



**The 14th Annual  
Spring  
Undergraduate  
Research  
Festival**

**Wednesday, April 18, 2018  
4:30pm-6:30pm**

University of Iowa  
University Capitol Centre  
2<sup>nd</sup> floor South Atrium  
Iowa City, Iowa

**This event is hosted by the  
Iowa Center for Research by  
Undergraduates.**

**ICRU promotes undergraduate  
involvement in research and creative  
projects at the University of Iowa,  
serving students, staff, and faculty.**

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The Spring Undergraduate Research Festival is proud to showcase over **100 visual presentations** given by the University of Iowa's student researchers and creative scholars. Presenters work in over **50 different departments** across campus and represent the senior, junior, sophomore, and freshman classes.

**Odd numbered posters will present from 4:30-5:30PM**  
**Even numbered posters will present from 5:30-6:30PM**  
**\*\*\*Please note that at 5:30, all of the boards will be turned around to show the even numbering and the second hour presenters' posters\*\*\***

We hope that you enjoy talking with these outstanding students and will see you again in for the 8th Annual Fall Undergraduate Research Festival!  
**Programs with full abstracts are available on the ICRU website: [www.uiowa.edu/icru](http://www.uiowa.edu/icru).**

*Many thanks* to the over 100 graduate and professional students and postdocs who have volunteered their time to serve as poster judges for this event.



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# First Hour Presenters

## 4:30-5:30PM

(odd numbers only)

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### 1 - Ashley Arkfeld

Majors: Business Analytics & Information Systems, Marketing  
Mentor: Jeffrey Ohlmann (Management Sciences)

#### *Optimizing Scholarship Allocations to Shape a First-Year Class*

Universities have a limited amount of scholarship monies to allocate in order to encourage students to matriculate at their institutions. Using data on student profiles, such as location, gender, ethnicity, intended major, and ACT score, we estimate how scholarship monies will impact the likelihood a student matriculating at the University of Iowa. We construct an optimization model that incorporates the predictions of student response to different scholarship amounts to provide recommendations on the allocation of scholarship money that achieves the goals of a high-performing and diverse class. The outputs of this optimization model can then be used to envision likely class outcomes for different scholarship allocation strategies.

### 3 - Serif Bacevac

Major: Health & Human Physiology  
Mentor: Antentor Hinton (Internal Medicine)

#### *Mechanisms for Insulin-dependent Regulation of Skeletal Muscle Mitochondria by OPA-1*

Mitochondrial dynamics is a stable process in which mitochondria endure recurrent cycles of fusion and fission, leading to a multiplicity changes in the cell. We examined a mitochondrial fusion protein called Optic Atrophy-1 (OPA-1), which has been shown to decrease in skeletal muscle in type II diabetic mice—correlating with reduced mitochondrial content, oxidative capacity, and dynamics. We hypothesized that insulin stimulation would increase OPA-1 protein levels and mitochondrial respiration by increasing OPA-1 oligomerization and cristae remodeling in skeletal muscle. Through various tests, we found that two hours of insulin treatment can increase OPA-1 levels, promote mitochondrial fusion, increase cristae number along with cristae area and volume density, decrease the distance of ER-mitochondria contacts, improve mitochondrial respiration, and perhaps may even have an influence in OPA-1 oligomerization in skeletal muscle cells. However, depletion of OPA-1 and MFN-2 blocked the metabolic effects of insulin stimulation, reducing cristae number, area, and volume density. This loss of OPA-1 resulted in compensatory elevation of Mitochondrial Associated Membrane proteins (MAMs), increasing

the number of ER-mitochondria contacts, blocking OPA-1 oligomerization, and decreasing the ER-mitochondria contact distance. Conversely, removal of OPA-1 decreases mitochondrial respiration, dampening metabolic responses to insulin in skeletal muscles cells.

## **5 - Jennifer Banks**

Major: Anthropology

Mentor: Matthew Hill (Anthropology)

### *Dismal River Housing: a comparative study of Apache housing structures*

The Humphrey site (25HO21) is an ancestral Apache site located in the Dismal River of Western Nebraska that dates to AD 1500-1800. During the 2017 field a season, a group of University of Iowa undergraduate and graduate students partnered with the Nebraska State Historical Society to conduct archaeological excavations of three well-preserved, burned houses occupied by ancient Apache people. The data from this field season indicates that these three structure were destroyed by fire soon after people abandoned this settlement. The high degree of preservation allows for a detailed study of the architecture and construction techniques of these people. This poster will summarize our findings from the 2017 fieldwork and allow us to compare these new finds to data from previously excavated sites. Because the presence of Apache groups on the central Great Plains is part of a larger migration involving many different groups, we hope that the study of ancient household architecture can tell us something about past social landscapes.

## **7 - Rachel Bartlett**

Major: Psychology & Informatics

Mentor: Kyle Rector (Computer Science)

### *Exploring Aural and Haptic Feedback for Visually Impaired People on a Track: A Wizard of Oz Study*

## **9 - Marc Beer**

Major: Biology

Mentor: Andrew Forbes (Biology)

### *Characterizing the functional role of color differences among closely-related fly species*

Species in the genus *Strauzia*, a group of plant-feeding specialist insects, display a variety of body color differences, but there is currently no evolutionary explanation for these differences. Three closely related varieties of *Strauzia longipennis* emerge sequentially from May-July and interact with the same plant species. The varieties that emerge earliest display darker body

color relative to the variety that emerges latest. The thermal melanism hypothesis may explain the correspondence between darker color and earlier emergence in *S. longipennis*. Darker coloration confers an increased absorption of light, which results in an increased heating rate and/or net temperature change when exposed to light. An increased heating rate or greater net temperature change may provide darker individuals with an adaptive advantage in low-temperature environments. As preliminary data, we demonstrate that *S. intermedia* and *S. perfecta*, notable for their body color and emergence timing differences, also differ in net temperature change. However, *S. longipennis* varieties do not differ in activity level when exposed to light at low temperatures. Preliminary results identify a relationship between emergence time, net temperature increase, and body color. Further research will evaluate the impact of body color differences and explore the roles of other morphological differences among *Strauzia* species.

## **11 - Mark Biangmano**

Major: Psychology

Mentor: Paul Windschitl (Psychological & Brain Sciences)

### *Do Wishes Influence Expectations? Depends How You Ask*

If you were asked how likely it is that your baseball team is to win the big game, would your answer be influenced by the fact that it is your team and/or that you want your team to win? Some people might think that even when they have "skin in the game" they can be objective when making a judgment. However, some research suggests that when people are asked about the outcome of an event in which they have a rooting interest, their expectations are impacted by the hope that their team wins. This is called the desirability bias or wishful-thinking effect. Most research showing a desirability bias has asked participants for an either/or prediction about the outcome. Few studies have looked at how different types of predictions influence the effect. In this study, participants read a hypothetical scenario about a competition in which they had a preferred outcome, and they provided one of three types of predictions: which competitor will win, which is more likely to win, or how likely one or another is to win. A desirability bias was observed, but its size was significantly influenced by the type of prediction being made. This has implications for both scientific research and everyday decision-making.

## **13 - Aaron Buelow**

Major: Biomedical Engineering

Mentor: Richard Shields (Physical Therapy and Rehabilitation)

### *Electrical Stimulation to the legs improves general health markers in people with and without Spinal Cord Injury*

People with spinal cord injuries have a greater chance of developing Type II Diabetes and Heart Disease. This increased risk is due mostly because ingested carbohydrates are primarily used through insulin dependent mechanisms with eventual loss of sensitivity. Non-injured individual who can move normally can use other pathways to move carbohydrates into muscle. We believe that activating the legs of people with spinal cord injury using electric stimulation may reduce the amount of glucose in their blood and the amount of insulin needed to pump it out. This may be affected by the fact that after a spinal cord injury the muscles change some of their properties that don't allow for as much glucose uptake. We also investigated other health markers that are changed in individuals with Type II Diabetes and Heart Disease.

### **15 - William Bui Tran**

Major: Biomedical Engineering

Mentors: Renata Pereira (Internal Medicine); E. Dale Abel (Internal Medicine)

#### *Fat-Derived FGF21 is Dispensable for the Resistance to Diet-Induced Obesity Observed in Mice Lacking OPA1 in Adipose Tissue*

Optic Atrophy 1 (OPA1) is a mitochondrial protein, which regulates mitochondrial dynamics, cristae structure, and respiratory capacity. In order to examine the role of OPA1 in adipose tissue, OPA1-floxed mice were crossed with Cre-recombinase mice in the presence of adiponectin promoter (OPA1 Ad-KO). The study shows that OPA1 deletion resulted in loss of fat mass when mice are fed normal chow and completely prevented diet-induced obesity (DIO). These changes are associated alongside with increased levels of FGF21, which is an anti-obesity hormone. In order to test whether FGF21 is required for the resistance to DIO observed in OPA1 Ad-KO mice, we generated mice lacking both OPA1 and FGF21 in adipose tissue (DKO). After 4 weeks of high-fat feeding, body weight and total fat mass were significantly reduced in DKO mice compared to wild type (WT) mice. Through NMR, there were no significant differences in body composition between 8-week old WT and DKO mice. However, upon euthanasia, gonadal and inguinal fat pads were reduced while brown adipose tissue was enlarged in DKO mice, as previously observed in OPA1 Ad-KO mice. In conclusion, these data indicate that FGF21 does not intervene the resistance to DIO reported in mice lacking of OPA1.

### **17 - Joseph Burba**

Major: Biochemistry

Mentor: Madeline Shea (Biochemistry)

#### *Mutations of the Calmodulin Protein and How They Affect Binding to Target Proteins*

Calmodulin (CaM) is a small, calcium-dependent protein found in all animals. It is very important for many bodily functions, such as nerve signaling, muscle contractions, and brain functioning. These processes are facilitated by one of CaM's target proteins, voltage-gated sodium channels (NaV). The NaV are a family of large trans-membrane proteins found primarily in nerve and muscle cells. CaM binds to a long, tail-like region at the end of the NaV in order to regulate its function. We expect that newly discovered mutations of CaM will affect its ability to bind to the NaV, and I will determine this by monitoring the fluorescence of CaM and the NaV upon the addition of calcium.

## **19 - Eleanor Burke**

Major: Psychology

Mentor: Gary Gaeth (Marketing); Irwin Levin (Psychology)

### *Errors in Estimation - Causes and Consequences*

It has been shown before that if people are asked to estimate an unknown amount of something, they will tend to over-estimate small amounts and under-estimate large amounts. In this experiment, grids of white and black dots were presented to participants alongside a description of a scenario involving chance, to see if the color of dots would affect how much they guessed. Additionally, we measured to see if their reaction to the scenario was affected by how much they over- or under-estimated. Results showed strong over- and under-estimation, but less effect of the color of dots. Future research will clarify what effect estimation has on the reaction.

## **21 - Akanksha Chilukuri**

Major: Neuroscience

Mentor: Hanna Stevens (Psychiatry)

### *Effects of Preeclampsia on Cortical Growth and Cortical-Dependent Behavior Using a Vasopressin Mouse Model*

Preeclampsia is a gestational disorder characterized by hypertension, proteinuria, and pregnancy complications, as well as an increased risk for neurodevelopmental disorders in children of preeclamptic mothers. For a better understanding of how it affects both offspring brain morphology and behavior, we model preeclampsia in mice, where we insert a subcutaneous pump into female mice that continuously releases vasopressin (AVP), a hormone elevated in human preeclampsia and is sufficient to cause preeclampsia, throughout gestation. Behavioral testing of the AVP offspring has found that adult females exhibit learning and memory deficits, while males display anxiety-like behavior and hypersociability. Brain morphology alterations include a decreased cortical volume in AVP mice at E18, P0, and P7 but not in adults. Microglia, which have been shown to regulate cell proliferation in the developing brain, were found to be increased at E18 and



P0 and may be an explanation for the alterations in brain morphology of AVP mice.

### **23 - Ross Clowser**

Majors: Music (Jazz Studies), International Relations

Mentor: Trevor Harvey (Music)

#### *Society for Ethnomusicology Podcast*

This podcast explores the cultural and societal relevance of musical practices in a global world. By interviewing ethnomusicology scholars, using musical excerpts, and narration, we use our 20-45 minute episodes to explain and share ethnomusicological research with academics and the general public alike. The episodes we have produced thus far study social and musical issues from around the globe in a wide variety of social settings. Using this media platform, we seek to analyze the impact of music and musical traditions on issues of racism, sexism, gender, economic influences, government policies, copyright laws, and many others, providing valuable insight not only to music and musical practices, but also the societies that create them.

### **25 - Liam Crawford**

Majors: Computer Science, Philosophy

Mentor: Juan Pablo Hourcade (Computer Science)

#### *StoryCarnival: Developing Design Principles for Early Childhood Learning Environments*

Interactive touchscreen devices - such as smartphones and tablets - have become increasingly present in the lives of young children. These new technologies are well within the range of their motor capabilities, and thus allow these children to use interactive computing devices in a practical manner. Despite the wide range of commercial apps targeted towards children of this age, little research has been conducted as to how to design these technologies with healthy childhood development in mind. In light of this, we have proposed an approach focusing on what we call the 3Cs: Creating, Connecting, and Communicating. StoryCarnival, the set of applications we have developed based on this strategy, is aimed at supporting make-believe play which connects preschool age children with their social and physical environment while emphasizing communication. Our preliminary findings from interactive "play sessions" have not only guided the design of StoryCarnival, but may hold the key to creating actionable design requirements for designing technology for children in general. The poster will explore our choice of design and research activities, our preliminary findings, and the future of our project.

## **27 - Christine Czarnecki**

Major: Chemical & Biochemical Engineering

Mentor: Jennifer Fiegel (Chemical & Biochemical Engineering)

*Formulation and analysis of dry powder antibacterial aerosols for the purpose of treating pulmonary bacterial infections*

Bacterial infections of the lungs are often difficult to eradicate due to the presence of bacterial biofilms which severely reduce the effectiveness of traditionally administered antibiotics. Our lab is working on developing combination therapies which increase the susceptibility of the biofilm bacteria to antibiotics. The objective of this study is to develop a dry powder aerosol containing an antibiotic and nutrient dispersion compound that has high yield, good aerodynamic properties, and high drug loading. The powders in this study were generated using a spray drier and analyzed using high-powered liquid chromatography (HPLC) and impaction.

