The 8th Annual Fall Undergraduate Research Festival

Wednesday, November 15, 2017
4:30pm-6:30pm

University of Iowa
University Capitol Centre
2nd 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 2017 Fall Undergraduate Research Festival is proud to showcase visual presentations focusing on the research and creative work performed by undergraduates at the University of Iowa. Presenters work in over **35 different departments**, representing sciences, arts, and humanities.

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***

Many thanks to all of the people who make FURF a possibility - all undergraduates presenting their research and creative work, all poster judges, all mentors of undergraduate researchers, the Office of the Provost, the Office of the Vice President for Research and Economic Development, and the ICRU Research Ambassadors.

Programs with full abstracts are available on the ICRU website.

**Upcoming ICRU Events and Opportunities**
- Excellence in Undergraduate Research Award - February 9, 2018
- Distinguished Mentor Award - February 23, 2018
- ICRU Research Fellows Applications Due - TBA March 2018
- Research in the Capitol - April 3, 2018
- Spring Undergraduate Research Festival (SURF) - April 18, 2018
4:30-5:30PM Presenters  
(odd numbers only)

1 - Jack Abrahamson  
Major: Finance, Business Analytics and Information Systems  
Mentor: Sam Melessa (Accounting)  

**Does the stock market overreact when firms miss earnings expectations?** 
Contrary to many traditional theory about companies' stock performance following an earnings miss, I predict that companies with large drops in stock price at their earnings announcement experience an increase in stock price during the following 60-day period. I find that on average there is an underreaction to earnings news regardless of the sign of the earnings news. However, I find evidence that for firms with (1) negative earnings news and (2) negative returns at the earnings announcement, the stock market overreacts to the earnings news, especially when the initial stock price decline is significant. That is, these company stocks are more likely to have a reversal and rebound during the post-earnings period.

3 - Uzair Ahmed  
Major: Human Physiology  
Mentor: Santiago Ortega (Neurology)  

**Contrast Induced Neurotoxicity Following Cerebral Diagnostic Angiogram**  
Contrast Induced Neurotoxicity, or CIN, is an uncommon neurological complication that occurs after the administration of contrast mediums. A contrast medium is a substance that is utilized to enhance medical imaging. In previously documented cases, CIN has been associated with iodine-rich intravascular contrast mediums, such as those used in cerebral and coronary angiography. Symptoms of CIN include headache, brain damage, vision loss, and confusion. The symptoms of CIN have been shown to spontaneously resolve within 48 hours. The purpose of this case report was to examine a clinical presentation of CIN following a cerebral diagnostic angiogram. An angiogram is an imaging technique which uses contrast agents to place emphasis on visualizing blood vessels. Retrospective clinical data was reviewed to better understand the
development of the disease within the hospital course. This patient was originally admitted to the University of Iowa Hospitals and Clinics for subarachnoid hemorrhage, and developed CIN symptoms shortly after administration of the contrast agent iopamidol. The patient recovered spontaneously within 48 hours. In conclusion, this case demonstrates various clinical aspects of a rare neurological complication which is not thoroughly understood. Health practitioners should be aware of this complication in order to predict outcomes.

5 - Nicholas Barry  
Major: Finance  
Mentor: Jeff Hart (Finance)  
*Hedge Fund Activism: A Review of Value Creation, Operational Efficiency, and Corporate Strategy in Targeted Firms*  
Shareholder activism, primarily initiated by hedge funds, has given rise to numerous debates regarding value creation in targeted firms. Do activists compromise a firm’s long-term performance for short-term profits? Are they actively engaging in practices that impact operational efficiency? Is there evidence that activists are positively supporting corporate governance and strategy? The answers to these questions can shape the economic, regulatory, and political environments that investors face. For this reason it is appropriate to analyze the results of such practices. This paper aims to assess the current activist landscape by considering both broad and specific activist tendencies brought forth by previous research. Despite management teams and media sources citing the value-destructive nature of activist intervention, academic research largely concludes the contrary. The majority of research suggests these practices are not value-destructive, but typically value-accretive, at a statistically significant level. Finally, I suggest future research attempt to quantify the impact of activist-influenced mergers and acquisitions on the acquiror.

