PRESENTATION SESSION I

1.A.1  A Malaria Type Effector in the Soybean Cyst Nematode Modulates the Plant Immune System
Danielle Andrews

Cyst nematodes (CNs) are sedentary endoparasitic round worms that infect the roots of economically important plants such as soybean, potato and sugar beet. CNs secrete proteins (effectors) into root tissues and cells to promote parasitism. Sequence analyses of one CN effector determined that it has marginal, but significant similarity to an effector found only in the Malaria parasites (*Plasmodium* spp.), the Circumsporozoite Protein (CSP). Furthermore, the CN effector and *Plasmodium* CSPs share four protein domains that are essential for CSP function inside animal cells. Numerous evidences indicate that *Plasmodium* CSPs suppress the immune systems of their animal hosts by multiple, diverse strategies. As plants have immune systems, with significant overlaps with the animal innate immune system, we performed assays to test whether the CN effector suppresses plant immunity. Remarkably, multiple lines of evidence indicate that the CN effector strongly suppresses both of the major routes of the plant immune system. We are currently testing whether a CSP from the monkey Malaria species, *P. fieldi*, which the CN effector is most similar to, also suppresses plant immunity. We hypothesize that the CN effector and CSPs have converged on similar sequences to execute similar functions in their plant and animal hosts, respectively.

1.A.2  The Effects of Cover Crop Termination on Subsequent Corn Seedling Growth
Abigail Peterson

Cover crops are grown to protect and improve soil during fallow periods between crops. The benefits of cover crops include preventing soil erosion, increasing nutrient retention, and suppressing weeds. A challenge associated with cereal rye cover crops is that sometimes there is a decrease in corn yield the following year. Cereal rye is one of the main cover crops planted in Iowa, and like corn is also a grass species. Because of this relationship both grasses may be attacked by the same plant pathogens. I hypothesized that if a winter rye cover crop was terminated with glyphosate a few days before planting corn, then there would be an increase in corn root seedling infection caused by higher levels of pathogens passed on from the dying rye plants. I found that terminating rye cover crops three days before planting corn resulted in an increase in mesocotyl infection and shorter radicles than terminating fourteen days before planting. To evaluate the source of root infection, DNA extractions were conducted to detect specific fungal pathogens in the *Pythium* and *Fusarium* genera infecting the corn radical, both three days and fourteen days after termination, with and without using the herbicide glyphosate for termination.
1.A.3 Oxygen Demand of Red Flour Beetles in Sorghum
Christian Miller

Sorghum is the third most internationally traded cereal grain in the world and is Nigeria’s highest produced cereal grain. Full return storage is pivotal to maintaining edible feed in this region. Hermetic storage, which is a non-chemical storage method that utilizes the capability of oxygen seals for possible aerobic asphyxiation of pest, has been evaluated for the control of the red flour beetle (*Tribolium castaneum*), which causes large storage losses. Using hermetically sealed containers and a fixed ratio of beetles to sorghum mass at different temperatures (22°C and 34°C) and grain moisture (8% and 16%), the oxygen requirement of the red flour beetle was determined. Time to 100% beetle mortality in hermetic storage, as a function of infestation level, storage volume, temperature and grain moisture content, can be estimated by using these oxygen requirements results. These estimates can be utilized to design effective hermetic storage systems for sorghum.

1.B.1 Increasing *Escherichia coli* Membrane Robustness to Long-chain Fatty Acids
Will Black

"Product generation through genetically modified microorganisms has enabled scientists to produce hydrocarbons, antibodies, and proteins of their choosing. However, the inhibitory nature of these products reduces production rates and final titer of products. Genetically modifying microorganisms to withstand these products so they can continue to produce product at higher concentrations is just one way to bring these bioproducts to a competitive economic scale. Here, we investigate the deletion of two proteins, protein X and protein Y, associated with fatty acids in *Escherichia coli* MG1655. These proteins allow for the buildup up fatty acids in the cell, which degrade the cell membrane and inhibit growth. The knockout of protein X did not yield an increase final free fatty acid titer. However, the knockout of protein Y significantly decreased the final titer achieved, the opposite trend as expected. The double knockout of protein X and protein Y resulted in the same decrease in fatty acid titer as the protein Y knockout, but the double knockout strain exhibited drastically different growth rates. The double knockout enabled growth rates to rise, and the final titer was reached over twice as fast as the other three strains. The deviation from expected results could help understanding additional functions of these proteins.

1.B.2 Using Biomaterials to Reduce Fibrous Encapsulation of Biomedical Implants
Catherine Le Denmat

Fibrous encapsulation, commonly referred to as scar formation, can cause failure in many biomedical implants, such as in the artificial pancreas for type I diabetes treatment. Scar tissue prevents wastes and nutrients from being able to be exchanged in the implant, ultimately rendering the treatment painful or ineffective. For example, one potential therapeutic for type I diabetes involves using a polymer to protect insulin-producing cells. This artificial pancreas provides diabetics with their much needed insulin on-demand. If scar tissue forms around this artificial pancreas, the device loses the ability to deliver insulin and becomes useless. Our goal is to reduce the fibrous encapsulation of implants using biomaterials and improve the understanding of how cells involved in scar formation respond to biomaterials. We show that our materials can reduce fibrous capsule formation by inhibiting certain physiological pathways. This research will not only improve the success of the artificial pancreas, but other biomaterials.
1.B.3  T4 Phage Drying on Paper
Christopher Lim

Recent technological advances have enabled scientists to develop different types of products to detect water contamination by bacteria. These products are accurate, but they are expensive and conducting a field test is still a challenge for them. Our research focuses on providing a method to overcome these challenges by using bacteriophage as our biological indicator for contamination. The specific bacteria and phage that we use are Escherichia coli K-12 and T4 respectively. Our first research objective is to determine whether our method is viable or not. We first test whether T4 phages still show activity when bound to a filter paper. Then various stabilizer solutions are introduced to the T4 phages to determine whether their addition can aid T4 phages in maintaining their activity over time after binding to filter paper. Different time-dependent drying methods are then introduced to study how drying time will affect the T4 phage activity. Lastly, the T4-bound filter paper will be stored to determine the shelf life of T4 phages. Our qualitative research then can be used as a framework for a quantitative research in studying how phages concentration on paper changes over time.

1.B.4  Mesophorous Block Copolymer Membrane
Sittinon Nuethong

"Block-copolymer research has long been a center of attention among engineers and scientists seeking solutions to combine two thermodynamically incompatible polymers with hybrid properties. This research focuses on creating triblock copolymers from polystyrene, polyisoprene, and polydimethylsiloxane using an anionic polymerization technique to synthesize then etch of one of the polymer’s block to form a mesophorous membrane. A series of experiments was conducted to form block-copolymers of different molecular weights, which were then tested for their flexibility and permeability. The goal is to develop suitable block-copolymer membranes that can be tailored to the specific needs to support “microbial factory” that are currently facing the incompatible polymer separations challenges.

1.C.1  Values and Attitude Change
Ban Joo Ang

The amount of time it takes for an attitude to be expressed (i.e., accessibility) is one of the most basic structural properties of an attitude and an important factor to consider in attitude strength (e.g., attitude extremity). Despite its importance, relatively little work has examined the role of accessibility in an inter-attitudinal context, particularly as it relates to the strength of related attitudes in the network. The present research examined the role of accessibility of an individual’s political ideology (i.e., beliefs about how liberal or conservative one is) may polarize an attitude associated with their political ideology (i.e., gun control laws). The study utilized a repeated expression paradigm to manipulate accessibility of one’s ideology, such that participants expressed their political ideology either once (the single expression condition) or eight times (the repeated expression condition). Participants then reported their attitudes toward gun control laws prior and after writing their thoughts about their attitude. As expected, participants in the repeated expression condition a) had more polarized attitudes toward gun control laws and b) reported that their thoughts reflected their political ideology more than in the single expression condition. Implications for the role of accessibility in inter-attitudinal strength are discussed.
1.C.2  The 50 Shades of Social Rejection: The Role of Rejection-Sensitivity in Everyday Exclusion Experiences
Alison Miller

Being rejected is rarely a pleasant experience. However, the reactions people have to being excluded are more consequential than the rejection itself. Critically, individuals differ in how they perceive and evaluate rejection circumstances. In fact, rejection sensitivity refers to an individual's disposition to "anxiously expect, readily perceive, and overreact to rejection" (Downey & Feldman, 1996). Rejection sensitive individuals have a heightened vulnerability to experiencing rejection and responding in a maladaptive way (including instances when there is no intended rejection). To what extent the rejection experiences these individuals have differ from those of others in terms of type of rejection (outright rejection vs. passive exclusion), source (friend vs. romantic partner), or specific emotional reactions (e.g., anger) still remains largely unknown. To this end, the present study will examine the nature of rejection experiences reported by highly rejection-sensitive individuals, identify distinctive qualities of these experiences, and test whether they are more likely to involve angry reactions. The findings will illuminate everyday experiences of rejection and will reveal the unique nature of social experiences of rejection-sensitive individuals.

1.C.3  In the Line of Fire: Post-Traumatic Stress Effects on Officers Involved in Shootings
Logan Godar

Individuals who face violent and critical situations often times experience acute stress disorder and post-traumatic stress symptoms. In this study, we will be illustrating the correlation between critical shooting incidents and the stress symptoms and disorders that follow. In addition to the acute post-traumatic stress symptoms measured, I documenting physical experiences each officer had during the critical incident. Mapping individual experiences during the incident, directly after, and an extended period afterwards, is to show how the recovery process happens and what factors lead to a better and quicker recovery. This study surveyed officers involved in critical shooting incidents within their career. Respondents answered both quantitative, and qualitative questions which measured physical distortions (time, visual, and auditory) and cognitive alterations during and after the incident. In addition, respondents were asked to give their opinions on what would assist and improve the emotional recovery of the officer(s) involved. The collected information shows that emotional debriefing, time off, and departmental support are correlated to the amount of psychological stress an officer may experience post-shooting. These results help illustrate how to efficiently handle a critical incident and how to help the subjects receive optimal recovery.

1.C.4  Suspect Suggestibility During Police Interrogations
Brooke Kindelsperger

Previous research on police interrogations have operated under the premise that as an interrogation persists, a suspect's resistance to interrogative influence steadily declines. However, addressing the issue from the perspective of a stress and coping framework suggests that the threat of police interrogation may cause a suspect's resistance to initially spike, similar to the flight or fight response, and only afterwards might a suspect's resistance begin to decline. This research tested the first half of this prediction by examining whether the threat of police interrogation increases a suspect's resistance to interrogative influence. Participants (N = 364) were made to be either guilty or innocent of cheating on a laboratory task and either accused or not accused of academic misconduct by the experimenter.
The accusation manipulation was intended to vary the threat of the situation. Participants’ resistance to interrogative influence was assessed with a measure of suggestibility. The results supported the hypothesis by showing that participants who were accused of cheating exhibited less suggestibility than participants who were not accused. In other words, participants for whom the situation was more threatening showed greater resistance to interrogative influence than did participants for whom the situation was less threatening.

1.D.1 Metals Binding by Methanobactin from *Methylosinus trichosporium* OB3b and *Methylocystis strain* SB2

Nathalie Fuentes

Methanobactin is a class of copper-binding peptides produced and secreted by some methanotrophs as the extracellular component of a copper acquisition system. In addition to copper, methanobactin has the ability to bind a variety of metals. It was shown, that extracellular compound of methanotrophs might lead to an increase in the mobility of some heavy metals. Since both, methanotrophic bacteria and heavy metals, are present in hazardous waste sites, it is necessary to study their role in the environment. This research focuses on the metal binding properties of two types of methanobactin: Methylosinus trichosporium OB3b (mb-OB3b) and Methylocystis strain SB2 (mb-SB2). We examined the ability of SB2-mb to bind the lanthanoids Cerium III chloride heptahydrate (Ce3+), Neodymium III nitrate hexahydrate (Nd3+) and Praseodymium III nitrate hexahydrate (Pr3+). Our results indicated that mb-OB3b might be binding Ce3+, Pr3+ and Nd3+ whereas mb-SB2 shows little or no binding for these metals. However, further studies are needed to confirm our findings.

1.D.2 Reduction of Cell Wall Methylation Affects Plant Growth and Stress Resistance

Lauran Chambers

Pectin Methylesterase is an enzyme present in plants and some microbial organisms and plays an important role in plant growth and stress resistance. The Zabotina lab created a transgenic Arabidopsis plant expressing a fungal pectin methylesterase (AnPME) within the cell wall. We are elucidating the effect of AnPME on the plant’s resistance to abiotic stresses. Overall, AnPME plants exhibit stunted growth and dwarfed features in comparison with wild type. From previous experiments, AnPME plants are more resistant to salt stresses, but under osmotic and reactive oxygen stresses demonstrated a similar phenotype to the wild-type plants. Future testing of PEG stress (imitation of drought conditions) will be conducted. Ongoing experiments to characterize the effect of the pectin methylesterase in-depth include a western blot to confirm presence of enzyme in the apoplast in active form, an enzymatic activity assay, and cell wall compositional analysis. TAIL-PCR will be used to confirm the position of the AnPME within the Arabidopsis genome. Our research will give us a better understanding of cell wall integrity and advantages and disadvantages to utilizing the AnPME gene.

1.E.1 Atmospheres: Explication and Excess

Matthew Darmour-Paul

As the world becomes increasingly quantifiable and as innovative technologies allow for novel measurements of new phenomena, it is the ‘givens’ of everyday life, and the responsibilities a new attentiveness may harbor, that are under the so-called ‘attack’ of modernity. Architecture is not immune to this phenomenon, particularly in the trending topics of study such as ‘climate design’ and ‘atmospheric construction’. These are cited both as a response to an impending climate change, and as a
technical means to design large commercial projects. As architects find ways to incorporate new representational technologies into the discipline, new ‘materials’ such as heat or the density of vapors are being made visible, and are therefore subject to manipulation. It is crucial that the architectural community is critical of these new awarenesses, before they are implemented at large scales. By analyzing the work of two architectural atmospherists one begins to identify a series of explications and the questionable contradictions they present. It can be argued that it is both the fundamentally vague conceptual basis of atmospheres and their simultaneous revealing of latent environmental potential that engenders an ethos of wasteful energy practices, and a distancing of authorship, and therefore control, in atmospheric design.