## **29 - Sarah DeLong-Duhon**

Major: Environmental Science

Mentor: Andrew Forbes (Biology)

*Determining relatedness of three locally found varieties of "False Turkey Tail" mushroom*

One of the most abundant and easy to find mushrooms in Iowa's forests, the wood decaying fungi genus *Stereum* - often referred to as "False Turkey Tail" - can be found in at least three variations: *Stereum ostrea*, *Stereum hirsutum*, and *Stereum complicatum*. However, specimens of these fungi often display intermediate forms that make it hard to identify it as one species or the other. Due to these morphological inconsistencies, it has been suggested that some *Stereum* species exist as part of a species complex and are able to hybridize with each other. To test this hypothesis, we have collected many *Stereum* specimens of each variety from state and county parks in Linn and Johnson county, and will be using DNA analysis to assign each specimen a place in a phylogenetic tree. We anticipate that this resulting tree will allow us to clarify the species status of these three *Stereum* varieties, as well as the relationship between morphology and "species".

## **31 - Monica Derby**

Major: Nursing

Mentor: Stephanie Gilbertson-White (Nursing)

*Personalizing symptom management strategies to meet the needs of rural residents with advanced cancer*

Purpose and Background/Significance: Patients undergoing treatment for

advanced cancer often experience symptoms in clusters. Oncology Associated Symptoms and Individualized Strategies (OASIS) is a web-application developed for patients with advanced cancer to help them develop self-management skills and focus on symptoms most important to them.

Methods: Data from users enrolled in the OASIS study will be analyzed. Metadata from the daily tracker on OASIS web-application will be extracted for analysis. Analysis of the symptoms and strategies that patients select will be conducted. In addition, descriptive qualitative analysis of patients' journal entries will be conducted.

Results: N=5 adults (40% male, mean age = 63 years, range 56-70 years) with advanced cancer participated. Cancer types included breast (2), rectal (1), kidney (1), chronic lymphocytic leukemia (1). Themes identified include: patient identification of effective self-management strategies, ability to easily implement strategies into their daily routine increases use, and fatigue hinders use.

Conclusions: The results of this research have the potential to improve care of patients with advanced cancer in terms of making the symptom management education more tailored to their individual experience.

### **33 - Joshua Dunigan**

Majors: Genetics & Biotechnology

Mentor: Madeline Shea (Biochemistry)

#### *Calcium-Triggered Activation of Calcineurin: Release of the Auto-Inhibitory Domain is Regulated by Calmodulin*

In humans, embryonic heart development, immune rejection of organ transplants and maintenance of neuronal plasticity all depend critically on calcium-activated calcineurin (CaN). CaN is a heterodimeric serine/threonine protein phosphatase consisting of an auto-inhibited large catalytic subunit (CaNA) and a small regulatory subunit (CaNB) that binds calcium. Two isoforms of CaNA ( $\alpha$ ,  $\beta$ ) are abundant in the brain and heart, and tightly bind calcium-saturated calmodulin (CaM); this lets them achieve full enzymatic activity. CaM is similar to the intrinsic CaN subunit CaNB; both have two homologous 4-helix bundle domains that adopt an "open" tertiary conformation after binding calcium ions cooperatively at paired EF-hand binding sites.

We hypothesize that  $\text{Ca}^{2+}$ -dependent regulation of CaN activity is linked to a 3-step mechanism mediated by calcium binding to sites of CaNB, followed by association of calcium-saturated C-domain of CaM (CaMC) with CaNA and then binding of calcium to the N-domain of CaM (CaMN) that triggers it to relieve auto-inhibition. This study focuses on determining how CaMC and CaMN interact to regulate CaN activity. We are probing this with site-specific mutations in the calcium-binding sites of each domain of CaNB and CaM as well as testing physiologically identified mutations of CaM known to interfere with heart function or locomotion.

### **35 - Lauren Dunlay**

Major: Psychology

Mentors: Ryan LaLumiere (Psychological & Brain Sciences); Victoria Muller Ewald (Psychological and Brain Sciences)

*What do infralimbic cortical neurons code during the extinction of cocaine seeking behaviors?*

Scientists can study how cocaine-taking affects the brain using a rat model of cocaine-seeking, where animals are placed in an operant chamber and learn to press a lever for the drug. In this study, we investigated the activity of neurons in a brain region called infralimbic cortex, when animals seek or abstain from cocaine. This study presents information looking at what neurons in this brain region are doing when animals self-administer cocaine, receive no cocaine for a period undergoing withdrawal (extinction), and then are given cocaine again. This research has confirmed the responsiveness of neurons in this brain region to lever pressing for cocaine, but it also shows the responsiveness of neurons to signals that cocaine is available. Specifically, neurons respond to environmental cues, such as the extension of a lever or lights. We also report the existence of pre-motor neurons, which predict the rat's cocaine-seeking response. This data shows how the infralimbic cortex can have such pervasive control over cocaine-seeking behavior. These data also give us a better understanding of what neuronal changes happen when an individual is addicted to cocaine and can be harnessed to better inform human therapies for drug abuse in the future.

### **37 - Ryder Fink**

Major: Human Physiology

Mentor: Toshihiro Kitamoto (Anesthesia)

*Genetic Modifiers of a Drosophila model of sodium channelopathies*

Epilepsy is a very common and debilitating neurological disease. One third of epilepsy patients don't respond to available treatments, which indicates a need for developing a deeper understanding of the nature of the disease. Many epilepsy cases also have no identifiable cause, but are likely due to mutations in genes important for the brain's electrical activity. Our lab uses a fruit fly model of genetic epilepsy to investigate how other genes within our DNA can interplay with epilepsy-causing mutations to ameliorate or worsen their seizures, which gives insight to our understanding of the basic molecular underpinnings of human epilepsy. We used an unbiased forward genetic screening technique to find regions of the *Drosophila* genome that functionally interact with an epilepsy-causing mutation within the fly's voltage-gated sodium channel gene. Voltage-gated sodium channels mediate the electrical activity in our brain and mutations in these genes can cause epilepsy. In our approach, we remove 50% of a candidate region's DNA and screen for interacting genes within the region that suppress epilepsy in our fly

model. We have identified multiple candidate regions using our screening approach, and we expect that it will deepen our understanding of epilepsy mechanisms and facilitate development of novel therapies.

### **39 - Kathryn Gabel**

Major: Speech & Hearing Science

Mentor: Elizabeth Walker (Communication Sciences & Disorders)

#### *Storytelling Skills in Children who are Hard of Hearing*

The ability to effectively tell a story is a central component of language and plays an important role in children's academic success. For children with hearing loss (CHL), the language they hear is often of lower quality than children with normal hearing (CNH), putting their language development at risk. Previous research suggests that CHL lag behind CNH in narrative skills, however few studies focus specifically on children with mild-to-severe hearing loss (children who are hard of hearing; CHH). The current study examined multiple aspects of narrative skills and related components in second grade CHH compared to same-age CNH. Our research aims addressed the following questions: 1) Are second grade CHH delayed in their narrative skills compared to CNH?, 2) Does amount of hearing loss have an impact on narrative production skills?, 3) Do CHH struggle in areas of working memory, vocabulary, or grammar compared to CNH? How do these factors impact narrative skills in CHH?, 4) Do CHH perform worse on grammatical measures in their narratives when compared to CNH or between HH groups?

### **41 - Manisha Gore**

Majors: Speech and Hearing Science

Mentor: Eileen Finnegan (Communication Sciences & Disorders)

#### *The effects of vocal exercises on vocal folds*

Teachers, singers, preachers and other persons who use their voice excessively for their occupation are at risk for voice problems. In many cases, when the voice disorder is due to voice use habits, a speech-language pathologist can provide voice therapy to help remediate the problems. Speech-language pathologists use many different approaches to help the client. In this study we examine the effectiveness of one set of vocal exercises. Subjects in the study were asked to perform exercises such as lip trills and saying a vowel through a straw while we looked at their throat and vocal folds with an endoscopy that was placed through the nose. The endoscopic exam was videorecorded and measures made to see the changes subjects made during these exercises.

### **43 - Christina Grimes**

Major: Psychology

Mentors: Victoria Muller Ewald (Psychological & Brain Sciences); Ryan LaLumiere (Psychological & Brain Sciences)

## *Characterization of infralimbic cortical activity in rats while seeking or abstaining from cocaine*

The infralimbic cortex in a rodent is necessary to inhibit cocaine-seeking behavior. Rats learned to self-administer cocaine by pressing an active lever which resulted in an infusion of cocaine. During cocaine self-administration, the infralimbic cortex is important for promoting cocaine-seeking behavior. During a period of extinction, when nothing happens following a lever press, the rats learn to withhold cocaine-seeking behavior and this brain region decreases cocaine seeking. We know the infralimbic cortex is important to control cocaine-seeking behavior, but literature fails to explain how neural activity in this region changes as the rat learns to inhibit their cocaine-seeking behavior. In order to examine single cells activity in the region when rats undergo cocaine self-administration, extinction, reinstatement, our lab uses the technique known as electrophysiology, which studies the production of electrical activity. The data revealed there were not significant changes in the percentage of neurons that fire due to behavioral events during the extinction training. Instead, during the extinction training where the rats learn to withhold their lever pressing behavior there was an increase in neuronal bursting and baseline firing rates. Our data helps us better understand the changes that occur in the brain after chronic cocaine use.

### **45 - Emily Hanson**

Major: Communication Sciences & Disorders

Mentors: Inyong Choi (Communication Sciences & Disorders); Shawn Goodman (Communication Sciences & Disorders)

## *Quantifying and Identifying Hidden Hearing Loss*

Speech is the primary mode of human communication. If a listener is not able to understand the speaker in conversations, this poor speech perception can negatively affect a person's lifestyle. Even though a basic hearing test may suggest that an individual's hearing is normal, they may still have trouble understanding speech in background noise. Recently, this problem has been referred to as "hidden hearing loss" (HHL). For individuals with HHL, speech perception may be affected in even moderate levels of noise, such as noise in restaurants. However, there is no currently agreed on standard method to diagnose or quantify HHL. Therefore, the aim of this study is to first find a way in order to quantify HHL. By doing so, we can also identify the underlying physiology of HHL and counsel individuals with this type of hearing loss. Finally, if there is a direct way to quantify HHL, we can see if does in fact directly affect speech perception.

### **47 - Carolyn Hoemann**

Major: Ethics & Public Policy

## *Young Cambodian People's Experiences With Healthcare*

This research explores the experiences that young, urban Cambodian people have with accessing general and reproductive healthcare. Fourteen interviews were conducted with young Cambodians who live in urban areas. The research focused on primary care and reproductive healthcare. The interviews included topics like the differences between publicly-funded and privately-owned healthcare services, corruption in the healthcare system, and public opinion of the healthcare system. Participants commonly said that they trusted private clinics over public hospitals because they felt the public hospitals were more corrupt. Additionally, many participants reported gender and class-based discrimination in both public and private clinics. People were less likely to trust medical institutions if their peers had negative healthcare experiences. This research was funded and supervised by the Center for Khmer Studies in Siem Reap, Cambodia.

#### **49 - Jessica Janota**

Major: Speech & Hearing Science

Mentor: Alison Lemke (Communication Sciences & Disorders)

#### *Aphasia Reading Club Outcomes: Acquisition and Use of Reading Strategies*

Aphasia is the result of brain damage that causes difficulty in the comprehension and/or expression of language. As a result, individuals with aphasia find it challenging to understand, speak, read, and write language. The Aphasia Reading Club (ARC) is an opportunity offered by the Wendell Johnson Speech and Hearing Clinic for people with aphasia to develop their reading skills within a group setting. Group therapy has shown to be beneficial because individuals in group therapy typically feel more confident, supported, talkative, motivated, and socially accepted. Research indicates that the use of reading strategies improves reading comprehension for individuals with aphasia. Examples of reading strategies are previewing the text, underlining, adjusting reading speed, and summarizing. In ARC, clinicians provide instruction and a variety of reading supports that work to develop individual reading comprehension. For this study, an analysis to determine individuals' acquisition and use of reading strategies over one year of ARC participation was conducted. By obtaining this information, the effectiveness of ARC and the most beneficial activities were highlighted, which can help develop other aphasia reading groups as well.

#### **51 - Tiara Kane**

Major: English

Mentor: Takis Poulakos (Rhetoric)

#### *Social Justice in Dickens' A Tale of Two Cities and today*

Charles Dickens' novel *A Tale of Two Cities* was written during a time when the strict, Procrustean-like laws of England and France favored the upper class. By incorporating the plight of the lower class and poverty stricken people in this novel, Dickens establishes a sharp tension between law and social justice—what the letter of law dictates and what real justice requires. In this project, I focus on this tension in order to articulate the disjuncture between law and social justice. Not only do I explore Dickens' rhetorical notion of social justice in *A Tale of Two Cities* and his decision to publish this type of a novel in the 19th century, but I also examine the relevance of Dickens' perceptions of social justice in American society today.

### **53 - Alethea Kapolas**

Major: Environmental Science

Mentors: Emily Finzel (Earth & Environmental Sciences); Justin Rosenblume (Earth and Environmental Sciences)

#### *Sandstone:shale ratio maps of the Pennsylvanian lower Cherokee Group in southern Iowa*

This research aims to better understand how a ~300 million year old continental-scale river system delivered sediment from the Appalachians to the midcontinent. Our goal is to map this ancient river system using subsurface rock cores from across southern Iowa. The sedimentary layers have been subdivided into three distinct units called formations. Using handwritten logs that describe the core and core images, the percentages of sandstone and mudstone, as well as the thicknesses of each formation, that occur in each of 84 wells were recorded and mapped. Results from this study consist of maps that display rock type percentages as pie charts, scaled by the thicknesses, at each core location. Sandstone deposits are interpreted as ancient river channels, whereas mudstone deposits represent ancient floodplains. Based on these maps and the presence or absence of glacial deposits, we are able to estimate relative amounts of fluvial channel incision, times of non-deposition, and periods of recent glacial erosion. This research project is important because these maps will be used to guide additional studies by providing constraints on the locations and movement of the ancient stream channels through time.

### **55 - Madison Kasperek**

Major: Physiology

Mentor: Teresa Marshall (Preventative & Community Dentistry)

#### *Acceptability of Measures assessing Environmental Confounders of Dietary Habits*

Background: Despite available healthy dietary information, society does not



practice healthy dietary behaviors; approximately 39% of adults and 18% of children were classified as obese in 2015-16. Numerous environmental and individual barriers impact dietary habits.

Objectives: 1) Develop a model identifying environmental confounders of dietary habits. 2) Identify validated tools assessing environmental confounders for determination of their acceptability, 3) Create a survey to identify how environmental factors influence dietary knowledge.