7 - Joshua Berger  
Major: Economics; Political Science  
Mentor: William Reisinger (Political Science)  
*Legality and Corruption: Perception Bias in Government*  
Do people perceive corruption in leadership by projecting their own relationship to legality onto politicians? This poster examines how
people value legality and how this is projected onto views of politicians. In particular, we analyzed the influences on citizens’ perceptions of corruption within leadership is affected, using results from a 2015 survey conducted in Russia. We argue that those who value legality less project this onto their leadership, therefore perceiving more corruption in government. This is due to people thinking that politicians reflect the attitudes of the population and would have the same feelings on issues of corruption. Across all levels of corruption, we found a negative correlation between respondents’ legal consciousness and perceptions of corruption in government leadership. High confidence in a government that represents peoples’ attitudes seems to lead to transference of legality onto politicians.

9 - Anamar Blanes
Major: Chemistry
Mentor: Tori Forbes (Chemistry)

*Studying Actinide Chemistry in Conditions Relevant for Environmental Applications*

The actinide elements are the primary component within the nuclear fuel cycle, but these radioactive metals have proven to be problematic in the development of new ways to store spent nuclear material. The basic knowledge of how these radioactive metals interact with environmentally relevant organic molecules is lacking. The chemical and physical properties of the organic molecules play an important role in the way these organic molecules bind to the actinide element in aqueous environments. This information is vital to the understanding of how these radioactive elements move in the environment. This study focuses on the differences in how thorium(IV), uranium(VI), and neptunium(IV,V,VI) react. This is achieved through the study of crown ether compounds formed with these actinide elements. An experimental comparison between thorium (IV) and neptunium (IV), as well as a comparison between uranyl, [U(VI)O2]2+, and neptunyl, [Np(V,VI)O2]n+ (n=1,2), has been employed to build a more comprehensive knowledge of the interactions between these metals and organic molecules. Single crystal X-ray diffraction reveals information about the structures of the compounds synthesized in order to shed light on the subtle differences of actinide chemistry.
11 - Eleanor Burke  
Major: Psychology  
Mentors: Gary Gaeth (Marketing); Irwin Levin (Psychology)  

*Everyday and Consumer Decision-Making by Adults on the Autism Spectrum*

This research focuses on how adults with characteristics of Autism Spectrum Disorder make decisions differently than other adults. We used an internet survey platform to gather and screen a large group of participants, and found self-reported differences in how hard they find making everyday decisions, decisions about what to buy, and how to interact with people around them. Our findings so far also suggest that these differences are not only found in extreme clinical cases, but they range across all people to various degrees.

13 - Allison Buser  
Major: History  
Mentor: Stephen Warren (History)  

*The Andreae System: Defending Brewing Interests and Consolidating German-American Political Power in the 1914 Iowa State Elections*

Scholars of Iowa history have identified prohibition as one of the state’s most significant political issues during the nineteenth to early twentieth century. Throughout the 1914 Iowa elections, the Iowa Brewers Association fervently worked to elect anti-Prohibition candidates and prevent further “dry” legislation. The brewers followed a strict campaign plan in which the state’s German-American population played a central role. Iowa’s largest immigrant group during this time period, Germans vehemently opposed prohibition as beer was an integral part of their social customs and a symbol of their culture overall. Ethnic Germans dominated the brewing industry within the state. Using letters from the Iowa Brewers Association, articles from Iowa newspapers, and supporting secondary material, this paper will examine the campaign strategies employed by the Iowa Brewers Association during the 1914 state elections, the degree of success their anti-prohibition campaign attained, and the consolidation of German-American political power on the eve of World War I.

15 - Rachel Canon  
Major: Speech and Hearing Science
Hearing Device Limitations on Bicycle Riding in School Age Children

Many children who are deaf receive cochlear implants (CIs). This auditory prosthesis provides auditory access and facilitates social/communication development but may also limit participation in daily activities. Specifically, participation in bicycling may be affected due to the difficulty in wearing a helmet and CI simultaneously. This project aimed to investigate how bicycling habits of children with CIs compared to same-age hearing peers. This study was part of a collaborative project between researchers at the University of Iowa and Leiden University in the Netherlands. An online Qualtrics questionnaire was sent to parents of children with CIs and hearing children. Nineteen parents of 8 to 12-year-old children with CIs and 45 parents of hearing children completed the questionnaire. Our results indicated that children with CIs rode their bikes more often than hearing children but wore helmets less often. Children with CIs also began biking without training wheels at an older age. Fifty-eight percent of parents reported that they feel their child’s hearing loss poses a significant safety risk with cycling. The long-term goal of this study is to bring awareness to the effects of hearing loss on the quality of life for children and reduce participation restrictions for children who are deaf.