1.E.2  Rethinking the Way We Live: A Case for Passive House Retrofitting
Jackie Katcher

In order to reduce our energy consumption in buildings, it is best to begin with the individual and therefore, housing. The residential sector contributes 54% of all energy consumption related to buildings, and it is also a personal environment for each of us to live and grow. Because of the deep connection we have with our homes, it is important that these houses are not only energy efficient and affordable, but also comfortable and enjoyable places for us to live in. Weatherizing and updating appliances and mechanical equipment in existing houses isn’t enough to significantly reduce energy consumption and lower operating costs. The passive house standard, which was developed in Germany, is currently the most rigorous energy standard created and aims to achieve not only a reduction of a building’s ecological footprint, but also to create houses that are more comfortable and enjoyable places to live. In this study, I will discuss how the passive house standard is applied to existing homes and the importance of implementing this way of thinking into our daily lives. My research includes a building performance analysis of an existing conventional home in Ames and a design proposal of how one might retrofit an existing building to the passive house standard.

1.E.3  The Interlock House Environmental Control and Alert System
Kelsey Fleenor

One of the problems in architectural research involving sensors is detecting errors within raw data and separating these errors from the reliable and relevant data. This research on the Interlock House aims to develop an alert system to notify when the house is operating below efficiency and for identifying abnormal data caused by sensor errors/failures. Additionally, the system would assist in controlling environmental settings. There are three parameters for operating this alert system. The first parameter, used to signify if a sensor is malfunctioning, includes the range for each sensor’s capabilities based off technical specifications. The second parameter, derived from historical data, signifies data that does not have historical precedence (ex. record breaking temperatures). The third parameter, depending on what the specific sensor is measuring, focuses on either the range of human comfort or equipment specifications, using the maximum and minimum again, to control environmental settings and identify when a mechanical component is malfunctioning. Together, the historical data and equipment standards aid in identifying when the house is operating below efficiency. The ideal results of this research would improve the energy efficiency of the Interlock House and thereby provide a model for improving the efficiency of other buildings.
1.F.2 Yerba Mate in Argentina: A Cultural Reflection and Projection through a Popular Pastime
Christina Goeddel

Yerba mate is a popular tea-like beverage widely consumed in many South American countries, including Paraguay, Brazil, and Argentina. Originally discovered and consumed by Paraguayan natives, mass production of yerba mate did not begin until the arrival of the Spanish in the sixteenth century. Its cultivation techniques developed over time, allowing production to spread to other countries including Argentina, today’s largest producer of yerba mate. In Argentina, yerba mate has evolved from simply being a stimulating beverage into a clear reflection of the country’s culture and values. The uses of yerba mate in Argentine literature – Jorge Luis Borges, Julio Cortázar, tango lyrics – demonstrate the beverage’s importance to everyday life and societal norms. Further connections between yerba and Argentine culture include straw-sharing with tactile communication, appetite-suppression with high beauty standards, and caffeine content with busy city life and laborious country work. These ideas are explored in this paper in order to assert that yerba mate’s own qualities project key aspects of Argentine culture, solidifying its continued popularity for years to come.

1.F.3 Comparison of Two Wetlands for Differences in Composition due to Age of Seeding
Elliott White

The Iowa Conservation Reserve Enhancement Program (CREP) wants to remove nitrogen and other agricultural chemicals before cropland tile-drainage water enters rivers and streams. This is done by the restoration or construction of wetlands in areas of high need for removal of excess nutrients. The goal is to protect drinking water supplies and reduce hypoxia in the Gulf of Mexico. The objective of this study was to survey wetlands across the north central region of Iowa for the success of seeding. These wetlands range in age from one to ten years and have been seeded at varying intervals. Each wetland received an identical seed mixture. We hypothesized that older wetlands would have a greater average shore to emergent edge width (littoral zone), less species diversity, and a predominance of monocultures. Vegetation surveys were completed using: transects and quadrats to estimate percent coverage, measuring the distance from shore to the emergent edge, and identify species. Preliminary results indicate that older wetlands are better at reducing levels of targeted nutrients from the watershed. This study can be used to inform future management strategies and the implementation of wetlands as a means to enhance water quality.

PRESENTATION SESSION II

2.A.1 Determination of Stimulation Focality in Heterogeneous Head Models during Transcranial Magnetic Stimulation (TMS)
Erik Lee

Transcranial Magnetic Stimulation (TMS) is an increasingly popular tool used by both the academic and medical community to understand and treat the brain. TMS has the potential to help people with a wide range of diseases such as Parkinson’s, Alzheimer’s, and PTSD, while currently being used to treat people with chronic, drug-resistant depression. Through computer simulations, we are able to see the electric field that TMS induces in an anatomically realistic human head models but there is no quantifying method to analyze this electric field in a way that relates to a specific patient undergoing TMS therapy. We
propose a way to quantify the focality of the induced electric field in a heterogeneous head model during TMS by relating the surface area of the brain being stimulated to the total volume of the brain being stimulated. This figure would be obtained by conducting finite element analysis (FEA) simulations of TMS therapy on a patient specific head model. Using this figure of merit to assist in TMS therapy will allow clinicians and researchers to more accurately stimulate the desired region of a patient’s brain and be more equipped to do comparative studies on the effects of TMS across different patients.

2.A.2 Using Virtual Reality to Visualize the 3D Pathline of Individual Particles in a Double Screw Mixer
Teshia Robinson

Granular flows are found in many industries including food processing, pharmaceutical production, and energy generation. Understanding particle-particle mixing is important for process modeling and optimization. Recent work has used X-ray particle tracking velocimetry (XPTV) to characterize the three-dimensional (3D) granular flow structures in a double screw mixer. However, visualizing the experimental 3D data can be challenging. This study uses virtual reality to allow a user to “walk through” the intermeshing screws of a simulated double screw mixing process and watch individual particles as they travel through the mixer. As the particle moves through the mixer, a particle path line is used to follow its movement. The virtual environment allows the user to view the particle from any direction using the physical movement of his or her body, augmented by a Wii remote for navigation beyond the physical space. The Wii remote also provides options to pause or reverse, to zoom in or out, and to slow down or speed up particle motion. Furthermore, the interaction code is flexible enough to allow other input devices, such as the Microsoft Kinect sensor and voice recognition, to control the system. The virtual reality environment provides researchers with a novel method to visualize the mixing process to gain unique insight into particle movement through a double screw mixer.

2.A.3 Calibration of Safety Performance Functions for the Michigan Department of Transportation
Rochelle Starrett

More than 30,000 people die in traffic accidents each year in the United States. To reduce this number, the Moving Ahead for Progress in the 21st Century Act (MAP-21) requires states to implement a Highway Safety Improvement Program (HSIP). A state’s HSIP plan must emphasize using data to derive a strategic approach for improving highway safety. One tool available to states is safety performance functions (SPFs) listed in the Highway Safety Manual (HSM). SPFs can be used to evaluate the relative safety of design alternatives and to help states prioritize sites for roadway safety improvement. However, SPFs cannot account for every roadway characteristic; states must calibrate their SPFs based on their own crash data. This study is being conducted to calibrate SPFs for the Michigan Department of Transportation (MDOT) for urban trunk-line roads for four intersection types (3-leg/4-leg stop-control and 3-leg/4-leg signalized). Data is currently being collected on sample intersection characteristics for analysis using one of the methods outlined in HSM. Additionally, a procedure for updating these SPFs as crash patterns change is also being developed to ensure that these SPFs are practice ready. These findings will help MDOT implement targeted safety improvements across their transportation network.
2.B.1 The Dangers of Feminine Political Narratives
Krista Klocke

The rhetorical analysis study investigated the political ads aired by U.S. Senatorial Candidate Joni Ernst and U.S. Congressional Candidate Staci Appel during the 2014 Iowa midterm elections. The ads were analyzed using narrative and feminist rhetorical criticism methods to identify the interaction between the narrative themes and narrator roles both women established and the gender roles they enacted. Female political candidates face unclear, changeable expectations and constraints for their gendered behavior during election campaigns. Given the effectiveness of each woman’s campaign, a link was established between the relative femininity or masculinity of their rhetorical discourse and whether or not they won their election. Moreover, this study seeks to illustrate that a purely feminine rhetorical style is no longer sufficient when running as a female candidate.

2.B.2 Insult to Injury: Transgender / Translucent
Sarah Hohnstrater

In one story, a pathetic (?) drag queen, on her quest to transition to the body she was meant to be born into, slays no dragons and marries no princes. She survives a subway ambush only to sustain facial injury at work. Why read this? Read on. In another, a bereft woman dances her way into culinary oblivion, serving up plates... of herself. Why? These two fictional works question the concept of victory. While the characters in the stories may initially be seen as victims, a closer reading excavates the phoenix within the rubble of their lives. The literary pieces offer audiences a way of slipping into another’s emotions and mind frames without tethering them permanently to a life that isn’t their own. However, once enveloped within the story, the readers can see that even to the characters themselves, the world as an unkind place might actually be an opportunity for acknowledging alternative ways of being. Read. Resist. Resonate.

2.C.1 CRISPR/Cas9 Mediated Mutagenesis in Danio rerio
Cassie Bullard

Zebrafish (Danio rerio) serve as a very useful model organism because they have a fast generation time, clear embryos and a well mapped genome. In this research project, the students in the Developmental Biology lab course and the students in the Freshmen Research Initiative have used these characteristics to conduct a screening of the zebrafish genome in order to identify genes that are required for development. The CRISPR/Cas9 system (a protein that creates double strand breaks at specific sites in the genome that are then repaired by the cellular machinery) was recently specialized for the use in zebrafish. However, there are usually mistakes made when repairing the break. By using this system we can create mutations at specific sites in the genome and even delete entire sections. We can then observe if the mutation has created any notable phenotypes in the developing embryo. That information can give us insight into what the genetic requirements are for development or how those mechanisms can go wrong in diseases such as cancer.

2.C.2 VCP Mediated Mutagenesis in Danio rerio to Model Motor Neuron Degeneration in ALS
Stephen Jones

Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease characterized by the death of motor neurons. Once these nerve cells die, the patient’s muscles waste away, resulting in paralysis and
eventually death. Two primary forms of ALS exist: Familial and Sporadic. Familial constitutes 5-10% of cases and is defined by ALS being present in one or more cases in a family’s lineage. Sporadic makes up 90-95% of ALS cases and is essentially when no family history exists with ALS but an individual has ALS. Mutations in SOD1 have been the most studied in regards to ALS. However there are many other genes linked to ALS that have not been studied. VCP is a gene that has been linked to several different diseases including familial versions of ALS. The protein has been linked to many different cellular processes including protein degradation and programmed cell death. To gain a better understanding into the development and eventual death of motor neurons, we are using both TAL-effector nuclease (TALEN) mediated mutagenesis and a VCP CRISPR to create zebrafish that are mutant for VCP. These mutant fish will hopefully allow us to create a new model of motor neuron degeneration or ALS.

2.D.1 Exploring Periostracum as a Potential Environmental Proxy in *Arctica islandica*

Katie Luzier

Shells of the common marine bivalve, *Arctica islandica*, are being considered as a potential proxy for changes in food web and ecosystem dynamics in the Gulf of Maine, USA. *A. islandica* is considered a valuable proxy because of its extreme long life span (more than three centuries), and because it has prominent annual banding in the shell material. To explore this further we are exploring the stable isotopic values of carbon and nitrogen from shell periostracum along the axis of maximum growth and along the isochron (perpendicular to the maximum growth axis). The long term goal is to establish isotopic time series with dead-collected shells that have been radiocarbon dated and live-collected shells. Three hypotheses will be tested to examine the potential of *A. islandica* periostracum material to serve as an environmental proxy. (1) The periostracum will reflect the ambient conditions during the lifetime of *A. islandica* shells. (2) Because each isochron represents an identical time in the shell’s life, the values along the isochron should be similar. (3) *A. islandica* shells can be used to infer food web and ecosystem dynamics.

2.D.2 Experimental Recreation of the Sub-Glacial System; An Analysis of Hold Time Versus Strengthening to Shed Light on the Mechanics of Stick-Slip Ice Streams

Ian McBrearty

Ice streams in Antarctica are known to move ice rapidly, in a narrow band, over a loose permeable substrate to the sea- contributing to sea-level rise and the decay of the Antarctic Ice Sheet. It has been observed that some of these ice streams move in a “stick-slip” fashion, lurching ahead small steps at a time. Past workers have proposed this observation is indicative of temporal strengthening in the ice stream when it’s sitting at rest, but have not satisfactorily concluded which components of the glacial system are directly causing the strengthening. To understand the mechanics dictating ice stream motion, and in turn put better constraints on predictions regarding the continued decay of the Antarctic Ice Sheet, we have resorted to experimentally recreating the sub-glacial system in the lab, in two “ring-shear” devices designed by Dr. Iverson at Iowa State University. Two main questions we wanted answered were: (A) “Do we observe a significant relationship between hold time and strengthening?” and (B) “Which component(s) (ice, water, and sediment) contribute to the strengthening, and by how much does each contribute?” To do this we ran a suite of “slide-hold-slide” experiments, in each case adding one more component of the glacial system, where time held still (corresponding to the “stick” phase of motion), was measured against the maximum strength the material achieved upon forcing it to undergo further shear (corresponding to the “slip” phase of motion). Our results indicate that there is indeed a significant relationship between hold times and strengthening, and that all three components
(ice, water, sediment) contribute to strengthening—however, with each component contributing differently depending on how long of a hold time they have undergone. These results are in agreement with first order physical principles, but further work is required to develop the mathematical relationships relating strengthening to hold time for each component of the system.

2.D.3  Contemporary and Future Extreme Winter Precipitation in the Upper Mississippi River Basin
Natalie LaLuzerne

We analyzed 28-year output from regional climate simulations of daily extreme precipitation events in the contemporary and future-scenario climates. We examined the Upper Mississippi River Basin in the winter months (December-February) for daily precipitation totals in the top 0.5% of all precipitation amounts that simultaneously occurred on several grid points in the simulations. All extreme events occurred when there was a low-pressure center east of the Rocky Mountains that produced strong moisture flow from the Gulf of Mexico. Intensity and spatial distribution of extreme precipitation events increases from the contemporary climate to the future-scenario climate, mainly due to a net increase in temperature and humidity, rather than a change in the atmospheric circulation patterns.