Results: A model was designed to identify factors, including their interrelationships, which influence food and beverage intakes. We then explored social media's role in dietary behaviors. Social media platforms contain a wide spectrum of both concrete and abstract food and nutrient-related information. However, these sites are not 'peer-reviewed', and the accuracy of such information is unknown. A descriptive survey designed to identify social media use and related behaviors surrounding diet and nutrition information was developed, and is currently being piloted.

Conclusion: Social media is highly persuasive and used by the majority of individuals. Information obtained from social media may positively or negatively influence dietary choices with potential health consequences. The survey will be used to identify health care students' social media use to inform their dietary knowledge and behaviors.

## **57 - Morgan Kemerling**

Major: Human Physiology

Mentor: Kathleen Markan (Pharmacology)

### *Investigating the Effects of Exercise on Adipose Tissue Metabolism*

Two types of adipose tissue exist: white adipose tissue and brown adipose tissue. Brown adipose tissue dissipates energy in the form of heat, whereas white adipose tissue primarily stores energy. White adipose tissue can become more like brown adipose tissue and dissipate energy as heat in a process called beiging. Beiging occurs with the activation of a protein called UCP1, or uncoupling protein 1. It is known that exercise promotes activity of UCP1, or beiging of white adipose tissue, in rodents. This protein activity ultimately results in an increased uptake of glucose and lipids by the body, enhanced oxygen consumption, and the dissipation of energy as heat. The central question within the field remains: why would exercise activate a mechanism that results in the wasting of energy? Our studies investigate the potential mechanisms involved in the activation of UCP1 in order to understand the effects of exercise on energy cycling. These studies will provide us with new insight regarding the relationship between exercise and the induction of UCP1.

## **59 - Eric Knapp**

Major: Chemical Engineering

Mentor: Julie Jessop (Chemical & Biochemical Engineering)

## *Optimizing Transferrable Shadow Cure*

The materials known as plastic are made of synthetic polymers. Polymers are very long molecules composed of many small molecules (called monomers) linked together by chemical bonds. The reactions that bond the monomers together are called polymerization reactions. In photopolymerization, light is used to initiate the polymerization reactions. Because light cannot penetrate deeply into monomer solutions, photopolymerization is generally limited to forming thin films and coatings. In cationic photopolymerization, the active centers that react are long lived, and are therefore able to migrate into regions of monomer not exposed to light and initiate polymerization. This property of cationic photopolymerization is known as shadow cure. This research is examining a new technique that utilizes shadow cure to create thick photopolymers.

### **61 - Virginia Lamas Meza**

Major: Environmental Chemistry

Mentor: Hans-Joachim Lehmler (Occupational and Environmental Health)

*Analysis of Extractable Lipids and PCB 136 (2,2',3,3',6,6'-hexachlorobiphenyl) in Transgenic Mice Tissues*

### **63 - Josh Larson**

Majors: Electrical Engineering, Physics

Mentor: David M. Miles (Physics & Astronomy)

*CaNoRock - The Canada-Norway Student Sounding Rocket Field School*

### **65 - Rikki Laser**

Major: Neuroscience

Mentors: Mark Blumberg (Psychological & Brain Sciences); Cassandra Coleman (Psychological & Brain Sciences)

*Deficits in REM sleep twitching indicate developmental delay in a mouse model of autism*

Autism is a neurodevelopmental disorder that affects approximately 1% of the population. Although autism usually expresses itself in children as impaired social behavior, movement irregularities are also common and may be better indicators for the early diagnosis of this disorder. Here, we studied differences in twitching - the jerky movements that occur exclusively during REM sleep and are particularly abundant in early infancy. Using high-speed videography and motion tracking, we found reduced twitching in mice from a strain designed to model autism. Our findings suggest that twitching can be used to assess risk for autism sooner than other currently available assessment approaches.

## **67 - Yahang Li**

Major: Biomedical Engineering

Mentors: E. Dale Abel (Internal Medicine); Antentor Hinton (Internal Medicine)

### *DRP-1 and Mitochondria-associated endoplasmic reticulum membranes are important for inducing fission during exercise*

Mitochondrial dynamics is a well-maintained process by which mitochondria endure recurrent cycles of fusion and fission, which lead to a diversity of metabolite and protein changes in the cell. Here, we examined Dynamin-related protein 1 (Drp-1), a cytosolic GTPase protein that plays a central role in mitochondrial fission during exercise with the help of mitochondria-associated endoplasmic reticulum membranes (MAMs). We hypothesized that MAMs can induce fission in the absence of DRP-1 in skeletal muscle after exercise. We used an editing technology called CRISPR, to remove DRP-1 from skeletal muscle DNA and implemented an in vitro electrical paradigm to induce exercise. Through various test, we found that the electrical stimulation decreases free glucose and increases in lactate in skeletal muscle cells. Moreover, we also found that when removing DRP-1 from skeletal muscle cells, the level of ER-stress markers and FGF-21 were augmented before electrical stimulation. Together, these results suggest that DRP-1 can be knocked down using the editing tool, CRISPR and that our in vitro exercise paradigm mimics exercise.

## **69 - Kaylee Lindburg**

Major: Economics

Mentor: John Solow (Economics)

### *Economic Effects of Johnson County Minimum Wage Increase on Local Business Activity*

This paper examines the effects of Johnson County, Iowa's minimum wage increase on local retail business activity. Using quarterly retail sales tax data, I examine the impact of the minimum wage increase on both the number of establishments and the volume of taxable sales in the eating and drinking sector, which is heavily dependent on minimum wage workers. In the first model, I compare all sectors in Johnson County to all sectors in three other Iowa counties (Linn, Black Hawk, and Story) that have similar economies and did not raise their minimum wage in the treatment period. In the second model, I compare eating and drinking establishments in Johnson County, which are heavily reliant on low wage workers, to the same sector in Linn, Black Hawk, and Story. In the third model, I compare Johnson County eating and drinking establishments to establishments in twelve other retail sectors in Johnson County that are less reliant on minimum wage workers. I find no evidence of a negative impact on either the number of eating and drinking establishments or on sales per establishment during the period of the increased minimum wage in Johnson County.

## **71 - Michael Lord**

Major: Human Physiology

Mentor: Rhonda Souvenir (Internal Medicine)

### *The Role of Uncoupling Protein 2 (UCP2) in Platelet Mitochondrial Function*

A large problem associated with cardiovascular disease is excess clotting. Platelets, the part of the blood responsible for clotting, are often too active in people with cardiovascular disease. Previous data showed an increase in uncoupling protein 2 (UCP2) is positively associated with cardiovascular disease risk. UCP2 is located on the inner mitochondrial membrane. Mitochondria makes ATP by utilizing a difference in hydrogen concentrations across its membrane. UCP2 allows hydrogen atoms to pass through the membrane without making ATP. Therefore, we sought to determine whether the increased levels of UCP2 were beneficial or detrimental. We did this by generating platelet specific UCP2 knockout mice. We analyzed protein levels to reveal lowered levels of UCP2 while also analyzing mitochondrial function. We found that there were decreased complex structures as well as decreased expression of mitochondrial complexes. Surprisingly, after analyzing mitochondrial function, we found that there is an increased ATP linked mitochondrial respiration in UCP- deficient platelets. Understanding the effects of UCP2 deletion on mitochondrial function has the potential to be a critical stepping stone in determining underlying mechanisms by which UCP-2 alters clotting.

## **73 - Lucas Maakestad**

Majors: Biochemistry, Chemistry

Mentor: Todd Washington (Biochemistry)

### *The Effects of Protein Architectures on Polymerase Selection During Translesion Synthesis*

DNA damage occurs from many sources. When DNA is being replicated, the replication machinery stops at the damage site, which can lead to cell death. DNA damage bypass is one way cells try and solve this problem. Translesion synthesis (TLS), a subcategory of DNA damage bypass, is performed by a group of proteins involving PCNA (the protein encircling the DNA in replication and repair), as well as Rev1 and Pol (the polymerases that attempt to fix the damage by adding pieces of good DNA). These proteins bind each other to form two different arrangements: the Rev1 bridge and the PCNA tool belt. We are interested in understanding how the appropriate polymerase is chosen for a given type of DNA damage. Computer simulations have predicted how often each protein within each arrangement interacts with DNA. This led to the hypothesis that the PCNA tool belt arrangement equally selects Rev1 and Pol, whereas the Rev1 bridge prefers Rev1 interaction with DNA. Förster resonance energy transfer will allow us to determine how often

each polymerase is chosen to interact with DNA. We will use modified forms of PCNA to force the proteins into the arrangements we want to study.

## **75 - Russell Martin**

Major: Biomedical Engineering

Mentors: Robert Cornell (Anatomy & Cell Biology); Alexander Bassuk (Pediatrics)

### *Using zebrafish to test potential drugs for their efficacy against epileptic seizures*

Epilepsy is a disorder whose primary symptom occurs when the brain sends erratic signals throughout the nervous system, which can cause convulsions. The severity of these convulsions can range from inconvenient to life-threatening and can have a variety of underlying causes, therefore there is strong motivation to seek novel anticonvulsant drugs. We are using data from an experiment that tested how well various drugs normalized abnormal seizure-associated gene expression levels in cells. New drug development is an expensive and time-consuming process, so a central goal in this work is to repurpose drugs that are already FDA-approved. We test these drugs on zebrafish given a proconvulsant to induce seizures, and then track their movement in a seizure assay. The purpose of this assay is to find a drug that will inhibit seizures caused by the proconvulsant. We are also working with CRISPR/Cas9 methods to create loss-of-function mutations in genes linked to human epilepsy, which will allow further testing of potential anticonvulsants. The overall goal of this work is to learn more about anticonvulsant drugs, and ultimately find some that may be used to treat epilepsy in the future.

## **77 - Hailey Moore**

Major: Physics & Astronomy

Mentor: Cornelia Lang (Physics & Astronomy)

### *Polarization in the Radio Arc in the Galactic Center*

In the center of our galaxy, there is a structure known as the Radio Arc. In this Arc, there are linear filaments that are emitting radiation. These filaments have been observed at varying frequencies by the Very Large Array radio telescope in New Mexico. This radiation is polarized along these filaments, and there are regions where the polarization is strongest. These regions are identified, and then later quantified. By comparing the values of the regions in polarization to the total intensity of all radiation in the filaments, we are able to determine what the fractional polarization of these regions are. Doing this will help us understand the structure and origin of the linear filaments, as well as help us to understand what may be causing areas of depolarization. We complete our work at two different frequency bands to help obtain a fuller picture of the structure as a whole.

## **79 - Sarah Nguyen**

Major: Psychology

Mentor: Cathleen Moore (Psychological & Brain Sciences)

### *Using the invisible to perceive the visible*

In order to represent and interact with our environment, the visual system has to organize what is seen into potential objects and their spatial relations. One aspect of perceptual organization is figure-ground segregation, the process of identifying which parts of a scene stand in front as figure and which lay behind as ground. There is a tendency for the visual system to assign convex shapes as figure and concave shapes as ground. Recently, this convexity bias was discovered to increase when the number of repeating figure-ground shapes increases. It has been hypothesized that this convexity context effect (CCE) is caused by observers mentally completing the concave shapes into a single background behind the convex figure shapes. If true, then the CCE should occur even when repeating figure ground patterns are disrupted by another surface that partially occludes them, but should not occur when the patterns are disrupted with a gap. The results of my project partially confirm these predictions in that partially occluded displays produced a similar sized CCE as unoccluded displays. However, discontinuous displays disrupted by a gap also produced a similar sized CCE. Follow-up experiments will address this failure of our control condition.

## **81 - Claire O'Connell**

Major: Biomedical Engineering

Mentor: Michael Schnieders (Biomedical Engineering)

### *Validating Rotamer Optimization Using Goldstein Elimination Criteria*

Proteins with an unknown structure can be comparatively modeled by basing the atomic coordinates for the unknown structure on the known atomic coordinates for a protein with a similar amino acid sequence. Although comparative modeling works reasonably well, comparative models can be optimized using a process called protein side-chain repacking. The protein side-chain repacking algorithm involves running energy calculations on each possible side chain conformation for each amino acid in a protein to find the side-chain position that has the most favorable, or lowest, energy conformation. Side-chain repacking is a combinatorial problem. Goldstein Elimination Criteria can be used to reduce this combinatorial problem to a much simpler problem by provably eliminating high-energy side-chain positions from the lowest energy conformation possible for the protein. To test the protein side-chain repacking algorithm in our Force Field X (FFX) software, we created intuitive tests. We systematically found the lowest energy side-chain position for all amino acids in a small protein and compared the results to those from the Goldstein Criteria calculated in FFX. The results from the FFX software matched the results from our tests, so we conclude that the

protein side-chain repacking algorithm was implemented correctly in the FFX software package.

### **83 - McKenna Pierson**

Major: Psychology

Mentor: Jatin Vaidya (Psychiatry)

#### *Adolescent Risk Taking and Sensitivity to Negative Outcomes*

Risk taking is an important construct to examine, especially when looking at it from a developmental perspective. Risk taking is multidimensional in that not only can risk behaviors be assessed, but so can responses to positive and negative feedback. Previous research suggests that risk taking during adolescence is a function of increased sensitivity to potential rewards. However, far less work has examined sensitivity to negative outcomes. The aim of our study was to investigate sensitivity to negative feedback with a widely used paradigm called the "Balloon Analogue Risk Task" in 133 adolescents and 72 young adults. The BART uses balloons to simulate real-world risk taking. Furthermore, we focused on how risk taking and sensitivity to negative feedback change throughout adolescence and young adulthood. Our findings indicate that young adults took significantly more risk than their younger counterparts. Additionally, young adults who scored higher on a personality measure of reward sensitivity were also more sensitive to negative feedback. These results indicate that young adulthood is a time when sensitivity to both positive and negative feedback is enhanced overall, as individuals are learning to better incorporate cues that result in the most advantageous outcomes.

### **85 - Morgan Rafferty**

Major: Mathematics

Mentor: Isabel Darcy (Mathematics)

#### *Artificial Intelligence for Financial Services*

Artificial intelligence for financial services using Topological Data Analysis is a vital tool in business. TDA is one of many systems developed by the software company Ayasdi which has allowed researchers to uncover information and discoveries on large data sets from disease research to information security to fraud detection and much more. Financial Crimes Intelligence is one of Ayasdi's three main areas of focus under financial services and has become increasingly important over the years with the growth of international fraud. One of the most challenging aspects of fraud detection is keeping pace with new, evolving techniques. The slow, monitoring process following the traditional detecting approach allows fraudsters to regularly change and improve their strategies. Fortunately Ayasdi's automated approach allows faster and more accurate results from high-dimensional data sets. Ayasdi's machine intelligence software quickly discovers critical outliers and subtle, new fraud patterns hidden within complex data. Identifying problem areas in

allows us to make fixes in existing models. The United States from detecting only a mere 30% of fraud to now 99% of fraud. While there has been much advancement, Ayasdi continually improves the software. Their Financial Service Solutions offer the important context required to address specific business challenges.

