conveyance of an anergic phenotype. In sum, these data suggest a Cbl-b-dependent role for optimal upregulation of GRAIL mRNA under energizing conditions and a Cbl-b-independent functional role for GRAIL in the anergic phenotype.

MEASURING CHILDREN'S ATTENTION TO EMOTION

Allison Wojnar, Seth Pollak (Mentor), Psychology

Adolescence is a time of increased risk for developing mental illnesses, such as depression. Attentional bias, or shifts in awareness to various features in one's environment, is proposed as a predicting factor for developing a mental illness. Additionally, it is proposed as a mechanism that can maintain and aggravate such conditions. The current study measures attention biases to emotionally salient stimuli by creating an attentional blink (AB) visual task appropriate for children and adolescents, which explores how children attend to various emotions (neutral, happy, sad). Results of the study will hold implications for the link between attention and mental health in this high-risk population.

THE COLLEGE PATH OF INDIVIDUALS IN A FAMILY BUSINESS

Kathryn Wolf, Laura Wolf,

Debra Holschuh-Houden (Mentor), Family Business Center

Our research focuses on the college path taken by former students whose families were involved in a family business while attending college. Our research examines whether the students' course choices and majors were influenced by the expectations of joining the family business once graduated. We will then look at whether the courses taken were relevant and needed for the individuals' future careers in their family businesses. The results will serve as guidance on useful courses and majors to peruse while in college for current or future students whose families are involved in a family business.

REGIONS OF INTEREST IN PARKINSON'S DISEASE

Rachel Wong, Catherine Gallagher (Mentor), Neurology

Parkinson's Disease is caused by the decrease in dopamine synthesis by the neurons that project to the putamen and caudate nucleus. Positron Emission Tomography (PET) can measure the levels of dopamine synthesis using dopamine synthesis tracers 6-[18F]FMT and [18F]FDOPA. Diffusion Tensor Magnetic Resonance Imaging (MRI) can be used to measure the quantity and length of brain fibers. The purpose of this twelve-patient study is to compare their PET scan results to their MRI results. By deciding the best imaging and analysis techniques, further information about Parkinson's Disease and its exact effects on the brain will be discovered.

DESIGNING THE OFFICE FOR GENERATIONAL SHIFTS IN THE WORKPLACE

Briana Woods, Trisha Beer, Tina Schnabel, Joyce Williams,
Roberto Rengel (Mentor), Design Studies

With the generational shifts going on in the workplace today, designers are looking for ways to create supportive office environments for every age group that will help ease transitions and improve relations between them. A literature review aimed at describing these groups, their general life experiences and views on work was undertaken. Further information was gathered during lectures from major office furniture manufacturers on office trends and site visits to two national architectural firms. The “new office” will be reduced in size, feature mostly open space plans and integrate an unprecedented amount of technological and sustainability features. The implications of this research are important for the continued success of corporate and public workplaces, all of whom are experiencing a changing workforce today.

SUPERIORITY THEORY USE IN JAPANESE AND AMERICAN HUMOROUS WORLD WAR II PROPAGANDA

Rachel Wroblewski, Adam Kern (Mentor),
East Asian Languages and Literature

The techniques and theories of humor expand beyond the bounds of region and culture, even when the content of the material is vastly different. Humorous propaganda is an especially good illustration of this concept. This study examines the tools of humor present in American World War II propaganda compared to that of the Japanese. By studying the jokes and puns present in the Private SNAFU cartoons produced by Warner Bros. and the rakugo, manzai, and phonograph English translation transcripts, this study finds a large reliance on the superiority theory of humor to convey the intended underlying message, especially when the enemy is present or implied. These results can help provide a better understanding of the techniques employed by current pieces of humorous propaganda.

HMONG HUMAN RIGHTS: THE SECOND GENERATION HMONG AND THEIR ENGAGEMENT IN TRANSITIONAL POLITICS

Lisa Xiong, Her Vang (Mentor), Asian American Studies

During the Vietnam War, the United States recruited the Hmong to fight against Communist forces in Laos. The failed U.S.-Hmong effort to “contain” Communism in Laos forced more than 100,000 Hmong into exile after 1975. Since then, the Hmong, including some second-generation Hmong who were born in the United States, have continued to work for social change and human rights in Laos. Among those second-generation Hmong were the students who founded the Hmong Human Rights Organization at UW–Madison. This research project seeks to analyze how HHR is working to bring social change and human rights to the Hmong people in Laos and Thailand. The project will draw on interviews with the organization’s founders, newspapers, and NGO reports.

IDENTIFYING THE ROLES OF HOMEODOMAIN PROTEINS IN CRYPTOCOCCUS NEOFORMANS

Lucy Xu, Christina Hull (Mentor), Biomolecular Chemistry

In eukaryotes, homeodomain proteins have been found to regulate development, including sexual development of the fungal pathogen *Cryptococcus neoformans*. Although two key homeodomain regulators of sexual development have been identified and characterized, many of the regulators of sexual development have yet to be identified. Bioinformatic studies have identified additional likely homeodomain proteins (HDPs). Due to the conservation of HDPs throughout evolution, we hypothesized that these putative HDPs in *C. neoformans* will play roles in sexual development. To test this hypothesis, we created deletion strains for several HDPs and evaluated them for phenotypes. Initial studies have not revealed detectable phenotypes in development, so future work will include further analyses of deletion strains to identify the roles of HDPs in other pathways in *C. neoformans*.