2.E.1  Exploring Strategy Effectiveness for English Language Learners through Scholarly Engagement
Lauren Perila

This exploratory project is undertaken in relation to President Leath’s ISU 4U Promise, a new university-school partnership intended to promote college access for youth historically excluded from higher education. It uses the idea of scholarly engagement, which emphasizes moving theory to practice in collaboration with the communities who have potential to benefit. This project was conducted in classrooms of the Iowa State University 4U Promise partnering elementary schools, King and Moulton. Drawing on research about engagement and academic success among English Language Learners (ELLs) and working with teachers, several identified strategies were tested. Over a semester, 5 hours a week was spent engaging ELLs in small groups and individual work. Field notes were documented detailing the activities and observations of the strategies’ effectiveness in promoting engagement in literacy acquisition. Results from the study are summarized as follows: engagement and academic success of ELLs is impacted by 1) family mobility; 2) positive relationships with individual students; and 3) the relevance to the learner of classroom activities. This experience facilitated an increased comprehension of the application of theory to practice, inform the work of ISU education researchers in these schools, and ultimately a better teacher of ELLs.

2.E.2  Chinese ESL Learners’ Pragmatic Competence in the Usage of Genuine Compliments, Ironic Compliments, and Ironic Insults
Jessica Sparr

This study examined the pragmatic competency of Chinese ESL learners’ with genuine compliments, ironic compliments, and ironic insults. A genuine compliment is praise framed positively (e.g., “Good job!”) while an ironic compliment is one framed negatively (e.g., “Lousy job!”). An ironic insult is an insult framed positively so that it resembles a compliment [e.g., saying “Good job” when it was lousy)]. Subjects rated nine scenarios with these three types of speech acts according to (1) how insulted the complimentee is likely to be, (2) what impact the compliment/insult might have on the complimenter-complimentee relationship, (3) what kind of emotional response the complimentee is likely to have, and (4) how the complimentee might respond. The results indicated that a positive impression is often
associated with genuine compliments, whereas a negative impression is associated with ironic compliments and ironic insults. This suggests that there is a miscommunication when irony is added to compliments. This study could be the basis for future studies that aim to understand how miscommunications are created, how they can be resolved, and how second language teachers can teach these solutions while taking into account the second language learner’s culture and background.

2.E.3 Speech Recognition Application for Pronunciation Training
Ariana Mora

There is a large number of immigrants in the U.S. who speak English as a second language. Their spoken English may not be completely intelligible to both native and other non-native speakers of English due to errors in the production of specific sounds as well as in the prosodic features of pronunciation. This study used speech recognition (SR) technology to improve pronunciation abilities of non-native speakers of English. Ten participants were asked to read 20 sentences, 5 of which were not used in the experiment (these sentences served as control to ensure that SR training rather than just participation in the experiment accounted for any changes). Participants were instructed to read these sentences up to five times similarly to a native speaker model, which was provided to them. The extent of improvement, if any, in pronunciation was measured by tallying errors made by SR in recognizing speech produced by participants in successive production of the same sentences. There was an overall decrease in errors following training. A t-test for related samples showed a significant improvement from Time 1 to Time 5 (p=0.001).

2.F.1 NATO Membership and the Democratization of Post-Communist Countries
M'lyn Crawford

I have always been interested in studying the influences international organizations can have on a country's domestic policy. Last summer I had the opportunity to study abroad in Brussels, Belgium and tour many headquarters of powerful international organizations, but the one that stood out most was NATO. After the Cold War ended and the Soviet Union disbanded, several countries formed new governments. Some became democracies and others did not. I looked at a potential explanation for a country’s democratization: NATO membership. Many post-communist countries became NATO members and with its last three expansions, the organization has nearly doubled in size, with all the new members being former communist states. I compared six countries’ levels of freedom based on Freedom House data from 2014 and concluded that on average for those six countries NATO members had greater levels of freedom than nonmembers. This study supports the theory that NATO membership influenced countries to democratize and is a small step in the path to better understanding international organizations influence on domestic policies. It is impossible to prove anything with a small case study, but I hope to expand my analysis in the future.

2.F.2 Remembering Alaska’s Forgotten Campaign
Lea Johannsen

The Aleutian Islands campaign of WWII is often called the “Forgotten Campaign”, because the outcome of the military actions were largely of little strategic importance. However, through my research into first-hand accounts of the events in Alaska and more recently written historical accounts, I make the argument that the Aleutian Islands campaign was crucial to the history of Alaska even if it was not crucial to the outcome of WWII. Before the beginning of the war, Alaska was a remote and
undeveloped landscape. As tensions mounted, the US military began to see Alaska as a place of strategic importance, and began to build up its defenses and infrastructure. The Japanese invasion of the Aleutian Islands, the first invasion of US soil since the War of 1812, proved anticlimactic, but the improvements to Alaska’s infrastructure and increase in attention from the public due to US military involvement had a profound impact on the land. It was transformed from what most simply called “Seward’s Folly” into the modern state we know today.

PRESENTATION SESSION III

3.A.1  Probe Effects on the Local Gas Holdup Conditions in a Fluidized Bed
Emily Whitemarsh

Fluidized beds are found in the energy production industry, it is important to know their hydrodynamic conditions, such as local gas holdup or volumetric gas fraction, for effective operation. Local measurement probes have been used to measure local gas holdup. Although the probes are typically as small as possible to mitigate their influence on the local conditions, the invasive nature of this measurement technique has the potential to alter the fluidized bed behavior. This study used a noninvasive measurement technique, X-ray computed tomography (CT) imaging, to determine the local time-average gas holdup everywhere within a 10.2 cm diameter fluidized bed filled with 500-600 μm glass beads in which simulated probes were inserted. Three different probe tips (pointed, rounded, and flat) and two different orientations (horizontal and vertical) were investigated at four different bed heights and two different fluidization velocities. The results show increases in local time-average gas holdup when the probes are present, but the scale of the effects was dependent upon the height at which the probes were placed; the lower the probe within the fluidized bed, the larger the local effects. Probe tip geometry showed no differences in the local gas holdup. Probe orientation was an important factor though, with the horizontal orientation showing a sustained increase in gas holdup values farther upstream from the probe. The two different flow rates used in this study (1.5Umf and 3Umf, where Umf is the minimum fluidization velocity) also showed differences in the amount of variation in gas holdup, but the trends were inconsistent.

3.A.2  Understanding Fast Pyrolysis of Biomass through Laser-Induced Fluorescence
Alex Tietz

There has been a large increase in interest in renewable energy, including the field of conversion of biomass to fuels. Currently, researchers seek to further understand the chemical products and energy resulting from the pyrolysis of various types of biomass and how to optimize the quantity and quality of biofuels generated. Optical diagnostics such as laser-induced fluorescence can be employed within a pyrolysis cell to provide insight on the quantity, physical state, and chemical composition of products formed at various spatial locations and times within the reactor. For this study, the absorption spectra for various products of pyrolysis including phenol, 2,2'-biphenol, guaiacol, and levoglucosan will be obtained using a UV-vis spectrophotometer. Next, the intensity and spectral characteristics of laser-induced fluorescence will be measured for these model compounds. The information gained from these studies will be compared to fluorescence measurements within a pyrolysis cell to provide an indication of the quantity and physical states of the different products of pyrolysis. This study will contribute to understanding how different types of biomass and varied pyrolysis conditions affect the production of biofuels, with the goal of efficiently converting biomass to biofuels at the industry level.
3.A.3 NdFeB Permanent Magnet Recycling Through Liquid Metal Extraction
Anthony Pribble

Rare Earth Elements (REE) are commonly utilized in the aerospace, defense, automotive, electrical, oil, and medical industries. In 2011, China produced 95% of the world's demand of REEs with the majority of their production coming from mining operations. Due to China's overwhelming market share, and the crucial applications in which REE are used, concerns over future supply have been raised. As such, recycling methods for REE need to be developed to help ensure future supply needs are met. Previously conducted research has shown that Neodymium is able to be extracted from NdFeB permanent magnets when placed into a crucible with liquid magnesium. From this, two potential recycling methods were identified. Creation of Mg-REE master alloy, or selective replacement of WE43 and WE54 magnesium alloys. Samples of extracted Nd are being produced in an Argon backfilled environment with varying sized scrap to determine the effect on the REE diffusion constants. Future tests and analysis will include producing test samples of new WE43 to be subjected to mechanical testing. In addition, an economic analysis will be conducted to assess the viability of the alloy.

3.B.1 Municipal Solid Waste Disposal and Landfill Alternatives in the United States
Brandon Movall

As the population of the Earth continues to grow exponentially, the question of what to do with all of our generated waste is becoming a major one, especially in the United States. Over the past 250 years, waste management in the U.S. has come a long way, with municipal solid waste (MSW) disposal, recycling, landfills, and other techniques. This report examines the past, present, and future of MSW, including new ways to dispose of waste like landfill mining, solar landfill covers, and waste-to-energy facilities. Our goal is not to say which method of dealing with waste is superior, but to highlight the variety of waste disposal techniques, of which we will have to incorporate many in order to keep ahead of the rapidly rising generated waste in the United States.

3.B.2 Evaluating Tall Wind Turbine Tower Designs
Chris Levandowski

Developing wind turbines taller than the 80 m standard used today is a major focus in the wind turbine industry in order to reach the stronger and steadier winds that occur at these heights. In order to access these winds and increase wind power production efficiency, new designs must be utilized to overcome issues with upscaling the current standard steel tubular tower design. In this research, a cost analysis of steel tubular towers was conducted to determine if this design is cost effective at heights above 80. Through this analysis, it was determined that steel tubular designs become less cost effective as tower height is increased and are not a cost effective option above 80 m. A second cost analysis was conducted to compare four potential 100 m turbine tower designs, each utilizing different materials. Cost estimates for each design were developed to compare capital costs and cost efficiency for both 20 and 40 year life cycles. In this analysis, the Ultra High Performance Concrete design was the most cost effective option. The precast concrete design was second most cost effective, followed by the steel-concrete hybrid design. The steel tubular design was the least cost effective at 100 m.
3.B.3 Biocementation Method for Soil Improvement
Yatong Zeng

Microbially induced carbonate precipitation (MICP) is a common natural process performed by introducing bacteria into the soil to hydrolysis urea and with the presence of calcium ions to form calcium carbonate. The produced calcium carbonate can form strong connections between soil grains. This study investigated using the MICP process for soil biologging to reduce permeability and increase the shear strength of soil. Biotechnology aims to improve the mechanical properties of soil (e.g. stiffness, strength, permeability) so that the soil can be more suitable for construction and environmental proposes. Biotechnologies are mainly related to the applications of plants or vegetative soil cover for soil erosion control, slope protection, prevention of slope failure, and reduction of water infiltration into slopes. These can be achieved at a low investment and maintenance costs. This research examined different styles of columns and boxes by biocemention method, and found that after the bio-clogging training process, the top surface of the sample is very hard, like the surface of rock. The unconfined compressive strengths of the sand treated with calcium-base over 10 treatments formed a relatively strong compressive strength and high calcium ion content.

3.C.1 Energy Efficient Residential Dehumidification by Solar Driven Liquid Desiccant Systems
Ryan Everly, Esdras Murillo

In regions with high humidity levels, liquid desiccant systems have the potential to be highly effective as renewable dehumidifiers in residential buildings. Unlike current air conditioning systems, which cool incoming air to levels far below comfortable temperatures in order to expel water in the air, liquid desiccants control humidity levels with no dependence on temperature. The consequence is a large electrical energy savings from a significantly decreased load on the air conditioning equipment. The current problem with this technology is the equipment must be small enough to fit in a residential mechanical room, yet powerful enough to effectively dehumidify the incoming air. This study aimed to determine if equipment could be designed that fit these requirements. In order to test the design, an experiment fed air at constant speed, humidity, and temperature through a design prototype where the dehumidification process would occur via liquid desiccant. Sensors at the inlet and outlet of the prototype measured temperature and humidity of the air flow. The experiment showed a relative humidity decrease at a constant 70°F from 80% at the inlet to below 30% at the outlet. While this technology is still in its infancy, this study shows it to be greatly promising.

3.C.2 Path Planning with Power Schedules for Solar-Powered Ground Robot
Nathaniel Kingry and Kishan Patel

This Research examines an integrated path planning and power management problem for a solar-powered unmanned ground vehicle (UGV). The proposed method seeks to minimize the travel time of the UGV through a given static area by both designing an optimal path and allocating the obtained power among the electrical components. Two types of path planes are examined in this research: a differential drive and pseudo-dubins. The UGV is operating under strict power constraints while harvesting ambient environmental energy along the designed path. A scalar field is first established to evaluate the solar radiation density at discrete locations. A modified Particle Swarm Optimization method is applied to search for a minimal time path wherein the energy gathered is equal to or greater than the energy expended. The proposed modeling and optimization strategy is verified through
computer simulation and test bed demonstration. Current and future work is also examined in the areas of a continuous smooth curve and alternative methods of capturing the solar density that will potential allow for constant updating and dynamic area path planning.

3.C.3 Quadcopter Modification for Grabbing Tasks
Mannooj Chandrasekaran

Quadcopters have been in operation for several years and have mostly been used for aerial photography. The Quadcopter can perform additional functions if their development is furthered towards specific tasks. This projects seeks to enhance Quadcopter function by developing a mechanical arm to grab objects at altitudes beyond the reach of humans or serve in place of humans in dangerous conditions. The arm design was initially performed through computer-aided drafting (CAD) software. Upon completion of the design, the mechanical arm will be tested independently and then fixed to a quadcopter and tested in flight. The results will provide a foundation for increasing the use of quadcopters, such as the harvesting of fruit from trees or perform repair operations on structures with high elevation.