## **87 - Alex Rice**

Major: Economics

Mentor: Julia Garlick (Economics)

### *How Technology is Transforming the Retail Space*

We have all seen how technology has advanced throughout the last decade. This paper will look at how these advances in technology have caused major changes in our economy. As technology advances, many occupations have the potential to be replaced in the near future due to machine automation. In order to show the effect technology has on the economy I have chosen to select one industry in particular and examine data on various growth and employment factors. The industry I have selected to examine is the retail industry. I have found that many traditional retailers are seeing decreased growth, mostly due to online retailers such as Amazon. This paper will address potential options for addressing the issues associated with the affect technology has on the economy. One of the solutions being a basic income grant and another being retraining the current workforce.

## **89 - Amy Schembari**

Majors: Marketing, Entrepreneurial Management

Mentor: Amy Kristof-Brown (Management & Organizations)

### *The Effect of Career Preparation and Proactivity on an Undergraduate's Anticipations of Fitting with Their Future Work Environment*

This study was conducted to determine the relationship between anticipations of person-environment (P-E) fit and proactivity in undergraduate students about to enter the workforce for the first time. P-E occurs when an individual is well matched with the aspects of their work environment, and is correlated with work related successes (Kristof-Brown et al. 2005). The current study sought to find whether students who perceive themselves as being more proactive, and who partook in more career preparation activities during their undergraduate years, will report higher anticipations of fitting with their first full-time employment positions. Participants' self-reports of anticipated P-E fit and perceived proactivity were collected through an online survey. Those willing to complete the study were also asked to report the various career preparation activities they participated in during their years as undergraduates, including: internships, career fairs, and memberships in professional organizations. The results of this study are currently being analyzed.



## **91 - Cassandra Sheridan**

Major: Psychology

Mentors: Ed Wasserman (Psychological & Brain Sciences); Leyre Castro (Psychological and Brain Sciences)

### *The Role of Category Density in Pigeon's Tracking of Relevant Information*

Categorization is the process in which ideas and/or objects are recognized, differentiated, classified, and understood. Most theories of categorization hypothesize that attention, in both animals and humans, must be allocated to the relevant features of the objects to be categorized for learning to occur. Prior categorization studies have shown that pigeons reliably track features that are relevant to a category discrimination. In these prior studies, category exemplars contained two relevant and two irrelevant features. Therefore, category density (the relevant to irrelevant information ratio) was relatively high. In this study, category density was reduced so that, in Phase 1, each exemplar contained only one relevant and three irrelevant features. This reduction in density greatly increased the difficulty of the task; after 100 days of training overall accuracy and relevant tracking rose to relatively modest levels. In Phase 2, we changed the exemplars so that they contained only one relevant and one irrelevant feature. Now, accuracy and relevant feature tracking further improved. Furthermore, the improvement was sustained when the pigeons were returned to the same exemplars that were shown during Phase 1. These results show that category learning is easier when the proportion of relevant information is larger; moreover, once the relevant information is learned, the amount of relevant information can be reduced, and performance will not be impaired.

## **93 - Neevetha Sivagurunathan**

Majors: Psychology, Statistics

Mentor: Molly Nikolas (Psychological & Brain Sciences)

### *The Effects of ADHD and Depression on Sensitivity to Reward and Punishment*

Individuals vary in the degree to which their behavior changes in response to rewarding and punishing experiences. There is some indication that individuals with ADHD or depression experience differences in their sensitivity to reward and punishment. Our goal was to investigate whether adults with both ADHD and depression differed in reward/punishment sensitivity from adults with just one of these disorders. Study 1 explored preferences across diagnoses (ADHD only, depression only, ADHD and depression) on a delay discounting task, in which participants chose between small, immediate rewards and large, delayed rewards. In Study 2, we investigated links between ADHD/depression symptoms and measures of reward/punishment sensitivity. Study 1 found that

all three diagnostic groups more frequently preferred smaller, immediate rewards than individuals without an ADHD/depression diagnosis. However, performance among the diagnostic groups did not differ. In Study 2, we found that the presence of both ADHD and depression symptoms in males impacted behavioral changes to reward/punishment differently than the presence of just ADHD or depression symptoms. Our results suggested that ADHD and depression are both related to atypical levels of reward/punishment sensitivity and that these differences vary by sex. Underlying differences in reward/punishment sensitivity can help us understand emotional/behavioral deficits of ADHD/depression.

## **95 - Brittany Stephanie**

Major: Mathematics

Mentor: Isabel Darcy (Mathematics)

### *Car Insurance Factors*

The purpose of this research was to find patterns in car accident claim data to educate and better insure specific age groups and genders that are driving. I have found patterns in the data that lead me to a number of possible conclusions. First, the youngest age group (between 17-20), with little driving experience, had the most car accidents over any other age group. Next, the oldest age group (60+) had the second highest amount of crashes. Finally, male drivers were also more prone to car accidents than female drivers. As a result, I conclude that young, elderly, and male drivers are more likely to get into a car accident and therefore shall pay more for their car insurance.

## **97 - Sarah Stueve**

Major: Biology

Mentor: Rhonda Souvenir (Internal Medicine)

### *Uncoupling Protein (UCP)-2 and Platelet Function*

Increased platelet activity can result in the formation of blood clots, a common feature of cardiovascular disease. Uncoupling Protein (UCP)-2 is a protein located in mitochondria, the part of the cell responsible for energy production. Data from the Framingham Offspring Cohort revealed that people at risk of cardiovascular disease have more UCP-2 in their platelets than most people. It was not clear if the increase in UCP-2 is beneficial or harmful, so we wanted to investigate how UCP-2 works in platelets and see if it affects blood clotting. To do this, we created mice that did not produce UCP-2 in their platelets. We then checked the levels of UCP-2 protein to confirm this. Platelet activation studies revealed that male mice without UCP-2 in their platelets showed less activation than those with UCP-2. A tail bleeding study also revealed that they bleed for longer than those with UCP-2. A model of deep vein thrombosis was expected to show that male mice without UCP-2 were less likely to form blood clots than those with UCP-2, but the results were inconclusive due to a small number of mice being used. These data support the conclusion that reduction of UCP-2 levels in platelets

reduces platelet activation and blood clotting. This research could help us better understand clotting in those at risk for heart disease.

## **99 - Keely Sybesma**

Majors: Mathematics, Chemistry

Mentor: Elizabeth Stone (Chemistry)

### *Effects of Biomass Burning Emissions on Pregnancies in Temuco, Chile*

With the primary focus on fine atmospheric particulates, the study of biomass burning in Temuco, Chile promotes a connection between air quality and regional human health. In the surrounding region of Temuco, the quantification of particulate matter is of key importance to measure the impacts of biomass burning on women's pregnancies and birth outcomes. Wood burning is a large source of air particulates for the Temuco region, due to the wide abundance of lumber and traditional cooking and heating. To evaluate the air quality of Temuco, fine particulates were collected onto filters, which were used to calculate the mass of fine particles present. Further analysis of the filter extracts was used for the quantification of biomass burning tracers: levoglucosan and potassium. The amount of atmospheric particulates was determined to continuously exceed the World Health Organization (WHO) guidelines. The elevated levels of atmospheric particulates and biomass burning tracers, leads to the deterioration of Temuco's air quality. The findings of this study will assist in the furthering of the expected correlation between regional biomass burning and the health pregnancy of women outcomes in Temuco.

## **101 - Ravjot Viridi**

Major: Biomedical Sciences

Mentors: Joel Shilyansky (Surgery, Pediatrics); Chaobo Yin (Surgery)

### *Effect of therapy with AnV and CTLA 4 in a mouse model of breast cancer*

Breast cancer is the most common cancer diagnosed in women worldwide. Many breast tumors express phosphatidylserine (PS) on their cell surface. PS promotes tumor growth by inhibiting the immune response. The goal of the study was to test the effects of AnV (AnV) and an anti-CTLA 4 antibody on a 4T1 mammary tumor, a mouse model of breast cancer. AnV is a protein the binds to and blocks PS. It is expected to retard tumor growth. CTLA 4 is a cell surface receptor located on the immune system's T-cells. When a substrate is bound, it downregulates T-cell function. In theory, blocking CTLA 4 with an anti-CTLA 4 antibody could inhibit this downregulation, and therefore promote early proliferation of anti-tumor T-cells. Based off of previous studies, it was hypothesized that blocking CTLA 4 and introducing AnV would be most effective in retarding tumor growth. Mice were injected with 4T1 tumor cells, then treated with ad-AnV virus, and/or anti-CTLA 4 antibody. Tumor growth

was carefully monitored and measured. It was found that anti-CTLA 4 antibody slowed tumor growth considerably, indicating that the antibody is an effective mode of treatment for 4T1 tumors. Ad-AnV was not consistently effective in the 4T1 model as in previous studies. The lack of anti-tumor activity may be the result of timing of Ad-AnV administration, insufficient gene expression in mice, or low expression of PS by 4T1 tumor cells in vivo.

### **103 - Bowen Wang**

Major: Accounting

Mentors: Kevin Markle (Accounting); Jaron Wilde (Accounting)

#### *Effect of Country-by-Country Reporting on Multinational Enterprise Tax Avoidance Strategy*

In recent years, the Organization for Economic Co-Operation and Development (OECD) proposed the Base Erosion and Profit Shifting (BEPS) Action Plans. BEPS refers to tax planning strategies that take advantage of gaps and mismatches in tax rules to artificially shift profits to low or no-tax locations. Although some of the schemes used are illegal, most are not. This undermines the fairness and integrity of tax systems because MNEs can use BEPS to gain a competitive advantage over domestic companies. Among all Action Plans, the Action 13 Report introduced Country-by-Country Reporting. Set out as a highlight in the Action 13 Report, Country-by-Country Reporting (CbCR) is expected to offer a tax administration in undertaking high level risk assessment of transfer pricing and other BEPS related tax risks. This research evaluates the potential effect CbCR could have on MNEs' tax avoidance strategy, and concludes that CbCR alone could not disclose essential tax information. Therefore, CbCR would not be effective so far as expected.

### **105 - Nicole Wendel**

Major: Chemistry

Mentor: Lei Geng (Chemistry)

#### *Monitoring and Modeling Drug Dissolution Kinetics: New Experiment for Pharmaceutical Education*

The monitoring of drug dissolution is one of the central operations in research and development in pharmaceutical sciences, to guide the development of new drug release vehicles and to maintain the consistency in drug production. Although a substantial number of students in science and engineering go into careers in pharmaceutical sciences, a comprehensive teaching lab on drug dissolution does not exist. This work develops a new laboratory experiment for the training of life scientists towards a career in pharmaceuticals.

We created and tested a reliable cost-effective dissolution apparatus to efficiently monitor drug dissolution kinetics. Utilizing the apparatus, naproxen sodium tablets were dissolved, and the amount of drug dissolved over the

progression of time was detected with UV spectrophotometry. The kinetic data was modeled with nonlinear least squares method (NLLS) to determine the mechanism of drug dissolution. Many dissolution curves were collected through the use of this apparatus and compared in order to ascertain the consistency in the dissolution kinetics, a key measurement mandated by the FDA. The protocol has been tested in a Chemistry laboratory course (CHEM:2021) and proved to be a successful experiment for pharmaceutical education.

### **107 - Ziling Xia**

Major: Health & Human Physiology

Mentor: Gayle Walter (Health & Human Physiology)

#### *How to Improve the Health of International Students in American Colleges*

My research is looking for strategies to improve the health of international students who study in American colleges to include improving mental health services, recommending cultural competency education for staff and faculty, and creating an inclusive community for all students.

### **109 - Ziyang Yu**

Majors: Finance, Mathematics

Mentor: Shagun Pant (Finance)

#### *Will social media sentiments affect the stock returns?*

Once the automobile company announced about their new coming product, there will be many different comments posted on social media. However, the attitude of the same product may be altered around the product releasing day, especially for some high tech products like Plug-in Electric Vehicles (PEVs), since when they put the product into practice they may find more disadvantages. When Tesla announce their Model 3, their stock price increased a lot, whereas when the news of insufficient production capacity came out, the stock price drop even more than before. Thus, will these social media sentiments really bring a highly related connections to the stock price change? Based on analyze the news and changes of stock price of several products and the company performance, we may find the relationships inside.

### **111 - Cody Zak**

Majors: Psychology, Neurobiology

Mentors: Ryan LaLumiere (Psychological & Brain Sciences); Kelle Nett (Psychological and Brain Sciences)

#### *Role of the pathway from the infralimbic to nucleus accumbens core on drug seeking behavior in rats.*

While the infralimbic cortex (IL) and the nucleus accumbens core (NAc) both play a role in inhibition of drug seeking behaviors: not much is known about the role of the pathway from the IL to the NAc. In order to test the role of this pathway, after rats went through a self-administration phase of receiving cocaine (with light and tone cues), rats would go through an initial extinction phase where the previous cocaine rewarded task would no longer give them cocaine but would cause inactivation of the IL to NAc pathway through the use of optogenetics. After the extinction phases, rats then received cued (light and tone), cocaine-prime (cocaine infusion), or cued + cocaine prime (both) reinstatements to test drug seeking behavior. Preliminary data showed that inactivation of this pathway during an extinction phase did not cause an increase in drug seeking behavior during reinstatement. However, an observable effect may not be noticeable due to a lack of experimental groups which is currently being addressed. This preliminary data, if supported by current experimental groups, could suggest that while individually, the IL and NAc individually play a role in inhibition of drug seeking behavior but the pathway between them does not.