MECHANISMS OF QUORUM SENSING BY VJBR AND BLXR REGULATORY PROTEINS IN BRUCELLA MELITENSIS

Elisa Yoritomi, Gary Splitter (Mentor), Pathobiological Sciences

Brucellosis is the most common zoonotic disease worldwide. Many *Brucella melitensis* virulence factors are regulated by quorum sensing, a bacterial communication system. Two *Brucella* quorum sensing regulatory proteins, VjbR and BlxR, are required. We hypothesize that these proteins dimerize and interact with promoter DNA in the absence of the signal molecule. A yeast two-hybrid system was used to test for protein interactions, while an EMSA was used to observe protein and promoter DNA interactions. We observed that VjbR forms homodimers.

STRUCTURAL ANALYSIS OF LIGAND-BOUND XANTHOMONAS AXONOPODIS CYCLIC AMP RECEPTOR PROTEIN-LIKE PROTEIN

Christine Yu, Katrina Forest (Mentor), Bacteriology

Xanthomonas species are plant pathogens responsible for large-scale damage to commercially important crops. The transcription factor Clp (cyclic AMP receptor protein-like protein) orchestrates the regulation of subcellular levels of many proteins involved in Xanthomonas pathogenesis. Clp belongs to the CRP superfamily of bacterial transcription factors, which in general switch from non specific to specific DNA binding upon binding of cAMP. Xanthomonas axonopodis does not produce cAMP, and recent research found that its Clp may be allosterically inhibited by cyclic di-GMP. I will attempt to solve the crystal structure of the *X. axonopodis* Clp bound to the secondary messenger cyclic di-GMP to provide the first direct evidence for a possible negative allosteric function of a member of the CRP superfamily of proteins.

MADISON ACTIVIST STUDY

Yonas Zewdie, Katherine Hale, Brian Christens (Mentor),
Interdisciplinary Studies, Community and Environmental Sociology

This study consists of interviews with community activists in Madison, Wisconsin. The interviews relate to the experiences that activists have had participating with nonprofit organizations to achieve social change. The interviewees are being identified through snowball sampling, and are asked about the local organizations they have participated in and are aware of. Interviewees then are asked to describe their experiences and ideas around activism's role in change, the roles of race, globalization, and leadership development within their experiences with advocacy. The analysis of the qualitative data gathered through this study will provide insights into the variety of experiences of community activists, and the roles that race and interpersonal relationships play in the evolution of community organizations and leadership development.

REDUCED CAMP PRODUCTION IN FX CELLS MAY BE DUE TO FMRP ASSOCIATION OF ADENYLATE CYCLASE MRNA

Jacob Zimbric, A Bhattacharyya (Mentor), Waisman Center

Loss of fragile X mental retardation protein (FMRP) causes Fragile X syndrome (FX). FMRP shuttles and translates specific mRNA, including possibly adenylyl cyclases (AC), which are responsible for cyclic AMP (cAMP) synthesis. We hypothesize FX cells cannot shuttle and translate the AC mRNA, causing reduced production of cAMP that occurs in FX cells. Our qPCR data show reduced AC mRNA in human FX cells. To determine if FMRP is associated with AC mRNA, FMRP was immunoprecipitated from cultures of cells and probed for association of AC mRNA. The results demonstrate association of FMRP with AC mRNA in control cells. In the absence of FMRP in FX cells, no AC mRNA is detected. These results provide a mechanism for reduced cAMP production in FX cells.

METHOD TO CONFIRM IN FRAME DELETIONS OF DOUBLE KNOCKOUTS OF *E. COLI* K-12 MG1655

Emily Zimmerman, Michael Donath (Mentor),
Great Lakes Bioenergy Research Center

High throughput methods using robotics have been used to create knockouts in *E. coli* K-12 MG1655 and definitive confirmation that the large scale method need to be made. The project goal is to develop a timely process to verify the deletion of each gene in a double knockout via polymerase chain reaction. Once confirmations are successfully made, growth on a diversity of media will be observed. Data will be used in bioinformatics and in silico methods to create a metabolic model of the metabolism of *E. coli* K-12 MG1655.

EXPANDING THE FAMILY BUSINESS: PRIVATE EQUITY

Dustin Zucker, Debra Holschuh-Houden (Mentor),
Family Business Center

Nationwide, family-owned businesses constitute for approximately 85% of all businesses. When a family decides to expand and grow their firm, many issues may arise. This research addresses a major concern that a family owned business might face. Many times, capital must be raised relying on outside private equity firms. Adding both a financial and managerial obligation and burden to the firm, this study will look at issues the family may have with bringing outside people into the business, what specifically they may look for in hiring an outside firm, as well as what that firm may require (financially and personally) from the family business. Research will focus on attitudes, obligations, and resources the family themselves may be required to face.

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