3.D.1 Investigation of Multidrug Resistance Protein 1 Involvement in Phosphoramidate Mustard-induced Ovotoxicity
Aysha Majeed

Anti-neoplastic chemotherapy causes female infertility and accelerates the onset of ovarian senescence (menopause). Cyclophosphamide is a prodrug that undergoes hepatic biotransformation to form the anti-cancer and ovotoxic metabolite, phosphoramidate mustard (PM). PM creates DNA crosslinks and induces double-stranded breaks, resulting in cell death via apoptosis. We have previously shown that ovarian PM exposure increases glutathione S-transferase enzyme expression, involved in catalysis of glutathione (GSH) conjugation to PM. The aim of the current study was to investigate induction of ovarian Multidrug Resistance Protein 1 (MRP1) during ovarian PM exposure. MRP1 is an ATP-binding cassette (ABC) transporter, involved in phase III biotransformation. Its substrates include drugs that are conjugated to GSH, and since PM can be conjugated to GSH, it is a potential substrate. Spontaneously immortalized granulosa cells (SIGC) were cultured in media containing vehicle control or PM (6 µM) for 1, 2 or 4 days. Cell viability was measured using Trypan blue staining and cell counting. Total RNA and protein were isolated followed by qRT-PCR and western blotting to measure Mrp1 mRNA and protein abundance, respectively. Loss (P < 0.05) of cell viability was observed after 48h of PM exposure. Mrp1 mRNA or protein was not impacted by PM exposure after 48h of PM exposure. These data could indicate that changes to Mrp1 mRNA previously observed are localized to non-granulosa cell ovarian compartments, or could suggest that changes to abundance or localization could occur earlier than 48h. Our current studies are investigating these possibilities. The significance of these investigations are that determining mechanisms to accelerate ovarian clearance of an ovotoxic chemical that is required medicinally could lead to interventions to protect fertility in female cancer survivors.

3.D.2 Identification of Mutations in the HIV-1 gp41 Subunit Associated with Neutralization Resistance
Miah Blomquist

HIV-1 affects over 34 million people worldwide. Although there is no vaccine, some patients develop broadly neutralizing antibodies after years of infection. These antibodies, however, are incapable of
neutralizing all HIV-1 strains. To produce an effective vaccine, overcoming these downfalls are crucial for creating a vaccine targeting many different strains. Differences in the exposed envelope glycoprotein may explain why certain strains are easily neutralized but other strains, found in most infected patients, cannot. Previous work identified a region within the envelope gp41 subunit that appeared responsible for differences in sensitivity to neutralizing antibodies binding nearby. Inside this original region, we identified seven amino acid differences between two representative strains and determined that individual changes were not responsible for determining sensitivity or resistance. Further testing revealed that the area responsible for differences was larger than anticipated, containing 17 total changes, and that there must be at least two amino acid differences. Analysis of a recent HIV-1 envelope structure revealed three amino acids that may interact together and thus may be responsible for determining neutralization sensitivity. If we learn how differences prevent neutralizing antibodies from binding, we could produce better immunogens to guide the immune system to overcome these resistance-inducing changes.


Aric McDaniel

*Mycoplasma* spp. cause a variety of diseases in cattle including pneumonia, arthritis, and mastitis. *Mycoplasma bovis*, the most pathogenic species in cattle, has been shown to be accurately identified using Matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry. After confirming the identity of 13 *Mycoplasma* standard organisms, 35 *Mycoplasma* case isolates were run through MALDI-TOF. Of the 35 isolates, 13 had no reliable identification (NRID), 12 identified as *M. bovis*, and 9 identified as a non-*M. bovis* species. All 12 isolates identified as *M. bovis* were confirmed by an *M. bovis*-specific PCR, and 7 of the non-*M. bovis* isolates were confirmed *M. bovis* negative by the same *M. bovis*-specific PCR. It was concluded that with the current MALDI-TOF library, non-*M. bovis* isolates can be identified accurately 78% of the time. This useful tool will not only give results up to a week sooner than the current protocols, but will also reduce costs to the clients by up to $30 per isolate.

**PRESENTATION SESSION IV**

4.A.1 Historic Preservation of Interiors: Collaborating with Public to Rehabilitate Sigourney Carnegie Library

Albert Li, Amanda Hills and Hannah Bixby

In 2014, Iowa State University’s (ISU’s) Historic Preservation of Interiors class (ARTID 469D/569D) collaborated with community members and the State Historic Preservation Office to propose concepts for rehabilitation of the Sigourney Carnegie Library. Research shows that the library is historically significant to Iowa because it manifests an international phenomenon of the late nineteenth and early twentieth centuries that advocated cultural advancement through publicly shared and free literary resources and facilities. It is one of more than 2000 libraries founded within four decades and funded by American industrialist Andrew Carnegie. The Sigourney Carnegie Library served local residents for over 90 years, until a new public library replaced it. In 2013, Sue Winters acquired the library and sought assistance from ISU’s College of Design to convert its function to a residence. The process produced
extensive historical documentation, ten preservation-sensitive solutions, and a collaborative research model of benefit to academia and communities.

4.A.2 Chicago Lakeside; A Study of a Reclaimed Brownfield Site for a New Urban Community
Rose Tashjian and Alex Robinson

As landscape architecture students, we have conducted research on the Lakeside Development plot of land on the South Side of Chicago and created our own designs intended to create a captivating space on a 500-acre undeveloped site on Lake Michigan. This site, a former steel mill, is now classified as a brownfield. The history of this land created design restrictions dealing with soil quality, plant growth, and structural stability. Our research about the history of the site, current conditions, demographics, and infrastructure lead us to design strategies for neighborhood revitalization and brownfield reconstruction. Our findings and design specifications are expressed through detailed renderings and illustrative drawings. The main goal of our research is a comparative analysis of the McCaffrey Interests existing design strategy with our research-based design. Our designs will improve the ecological conditions, provide blue and green infrastructural elements, connect the nearby communities, and provide a nature infused connection to Lake Michigan.

Joseph Danielsen

This project explored residential interior design at a compact scale, and addressed client issues of cultural identity, changing contexts, human behavior and special needs. Architect Frances Cova and his elderly mother Letizia, originally from Barcelona, Spain, purchased a condominium in Brooklyn, New York. The Covas desired a design concept that would incorporate their ancestral Spanish heritage, and its cultural identity, with the contemporary ideology of simplicity. Design methodology included assessing each client’s functional spatial and character needs. Researching Letizia’s physical limitations led to developing spatial arrangements to enable ergonomic comfort in her living quarters. To express architectural aesthetics through character, it was necessary to analyze Hispano Moresque and Roman classical forms reflecting Spain's Moorish and Imperial Roman influences. The design solution juxtaposed Spanish antiques, Moorish textiles and classical elements with contemporary furnishings, creating reasonable visual signs of the Cova's cultural heritage and Mediterranean life. Reimagined forms draw from the traditional language of the past, while reflecting the contemporary preferences through restraint. The project is important to designers who collaborate with clients to preserve individual cultural identities in a global economy, using traditional materials, forms, motifs and symbolism. In addition, it innovatively expands the perception of space within a small footprint.

4.B.1 Gene Expression Analysis During Retinal Ganglion Cell Development
Andrea Wester

Retinal ganglion cells are the final output neurons that gather electrical signals from light-sensing cells and relay this information to discrete locations in the brain. The loss of ganglion cells due to cell death is an irreversible process in glaucoma. Therefore, to fully restore vision in glaucoma patients, cellular replacement therapy is being explored as future treatment. However, for cellular replacement therapy to be a viable option, we must gain a better understanding of the networks of genes that combine together to generate retinal ganglion cells. The goal of our lab is to gain insight into the gene networks responsible for the generation of retinal ganglion cells. Using single-cell transcriptomics and
microarrays, we have characterized the transcriptional programs that are activated in individual developing ganglion cells during normal development in the mouse, zebrafish and chicken. These experiments enable us to focus our future functional experiments on those networks that are the most conserved and, therefore, the most likely to be critical in ganglion cell development.

4.B.2 Understanding the Function of OPTN Gene in Neurons using TALEN Facilitated Mutagenesis
Alicia Manning

Amyotrophic lateral sclerosis (ALS) is a well-known neurodegenerative disease caused by motor neuron death within the spinal cord and brain. Soon after the nerve cells die, the patient’s muscle cells degenerate resulting in paralysis and eventually death. Another debilitating human disease is primary open-angle glaucoma (POAG). POAG is an ocular disease triggered by the rise in internal eye pressure which damages the optic nerve, reducing image signals to the brain. Most cases of ALS are sporadic and the direct causes for the increase of internal eye pressure are questionable, meaning that a clear genetic and molecular understanding of the mechanisms leading to the diseases is not well understood. The gene optineurin (OPTN) has been identified and implicated as a contributor to the mechanisms leading to the onset of both of these diseases. To gain a better understanding of the cellular functions of OPTN, we are using TAL-effector nuclease (TALEN) facilitated mutagenesis. The TALEN specific for the OPTN gene in zebrafish has been generated, injected, and has produced mutations. The mutations are being characterized for their consequences on zebrafish eyes and motor neurons to hopefully allow us to create new zebrafish models for ALS and glaucoma.

4.B.3 Understanding the Function of SIGMAR1 Gene in Neurons Using TALEN-mediated Mutagenesis
Madelyn Mullally

Amyotrophic lateral sclerosis, also known as Lou Gehrig’s disease, is a neurodegenerative disease caused by the death of motor neurons in the central nervous system. The death of these nerve cells leads to the degeneration of the patient’s muscle cells, resulting in paralysis and eventually death. Because the majority of ALS cases are sporadic, there is not a clear understanding of the molecular and genetic mechanisms that lead to the death of the motor neurons. Superoxide dismutase (SOD1) is one gene that has been implicated in ALS, but there are also a large number of genes that are linked to ALS but have not been studied in depth. Sigma non-opioid intracellular receptor 1 (SIGMAR1) is one gene that has been found to have a connection to different forms of ALS, including juvenile ALS, but the relationship between the two is not understood. To gain a better understanding into SIGMAR1’s role in the development and death of motor neurons, we are using Tal-effector nuclease (TALEN) mediated mutagenesis to create SIGMAR1 mutant zebrafish. Once created, these fish will hopefully provide insights into the function of SIGMAR1 and allow us to create a new model of nerve cell degeneration.

4.C.1 Programmatic Implementation of an Algorithm Relating Differential Equations and CRNs
Charles Labuzzetta, Adam Hammes and Nyle Sutton

The goal of the project is to develop software to programmatically convert a system of differential equations into a system of chemical reactions (CRN). A 1979 paper described an algorithm that can accomplish this. We implement this algorithm in Python for practical use within the field of molecular programming. The program we develop will give scientists an additional tool in designing CRNs, as well as hopefully reveal key insights on their behavior. Expanding upon the original paper, a proof is provided that the algorithm is one-to-one. The presentation discusses areas of improvement for the program, as
well as possible future functionality. Finally, we examine the possibility of reducing CRNs produced by
the program to equivalent networks with fewer equations.

Xinhang Shen

In this presentation a mathematical framework is presented for studying mass transport into and out of
artificial organs. In particular diffusion through polymer coated alginate/cell core/shell geometries are
examined. This geometry has been proven relevant for biomedical applications such as pancreatic islets
encapsulated in alginate for treating diabetes. The governing equations are presented and then
transformed into non-dimensional form. A semi-analytical solution is produced that can be solved using
a simple finite difference approach. A diffusion model is presented to describe the uptake of proteins
from an aqueous solution by an antibody laced alginate bead. The model is fit to experimental data and
the phenomenological parameters are determined.

4.C.3 Using the Eclipse IDE to Develop Large-Scale Data Mining Programs in Boa
Sambhav Srirama

Boa is a domain-specific computer programming language used to query the Boa infrastructure, a big
data infrastructure developed by Dr. Hridesh Rajan and others at Iowa State University. Boa
infrastructure contains historic data from around 700,000 open source software projects that makes it
possible to analyze software and its evolution. While the Boa language eases these tasks, there does not
exist a development environment that eases the writing of Boa programs. Programmers that wish to
verify the syntactic correctness of their algorithm must submit the query to the Boa servers and wait for
a compile status. Having to do this every time a program is written or a change is made significantly
increases the amount of time it takes to develop sound programs. To ease the development of Boa
programs, we have created an Eclipse IDE plugin for Boa. Features include, but are not limited to, the
ability to locally manage their online profile, view source code, delete jobs, and check
compilation/execution status. Additionally, users can get live syntax/semantics checks for their
programs prior to sending their job request. A possible future for the project would be to compile Boa
programs locally and send that product to the Boa servers.

4.D.1 The Effect of Soil Organic Matter on Potassium Fixation
Nathan Smith

One of three primary nutrients required by crops, potassium (K) is found in several pools in the soil.
Plants can readily take up K from the cation exchange sites of soil particles, but in the case of certain clay
minerals, namely vermiculite, K can become fixed in the clay interlayer where it is slowly available to
plants over longer timescales. Soil organic matter can bond to the surface of the clays and reduce K
fixation. It was hypothesized that removal of organic matter could increase the K fixation potential. To
test this, an experiment determined the K fixation capacity for eight whole soils, and again with the
organic matter removed. However, this study found that on average, nearly 60% of the K fixation
capacity was lost when organic matter was removed. It is possible the procedure, in addition to
removing the organic matter, oxidized iron in the clay minerals from ferrous to ferric iron, effectively
reducing the net negative charge of the clays and therefore the K fixation potential. Further research is
needed to determine organic matter's effect on K fixation without affecting the charge of the soil's
mineral fraction.
4.D.2 Novel Strains Isolated from Soil for Cellobiosan Utilization

Yee Shiean Tan

The microbial utilization of levoglucosan has been explored in the recent decades (Zhuang and Zhang, 2002; Zhuang et al., 2001; Jarboe et al., 2011), but the literature concerning catabolism of cellobiosan, another component produced from thermochemical processing, is very scarce. This work focuses on the potential of cellobiosan to be metabolized by microbes isolated from soil as a sole carbon source. This will contribute to the study on the utilization of cellobiosan as an energy source during fermentation to produce useful products in the green chemicals industries. The work presented has demonstrated that cellobiosan is able to be utilized as a sole carbon source and also during co-fermentation with the other pyrolysis product, levoglucosan. The ability of novel strains to maximize the utilization of cellobiosan is supported by the usage of mineral medium to ensure that cellobiosan is the only carbon and energy source during fermentation.