### **113 - Shao Yang Zhang**

Major: Biomedical Engineering

Mentor: Justin Grobe (Pharmacology)

#### *Angiotensin AT1A Receptors on AVP-expressing Neurons Contribute to Vasopressin Secretion*

Arginine vasopressin (AVP) is a hormone generated within specific nuclei of the brain, which is secreted in response to blood loss and cardiovascular hormones such as angiotensin. AVP acts at the kidney to cause water retention, and on blood vessels to cause constriction - ultimately to retain blood volume and maintain blood pressure during cardiovascular insults such as hemorrhage or dehydration. Inappropriate increases in secretion of AVP are implicated in various blood pressure and fluid balance disorders. Thus, our team is working to understand the neurocircuitry that mediates the control of AVP secretion. Here we have utilized cutting-edge microscopy, genetic, surgical, and cardiovascular phenotyping methods to clarify the sites of action and functions of major angiotensin receptors in the control of AVP secretion. Insights gained inform our understanding of the neurobiology of AVP, which ultimately informs the delivery of care for hypertension, diabetes, obesity, obstetric and trauma medicine.

### **115 - Shiwen Zhou**

Majors: Psychology, Communication Studies

Mentor: Grazyna Kochanska (Psychological & Brain Sciences)

#### *Parents' Mind-Mindedness in Infancy and Children's Theory of Mind at Preschool Age*

Parental mind-mindedness (MM) refers to the parent's ability and willingness to perceive their child as a psychological agent and an individual with his or her internal mental states, such as thoughts, emotions, motivations, and desires. A growing body of research on parent-child interactions in infancy has revealed a host of significant implications of individual differences in parental MM for children's future development, including positive associations with children's emerging Theory of Mind (ToM). The current study examined this association by coding parental MM in 102 community mothers and fathers from their spontaneous comments to their 7-month-old infants in a naturalistic setting and assessing children's ToM at 52 months, using false-belief tasks. Higher levels of both parents' mind-minded comments were associated with children's better ToM. Furthermore, there was an interaction between child gender and fathers' MM: fathers' mind-minded comments were predictive of ToM development in their sons but not in their daughters. The study opens paths for future research on the relation between parents' MM and children's development of ToM and it highlights possible gender effects in socialization of social cognition.

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## Second Hour Presenters

**5:30-6:30PM**

**(even numbers only—boards will be turned around)**

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### **2 - Kevin Blicharski; Alexander Powers**

Major: Computer Science and Engineering; Computer Science and Engineering  
Mentor: Hans Johnson (Electrical and Computer Engineering)

#### *Using Machine Learning to Create Training Datasets for Automatic Cerebellum Labelling*

Although the cerebellum is one of the oldest brain structures, it is also one of the most anatomically complex. It consists of branching, tree-like patterns that are difficult for normal machine learning methods to detect and label. One technique that may be particularly well-suited to this sort of problem is deep learning, a form of machine learning that relies on large amounts of data. However, creating a dataset large enough for this purpose manually is impossible due to the amount of time required for labeling. In order to resolve this dilemma, we used a small seed of manual labels to train traditional machine learning models. These models then produced probability label maps, which we extracted the most confident results from and added them into the dataset. Through this iterative process, we are able to begin creating a large enough dataset to start applying deep learning methods.

## **4 - Alexis Brannan**

Major: Human Physiology

Mentors: Leonard MacGillivray (Chemistry); Gonzalo Campillo (Chemistry)

### *A New Form of Supramolecular Catalysis in the Solid State Using Boronic Acids*

Enzymes are the fastest known catalyst designed by Nature. It is widely known that most enzymes use non-covalent or supramolecular interactions (e.g. hydrogen bonding, electrostatic, hydrophobic, van der Waals forces) in solution to facilitate chemical reactions, normally in aqueous phase. Inspired by this fact, we endeavored a methodology to achieve supramolecular catalysis in the solid state by using boronic acids as catalysts, a class of compounds known for its low-toxicity, ease of use, and broad commercial availability. We discovered that boronic acids catalyze the formation of cyclobutane-containing molecules from olefins (molecules containing a double bond) when the solids are co-ground and exposed to UV-light. Cyclobutane-containing molecules are commonly present in pharmaceuticals and in natural products but most conventional methods to produce them are challenging, time extensive and environmentally degrading. Our work revealed a way to construct cyclobutane products in a similar fashion as enzymatic reactions occurring in solutions; however, in our study, the complete catalytic process is carried out in the solid state without the use of solvents. This method providing a much more environmentally friendly alternative. We anticipate that catalysis in the solid state can be extended to the production of pharmaceuticals and chemicals at larger scale.

## **6 - Ashely Chong**

Major: International Studies

Mentor: Natasa Duricova (International Writing Program)

### *Exploring the Creative Process*

What is the relationship between a finished creative piece and the process and environment it was made in? This presentation explores the creative process through three different projects. First, I traced the creative process backwards from the finished piece to the environment which it was created for my research for the Origins podcast by the International Writing Program. Then I compared two creative processes when I helped organize an event between classical musicians and the IWP's Fall Residency writers. Finally, I initiated a creative process for my online anthology based on the term madang, meaning open space. Reflecting on my projects, I have realized that the creative process doesn't end with the finished piece; the finished piece feeds from how and where it was made and the origins of the finished piece live on in the piece. Because of the dependency between the two, it is important to understand all aspects of a finished piece. Additionally, the dependency means that there are



possibilities to create further projects when looking into the creative process of a finished piece.

## **8 - Greg Collins**

Major: Human Physiology

Mentors: E. Dale Abel (Internal Medicine); Helena Kenny (Internal Medicine)

### *OPA1 deletion results in ER stress, cardiac dysfunction and death*

Heart failure is a major health problem affecting 23 million people worldwide. Mitochondria are important subcellular organelles that when subjected to cellular stress can contribute to the progression of heart failure. Mitochondrial fusion occurs when two mitochondria combine and this is mediated by specific proteins; MFN1, MFN2 and OPA1. Mitochondrial fission occurs when a larger mitochondria divides. This process is mediated by DRP1. Imbalanced mitochondrial dynamics may lead to mitochondrial dysfunction, reduced cardiac function and death. This study will investigate if the knockout of OPA1 will compromise mitochondrial function leading to a reduced cardiac function and ultimately death. We will investigate if altered mitochondrial dynamics in the presence of OPA1 KO leads to ER stress. To reduce the burden of heart failure, it is imperative that we gain a better understanding of the underlying cellular and molecular mechanisms involved. Mitochondrial dynamics has emerged as an important mechanism to maintain cardiomyocyte integrity. This study will investigate the importance of balanced mitochondrial dynamics in maintaining cardiac function.

## **10 - Geoff Collins**

Major: Biochemistry

Mentor: Meng Wu (Pharmaceutical Sciences and Experimental Therapeutics)

### *The formation and tracking of 3D breast cancer cellular spheroids in a high throughput format*

In this research, we are developing a method of 3D cell spheroids to better reflect the breast cancer in human patients. This method includes the addition of basement membrane extract (BME) to form and increase the densities of the spheroids for one cell line named SK-BR-3. The timeline of SK-BR-3 spheroid formation is established and will be used to determine the rate of formation of MCTS's future research. The method can be used with automation for drug discovery for personal medicine and individual therapeutics.

## **12 - Cody Crawford**

Major: Biology

Mentor: Cindy Opitz (Pentacrest Museums)

## *Revitalization of the University of Iowa's Bird Egg Collection after 100 Years of Dormancy*

The University of Iowa Museum of Natural History's egg collection is made up of bird eggs from 6 continents. Most of these eggs were collected in the 1870s to 1910s, and haven't been used for research since they were received by the museum. Almost all have been separated from the information we once knew about them. Our current project is aimed at reuniting the eggs and the data cards. We scanned over 2,000 egg data cards, which were transcribed by volunteers, then we verified the volunteers' work. We are using the information on the cards, the writing on the eggs, and outside books and websites to reunite the eggs and their data. We are then adding this information to our database. We will take a picture of each egg, and make a map of all the locations the eggs were found using the GEOLocate website. We will then organize the entire collection, then upload the data to websites like VertNet which researchers use to gather data from museums around the world. Most of the work on this project is carried out by student volunteers and interns, who make this work possible.

### **14 - Mackenzie Cross**

Major: Anthropology

Mentor: James Enloe (Anthropology)

## *All Dogs Go to Woodpecker: Analyzing the Faunal Assemblage Produced by Woodland Hunters*

Excavated bones from Woodpecker Cave can tell a lot about how these past peoples lived. Through bone identification, one can discern which species were found at the site. From this identification, use of a quantitative measure called minimum number of individuals (MNI) provides a baseline for how many of individuals were at the site. Additionally, these bones were examined for cut marks or other forms of bone processing. Bone processing shows that inhabitants of Woodpecker Cave cut these individuals for food. Therefore, these marks provide invaluable information concerning these people's diets.

### **16 - Victoria Cunningham**

Major: Human Physiology

Mentor: Susan Lutgendorf (Psychological & Brain Sciences)

## *Familial Characteristics of Urinary Chronic Pelvic Pain Syndrome (UCPPS) in the MAPP Research Network Data*

Urinary Chronic Pelvic Pain Syndrome (UCPPS) includes two disabling conditions involving pelvic pain, urinary frequency and urgency: Interstitial Cystitis and Chronic Prostatitis. Previous studies have shown that a family history of this condition could be a factor in the development of UCPPS. This study aimed to

identify differences between participants with and without a family history of the disease using the Multidisciplinary Approach to Chronic Pelvic Pain (MAPP) Research Network database. The MAPP enrolled 424 UCPPS patients, 39 of whom reported a family history of the condition. The information from these participants was compared against those without a family history using statistical analyses to determine differences between the groups. The majority of variables examined including sex, prevalence of comorbid disorders, local vs. widespread symptoms, levels of anxiety and depression, and inflammatory and cortisol profiles showed no differences between those with and without family history of UCPPS. The only factors that were different between the groups were duration of symptoms and years since diagnosis. In conclusion, data from this large-scale study did not support previous findings of differences between patients with and without a family history of UCPPS with the exception of age of diagnosis and symptom duration.

## **18 - Riley Deutsch**

Major: Biomedical Engineering

Mentor: Jessica Sieren (Radiology)

### *A Method for Increasing Image Contrast to Non-Invasively Study Tissue Samples with Micro Computed Tomography*

To better understand healthy and diseased states, the current gold-standard technique, histology, involves dyeing a sample and analyzing a thin slice under the microscope. While this technique is reliable, it involves cutting from a larger sample and only provides a snapshot of what the whole sample might look like. Micro computed tomography (micro-CT) is an imaging tool that can create high resolution, three-dimensional images of whole tissue samples. As with histology, by using some type of chemical stain or dye, information about the interior of a sample can be discovered. For these purposes, a useful dye increases how bright some structures appear in the image while allowing others to remain dark. In these experiments a specific dye, phosphotungstic acid (PTA), was used to create contrast in tissue samples. A variety of staining protocols were tested to determine the optimal concentration of PTA. Stained samples were imaged in a clinical CT scanner and also using micro-CT. The image brightness was analyzed at several tissue regions, and it was found that stained tissues did exhibit higher contrast.

## **20 - Alayna Dieter**

Major: Biochemistry

Mentor: Marcelo Correia (Internal Medicine)

### *Skeletal Muscle-Specific DRP1 Deficiency Alters Autophagy, Increases ER Stress and Apoptosis and Reduces Force Generation in Skeletal Muscle*

Dynamin Related Protein (DRP) is a mitochondrial fission protein that works in

conjunction with other proteins to maintain the morphology and size of mitochondria in cells. Skeletal muscle of type 2 diabetics exhibits mitochondrial dysfunction linked to increased mitochondrial fragmentation. The purpose of this research was to study the effects of muscle-specific DRP1 deficiency on systemic metabolism, muscle function and markers of autophagy, ER stress and apoptosis. A mouse colony was generated with a removal of the DRP1 gene to be compared to wild type mice for experiments. Our observations were focused on the differences between DRP1 deficient and wild type mice in their size, glucose tolerance, exercise performance, and protein expression. Through these assessments skeletal muscle-specific DRP1 deficient mice appear to be reduced in total lean mass and force generation compared to the control wild type mice. These findings suggest that DRP1 could regulate ER stress and autophagy; the absence of DRP1 may induce programmed cell death in skeletal muscle.

## **22 - Gabrielle Duncan**

Majors: Human Physiology, Cell & Developmental Biology

Mentor: Gen Shinozaki (Psychiatry)

### *Epigenetic Investigation of Military Sexual Trauma in PTSD and Major Depression*

The disturbing reality is that many servicewomen in our military experience high levels of trauma during their service, not only from combat but also from sexual assault from fellow service members. In fact, over 30% of veteran women report being sexually assaulted during their service, around 10% of them resulting in posttraumatic stress disorder (PTSD). In our lab at the Department of Psychiatry, we are exploring if epigenetic marks on DNA (DNA methylation) obtained from servicewomen are correlated with their exposure to sexual trauma. We are also investigating if such biomarkers are associated with risk for PTSD. Finally, we aim to identify DNA methylation changes predictive of treatment responses. Our goal is to find such an epigenetic biomarker that can identify individuals susceptible to PTSD, and ultimately predict treatment response so that the best treatment option can be selected for Veterans suffering from these conditions.

## **24 - Caroline Emory**

Majors: Speech & Hearing Science, Psychology

Mentor: Shawn Goodman (Communication Sciences & Disorders)

### *Auditory Feedback During Speech*

Most mammalian auditory systems contain two feedback loops: 1) the middle-ear muscle reflex (MEMR) and 2) the medial olivocochlear reflex (MOCR). Presently, the exact purpose of the reflexes is unknown. A prevalent hypothesis is that these reflexes activate to protect our ears from loud sounds.

However, prior to the industrial revolution it is doubtful that anything in nature would have been loud enough to necessitate the development of such a protective mechanism. Another hypothesis is that the reflexes activate during vocalization to protect the ears from one's own voice. Prior research using animal models have established that the reflexes do activate during self-vocalization. However, to our knowledge, no published studies have examined the effect of the reflexes during human speech. Thus, the purpose of the present study is to examine the effect of the MOCR and MEMR during speech.

## **26 - Zhiting (Jack) Feng**

Majors: Biochemistry, Ethics & Public Policy

Mentor: Leonard MacGillivray (Chemistry)

*Bring sustainability to organic chemistry: Connect Boron with Green Chemistry through [2+2] photocycloaddition*

This project highlights solvent-free synthetic methodologies. Green chemistry is applied by the core reaction for [2+2]-photodimerizations that takes place in organic solid state. In fact, solvents are generally expensive, highly regulated, volatile, toxic and carcinogenic. Instead, the nature of dry media reaction in this project is environmentally friendly while having ultimately 100% quantitative yield. In this project, we prevent waste, maximize atom economy and avoid any kinds of solvents in the chemical reaction thanks to the unique nature of the interactions between boronic ester and other molecules. Boronic ester favorably organizes olefins to achieve [2+2]-photodimerizations in organic solid state under UV light. The combination of <sup>1</sup>H-NMR spectroscopy and X-ray diffraction techniques provide insight on product yield and purity, which further demonstrates the wellness of green chemistry application in this project.

## **28 - Rebecca Frederick**

Majors: Psychology, English

Mentor: Cathleen Moore (Psychological & Brain Sciences)

*What's in front? Measuring figure-ground segregation across the visual field*

One of the first things that vision has to do is identify which parts of the image at the eye correspond to objects in the world versus the background, a process known as figure-ground segregation. One tendency is for convex shapes to be perceived as figures and concave shapes to be perceived as background. Recently it was discovered that this convexity bias increases with the number of regions present, something known as the convexity-context effect (CCE). We hypothesized that figure-ground segregation is different in peripheral vision than central vision. We measured the CCE for stimuli at variable distances from where people were fixating, increasing the size of the

stimuli as they were further out in peripheral vision to control for changes in image quality. Results so far support the hypothesis that figure-ground segregation is different in peripheral vision, in that the CCE changes with distance from fixation.

### **30 - Diana Garcia**

Major: Anthropology

Mentor: James Enloe (Anthropology)

#### *Hammering it Out: Stone Tool Manufacture and Distribution of Lithics at Woodpecker Cave*

Woodpecker Cave (13JH202) is a seasonal site that was occupied during the late Woodland period, the excavation site is located in Johnson County Iowa. Due to its locality it is influenced by the Southern Iowa Drift Plain which has lead to the discovery of different types of lithics and resulting in both focal and diffuse raw material. My objective is to look at the overall identified raw materials and determine the amount of each lithic type. Focusing on the quantity and the type of lithic in order to measure and differentiate between lithic techniques and styles.

I also focused on the distribution of identified raw material by looking at distribution maps and categorizing the material as either primary (local) meaning it is an item that is found in close to the geological context where it was formed. Or secondary (non-local) where the resource is no longer in or in the proximity to where it was formed. This can provide information on context of any found item in the excavation site as the context of items found can indicate its use or where the item came from. Among other information about the people who occupied the area.

### **32 - Austin Greenough**

Major: Accounting

Mentor: Cristi Gleason (Accounting)

#### *A Comparison of the Critical Accounting Policies Between Significant U.S. Companies and Their Chinese Counterparts*

This paper examines the quality of the Critical Accounting Policies disclosure in the Management's Discussion and Analysis section of an SEC filers annual filing. Specifically, the paper compares nine large, visible U.S. companies and their disclosures with that of six equivalent Chinese firms who file with the Securities and Exchange Commission. Throughout the last decade, Chinese companies that file in the United States have come under scrutiny for accounting scandals and other fraudulent reporting. I find that, in contrast to SEC guidelines to limit the number of policies to a few, Chinese firms disclose significantly more "critical" accounting policies than their U.S. counterparts. These disclosures have more words and fewer numerical estimates and change

less from year to year. Taken together, these differences are consistent with Chinese firms providing less useful disclosures about their critical estimates than their U.S. Peers.

### **34 - Ye Guo**

Majors: Finance, Business Analytics & Information Systems

Mentor: Tong Wang (Business)

#### *Interpretable Models for Explaining and Assisting Convolutional Neural Networks*

The most important elements of a computer neural network are the layers. A developed neural network, based on complexity, have various number of layers. However, no matter what kind of neural networks you are building, there are always the input layers, which is the information (data) you have on hand. There are also the hidden layers, which do all the calculations for you. There can be one or hundreds of hidden layers, how these hidden layers work remains unknown. For example, a well-built convolutional neural network can be used to recognize hand-written numbers. However, why does your computer think a 6 is a 6, a 9 is a 9? Your computer won't tell you the process, just the result that it is 6, not any other numbers. For another example, when you build a convolutional neural network with an input layers of thousands of cat and dog images, why does your computer think a dog is a dog and a cat is a cat when you give it your test data? The purpose of this research is to unlock the black box of convolutional neural network, and to tell how a simple image recognition AI distinguish a dog from a cat, using classification model. Academically speaking, we use a liner model with features selection function to examine the intermediate layer(s) of a simple convolution neural network.

### **36 - Cameron Hauser**

Major: Human Physiology

Mentor: Gordon Buchanan (Neurology)

#### *Role of locus coeruleus norepinephrine-containing neurons in CO<sub>2</sub>-induced arousal from sleep*

CO<sub>2</sub>-induced arousal from sleep is a vital protective mechanism involved in diseases such as obstructive sleep apnea, sudden infant death syndrome, and sudden unexpected death in epilepsy. The brain signaling molecule serotonin (5-HT) is necessary for CO<sub>2</sub>-induced arousal though the specific mechanism to which it results in arousal is unknown. We hypothesized that midbrain 5-HT neurons sensitive to changes in CO<sub>2</sub> activate locus coeruleus neurons containing the signaling molecule norepinephrine (NE) and signal for arousal. C57BL/6J mice were treated with LC NE-containing neuron toxin DSP4 or saline, implanted with electrodes to record brain and muscle activity, and exposed to room air or 7% CO<sub>2</sub> to measure arousal latency. A decreased but

not lost responsiveness to CO<sub>2</sub> was observed indicating remaining LC NE-containing neurons are sufficient for CO<sub>2</sub>-induced arousal or the involvement of other structures signaling for arousal.

### **38 - Kaelynn Heiberg; Rachel Maller**

Major: Sociology, Ethics & Public Policy; Sociology

Mentor: Sarah Bruch (Sociology)

#### *Equity Implemented: A Research-Practice Partnership with the Iowa City Community School District*

In this project, we work with the Iowa City Community School District to improve the equitability of school experiences and outcomes for students. We begin by examining how 5th-12th grade students in ICCSD perceive their school environments using an extensive survey that asks students about several aspects of their experiences. From this data, we assess the extent of disparities between students with different characteristics such as race, gender, sexual orientation, and parent education. We then facilitate a task force of students, teachers, and community members who consider several evidence based recommendations to reduce these disparities. Finally we evaluate the programs the district adopts to assess whether they are being effective in reducing the disparities in student experiences and outcomes. Evidence from these evaluations suggests some positive changes in teacher knowledge and awareness of implicit bias and restorative justice practices.

### **40 - Elise Heitmann**

Major: Anthropology

Mentor: James Enloe (Anthropology)

#### *Don't be so Dense: The Creation of Density Contour Maps*

Density contour maps allow archaeologists to see the distribution of artifacts throughout excavated sites to analyze the space. Contour maps show us where the highest densities of certain artifacts, like bone fragments or ceramic pieces, are located. We can use this information to tell us which areas were used for cooking, tool making, or for trash. Some sites, such as Woodpecker Cave in Johnson County, Iowa, have multiple layers where the site layout was different. Level 5, which is approximately 50 centimeters below the surface, had densities of artifacts that allowed us to determine which parts of the site were likely used for cooking. Deeper in the site, different layers have begun to show us that different areas were used for cooking at different times when the site was inhabited. While density maps alone cannot give us all the information we need, they help us organize the data we have in order to start analyzing the site. Creating density contour maps has required data organization and collaboration with others in the lab to make sure the right information gets on the maps, so I can compare and contrast different levels.



## **42 - Brenda Herrera**

Major: Global Health

Mentor: Julie Reynolds (Dentistry, Public Policy Center)

### *Mechanisms Impacting Oral Health Equity in Low-Income Adults in Iowa: Perspectives from Medicaid Members and Dentists*

The Affordable Care Act, also known as Obamacare, expanded the Medicaid program to low-income adults not previously eligible for Medicaid. Iowa was one of 14 states that chose to expand its Medicaid program. Dental benefits were provided to this Medicaid expansion population through a program called the Dental Wellness Plan (DWP). Using open-ended comment data from surveys administered to DWP members and Iowa dentists in 2016, authors analyzed these comments in order to identify and describe common themes. Members were most likely to discuss their oral health status and needs, their ability to find dentists who accepted their insurance, and aspects of dental coverage within DWP. Whereas dentists most frequently cited administrative burden, reimbursement for services, and coverage for oral health care. We describe the salience of themes present in a previously published conceptual model about how Medicaid expansion can impact oral health equity, as well as identified potential gaps in the model.

## **44 - Joshua Hjelmaas**

Major: Business Analytics and Information Systems

Mentor: Andrew Hosmanek (Management & Organizations)

### *State Surveillance Through Quantum Computing: The Future of Electronic Privacy Law*

The majority of current encryption algorithms used to securely transmit electronic communication rely on a set of mathematical problems that are unsolvable for today's computers. These algorithms will be extremely vulnerable to decryption by a quantum computer with a sufficient amount of processing power, which researchers have suggested will occur between 7-10 years from now. Federal agencies will almost certainly have access to these resources before a consumer-grade version becomes available to most US citizens. Thus, the government will have more power to surveil Americans through mass collection and decryption of electronic communication. Existing privacy laws and current interpretations of the 4th Amendment do not protect citizens against warrantless search and seizure in a digital environment. Drawing on contemporary research into photonic quantum information processing, asymmetric encryption standards and electronic privacy law, this paper advocates for updated legal standards that restrict the ability of the state to surveil a citizen's private electronic communications while our society transitions to networking and encryption standards that are resistant to attacks from a quantum processor.

## **46 - Zachary Juron; Mohamad Abdullah Mohd Kamal**

Majors: Mathematics; Statistics, Mathematics

Mentor: Isabel Darcy (Mathematics)

### *Topological Data Analysis (TDA) & the Chicago Cubs*

Topological data analysis is an area of applied mathematics that utilizes techniques from topology to analyze large complex datasets. The primary motivation of TDA is to study the shape of the data and gain understanding from those shapes. In order to do this, one must combine algebraic topology and different tools from mathematics to create a rigorous mathematical study of "shape". The most widely utilized tool is the TDA mapper package within R and Python Mapper. Mapper does not place any conditions on the clustering algorithm and thus any domain-specific clustering algorithm may be used. Our research is centralized around the Chicago Cubs Baseball Statics. We utilized an 18-dimensional Euclidean space with 47 datasets. The 18 variables we chose to analyze for the 47 players are: games played, at bat, runs scored/allowed, hits scored/allowed, doubles hit/allowed, triples hit/allowed, home runs hit/allowed, runs batted in, stolen bases, caught stealing, bases on balls/walks, strikeouts, total bases, double plays grounded into, times hit by a pitch, sacrifice hits, sacrifice flies, intentional bases on balls.

## **48 - Khaled Kayali**

Major: Biomedical Engineering

Mentor: Hanna Stevens (Psychiatry)

### *Effects of Cypermethrin on the Morphology and Number of Microglia in the Embryonic Brain*

Alpha-cypermethrin is a type II pyrethroid that is found in commonly used household insecticides. It has also been recommended for use by pregnant women to prevent the transmission of the Zika virus by mosquitos. Studies have shown that prenatal exposure to alpha-cypermethrin is a risk factor for altered neurodevelopment in children, however little is known about the exact mechanisms through which this occurs. We studied, how prenatal exposure to alpha-cypermethrin affects the morphology of microglia in the embryonic brain, as microglia play critical roles in the processes of neurogenesis, synaptic maturation, and brain wiring during development. The morphology of microglia is important because it indicates how far in development the cells are. Pregnant CD1 mice were administered alpha-cypermethrin via oral gavage at doses of 0 mg/kg or 10 mg/kg daily from embryonic day 11 to 14. Dams were sacrificed on embryonic day 14.5 and embryonic brains were stained with Anti-Iba1 to identify microglia. We used fluorescent microscopy and stereology to assess the microglia. It appears as if alpha-cypermethrin alone does not influence the morphology of microglia, as the percentage of each morphology remained the same before and after administering the alpha-

cypermethrin. Further research could involve studying microglia with higher dosages or with other factors such as stress.

## **50 - Katelyn Kelly**

Majors: Anthropology, Psychology

Mentor: James Enloe (Anthropology)

### *Where Is It?: Analyzing Piece Plotted and Screened Artifacts from Woodpecker Cave*

At Woodpecker Cave in Coralville, Iowa, a team of archaeologists collected a variety of artifacts such as bone, ceramic, fire-cracked rock, lithic, and shell. I analyzed the data by plotting artifacts that we could record in its original spot on Photoshop grids. I furthered examined the distribution of the individually plotted artifacts from our excavation in conjunction with the density maps of the significantly larger number of artifacts recovered from the screening process of each 10 centimeter level from every 1x1 m<sup>2</sup> square. While analyzing the combined plotted artifact grids and density maps, we can examine the different between large plotted artifacts and small screened artifacts and how it could be indicative of patterns of behavior in the use and discard of artifacts at Woodpecker Cave.

## **52 - Breanna Kramer-Riesberg**

Major: Microbiology

Mentor: Al Klingelutz (Microbiology)

### *Ebola Virus Infection of Skin*

The 2014 Ebola virus outbreak provided evidence of skin-to-skin transmission of the virus. In a lab with the highest biosafety level, Ebola virus was able to infect small patches of human skin. We hypothesize that Ebola infects skin cells and that this is important for transmission and/or pathogenesis of the virus. To begin to address what specific cell types in skin support Ebola infection, we used a safer virus, Vesicular Stomatitis Virus (VSV), to express Ebola glycoprotein (the receptor used by Ebola to infect cells). We found that human skin keratinocytes (epidermis), fibroblasts (dermis), and adipocytes (hypodermis) were all productively infected by the VSV-Ebola recombinant virus. In studies with keratinocytes, the VSV recombinant virus initiates an innate immune response that inhibits infection and causes partial resolution of infection. Further studies are needed to determine how the innate immune system in keratinocytes responds to actual Ebola virus infection. We are currently using receptor inhibitors and antibodies to identify which skin cell receptors Ebola virus is using to enter and infect cells. These studies will be important for determining how EBOV is transmitted through skin and could lead to better strategies to reduce EBOV transmission.

## **54 - Yunyi Li**

Major: Business Analytics

Mentor: Tong Wang (Management Science)

### *Series crime predictor*

The purpose of my research project is to develop a crime prediction model to optimize the distribution of police power in the areas that most need it. In a certain area, given the time, location, and series information of historical crime incidents, and the property (land use) information in that certain area, our model could predict the location of next crime hit by calculate a heat map and rank the risk in cells of that certain area.