4.E.1 Honey Bee Behaviors and Viruses

Amber Haritos

In recent years, honey bee populations have been under increased stress, which has led to declines in bee populations worldwide. One important stressor to honey bee health is infection with poorly understood viruses. Little is known about how these viruses affect bees, but their effect on behavior is particularly understudied. We hypothesized that the virus would initiate the infected bees to interact more with the “healthy” bees to spread the virus more efficiently. Therefore, to better understand how viral infection affects honey bee behavior, we experimentally infected adult honey bees and then used laboratory assays to observe and record the effect on their social behavior. We observed how infected, uninfected, and pseudo-infected (bees fed inactive virus) bees interacted with an uninfected nest-mate to identify how viral pathogens could change these interactions. We observed a total of 360 honey bees for differences in occurrence between the different treatment groups. We found that the majority of behaviors we recorded remained the same between the groups. However, some potentially important social behaviors, such as grooming, differed between the groups, with the infected bees expressing more/less of a behavior. Our results indicate that viral infection can lead to differences in social behavioral phenotype in honey bees. These behaviors are particularly important because they could be involved in the spread of pathogens or social behaviors that help stop infections from spreading. Drastic changes in behavior could also lead to larger-scale effects on the colony as a whole, with important potential impacts on overall hive health. In the future, we can perform more fine-tuned behavioral observations, focusing on the behaviors we identified as important and scaling up our experiments into larger settings, such as full-sized bee hives. Another idea is that we may choose to video tape the interactions between the honey bees and score the behaviors this way because although this method would take longer, it’s a lot more accurate to notice every single detail.

4.E.2 The Effects of Nutritional Stress and Viruses on Honey Bee Survival and Foraging Behavior

Giselle Narvaez Rivera

Honey bees (Apis mellifera) are extremely important worldwide pollinators, but have been in decline in recent years. Researchers have tied these losses to several environmental stressors, including landscape use (lack of forage), pests and pathogens, and pesticide exposure. Two of the most problematic issues are viral pathogens and pollen nutrition. Pollen is the primary nutritional source for bees and monoculture crop systems have led to a substandard diversity of pollen which can negatively affect bee
health. Despite studies on these factors individually, the interaction of honey bee nutritional stress and viruses is poorly understood. We studied this interaction using a semi-field experiment in which we manipulated small “nucleus” bee hives by experimentally controlling their diet and infecting them with viruses to learn how these factors affect their survival and foraging activity. Our findings will provide a better understanding on how these stressors affect honey bee health and foraging behavior.

4.F.1 Evaluation of Perennial Forage Grown as Bioenergy Crops as a Feedstuff for Beef Cattle
Stephanie Clark

The enteric nervous system (ENS) consists of neurons and glia that control motility, secretions, and blood flow within the gastrointestinal tract. Using the zebrafish, Danio rerio, as a model we aim to understand ENS development and how this process might go array in disorders such as Hirschsprung’s, in which children are born lacking neurons in portions of their gastrointestinal tract. The number of markers for enteric glia is relatively small and many of the current immunohistochemical approaches are confounded by the uncertainty of cross-reactivity patterns between species. In preliminary experiments using established glia markers, we obtained unexpected results identifying glia in mutants lacking the ENS, suggesting a lack of glia marker specificity, or the presence of an uncharacterized subpopulation of glia in our mutants. To distinguish between these possibilities, we have cloned other markers to examine glia populations in normal larvae and larvae with defects in ENS development.

4.F.2 Small-Scale Farmers’ Livelihood in Uganda: Egg Production for Rural Development
Celize Christy

Managing small livestock, like poultry usually requires a marginal initial investment. Poultry livestock can be easily raised by rural impoverished farmers with limited inputs. The Center for Sustainable Rural Livelihoods (CSRL) have designed initiatives to aid smallholder rural farmers in the Kamuli District of Uganda. Through this research study we sought to understand how egg production is affecting the economic well-being of these farmers. In our study, we gathered data through surveys conducted in various villages within the Kamuli District. Helping us understand farmers’ limitations, challenges, and aspirations for egg production. Findings showed that many farmers are limited due to the lack of market access, limited income to expand production, and limited support from local organizations such as CSRL. Analyzing and understanding the variables farmers are facing can help non-government organizations establish sustainable strategies to benefit the livelihoods of rural smallholder farmers.

PRESENTATION SESSION V

5.A.1 An in vitro Model to Investigate the Interactions of Transdifferentiated Mesenchymal Stem Cells with Neural Progenitor Cells
Deborah Lincow

Injuries of the peripheral nervous system (PNS) can be debilitating and result in further neurological disorders. Schwann cells help to repair peripheral nerve injuries by providing insulation and maintaining the myelin sheath around nerve axons. Previous research demonstrated the benefits of Schwann cells within a nerve conduit to promote regeneration. However, Schwann cells are difficult to obtain in sufficient quantities and must be sacrificed from another nerve. Bone marrow-derived mesenchymal stem cells (MSCs) may be an alternative to Schwann cells for peripheral nerve repair. MSCs are multipotent stem cells that are easily isolated, expand readily, and have great plasticity. MSCs have also
been shown to transdifferentiate into various neural cell types. In this study, transdifferentiated MSCs (tMSCs) expressing Schwann cell characteristics were grown in co-culture with adult hippocampal progenitor cells (AHPCs) to explore the interactions of these tMSCs with a neural cell line. The purpose of this research is to determine if tMSCs have the capacity to influence the growth properties of AHPCs. Our data so far indicate that tMSCs do support growth and differentiation of AHPCs in vitro.

5.A.2 Analysis of the Maize Cytokinin Receptor Zea Mays Histidine Kinase-1 Function using Saccharomyces cerevisiae

Anna Rogers

Cytokinin (CK) regulate a diverse assortment of processes in plants, including cellular division, biosynthesis of chloroplasts, and differentiation within root and apical meristems. Response to CK is regulated through a two-component signal transduction system consisting of a receptor and a response regulator. Two-component signaling systems are highly conserved in bacteria, fungi and plants and allow organisms to sense and respond to external and internal stimuli. Our analysis of the semi-dominant, leaf patterning maize mutant Hairy Sheath Frayed1 (Hsf1) identified the maize CK receptor Zea mays Histidine Kinase1 (ZmHK1) as the underlying gene. The Hsf1 phenotype is marked by the outgrowth of proximal leaf tissue (sheath, auricle and ligule) in the distal leaf blade, reduced leaf size, and increased leaf pubescence. Missense mutations in the CK binding domain of ZmHK1 increase ligand binding affinity, resulting in CK hypersignaling and giving rise to altered leaf patterning in Hsf1. We are using a two-component signaling assay in Saccharomyces cerevisiae to understand the relationship between these amino acid changes and altered ZmHK1 activity. We have assayed the three independent Hsf1 alleles (Hsf1-1595, Hsf1-1603, and Hsf1-AEWL) using the yeast system and found some signal in the absence of added CK. We are making additional targeted amino acid changes near the CK binding domain in ZmHK1 to determine which residues are critical for ligand recognition, binding and signaling. Our current results will be presented.

5.B.1 Novel Clostridium Species, from the Swine Intestinal Tract
Sarah Azam

The swine intestinal tract is one of the most densely populated microbial ecosystems identified. The microbiota greatly impact host physiology, metabolism, and immunity. However a large portion of intestinal microorganisms remain unidentified. Characterization of unclassified members fills an important gap in understanding the microbiota composition and function. To address this need, we isolated and characterized a novel bacterium (strain 68-1-5) from the swine intestinal tract on mucus-based media. This gram-positive bacterium belongs to the genus Clostridium, which includes 150 characterized species. In the intestinal compartment, these organisms promote intestinal health by stimulating the immune system and producing compounds beneficial to the host. Based on DNA sequence divergence, and many physiological characteristics dissimilar to its closest relative, we propose this isolate is a novel species within the genus. This bacterium exhibited a high tolerance for alkaline and saline conditions. Notably, while most relatives are spore producers, spore formation was not detected in 68-1-5. Additionally, 68-1-5 demonstrated resistance to several antibiotics commonly used in agriculture, reflecting long-term exposure in livestock production. Our future goals include naming this organism and publishing our findings to improve our understanding of the swine intestinal microbiota and essential interactions with the host.
5.B.2 A Novel Modification of the Tetrapod Scapula during Development of Turtles with Shell Closing Systems
Kevin Quinteros

The general evolutionary trend of the shoulder girdle in four-legged backboned animals (i.e. tetrapods) is characterized by the loss or reduction of bones. The turtle’s shell is perhaps the most recognizable exception to this trend. Little is known about other skeletal modifications in turtles that may have accompanied the evolution of the shell during its evolutionary history. We investigated changes in the development of two bones (episcapula and suprascapula) in the shoulder girdle among turtles of the *Emydidae* family that feature shell-closing systems (i.e. shell kinesis) and those that do not. Development and morphology of extant turtle species were compared to phylogenetic representative of extant tetrapod lineages. Scapula structures were analyzed for changes in cartilage and ossification composition. Our observations suggest that turtles with shell-closing systems regain the capacity to develop additional skeletal elements derived from the scapula. The suprascapula becomes a separate component of the shoulder girdle and is characterized by de novo formation of a synovial joint. We hypothesize that plasticity in bone development promotes the evolution of novel skeletal arrangements in tetrapods.

5.B.3 Characterizing Feed Restriction’s Impact on Biomarkers of Leaky Gut
Erin Nolan

Study objectives were to determine a magnitude of feed restriction which causes “leaky gut” and characterize its temporal consequences on production and blood parameters. Twenty-three lactating Holstein cows (157 ± 46 DIM; 713 ± 54 kg BW; parity 2-4) were enrolled in two experimental periods. Period 1 lasted 5 d and served as baseline for period 2 (P2), which lasted 5 d during which cows received one of five dietary treatments: 100% of ad libitum feed intake (AL; n=3), 80% of ad libitum feed intake (AL80; n=5), 60% of ad libitum feed intake (n=5), 40% of ad libitum feed intake (AL40; n=5), or 20% of ad libitum feed intake (n=5). As feed restriction increased, milk yield and milk urea nitrogen, lactose, and other solids decreased linearly (P<0.01) while milk fat linearly increased (P=0.02). Heart rate declined linearly with increasing feed restriction (P<0.02) while respiration rate declined similarly for all treatments (P=0.02). Body weight loss increased linearly with feed restriction (P<0.01). Both plasma insulin and BUN decreased while NEFA increased linearly with greater feed restriction (P<0.01). Lipopolysaccharide binding protein, haptoglobin, and serum amyloid A tended to increase linearly with increasing feed restriction (P=0.09, P=0.07, P=0.10, respectively). Circulating lymphocytes increased with increasing feed restriction (P=0.04). AL40 and AL-fed cows were sacrificed to determine the effect of feed restriction on intestinal histology. Jejunum villus width and goblet cell area and ileum height and crypt depth were or tended to be reduced (P=0.03, 36%; P=0.02, 52%; P=0.06, 22%; P=0.03, 28%, respectively) in AL40 cows compared to AL controls. Liver weight tended to be decreased (15%) in AL40 compared to AL cows (P=0.07). Liver fat and moisture percentages did not differ between treatments. In summary, feed restriction tended to increase circulating acute phase proteins which we speculate is due to an increase in leaky gut as demonstrated by the deterioration in intestinal structure. Therefore, cows fed 40% of their ad libitum intake exhibited symptoms of compromised intestinal integrity.
5.B.4 The Effects of Nutrition and Mechanical Stress on Social Wasp Development
Frances Hunter, Animal Ecology/Biology

Social insects (bees, ants, wasps, termites) are known for their unique communal living. While some insects may live in solitary, producing and taking care of their own larvae, social insects have one reproducing member (queen) with the rest of the colony insects (workers) taking care of the queen’s offspring. A great deal of research on social insects today attempts to understand what determines why a member of a social colony becomes the queen or one of the workers. In social wasps, some of this research suggests that a wasp’s role is determined through mechanical manipulation and nutrition. Our research aims to answer if the addition of a vibration and the amount of nutrition can affect a wasp’s physiology, gene expression, and behavior. This question was tested by adding/not adding artificial vibration onto a nest and lowering nutrition or leaving nutrition at a normal level on experimental nests. Videos of wasp contests were taken to observe behavior, lipid assays and dissections were performed to review physiological changes, and qPCR was performed to observe gene expression changes. We observed a few significant differences in our data but not in every section, suggesting that we don’t understand the whole picture of queen/worker differentiation.

5.C.1 Evaluating the Effectiveness of Knee Pads in the Sport of Wrestling
Logan Gushiken

There is very little research on the sport of wrestling, despite the high physical and mental demands. There is a high risk of injury with the sport, with the knee being the most common site of injury. This study compares the effectiveness of wearing a thick knee pad, a thin knee pad, and no knee pad during a wrestling penetration shot on knee impact forces. A penetration shot is a very common movement in the sport and one that is regularly practiced during a training session. The motion involves stepping forward with one leg, striking the knee of that leg to the ground, and following through with the trail leg into a standing position. This study was completed in the Biomechanics Lab and involved video tracking of markers on the right leg and a force platform to measure knee impact forces. A cushioned mat was placed over the force platform and participants were asked to perform a penetration shot with the knee striking over the force platform. Vertical and anterior/posterior ground reaction forces were recorded using Vicon Nexus 1.8.5 software. Maximum knee impact forces and rates of loading with the two knee pads and no knee pad will be compared.

5.C.2 Assessment of Physical Activity Behavior in Adolescents Through a Self-Report Tool
Amanda Bries

Schools routinely assess physical fitness during physical education but a key need is a tool to assist schools in analyzing physical activity behaviors. The Youth Activity Profile (YAP) is a simple 15 item self-report questionnaire designed to make it easy for schools to capture the behaviors related to physical activity. Currently, there are two different versions of the YAP (print and online), which have been developed to accommodate various schools. The purpose of this study was to compare the reliability and utility of the two versions (print and online) in three groups: 5th, 7th, and 9th grades by randomly assigning them to complete one version. The research team provided information regarding the YAP throughout completion. A study population of 356 students aged 11-15 years was obtained; the reliability analyses indicate week one YAP scores corresponded to the YAP scores reported two weeks later. In turn, the equivalence analyses followed parallel results, revealing similarities in results from both YAP versions (print and online) at the two designated data collection instances. Varying obstacles
make it challenging to assess children’s physical activity behavior, however the results show the YAP can be feasibly completed during school PE to provide supplemental information regarding physical activity.

5.C.3 The Influence of Activating versus Relaxing Music on Repetitive Movement and Associated Motor Cortical Activity
Patrick Frick

Music is a therapeutic strategy proposed to improve movement performance in people with neurological impairments. Research examining brain activity associated with movement and music is lacking. It has recently been shown in healthy adults that the style of music can differentially affect movement amplitude while the rate of movement remains constant. The purpose of this proposal is to examine fine motor movement performance and associated cortical activity completing repetitive finger movements to different styles of music in healthy young adults. We recorded electroencephalography (EEG) from 40 participants while they tapped their finger in time with a tone, in time with activating music, and in time with relaxing music at two different rates. We hypothesize that the activating music will increase brain activity in the alpha band (oscillations associated with attention) compared to the tone alone and relaxing music at both rates. Data generated from this study will inform future studies in persons with Parkinson’s disease to develop strategies for improving movement performance.

5.C.4 The Effectiveness of an Online Community of Practice as an Intervention for Childhood Obesity
Casey DeBoer, Kinesiology

A significant portion of the children in the United States do not reach the recommended amount of physical activity (PA) each day. Childhood obesity and a sedentary lifestyle are associated with a cycle of deficits to physical and psychological health that continue throughout the lifetime. Schools are ideal locations for improvement, and implementing programs that include PA in the classroom is one promising solution; however, teachers are not provided with adequate support to apply this strategy. It is imperative that effective ways to increase teachers’ inclinations to incorporate PA be found. The purpose of this research was to examine the effect of an online community of practice (CoP), named “Move for Thought”, on pre-service teachers’ intentions and perceived competence to include PA in their future classrooms. The “Move for Thought” CoP supplied participants with a location to interact, share ideas and train each other to successfully implement PA in the classroom. Pre-service elementary teachers at Iowa State University and University of South Carolina participated in the Move for Thought CoP for ten weeks. Level of participation, and pre-posttest surveys of perceived competence and intention were collected. Results and discussion on the effectiveness of the “Move for Thought” CoP will follow.

5.D.1 Using X-ray Diffraction to Determine Stresses
Ashley McKenna and Rebecca Whitesell

In recent years 3D printing has emerged as an increasingly intriguing technology: used to create toys, models, and even full size houses. Though most common in plastics, 3D printing is being considered for commercial metal products as well. As in other casting and processing techniques, the properties of materials that are 3D printed can vary greatly. For example, in the manufacturing of hot metals, controlled cooling is necessary to avoid embrittlement. In 3D printed metals, one property of particular concern is residual stress, as it can cause metal parts to warp when cut free from their base plates. It is
therefore, important to understand how the 3D printing process effects the distribution of the stresses in parts. High energy x-ray diffraction (HEXD) is one of the tools that can be used to investigate residual stresses. HEXD measures volumetric strain profiles, which can then be analyzed to find out more about the stress characteristics of the part. We will use these profiles to measure the residual stress depth in several aluminum bars and present the results.

5.D.2 High Precision X-ray CT-scanning of Biological Samples
Olivia Valley, Abigail Collision, Nick Cosentino and Nicholas Collision

Visualizing the micro-scale details of an item without disturbing its natural structure is always desirable because critical information is often lost during dissection or destructive analysis. High precision X-ray CT scans are used in engineering analyses to non-destructively view samples with volume elements as small as 10micro-meters, but this technique is problematic for non-rigid biological samples. Other problems arise from low x-ray contrast of tissue and the long scan times required. We will present results of micro-CT scans performed on biological samples as small as a bovine embryo and as large as a coyote skull. We will also discuss techniques to enhance the details captured in the x-ray images using contrast enhancers such as iodine (stains). We are working on post scan techniques to improve image quality, reduce scan times and to isolate items appearing in CT scans so they can be accurately recreated using a 3-D printer. Results and progress will be reported.

5.E.1 Short Film: Nonverbal Communication
Margaret McGinity

This creative project is a short silent movie titled “Meet Me At Seven.” The script is based on a literature review of forms of nonverbal communication (including acting, written language, visual communication, music, and body language) and their effectiveness, as well as the art of cinema and silent film. Upon completion of the script, the movie was cast with individuals who could express ideas and emotions in a convincing, yet over dramatic manner, as the genre of silent film requires. The filming was completed on an iPhone in locations near and on the Iowa State University campus. Once filming was completed, the film was edited to its final version in iMovie by cutting extra footage, writing inter titles (characters’ dialogue on screen), and adding in an original piano score to supplement and advance the message of the film.

5.E.2 Social Presence Support between College Students and their Parents: A Comparison of Communication Channels
Angela Sequeira

Research has shown that how students communicate with their parents while away at college influences how well they adjust to college. Conveying social support is especially important in these interactions, but little is known about what channels are most effective in this specific context. Media Richness Theory suggests that channels with more cues should be more effective than channels with fewer cues. For this study, 104 college students completed a survey measuring the amount of social presence support for communicating via telephone calls and via texting. Results supported Media Richness Theory, as students reported significantly higher levels of social presence support through telephone calls than through texting. However, texting was found to be a better statistical predictor of social presence support since people reported using texting much more than telephone calls. These findings indicate that although telephone is better at conveying social presence support, students rely more on
texting. Because of this, future research should consider using texting as a predictor in relationship quality measures. Additionally, these results should be further explored to determine if they have significant effects on stress levels, which could help inform counselors and therapists in helping students cope with homesickness and other college adjustment issues.

5.F.1 Surface Roughness of Drivetrain Gears
Patrick Keep

Surface roughness of gear surfaces has a significant impact on the life of gear tooth contacts in a drivetrain. We use an optical profilometer to scan the surface of a gear tooth from the drivetrain. Although the profilometer does several calculations, we are looking for more options and capabilities to aid in the gear sample analysis. To meet this goal, a MATLAB program was developed to calculate the average of absolute values (Ra), root mean squared (RMS), skewness, kurtosis, and average correlation length for each set of data. In addition, the program removes large spikes and fills in null points. It was found that the dedendum region had about twice the average Ra and RMS of the rest of the gear tooth. This region is one place where gear teeth slide against each other when interlocking. Lower Ra and RMS values are preferred since it will result in a lower coefficient of friction leading to less wear. An understanding of the effect of surface roughness on the life of a gear contact can help prevent future failures of drivetrains or similar components.

5.F.2 Polymerization of Diblock Copolymers Containing a Zwitterionic Arginine Moiety
Catherine Meis

Some cationic polymers used as nucleic acid delivery vehicles can exhibit high cellular toxicity (such as JetPEI). Recent literature shows that polymers containing zwitterionic moieties or blocks can be less toxic alternatives for DNA delivery applications, while showing high efficiency in uptake. We employ multiple methods to synthesize and purify a methacrylate-based zwitterionic monomer and polymerize it using reversible addition-fragmentation chain transfer (RAFT) polymerization. The chosen monomer is a derivative of the amino acid arginine, which is synthetically modified to be compatible for RAFT polymerization. RAFT polymerization conditions are determined to reliably produce diblock copolymers of zwitterionic arginine monomer and polyethylene glycol (PEG). Nuclear magnetic resonance (NMR) spectrometry was used to analyze synthesized products and determine purity. Size exclusion chromatography (SEC) was used to determine the molecular weight (Mw) and dispersity (D) for the synthesized polymers.

PRESENTATION SESSION VI

6.A.1 Development, Acceptability, and Shelf Life of a Gluten-Free Fruit and Whole Grain Snack
Celia Bravard

Snacking and food allergies are topics of increasing interest. Many on-the-go snacks, specifically granola products, do not meet the needs of children with food allergies. The goal of this project was to create a bite-sized, gluten-free fruit and whole grain snack featuring international flavors for children under the age of eleven. Additionally, this snack could not contain these common allergens: gluten, soy, dairy, eggs, fish, and peanuts. A final parameter chosen was for the product to provide over half a serving of fruit per serving. The methods included optimal formula development, process flow diagram generation, acceptability feedback, and shelf-life estimation. A sensory panel, involving a 5-point
hedonic liking test, was conducted with 99 fourth grade students to evaluate overall product acceptability. Analytical procedures, including water activity and lipid oxidation quantification (using gas chromatography), were analyzed for shelf-life estimation, with water activity exceeding 0.6 being chosen as the failure parameter. The estimated shelf life is conservatively predicted at 6 weeks at 20°C. Fifty-one percent of the sample population liked the snack, with an additional 33% recording neutral scores. These data indicate a nutritious, uniquely flavored snack, free of many top food allergens was successfully created for the target market.

6.A.2 Dietary Resistant Starch Prevents Urinary Excretion of Vitamin D Metabolites and Maintains Circulating 25-Hydroxycholecalciferol Concentrations in Zucker Diabetic Fatty Rats
Yi Ting Loo

It is common that individuals with type 2 diabetes (T2D) diagnosed with nephropathy exhibit suboptimal serum 25-hydroxycholecalciferol (25D) concentrations, which is the major circulating form of vitamin D. 25D is activated to 1,25-dihydroxycholecalciferol (1,25D) through enzyme activity in kidney. The objective of this study was to examine whether dietary resistant starch could prevent loss of vitamin D and maintain serum 25D concentrations in Zucker diabetic fatty (ZDF) rats - a model with characteristics of human T2D. Control Zucker rats were fed with a standard semi-purified diet (AIN-93G); while ZDF rats were divided into two groups and fed with the control AIN-93G diet or the AIN-93G diet with cornstarch replaced by resistant starch (RS). The results indicated that the control diet-fed ZDF rats had 89% and 97% higher urinary excretion of 25D and 1,25D, respectively, and 31% lower serum 25D concentrations than RS-fed ZDF rats. Also, RS reduced diabetes-mediated damage in kidney by 21% as indicated in histopathologic scoring system. Blood glucose level was shown 41% lower in RS-fed ZDF rats compared to control diet-fed ZDF. In conclusion, dietary resistant starch can help protect kidney health which in turn maintains vitamin D status in T2D.

6.A.3 A Meta-Analysis of Surveys of Public Perceptions toward Genetically Modified Foods in the U.S.
Mikayla Sullivan

Despite Genetically Modified Organisms (GMOs) being commercialized for over 20 years, consumer’s suspicion remains high. This has led to numerous surveys concerning public perceptions and attitudes regarding GMO foods. A meta-analysis of surveys done between 2000 and 2013 of public perceptions toward GMO foods in the U.S. was carried out to consolidate the evidence. Studies were included when they reported U.S consumer’s opinions and knowledge on consumption, purchasing, safety, and labeling of GMOs. In total, 28 original studies were included. Over half of the U.S population does not understand GMOs. Around 90% of the population believes that GMO products need to be labeled. The general population support for plant-based GM products is higher than meat-based products. While opposition for GMOs has declined, overall support remains stable. However, many of these results are based on the wording on the questions and the order questions are asked in the specified surveys. The meta-analysis reveals survey participants have a limited understanding of GMO products and as such varying levels of support for GMOs. Evidence suggests a need for increased education of consumers and the general public as well as need for unbiased questions and wording when conducting surveys about GMOs.
Shumao Ye

Low iron bioavailability (IBA) is a major contributor of iron deficiency anemia, a most prevalent nutritional deficiency around the world. In vitro IBA is commonly measured using simulated gastrointestinal digestion, caco-2 cell uptake and followed by ferritin measurement. This method is cumbersome since it takes 24 hours and needs an expensive kit to measure ferritin concentrations. Hence, our objective was to develop a high throughput method to assess IBA in large number of samples quickly and economically. In this new method, the quenching of calcein fluorescence in caco-2 cells by food iron following in vitro digestion was used as an index of IBA. IBA assessed in this method was compared with published human absorption data and measured ferritin responses. Similar to human absorption, IBA was enhanced by ascorbic acid, and was reduced by bran, phytate, and tea. A high correlation was found between human absorption and the IBA we tested (r=0.90; p=0.04). Our data was also highly correlated with the data obtained using ferritin method (r=0.92; p<0.01). In conclusion, our method reliably predicts human iron absorption in a more cost effective and faster manner compared to the ferritin method. However, future studies are needed for more comparisons with human studies.

6.B.1  The Shape of Your Life
Corbin Zahrt

This project collected data on the movements, whereabouts, and number of people in the vicinity of six ISU students over the course of one month. The participants answered two questions two times each day. The questions were simple: Where are you now? How many people are around you? The final data was plotted onto an ISU campus map to reveal emergent patterns with the goal of demonstrating the natural beauty of something as banal as our daily routines. The result was several images with a kind of natural beauty akin to the appearance of growth patterns of bacteria observed through a microscope or of circular fields observed from high altitude. It is important to remember that this work is ultimately an artistic one, focused on aesthetic beauty. While the data has not been modified, it has been repeated, and overlain to create visual impact.

6.B.2  Study of Light in Art
Riley Eveleth

Light is a highly underrated component that most people don’t quite understand or appreciate. Light fuels life and is apparent in everything we do, including art. This project researches the importance of light throughout history and the world such as ancient mythological beliefs and modern religions, as well as the technical roles light has specifically played in art. Studies of various master artists currently exploring the same subject, or have worked on the subject in the past, will be examined in order to gain a wide range of knowledge on the matter. Finally, I intend to explore and experiment with multiple mediums and topics and apply them to an original work. Studying the element of light will provide an understanding of the importance of this component to life as well as art. Learning the symbolic qualities of light will give a heightened sense of conceptual-ism, while the technical aspects will allow me a vast range of skills in order to more fully explore in my own art.
6.C.1  A Computational Vision on Human Emotion  
Rohit Zambre

Late 20th century Artificial Intelligence research treated emotion and cognition as antithetical entities. Recent neurological studies, however, suggest that the two are closely related. Emotion plays a critical role in decision making. Studies also have established that neurological deficits in emotion processing lead to deficiency in decision making. These findings have invoked a new interest in the modeling of emotion in artificially intelligent systems. The Dependable Computing and Networking Lab (DCNL) at ISU, led by Dr. Arun Somani, is researching human emotion modeling using Computer Vision. The study will engender novel ideas to adapt the existing emotion-modeling framework in the research realm to the needs of the Human and Object Detection project in the DCNL group. We believe that this study could also lead to new and innovative models of human emotion. Computational tools such as OpenCV and MATLAB will be used to test and validate new models and adaptations. Using machine learning methods, the reliability and efficacy of the new methods will also be evaluated.

6.C.2  Continuous Mobile Authentication Using Gestures  
Cimone Wright

Smartphones have become a main medium of communication which act as hubs of personal and confidential data. Efforts of keeping this data secure have yet to offer solutions which allow for continuous user verification. Conventional authentication systems identify a user only at the entry point. Active authentication continuously verifies the user as long as the device is active. This work focuses on using behavioral biometrics, extracted from touchscreen gestures, as “something a user is” for active authentication. This scheme performs continual verification in the background, requires no additional hardware devices, and is invisible to users. A public data set involving touchscreen gestures provided by Mario Frank, a researcher at the European Patent Office, has enabled us to verify that users can be de-identified based on their touchscreen gestures. 30 behavioral touch features were extracted from the raw touchscreen logs data set and each user occupies a distinct subspaces of this feature space.