## **56 - Carter Lilly**

Major: Human Physiology

Mentor: Terry Wahls (Internal Medicine)

### *Measuring the Effect of the Wahls and Swank Diets*

Multiple Sclerosis is a neurodegenerative disease with symptoms such as pain, fatigue, and decreased motor function. Diet modification may improve these symptoms. We will measure and compare the effects of two dietary interventions on motor function. The Wahls Elimination diet restricts dairy, eggs, and grains while increasing fruits and vegetables. The Swank diet limits saturated fat and recommends 4 daily servings of grains. We hypothesize that both diets will improve completion times in the 9-hole peg test and 6-minute walk test. Participants will be randomly assigned to one of the two diets after an observation period. Each participant will complete the tests during the observation period and at 12 and 24 weeks on the assigned diet. No outcomes will be analyzed until completion of the study.

## **58 - Lingyi Liu**

Majors: Chemistry, Biochemistry

Mentor: Lei Geng (Chemistry)

### *Probing Molecular Transport in Nanoporous Silica Particles by Single-Molecule Spectroscopy*

Nanoporous materials have found wide applications in many fields of chemistry and biomedicine, including chemical separations, drug delivery, biosensing, catalysis and environmental remediation. Although these applications are very diverse in their objectives and requirements, the functional properties are all controlled by the molecular transport in the nanopores: the wetting of the nanopores, the diffusion of molecules in the pores, and the adsorption and partition of the solute molecules on the pore surface.

In this work, single molecule spectroscopy is used to probe these molecular processes in order to understand their fundamental mechanism. The advantage of using single molecule spectroscopy is that the dynamic processes of molecular transport of individual molecules reveal the population heterogeneity in the nanopores. A statistical population of single-molecule photon-bursts data collected from 100 locations in 19 silica particles was built to analyze the adsorption, diffusion, and local concentration of rhodamine 6G molecules in nanopores. Structural heterogeneity on the nanopore surface is discovered through analyzing the transport parameters. The insights obtained through single molecule spectroscopy are valuable and essential in guiding the optimal design of functional applications of the nanoporous particles.

## **60 - Leigha Meredith**

Major: Environmental Science

Mentor: Heather Sander (Geography)

### *Listening to the Trees: Field Audio Recording in Iowa City's Forests*

The purpose of this project is to integrate aspects of my formal scientific research with my looser artistic practice to construct a holistic understanding of ecological communities in urban areas. In this age of rapid habitat loss and species extinction, observational science is just as relevant as ever with new motivations to monitor wildlife for conservation efforts and understand human impacts on the environment. My research adopts this discipline, as I have collected extensive data on natural and planted vegetation on the local scale in Iowa City. Similarly, my art practice relies on observations of the natural world as I imitate the styles of historical naturalists and explorers in the modern age, documenting scientific notes and aesthetic impressions together. I began with traditional field surveys, identifying and measuring trees to characterize plant communities in Iowa City and nearby forested areas, then added a dimension of modern technology by surveying soundscapes in the same locations with a handheld recorder. While using these recordings as a scientific method to monitor biodiversity of songbirds, I am also adding an intermedia facet to my field notes, curating a collection of sound files that represent a juxtaposition of wildlife and human development.

## **62 - Alissia Milani**

Major: Chemistry

Mentor: Elizabeth Stone (Chemistry)

### *Lake Michigan Ozone Study: Characterization and Sources of Airborne Particles*

Air pollution in coastal regions affects nearly one-third of all Americans. It is important to study fine airborne particles because of their negative impact on human health and climate. Breathing in fine particles can worsen lung

problems such as asthma and accounts for nearly two million premature deaths annually. In the environment, particles reduce visibility, damage plants, and alter ecosystems. Along the Lake Michigan coastline, elevated levels of ground level ozone (a harmful gas) are consistently observed in the spring and summer. The sources contributing to ozone formation are not well understood but can be inferred through the study of airborne particles. Elevated levels of elemental carbon, a type of particle tied to fuel combustion, were observed with elevated ozone concentrations on poor air quality days. Fuel combustion also releases other gases that can contribute to ozone formation and/or react to form particles. Over 90% of the world's population is at risk of developing adverse health effects linked to poor air quality such as stroke, heart disease, and cancer. By identifying major sources of air pollutants, strategies to reduce air pollution can be developed and evaluated in order to protect human health.

## **64 - Prince Morkeh**

Major: French

Mentor: Sarit Smolikove (Biology)

*ATL-1, the C. elegans ATR homolog, is required for maintaining chromosomal integrity in aging reproduction tissue*

A highly conserved gene among mammals known as ATL is involved in cancer formation. The model organism, *Caenorhabditis elegans* is known to have a homolog of this gene called ATL-1. We studied the function of this gene in the germline of this organism, the organ that produces eggs and sperm. The normal wild-type strain for this organism would be expected to maintain the structure of its germline chromosomes during its lifetime, however, the mutant *atl-1* strain chromosome abnormalities are found resulting from breakages in the chromosome. We found that this abnormalities result from inability to progress with normal repair of DNA damage during replication as the germline ages. This indicates that ATL may be more crucial for reproduction in older individuals.

## **68 - Margaret Mungai**

Majors: Biology, Neuroscience

Mentor: Antentor Hinton (Internal Medicine)

*MFN-2, a mitochondria-associated endoplasmic reticulum membrane protein may be important for the formation of insulin mediate ER-Mitocontacts*

Type 2 diabetes disrupts special contacts between the mitochondria and endoplasmic reticulum membranes (MAMs) of skeletal muscle in humans and mice. These special membranes, MAMs are important for skeletal muscle cells to relay calcium between the endoplasmic reticulum and mitochondria.

Reduced MAM protein, MFN-2 decreases during type 2 diabetes. MFN-2 has been shown to be important for MAM formation. We hypothesize that the loss of MFN-2 in skeletal muscle cells would decrease these special contacts and promote insulin resistance by limiting intracellular calcium, formation of ER-mitocontacts, and mitochondrial respiration. By conducting numerous experiments including four hours of insulin treatment, we noticed an increase in the expression level of MFN-2 protein, increase in mitochondria fusion, respiration, and ER-mitocontacts. In conclusion, insulin mediate metabolic effects were enhanced by an elevated outer mitochondrial membrane protein, MFN-2. Moreover, the loss of MFN-2 resulted in decreased MAM formation and was able to ablate the metabolic effects of insulin.

## **70 - Matthew Murry**

Major: Biology

Mentor: Quan Jiang Zhang (Internal Medicine)

### *Cellular digestion protects heart cells against lipid-induced death*

Autophagy is the process by which a cell digests its own waste. This process is integral to cell survival. However, it's not completely understood how autophagy works to maintain homeostasis when a cell is in a high fat extracellular environment. Our study sought to elucidate the role that autophagy plays in protecting cells in high fat environments. We incubated pig heart cells in a fatty acid medium to simulate a diabetic environment, and impaired mechanisms that are believed to be integral to autophagy. Cell survival markedly decreased after silencing these mechanisms. Our findings indicate that fatty acid incubation activates intercellular mechanisms to initiate autophagy, which promotes cell heart survival likely by inhibiting programmed cell death.

## **72 - Danielle Nauman**

Major: Speech & Hearing Sciences

Mentor: Jerry Moon (Communication Sciences & Disorders)

### *Effects of speaking effort on speech production*

Following surgical removal of the larynx, patients choose an alternate speech-production mechanism. The electrolarynx can serve as a substitute sound source. However, removal of the larynx alters speech production. The airstream from the lungs used to articulate speech is no longer available. Increasing effort and exaggerating speech movements have been suggested, but the relationship between an individual's "effort level" and physiological parameters of exaggerated speech movements is not understood. This study compared the effects of varying speaking effort level on laryngeal and electrolaryngeal speech. Participants produced three bilabial consonants using conversational, clear, and electrolarynx speech modes. Bilabial contact

pressure (BCP) peaks, intraoral air pressure (IOAP) peaks, and their durations were measured. BCPs and BCP durations increased from conversational to clear to electrolaryngeal speech, for all phonemes studied. IOAP did not differ significantly as a function of speech mode, while IOAP duration was significantly lengthened during electrolarynx speech. Speech produced with an electrolarynx is different from laryngeal speech and appears associated with greater effort than conversational or clear speech. These results can be generalized to clinical instruction for electrolaryngeal speakers to produce clearer and more intelligible speech.

## **74 - Nhan Nguyen**

Major: Biomedical Engineering

Mentor: Fang Lin (Anatomy & Cell Biology)

### *Wnt5b is required for endoderm morphogenesis*

The endoderm is the deepest germ layer that contributes to the inner lining of the gut and the associated organs. In zebrafish, during early segmentation (1-12 somites), endoderm undergoes convergence and extension movements (C&E movements) and transform wide endoderm sheet into a narrow endodermal rod or gut anlagen. Non-canonical Wnt/Planar cell polarity (Wnt/PCP) signaling has been implicated in gut morphogenesis in mouse, frog and zebrafish. The underlying cell and molecular events, however, are not clear. During early segmentation, endodermal cells increasingly polarize along embryonic mediolateral axis and intercalate (shuffle) with neighboring endoderm cells as they undergo C&E movements. As a result, wide endoderm sheet transforms into a narrow endoderm sheet (at 12S) that later form gut anlagen. *Wnt5b* mutants but not *wnt11* display a wide endodermal sheet at 12. This result suggests that *wnt5b* is required for endodermal C&E movements. In another project in Dr. Lin's lab, similar results were observed in *wnt* co-receptor Receptor-like tyrosine kinase (RyK) morphant embryos. Currently, we are investigating whether *Wnt5b* control planar cell polarity in endoderm via RyK.

## **76 - Aleisha Norton**

Majors: Biology, Psychology

Mentor: Susan Lutgendorf (Psychological & Brain Sciences)

### *Psychosocial Well-Being and Depression in Ovarian Cancer Survivors*

This study's aim was to explore the relationship between psychological wellbeing (PWB) and depression in ovarian cancer survivors and explore buffers the effects of perceived stress on depression. Participant data examined in the current study were drawn from three previous studies. All participants (N=147) had epithelial ovarian cancer diagnosis, completed primary treatment, and completed psychosocial assessments. PWB was



assessed as a total score and four subscales: environmental mastery, personal growth, purpose in life, and self-acceptance. CESD was utilized as a measure of distress. First, analyses were used to determine whether PWB has an inverse relationship with distress after adjusting for age, marriage, current disease status, cancer recurrence, and years since diagnosis. Then, an interaction between wellbeing and a measure of current stress was tested. PWB had a negative association with depression. Significant relationships were examined using the four subscales with environmental mastery having the greatest impact. Next, a significant interaction between PWB and perceived stress was found indicating that PWB was protective against the effects of perceived stress on depression. Implications for these results include interventions targeting well-being in cancer survivors.

## **78 - Danielle Pellack**

Major: Human Physiology

Mentor: Michael Anderson (Molecular Physiology & Biophysics,  
Ophthalmology & Visual Sciences)

### *Role of Mitochondria in Neuroprotection for Glaucoma*

Glaucoma is an age-related disease, leading to irreversible blindness in the eyes. One way to determine the advancement of disease is by observing cells in the eye, known as retinal ganglion cells. The quantification of retinal ganglion cells give an indication of how the disease is affecting the eye. Retinal ganglion cell axons, which transmit visual information from the eye to the brain through the optic nerve, are also quantified and correlated to visual outcome. This study tests the effect of a gene we believe is neuroprotective on congenital glaucoma in the nee mouse model. We expect that this gene, which is involved in mitochondrial dynamics and energy production, can hinder the progression of blindness in mice with glaucoma.

## **80 - Marissa Roseman**

Majors: Biology, Environmental Science

Mentor: Maurine Neiman (Biology)

### *Do parasites help drive life history variation in natural populations?*

Different organisms use a variety of life history strategies: some invest a lot of resources into a few offspring, some make many offspring but put little investment into each, and some use intermediate strategies. Why does variation in such extremely important traits exist? In this experiment, we explore whether disease might contribute to the variation in life history traits. We used a New Zealand freshwater snail that is found in lakes with high levels of a parasitic worm and lakes with low levels of the parasite. Snails infected with the parasite are unable to produce babies, so we hypothesized that the risk of infection in these lakes may affect the snails' growth rate and the size

and age at which they had babies. Female snails whose grandparents came from high-infection lakes and low-infection lakes were isolated in cups and checked frequently for offspring. Their growth rate was recorded, as was their size and age when they first had babies. The results showed that snails that grew at a faster rate also tended to have babies sooner. The time it took them to have babies was not linked to their adult size. Originating from the same lake was a better predictor of life history traits than level of lake infection (high or low). This suggests that adaptations to each lake may be more important to life history variation than disease is. It also poses the question: what hidden costs of rapid growth and early reproduction may contribute to variation in life history traits?

## **82 - Alexi Rubin**

Major: Nursing

Mentor: Terry Wahls (Internal Medicine)

### *Analyzing the Effect of the Wahls and Swank Diets on Fatigue, Mood, and Cognition*

Multiple sclerosis is a debilitating disease of the nervous system. Most individuals experience decreased mobility, pain, and fatigue. Restricting certain foods may alleviate some of these symptoms. Our study compares the modified Paleolithic (Wahls' elimination) diet and the Swank diet. The Wahls diet excludes dairy, eggs, grains, legumes, sugar, and nightshade vegetables, and recommends 6 cups of vegetables and meat daily. The Swank diet is low in saturated fat (~15 grams) and recommends  $\geq 4$  servings of grains per day. Eligible participants have relapsing-remitting multiple sclerosis and moderate to severe fatigue as demonstrated by a Fatigue Severity Scale score of 4 or more (scale 1-7). Participants will eat their usual diet during the 12-week observation period. They will then be randomized and trained on the assigned study diet by a registered dietitian and supported with weekly telephone coaching calls for 4 weeks. Participants will keep 3 days of weighed food records during each 12-week study period to assess diet quality and adherence to assigned study diet. We will assess fatigue, mood, thinking and diet at baseline and weeks 12, 24, and 36. Data analysis will be completed at study conclusion.

## **84 - Eli Schmidt**

Major: Psychology

Mentor: Shaun Vecera (Psychological & Brain Sciences)

### *Long-term learning of a shape can guide attention*

Your boss wears a red shirt every day, so you begin to associate the color red with your boss. When a coworker wears red, you cannot help but to have your

attention drawn to that person when they enter the room. In the present study, we investigated whether this phenomenon, called statistical learning, is a long term bias that persists even when the association is no longer relevant. More specifically, in the present study, participants implicitly learned that a target within a visual search display would more likely appear in a certain shape than within another shape. After that association had been learned, the association was removed with the target being equally likely to appear in either shape.