6.C.3  Video Game Scripting to Enhance Learning.  
Garret Meier

Every year, Iowa State hosts the IT Olympics which expose junior high and high school students to principles of computing. One event requires students to automate navigation through a video game with self-written scripts. This project delved into the details of solving the design and coding problems associated with creating a game which includes scripting. The project aimed to create a fun and challenging avenue for students to observe basic programming principles. Development followed a traditional lifecycle including design, development, and testing phases for the major components. Major challenges included designing the commands and tools for students to use. Additionally, creating a compiler with sufficient complexity to allow for complex scripting actions proved difficult. Translating graphics from their original resolution which supported 16-bit screens to a 1080x1920 screen presented challenges with handling distortion of images. The resulting game will be used at this year’s IT Olympics and provides increased complexity and reliability over previous iterations of a scripting-based game for the competition.
6.D.1  A Roadscape: Evolution of a Vernacular Design  
Krithika Mohan

The objective of this project was to design a roadside shelter that best fits various elements of an assigned existing site. The site was analyzed in groups and the data was group sourced for this project. The final design was a product that had mixed elements gathered from the site. After going through several iterations, the roadside shelter design in Cades Cove, Smoky Mountains, TN turned out to be something monumental. The design process was elaborate and the iterations went through impressive changes. This project fabricated into a study of the design process.

Henry Herman

From the air the American grid takes shape. The unending expanses of agrarian landscapes broken by clean lines of road and rail. The objective of the Roadscape project is to gather and interpret information found in economic, social and cultural landscapes across the nation in order to creatively serve those that enjoy these everyday places. First our supervisors linked our team’s coordinates to Global Information Software (GIS). Next, our team divided up and gathered hand-drawn and handwritten information that would later be used to design over 30 small Roadscape Shelters. The shelters serve a dual purpose: to engage and reward road travelers and to testify to the growing body of information being collected in vernacular landscapes. It is these places that that our material culture is best displayed and our teams efforts were to demonstrate that they can be better understood.

6.D.3  The Crowd-sourced Roadscape Project  
Emma Lorenz

During the fall semester of 2014 the 32 Bachelor of Landscape Architecture (BLA) students in the traveling Savanna Studio participated in a semester-long experimental “crowd-sourced” project that was designed to engage students in hands-on site-assessment/field research for 32 separate “roadscape” sites arrayed along the 7350 miles traveled by the students and faculty during two three-week excursions. The students divided responsibilities for inventory of particular aspects of the sites (e.g. physical properties, existing plant communities, materiality, cultural conditions, climate factors, phenomenological character, etc.), documented their assessments while on-site and then later shared the information among the group in cloud-based files. Upon return to Iowa following the second trip, students chose individual roadscape sites and designed interventions (roadside shelters) in response to the site inventories, such that each student engaged a unique place but relied on the assessments performed by all 32 class members. This presentation documents the various phases of group work including inventory, analysis, and the author’s individual design proposals as developed and communicated through an iterative multi-media exploration in drawing and modeling.

6.D.4  Design Thinking  
Alexandra Vaughan and Samantha Creeger

Under the supervision of Seda Yilmaz and Tejas Dhadphale, we researched design thinking methods as they applied to business. Our goal was to understand how to apply these methods in a way that would facilitate innovation among individuals outside of the design field. We tested their effectiveness by presenting these methods to executives in agriculture in the form of a workshop held at the
Agribusiness Conference on January 7th. We are in the process of synthesizing the information we found and measuring how effective the methods were at teaching design thinking. We plan to continue holding workshops to test how the methods work when teaching students and professionals from different fields of study.

6.E.1  Harry Potter and the Terrible Government: An Analysis of Rowling’s Magical Government
Cathryn Kelzenberg

J.K. Rowling’s Harry Potter novels chronicle the adventures of a young wizard through his magical education and quest to defeat the evil Lord Voldemort. Set in a detailed universe, the world’s values, ethics, and infrastructure are all thoroughly developed. However, the structure of the magical government (Ministry of Magic) is exceptionally flawed and these inadequacies were exploited throughout the series to satisfy the ends of the antagonists. This study examines the United Kingdom’s magical government construction as outlined by Rowling, focusing on established policy implementation and appointment of officials. After distinguishing failings of the system, potential solutions are outlined through a comparative government analysis. The new policies were assembled by analyzing and adopting policies from nations which received top Democracy Index ratings by the Economist Intelligence Unit from 2011-2014. Changes to the Ministry of Magic include the implementation of voting procedures and the promotion of separation of powers. Though fictional, these changes would significantly improve transparency and democracy in magical government and exemplify the importance of government agencies and structure on society.

6.E.2  The Bloodless Spirits Wept: Orpheus’s Perpetual Love through Literature and Film
Brenda Tyrrell

Ovid scripted the tragic love story of Orpheus and Eurydice over two thousand years ago in his magnum opus, Metamorphoses. The mutability of this myth continues to be examined and adapted still today in a variety of mediums, including literature, film, opera, and music. The power of their love is portrayed in Marcel Camus’s 1959 film Orfeu Negro. Camus focuses on Orpheus’s perpetual love as the premise for a modern day romance, enhancing the myth with his own interpretation, while remaining true to other aspects of the myth. The purpose of this paper is to examine two specific directorial choices by Camus, the addition of Hermes and the role of music, and the effect these choices have on the viewer as they consider the overall constancy and potency of the love shared by Orpheus and Eurydice. Although there are more parallels between the film and Ovid’s tale, I will focus on these specific comparisons and contrasts on Camus’s part to create an even more poignant narrative between the ill-fated lovers and how these choices allow the tradition of the perpetual love story between Orpheus and Eurydice to remain timeless.

6.E.3  Tragedy Recollection, Self and Social, in Waltz with Bashir
Bradley Adams

What is memory, in both its individual and national forms? How do we manipulate and construct it? Waltz with Bashir, Ari Folman’s award winning and Oscar nominated film, plunges into the human psyche to reveal the fluid—and politically volatile—nature of individual and national memory. Folman, attempting to embrace his own elusive thoughts and feelings concerning his involvement in the Sabra and Shatila massacre in 1982 as an Israeli soldier, uses a unique, ethereal form of animation in a documentary format to produce a work that challenges viewers to question their own personal, social,
and historic reminiscence. This presentation will focus on the ways Waltz with Bashir questions memory when humans are confronted with horrific tragedy, and the disturbing implications of what he discovers for the individual as well as the nation.

6.E.4 Barbie’s Dream Life: Wine Sold Separately
Beth Trafton, English

There is nothing worse than flat and uninteresting characters that easily fit into cliché, cookie-cutter molds. This is especially true if those boring characters perpetuate negative and harmful societal stereotypes and expectations. However, in a majority of creative fiction work, reinforcement of negative and harmful gender stereotypes still persist. This repetitive way of recycling long-held gender roles is not only a hindrance on true creative expression, but it also solidifies the cumbersome notion that gender is a rigid, categorical means of identification that can’t slip past its given boundaries. Obliterating these gender expectations is what I mainly aim for with each creative fiction short story I write. By imbuing each character with an authentic voice and sense of self, I am able to defy what is normally expected. Breaking down the walls of rigid gender definitions and expectations can be accomplished by both supporting the work of people like me, and, on a grander scale, continuing to give recognition to other creative writers who use their work to better society.

POSTER SESSION

P.1 Application of Polymer Kinetics and Controlled Self-Assembly in Multi-dimension Nanomaterial Synthesis
James Boose

Interest in nanomaterials has risen in the recent past, primarily due to the unique properties of materials at the nanoscale. There are two main approaches to nanomaterial synthesis, viz; top-down (fragmentation) and bottom-up (self-assembly driven). Coupled approaches, however, have potential to give unprecedented control over material synthesis. We employed a top-down approach to increasing etch rate, and bottom-up approach to synthesize nano-sized beams, sheets, and cubes. One-dimensional coordination polymers were grown at steady-state conditions — achieved through solubility-limited etching of liquid metal alloys. Stoichiometric control of substitution around the central metal atom leads to asymmetry in substitution patterns, which in turn influences the self-assembly of these 1D polymers. Therefore, three separate growth rates exist; K1 (polymerization), K2 (x-y plane assembly), K3 (x-z plane assembly). These growth rates can be engineered to affect the self-assembly process to construct various nanomaterials including cubes (K1≈K2≈K3), sheets (K1=K2>>>K3), and beams (K1>>>K2>K3). All materials were characterized by scanning/tunneling electron microscopy (SEM, TEM), x-ray photoelectron spectroscopy (XPS), and x-ray diffraction.

P.2 The Social Stigma of Mental Illness: Negative Perceptions and Misattribution
Trevor Brammer
Mental illness carries a stigma due to lasting cultural beliefs and misattribution; however, research has shown that these negative perceptions have decreased over the years, possibly due to paradigm shifts in psychology and psychiatry (Phelan 2005). In order to study the stigma related to mental illness, a vignette experiment was conducted. There were 88 participants who were randomly assigned a vignette and filled out a survey. An ANOVA was conducted which found that the responses participants gave for schizophrenia, major depressive disorder, and a physical ailment (a ruptured disc) were statistically different. Participants were more negative towards someone with a severe behavioral disorder, schizophrenia. Major depressive disorder responses were more positive than the physical ailment responses, potentially due to proper attribution from education. Examining why depression has become less stigmatic but not schizophrenia should occur in future research.

P.3  The Influence of Activating versus Relaxing Music on Repetitive Finger Movement
Alison Brinkman

Music is a therapeutic strategy proposed to improve movement performance in people with neurological impairments. Research examining brain activity associated with movement and music is lacking. It has recently been shown in healthy adults that the style of music can differentially affect movement amplitude while the rate of movement remains constant. The purpose of this proposal is to examine repetitive finger movement performance while making those movements to different styles of music at different rates in healthy adults. Forty participants completed a finger tapping task in time with activating and relaxing music. Kinematic data was collected and compared across music condition and movement rate. Results revealed that movement amplitude was greater during the activating music condition, particularly at the higher rate. The results of this study will serve as the basis for exploring the use of music cues for improving movement performance in persons with Parkinson’s disease.

P.4  Effects of Manual Load Carriage on Kinematics of Gait
Mitchell Carlson, Morgan Stonewall, Emma Tilley and Carlee Cutler

Carrying hefty backpacks for extended periods of time is a daily part of life for college students across the nation. Studies on manual load carriage are limited, even though it affects a significant population of young adults. Previous research produced conflicting views on gait change with added weight in a backpack. According to a study that tested military personnel, length of stride increased as weight increased (Majumdar, Pal, and Majumdar, 2010). In a conflicting study, stride length and step time decreased as the weight increased (Kinoshita, 1985). We hypothesize that step length will increase as carried weight increases, as concluded in the military study, with the largest alteration in gait being observed at 20% of the participant’s body weight. According to a study on 19 year-old males, adverse effects began to emerge at 20% of the participant’s body weight (Al-Khabbaz, Shimada, Hasegawa 2008). Our subjects will walk the length of the GaitRite while carrying 0%, 10%, 20%, and 30% of their bodyweight. We will measure stride length, percent of time on one leg, width of stance, and step time. Posture will be visually examined as the participant walks with the specified weight. This qualitative
measurement will only show if the subject is leaning forward or backward. We expect that individuals will take longer and quicker steps, will spend less percent time in single stance, and will lean forward with increased weight.

P.5 Identification of Glial Marker Genes in the Developing Enteric Nervous System
Kendra Clark and Megan Trautmiller

The enteric nervous system (ENS) consists of neurons and glia that control motility, secretions, and blood flow within the gastrointestinal tract. Using the zebrafish, Danio rerio, as a model we aim to understand ENS development and how this process might go array in disorders such as Hirschsprung’s, in which children are born lacking neurons in portions of their gastrointestinal tract. The number of markers for enteric glia is relatively small and many of the current immunohistochemical approaches are confounded by the uncertainty of cross-reactivity patterns between species. In preliminary experiments using established glia markers, we obtained unexpected results identifying glia in mutants lacking the ENS, suggesting a lack of glia marker specificity, or the presence of an uncharacterized subpopulation of glia in our mutants. To distinguish between these possibilities, we have cloned other markers to examine glia populations in normal larvae and larvae with defects in ENS development.

P.6 Finger Tapping and Parkinson's disease: Patient Quality of Life
Jaime Freiburger

People with Parkinson's disease (PD) demonstrate impairments in repetitive finger movements. Performance of these fingers movements is characterized by increased movement rate, reduced movement amplitude, and hesitations. Clinically, physicians evaluate repetitive finger movement performance to assess disease severity and progression. However, to date, no study has examined how repetitive finger movement impairment relates to patient quality of life in persons PD. For this study, 68 participants completed a repetitive finger tapping task and the Parkinson's disease questionnaire (PDQ-39) to assess quality of life. Results revealed that participants that demonstrated greater impairments in repetitive finger movement (increased movement rate and decreased movement amplitude) had reduced quality of life (greater PDQ-39 scores). Thus, evaluation of repetitive finger movements may be a valuable tool to assess multiple domains of Parkinson's disease, from both the physician and patient perspective.

P.7 The Role of Sustainable Visual Merchandising Practices in Driving Retail Sales and Building Retail Store Loyalty
Xeniya Konika

As going green is becoming more economically feasible and popular in apparel retail, eco-friendly policies have penetrated stages of fashion industry through apparel production, store maintenance, and retail supply chain (Pegler, 2012). By utilizing sustainable practices in retail, a company does not only
benefit the environment, but also creates a positive retail image (Lee, Choi, Youn, and Lee; 2012). More consumers are willing to pay for eco-friendly products; moreover, they want to shop in green stores (Pegler, 2012). Since there is a rising demand for eco-friendly stores, relevant visual merchandising practices are essential to fulfil this need. The purpose of the present study is to identify sustainable visual merchandising practices and gain insight into consumers’ attitude toward such practices and ultimately to find out consumers’ intention to patronize and buy from such retailers which use green visual merchandising practices. Additionally, this study will determine the relationship between consumers’ attitude and retail store loyalty among consumers through sustainable visual merchandising practices. An online survey method will be used to collect data from Iowa State student sample. Data will be analyzed using correlation, regression, and structural equation modeling techniques. Results from this study along with significant practical implications will be discussed.

P.8 Determining the Effects of Wind Shear Events on the Power Output of Individual Wind Turbines on an Iowa Wind Farm

Samantha Lodge

The effect of wind shear on the power output of individual wind turbines is a relatively new area of research and is often overlooked, or not characterized alone. Renewable energy is becoming more important as a fossil fuel crisis seems imminent in our future. The intent of this study is to give a better understanding of the effects of wind shear alone on power production of multi-megawatt wind turbines on a wind farm in Iowa. Data from the Palmer, Iowa 150-m tall meteorological tower was interpolated to 80 m turbine hub height. Wind shear values were calculated and visually compared with power shear data from individual wind turbines. The data were analyzed using statistical t-tests and results showed that a low shear environment was more suitable for high power production. It was found that four out of five turbines produced statistically significant data, and the turbines in wakes of multiple turbines were found to be statistically insignificant. Future research in this area could include characterization of effects of wakes and turbulence with wind shear to produce a relationship between wind shear and power output for turbines in the wakes of other turbines.

P.9 Identification of Mammalian Orthoreovirus Proteins that are Responsible for Downregulation of Hif-1a

Tyler Meseke

Tumor outgrowth from the blood supply leads to low oxygen condition, or hypoxia in micro regions of solid tumors. The transcription factor, Hypoxia Inducible Factor-1 (HIF-1), regulates these hypoxic cells, and is formed when one of its components, HIF-1a, is stabilized. We previously found that Mammalian Orthoreovirus (MRV), a potent oncolytic virus, causes the downregulation of HIF-1a in infected hypoxic cells. Here we report that MRV proteins, m1 and m2 induce the downregulation of HIF-1a independent of viral infection. The ability of m2 to downregulate HIF-1a was attributed to strain specific differences, where the T1L and T3DC strains induced more downregulation than the T3DF strain. By examining single
amino-acid and deletion mutants, the region containing aa 188-380, and specifically amino-acid 208 of m2, and f domain of m1 were determined to be necessary for HIF-1a downregulation. These observations provide new insights into the effects of specific MRV proteins on HIF-1a when expressed in hypoxic cells.

P.10  Ways to Wing it: Correlation of Wing Shape with Habitat Preferences, Toxicity and Migration in Butterflies

Morgan Muell and Miranda Salsbery

The shape of a wing influences the airflow over its surface and governs the aerodynamic forces acting on the wing. Therefore, wing shape is tightly correlated with flight performance. For bats and birds, faster fliers generally have more slender and elongated wings (high aspect ratio), while slower fliers have more broad and short wings (low aspect ratio). The preferred flight speed, and therefore wing shape of an animal is usually adapted to its habitat, foraging strategy, and flight behavior. We examined the relationship of aspect ratio and wing shape (i.e., leading edge curvature and wing pointiness) of butterfly forewings, relative to habitat preferences, toxicity, and migration using geometric morphometrics. Pictures of 22 butterfly species from three different habitats (forest, open forest and open habitat) were digitized and analyzed using morphometric methods. Our preliminary results indicate that the previously shown relationship of wing shape and flight performance for larger fliers might not scale down to butterflies. We found a significant difference in aspect ratios for butterflies in different habitats. Suspected slower fliers had a higher aspect ratio than faster fliers. This could mean that we need to adjust our ecological interpretation of wing shapes for small fliers such as butterflies.

P.11  Barrow and Gilt Vocalizations during a Human Approach Test

Sarah Myers

Swine vocalizations may provide information on behavioral states. Previous studies have reported that an increased total number of high calls (≥1000 Hz) may be an indicator of a negative state in male pigs (Kluivers-Poodt et al., 2011). However, few studies have investigated if vocalizations differ between male and female pigs. Therefore, the objective of this study was to investigate differences between barrow and gilt vocalizations during a human approach test (HAT). Twenty barrows and 20 gilts were tested over two consecutive weeks. Each pig was individually tested in an arena with an unfamiliar human for 10 minutes. Digital audio recordings of pig vocalizations during HAT were captured with a Marantz recorder. Raven software was used to produce spectrograms and manually identify vocalizations. Two call categories were developed based on published literature: low (<1000 Hz) and high (≥1000 Hz). Within these call categories peak frequency, duration, and total number of vocalizations were calculated. During HAT, gilts expressed a greater total number of low calls, but barrows expressed a greater total number of high calls (P < 0.01). These data suggest barrows and gilts differ in their vocal response to HAT.
P.12  **Cell Signaling Mechanisms in Neurodegenerative disease**  
Madison Partridge and Ashlyn Welder

Parkinson’s disease (PD) is a debilitating neurodegenerative disorder characterized mainly by the progressive and substantial loss of dopaminergic neurons in the substantia nigra compacta (SNc), resulting in severe neurological deficits. The molecular mechanisms underlying the neurodegenerative process is still not clear. The laboratory’s research is primarily focused on elucidating cell signaling mechanisms in cell culture and animal models of Parkinson’s disease. The laboratory uses biochemical, immunological, molecular biological, neurochemical and behavioral techniques to understand the pathological mechanisms. We will be presenting the some of the methodologies that we have been trained during this mentorship.

P.13  **Effects of Singing on Speech in Patients with Parkinson's Disease**  
Hollie Radig

Nearly 75% of individuals with Parkinson’s disease (PD) have speech and voice impairments. In addition, difficulties in breathing and airway protection are the primary factors leading to death in persons with PD. Singing, like speech, is produced by the larynx in conjunction with the respiratory system. However, singing requires greater breath control and is considered to be a more sustained form of speech with greater emphasis placed on rhythm, tempo, and pitch modulation. Singing may also increase laryngeal and respiratory muscle strength needed to delay the development of respiratory complications due to muscle weakness associated with PD. This study measured the effects of a singing intervention in 27 participants with PD. Participants were assigned into a high (met 2 times per week) or low intensity (met one time per week) group. Voice and respiratory measures were recorded pre and post eight weeks of intervention. Both groups demonstrated significant improvements in maximum inspiratory and expiratory pressure ($F > 4.288$, $p < 0.05$), as well as vocal duration ($F = 4.233$, $p = 0.05$). These results suggest that singing may be a valid treatment option for maintaining and improving voice and respiratory control in persons with PD.

P.14  **The Effect of Physical Activity vs. Cognitive Activity in Reaction Time**  
Olga Riusech, Emily Forsyth, Andrea Garcia and Quintin Smidzik

Exercise is associated with an increase in cardiovascular functional ability. Results from previous studies indicate both visual and auditory reaction times were significantly faster after aerobic exercise compared to no exercise. We are replicating these results using a visual reaction time task. In addition we are comparing the effect of physical exercise to the effect of a mentally stimulating activity. We hypothesize that post-exercise reaction time will yield the fastest reaction time. To test this we will test 12 individuals, 6 males and 6 female on a 4-Choice Reaction Test after a 3-minute cardio regime and a Stroop task that requires mental effort. The cardio exercise consists of performing jumping jacks, high-
knees, and sprint-kicks for a minute each. The Stroop task requires participants to identify the ink color of color-words (for example, green) that are consistent with the ink color or different from the ink color. They read these words for 90 seconds. Before and between conditions we collect resting heart rate.

P.15  Examining the Role of the Primary Motor Cortex in Motor Equivalence
Mathew Schmitz

The primary motor cortex provides the final descending motor command. However, little is known regarding how sensory information influences activation of this brain region. The purpose of this case study was to examine if varying sensory information changes the brain activity associated with a simple finger movement. Electroencephalography (EEG) was recorded while a trained musician played either the guitar or mandolin. The musician was instructed to play one note, using a simple finger pick and the same fingering for each instrument (i.e. motor equivalency). Thus, only sensory information related to holding the instrument and sound of the instrument was modified. Brain activity over the primary motor cortex will be normalized to rest and compared between instrument conditions. We hypothesize that since the function of the primary motor cortex is to send the final motor command (i.e. not sensory integration), brain activity over this area will not differ between instrument conditions. Results of this study provide the basis for further research examining the contribution of the primary motor cortex in motor equivalency.

P.16  The Gallery Café: An Exploration and Expression of Shape, Form, and Space
Holland Shodeen and Cassie Cook

Through research and exploration of the current needs of the growing Iowa State University student and faculty population, a design concept was developed that would create a unique and innovative space at Iowa State University. Inspired by Helen Frankenthaler's 1968 painting, “Chalk Zone,” the former Christian Peterson Art Museum in Morrill Hall on the campus of Iowa State University was transformed into a café of enchanting and romantic character. The concept began with the development and construction of a sculpture encompassing the emotional character of Helen Frankenthaler’s painting. The sculpture then served as the primary inspiration for the café design. The Gallery Café is a space of accessibility and comfort for the students, staff, and faculty of the University. The open and rhythmic design provides for the multiple functions of the café including an eatery, lounge, and study space.

P.17  The Effects of Sedentary Activity on Individuals with Parkinson’s Disease
Rachel Wille

There are approximately 2 million people living with Parkinson’s disease (PD) in the United States. The most common symptoms of this disease are tremor, rigidity, slowness of movement, loss of balance, and difficulty speaking. Living with a degenerative disease that effects a person’s movement, like PD, can lead to an increase in sedentary behavior. Thus, the goal of this study is to measure how sedentary
behavior is related to quality of life in persons with PD. Thirty participants will complete the 39 question Parkinson’s disease Questionnaire (PDQ-39) that measures their subjective evaluation of quality of life. In addition, participants will wear a Jawbone Upband24 Activity Tracker for one week to measure sedentary behavior. Bivariate Pearson correlation analysis will be completed to assess the relationship between quality of life and sedentary behavior in persons with PD. We hypothesize that persons with PD that have a higher sedentary behavior rate (less active) will have higher scores on the PDQ-39 (poorer quality of life). This study will provide baseline data that will aid in developing new treatment strategies to increase physical activity and quality of life in persons with PD.

P.18 Eric and Anna Gustafson Residence; Designers Jiani Yao and Xinran Chen
Jiani Yao and Xinran Chen

Eric and Anna Gustafson have purchased a residential lot near Lake Minnetonka, in Waysata, Minnesota. They have hired Jiani Yao and Xinran Chen to develop a four-thousand square foot house plan, reflecting their client’s interests in history, global cultures, and modern technology. Eric is a hockey coach and Anna is a museum curator. Their children are grown, but are frequent visitors. Eric’s mother, Elsa is recovering from cancer and will be staying with the family for a few months while she recovers. Methodology included systematically researching client preferences and special needs, and also examining the building site. The team determined that the Gustafson’s desired a mixture of two different Asian styles, Chinese and Japanese. In addition, Elsa may require wheelchair use and children desire bedroom suites. The team’s design concept is based on the Japanese tatami grid system and incorporates a traditional Chinese style ceiling frame and multiple custom designed furniture, lighting, and finish elements. Integrating Chinese and Japanese historical elements with contemporary construction, created harmony and unity in the home. To accommodate Elsa’s needs, the team developed interiors according to ADA and Universal Design guidelines. The design process has broad significance in that it reflects a global world where interior designers have the dual responsibility of maintaining accuracy in traditional designs of various cultures, while reinterpreting designs to suit contemporary use. Though there is no standard approach, as this project demonstrates there are multiple solutions.

P.19 The 10 Most Medically Relevant Mosquito Species in the Midwest, Lucid Key Illustrations
Katherine Zumach, Selah Zaldarriaga, Chelsea Jackson and Shawna Synder

There is a current urgent need for accurate ways to identify medically relevant mosquito species, not only globally, but here in the heart of the Midwest. As a group of five illustrators from the BPMI (Biological Pre-Medical Illustration) program, we are underway collectively producing a project regarding a lucid key mosquito identification, which has never been accomplished before. A lucid key uses recognizable characteristics of a specimen to easily identify the species. For fast and accurate mosquito identification, we are illustrating the nine defining characters of ten mosquito species. This five person team, with the special attention of our mentor Isai Madriz, conducted intensive study of
mosquito specimens under microscopes and then produced different series of digital and traditional drawings illustrating these key informative characteristics. Our work will become the main component of a peer review collaborative manuscript between UW Madison and ISU, allowing this illustrated key to be widely available for its intended use. The lucid key will give people a better understanding of different mosquito characteristics, and it will be simple enough that those who are not entomological experts may utilize it.

P.20 Magnetostrictive and Magnetoresistance Properties of Thin Film Gd5Si4
Joe Benedict

The giant magnetocaloric effect of Gd5Si2Ge2 is widely reported in the literature. Many research papers and lab demonstration equipment have been produced since its discovery. The giant magnetocaloric effect of the material is due to its lattice structure change during a first-order phase transition from monoclinic to orthorhombic. That quality is also found in other materials such as (Tb5Si2Ge2 and Heusler alloys). However, Gd5Ge2Si2 passes through that transition close to room temperature, which makes it ideal for practical applications. The structural lattice of Gd5Ge2Si2 also produces another special characteristic called colossal magnetostriction as it passes through a first-order phase change. Researchers have studied the magnetostrictive properties of Gd5Ge2Si2 in its bulk form, but little research is available for Gd5Ge2Si2 as a thin film. Initially, the magnetostrictive and magnetoresistance properties of Gd5Si4 will be studied in order to understand the same properties of Gd5Ge2Si. The results of the research will help in understanding the material’s properties in thin film form, which will eventually be aimed at developing micro-cooling devices for integrated circuits and micro-devices.

P.21 Media Effects of Academic Achievement
Lucy Heiderscheit and Adam Morgan

The purpose of this study was to examine the effect of media use on academic achievement. Multiple studies demonstrate a negative correlation between media use and school performance among children and adolescents (Anderson, Gentile & Buckley, 2007; Rideout, Foehr, & Roberts, 2010). The current study extended these findings by exploring links between media use and grades in a college student population. A sample of 713 students completed a questionnaire measuring GPA, media habits (Anderson & Dill, 2000), video game addiction symptoms (Gentile, 2009) and relevant covariates (parental education, ADHD symptoms, self-control, demographics). We found a significant negative correlation between video game addiction symptoms and GPA (r = - 0.16, p < 0.01) as well as a marginally significant correlation between overall time spent using media and GPA (r = - 0.07, p = 0.06). Regression analyses demonstrated that the effect of video game addiction on GPA remained significant while controlling for key covariates (beta = -0.10, p < 0.03). This study used a cross-sectional correlational design and does not provide strong proof of a causal relationship between variables. Nonetheless, these findings suggest that video game addiction and time spent using media may contribute to poor grades in college.