Participants learned to preferentially attend to the important shape and that preference remained when that shape was no longer helpful to the task. This suggests that the learning of that shape was long-term learning of a relevant feature.

## **86 - Victoria Shihadah**

Major: Speech & Hearing Science

Mentor: Bob McMurray (Psychological & Brain Sciences)

### *Framing Expectations: Exploring How Noisy Speech Conditions in Varying Contexts Affect Spoken Word Comprehension*

Understanding speech involves interpreting what is heard as it unfolds in real time. To accomplish this, listeners use what is called competition. An example of this occurs when a listener hears the beginning of a word such as sandwich, they immediately consider multiple potential similar words (sandwich, sandal, santa). As the listener hears more of the word, they integrate this new information into their interpretation, narrowing down possible words until only one remains. Strategies used to effectively integrate such auditory information change in noisy situations (e.g., in a crowded restaurant). However, it remains unclear whether these listening adaptations are in order to help listeners, or reflect confusion due to the noise. To investigate this, we examined listeners in conditions where they expect noise but hear clear speech, to see whether any of these strategies may be adaptive. In preparation, we processed recordings such that each listener hears a noisy sentence (now click on the...), but the target word (...ball) is clear. We measured the moment-by-moment process of word recognition using an eye-tracking task. Listeners matched a spoken word (e.g., sandal) to one of four pictures representing competing interpretations (sandal, sandwich, etc). Fixations to each picture were recorded throughout the task to measure how the participant interpreted the word as it unfolded. Data collection is underway and preliminary results will be presented at SURF.

## **88 - Katie Sinwelski**

Major: Nursing

Mentor: Catherine Cherwin (Nursing)

### *Evidenced-Based Interventions for Chemotherapy-Induced Taste Changes*

Research has shown that patients receiving chemotherapy experience alterations in taste. Taste changes have been shown to negatively affect one's weight, nutritional intake, and quality of life. Research on interventions for chemotherapy-related taste changes are limited due to outdated sources of summaries of evidence. The purpose of this poster was to produce a more time-relevant summary of evidence on interventions for patients experiencing taste changes. Results from the studies have revealed things such as therapy that keeps the mouth cold (cryotherapy), education, reframing of thinking, and miracle fruit supplementation as helpful with chemotherapy-related taste changes. The little research that has been done has revealed the need to further research about interventions for taste alteration. Further research and use of this summary will help inform the practice of cancer healthcare providers.

## **90 - Zach Theiler**

Majors: Biochemistry, Chemistry

Mentor: Scott Daly (Chemistry)

### *Nuclear Waste Remediation: Extraction of Nuclear Waste Products*

Nuclear energy can be a long-term alternative to traditional forms of energy production provided that fundamental problems related to nuclear waste can be addressed. In particular, a closed nuclear fuel cycle that limits toxic and highly radioactive waste byproducts could help satisfy growing demand for energy. Extraction of radioactive elements from spent nuclear fuel could potentially close the nuclear fuel cycle and reduce the volume of generated waste. My research focuses on the design and synthesis of organic molecules that are tailored to exploit chemical differences in lanthanides and actinides (two classes of metals commonly found in nuclear waste). In this presentation, I will describe my work aimed at preparing and characterizing new lanthanide and actinide complexes so that more efficient nuclear waste management methods may be achieved.

## **92 - Maegan Tyrrell**

Major: Health Promotion

Mentor: Jon Winet (Art & Art History)

### *Initial Qualitative Assessment of The Passport Project*

The Passport Project is a First-Year seminar dedicated to introducing students to the cultural and scholarly offerings of The University of Iowa and Iowa City. The class consists of three components that work in congruence to create a unique class experience. Students attend 12 events across seven predetermined categories and participate in large group guest lectures opposite of Breakout groups, which pair approximately 10 First-Year students with an older undergraduate peer mentor. At the end of the Fall 2017

semester, an anonymous questionnaire was administered to students as the first stage in a new assessment plan for the program. The questionnaire consisted of three open-ended questions asking students about their takeaways from the class, suggestions for improvement, and ideas for future presenters. Out of 121 students, 103 responses were received. The overarching themes in the takeaway data indicate students were learning about campus, themselves, and continuing learning beyond college. Suggestions for improvements were mixed in response, but there was some agreement that there should be changes made to the event categories and course assignments. Conclusions drawn from this project will be used to refine the Fall 2018 rendition of the course and the next stage of the assessment plan.

## **94 - Allison Vaske**

Major: Chemical Engineering

Mentor: Chad Grueter (Internal Medicine)

### *Regulating Fibrosis of the Heart*

Cardiovascular disease is the leading cause of fatality in the United States. The heart is predominantly composed of two cell types; cardiomyocytes and cardiac fibroblasts (CFs). After a traumatic event, such as a heart attack, cardiomyocytes have little to no ability to reproduce themselves causing the heart to have essentially no regenerative capacity. Failure of heart muscles encompasses numerous complex alterations at the molecular and cellular level, which often results in cardiac remodeling. Cardiac remodeling is characterized by a change in size, structure, and function of the heart. Hyperactivity of CFs results in cardiac fibrosis, a scarring process by which fibroblasts accumulate and secrete excess collagen. Collagen serves an important role in maintaining the structural integrity of the heart but can also generate stiffness, deformation, and interfere with electrical signaling. Although the role of CFs in cardiac remodeling has been established, relatively little is understood about the cardiac fibroblast transformation. Here we are investigating the role of the CDK8 gene in the transformation of fibroblast into cardiac fibroblast. Our long-term goal is to determine if knockout or modification of CDK8 can inhibit the formation of cardiac fibroblasts and therefore serve as a potential drug target in the regulation of cardiac fibrosis.

## **96 - Sophia Vogeler**

Major: Biochemistry

Mentor: Charles Brenner (Biochemistry)

### *Vitamin supplementation during lactation benefits offspring development*

Nicotinamide Riboside (NR) is a form of Vitamin B3 that is a precursor to NAD,

which is necessary for the function of many enzymes in the body. Female metabolism, especially during lactation, has been studied very little. Here we examine the NAD levels in female mice during lactation after NR supplementation and see increased production of milk. Additionally, the milk from NR supplemented mothers contains more growth factors and metabolites. Increased expression of milk and fat producing genes in mothers is correlated to offspring that grow faster, have larger livers, and have a greater concentration of metabolic enzymes.

## **98 - Olivia von Gries**

Majors: Studio Art, Art History

Mentor: Veronica Rose Smith (Museum of Art)

### *#getsmART! - A Digital Art Series*

This research focuses on creating content for the #getsmART Digital Art Series, which is a part of the Legacies for Iowa Project. The Project aims to bring the University of Iowa Museum of Art's (UIMA) collection to the people of Iowa through a variety of formats including school visits, exhibitions, and online content. For the #getsmART Digital Art Series, the researcher connected objects and artists within the UIMA collection to holidays for every day of each month. I researched these artists, objects, and holidays and wrote 300- to 500-word posts that were published on various UIMA social media accounts and included in an online Art of the Day calendar on the UIMA website. The posts were written to be informative but took a more casual tone so everyone could be engaged by their content. The purpose of the Legacies for Iowa Project is to preserve the UIMA collection and create a legacy for the future of art in everyday life, which is partially accomplished by the #getsmART Digital Art Series. Overall, the objective of the #getsmART Digital Art Series is to make learning about artwork within the state of Iowa enjoyable and interesting.

## **100 - Jesse Weiss**

Major: Nursing

Mentor: Debra Brandt (Obstetrics & Gynecology)

### *Introducing e-consents in a Clinical Setting*

Preeclampsia is a condition that occurs after the 20th week of pregnancy. PE is characterized by high blood pressure. PE can cause organ damage, and even death, to mother and/or baby. Our lab has demonstrated that a protein, copeptin, is predictive of PE. To further study copeptin, our lab developed the Rule Out Preeclampsia Study (ROPE). The ROPE study recruits women who are admitted to Labor and Delivery (L&D) for evaluation of PE. However, women are admitted to the L&D around the clock and our lab does not have the available personnel to consent these women. Our project aimed to create an electronic informed consent (e-IC) that could be used for the ROPE study. The e-IC had to comply with the laws for research and be readily understood by

research participants. We asked women who had already been enrolled in one of our lab's studies, to test out the e-IC using an i-Pad. After completing the consent participants answered comprehension questions and also rated the feasibility of the consent. Our study demonstrated that the e-IC was well understood and easy to use by potential study participants. The next step will be to implement the e-IC in the ROPE study.

## **102 - Michaela Wiltgen**

Major: Nursing

Mentor: Debra Brandt (Obstetrics & Gynecology); Donna Santillan (Obstetrics & Gynecology)

### *Identifying risk factors for preeclampsia in subsequent pregnancies in women with a history of preeclampsia*

Preeclampsia (PE) is a condition that occurs in pregnancy characterized by high blood pressure that can lead to death of mother and baby. It has been reported that 60% of maternal deaths can be prevented. Studies have shown that nursing has the ability to influence the mortality rates by providing proactive and competent care. Part of proactive and competent care is to identify those women at the highest risk for PE. Multiple studies have identified a history of PE as a significant risk factor for PE in future pregnancies. We conducted a study with women enrolled in the Rule Out Preeclampsia (ROPE) study to identify risk factors most likely to lead to recurrent PE. A total of 116 women underwent evaluation to rule out PE. Demographic and risk factor data was obtained. PE developed in 88 of 116 women (75.6%). Risk factors were analyzed for the prediction of the development of PE in order of importance. Recognition of these risk factors will be of value to nurses when counseling and assessing women regarding PE.

## **104 - Arthur Wold**

Major: Anthropology

Mentor: James Enloe (Anthropology)

### *The Shellfish Informant: Using Bivalve Remains to Reconstruct Ancient Environments*

Bivalves are simple filter-feeding creatures that live on river and lake beds. They are used by ecologists to study the health of waterways, because they have specific preferences on where they "like" to live. Using these preferences, archaeologists can reconstruct ancient aquatic environments, although not many in North America have published papers on this topic. I apply information I have found in ecological research to better understand the ancient Iowa River, using the shellfish excavated from the site of Woodpecker Cave, which was inhabited by native people from about 650 to 1300 AD.

## **106 - Audrey Wood**

Major: Speech & Hearing Science

Mentor: Meredith Saletta (Communication Sciences & Disorders)

### *Beyond the Text: Using Supplemental Strategies to Support Reading Comprehension in Post-Secondary Students with Intellectual or Developmental Disabilities*

Traditionally, the education of individuals with intellectual and developmental disabilities (IDD) emphasizes functional independent living skills, which limits opportunities to develop age-appropriate reading comprehension skills. This has negative implications for this population's access to literature like print media and medical information, educational and vocational opportunities, and personal well-being. This study explored two possible methods of facilitating reading comprehension for adults with IDD in a postsecondary educational setting. First, existing research indicates that including different types of illustrations can support reading comprehension, so we alternately added colored photographs, black-and-white drawings, and a control nonsensical pattern to a passage. We tested participants' passage comprehension. In each of three separate iterations, we found no differences between conditions. Subsequently, we explored assistive technology utilizing the Universal Protocol for Accommodations in Reading (uPAR), a diagnostic tool that measures whether a student's comprehension improves when listening to a read-aloud accommodation. We investigated whether the same subject group could benefit from a text reader, in which a digitized voice reads text aloud, or audio of a recorded human voice. Subjects performed significantly better with both the human audio and the text reader than independently, suggesting value in pursuing assistive technology interventions.

## **108 - Cole Wymore**

Major: Human Physiology

### *Surveying Parents at a Health Fair About Attitudes and Practices Related to Helmet Use*

Background: ATV-related emergency department visits continue to be prevalent. Many of the treated injuries involved the head and neck. Current research studies have shown the importance of helmet use in both ATV's and bicycles, yet no current research has explored the relationship between helmet use for riders of these two vehicles. The objective of this pilot study, was to determine whether individuals believe helmet use is equally important during ATV and bicycle use, and discover what factors affect individual's beliefs and use of helmets. Methods: A survey was administered to people who attended the 2017 University of Iowa Health Fair who had at least one child under the age of 18 living in the home. Demographic information, frequency of helmet use, and factors that influenced helmet use, were collected. Results: Among those who rode ATV's, 68% responded they never wore a helmet; whereas those who rode bicycles, only 20% reported never wearing a helmet and 57%



reported always wearing a helmet. Interestingly, there was no difference in assigned level of important to helmet use for ATV's and bicycles. Conclusion: Evidence showed differences in helmet use between ATV and bicycle riders, but not in importance of helmet use.

### **110 - Yuanxi Zhang**

Majors: Accounting, Finance

Mentor: Cristi Gleason (Accounting)

#### *Does Failure to Timely Remediation of ICFR Weaknesses Lead to a Bigger Problem?*

The Enron Corporation scandal, which led to the company's bankruptcy, was striking news in 2002. Following Enron, an astonishing number of companies in the United States met similar accusations. In response to these scandals, Sarbanes-Oxley Act (SOX) was established to better protect investors in public companies. Although SOX is deemed to be a perfect solution by various parties and is gradually adopted by other countries around the world, it is still in the center of a drastic dispute over cost and benefit. Within 11 articles and subsections in SOX, Section 404 under Title IV is considered the most costly section to comply. This section requires management to disclose effectiveness of internal control on financial reporting (ICFR). While the audit fee paid to independent auditors is the largest share of company's compliance cost, past research papers prove a strong correlation between the audit fee and ICFR opinions. My research contributes to this topic by examining whether companies with ineffective ICFR opinions for three or more consecutive years have their audit fees increased constantly.

### **112 - Shiwen Zhou**

Majors: Psychology, Communication Studies

Mentor: Jodie Plumert (Psychological & Brain Sciences)

#### *Parent-child Conversations about Road-crossing Safety in a Virtual Environment*

Unintentional injury is one of the leading causes of childhood death and disability in the U.S., with traffic-related injuries making up a significant proportion of overall unintentional injuries in children. The current study examined the role of parents in preventing unintentional childhood injuries. Specifically, we investigated how parents and their 6-, 8-, 10-, and 12-year-old children talk about safety when engaged in a potentially risky action, crossing roads with traffic in an immersive virtual environment. We found that parents communicated differently with younger than older children. They suggested more gaps for crossing and were more likely to point out the chosen gap prior to its arrival with younger than older children (e.g., "let's take the next one"). Importantly, this strategy of pointing out the gap for crossing ahead of time predicted safer behavior when the pair actually crossed the road for all ages. This study provides new information for using parent-child conversations as a way to prevent injury in children.