17 - Tori Cassady

Major: Biomedical Sciences
Mentor: Ronald Weigel (Surgery)

Potential Novel treatments for Anaplastic Thyroid Cancer

Anaplastic thyroid cancer (ATC) is the deadliest of all thyroid cancers. Standard cancer therapies have not been successful in comparison to other types of thyroid cancer, in part due to a larger cancer stem cell (CSC) population. CSCs are responsible for cancer recurrence, metastasis, and chemotherapy resistance in many types of cancer, including ATC. This exposes a serious deficiency in cancer therapies targeting CSCs. A treatment that targets mechanisms regulating CSCs could function as a “broad spectrum” cancer treatment that could be used for cancers with large stem-cell populations, which might be associated with lower toxicity and lower cost of treatment. This research focuses on a mechanism called the SUMO pathway, which plays a very large role in the maintenance of CSC populations in ATC as well as many other cancers with expanded CSC
populations. In our experiments, when we inhibited the SUMO pathway in ATC cells with specific small molecule drugs, the CSC population was significantly decreased. Discovery of novel therapies that target the SUMO pathway will revolutionize the treatment of ATC and other malignancies based on SUMOylation.

19 - Elizabeth Cha
Major: Human Physiology
Mentor: Eric J. Devor (Obstetrics and Gynecology)

The microRNA-503 cluster on the X-chromosome targets several cancer genes and is coordinately down-regulated in uterine cancer

MicroRNAs (miRNAs) are small molecules that regulate expression of thousands of genes. Studies of miRNAs in cancer have shown that miRNAs are abnormally expressed, which leads to abnormal expression of the genes they target. The miR-503 cluster, composed of six miRNAs, is located on the human X-chromosome. This location is very close to the gene encoding placenta-specific protein 1 (PLAC1) that we have shown to be significantly over-expressed in several gynecologic cancers. We examined expression of the miR-503 cluster in uterine tumors and found that all of the miRNAs are significantly under-expressed compared with benign tissue. Expression of the miRNAs is highly correlated, indicating that they are regulated from the same source. We have used a DNA editing technique on that source to down-regulate the entire cluster. In addition, validated targets of cluster members includes a number of important cancer genes. This suggests that suppression of miR-503 cluster members contributes to uterine cancer. We have further shown that decreased cluster expression in uterine cancer cells is due to a natural alteration of the promoter. Thus, we conclude that the miR-503 cluster is a potential therapeutic target in endometrial cancer and that the promoter holds the key to normalizing expression.

21 - Ioana Cherascu
Major: Neurobiology
Mentor: Arlene Drack (Ophthalmology and Visual Sciences)

Ocular Gene Therapy in RS1 Mice

Juvenile X-linked retinoschisis (JXLR) is a genetic disorder that causes reduced vision in affected individuals that cannot be improved with conventional methods. Because it is an X-linked disorder, the condition
affects mostly males. Affected individuals cannot produce the protein retinoschisin, which is necessary for normal eye function. The goal of this experiment was to test a gene therapy treatment that would replace the missing gene in a mouse model for the human condition JXLR. In this experiment, affected and unaffected mice were injected with a gene vector that would make the missing protein, with the hope that it would improve both structure and function of the eye. Our results showed that the treated mice had an improvement in eye structure and electrical activity of the eye. Though further tests are needed to solidify results, the use of a human vector means clinical trials are on the horizon.

23 - Akanksha Chilukuri
Major: Neuroscience and Biochemistry
Mentor: Hanna Stevens (Psychiatry)

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

Preeclampsia, a medical condition during pregnancy characterized by high blood pressure and protein in the urine, affects 4-10% of women in the United States. Past experiments have shown us that infusing pregnant mice with the hormone Vassopressin (AVP) is uniquely able to cause preeclampsia, smaller offspring size, and an increase in the inflammatory protein, IL-17. We were interested in testing whether IL-17 alone could recapitulate some of the offspring neurodevelopmental effects we find after AVP exposure. We found that infusing mice with IL-17, as with AVP, results in IL-17 not recapitulating adult weight changes due to AVP but recapitulating the intrauterine growth restriction and maternal proteinuria. We also looked at the brains of offspring born to mice with preeclampsia and found that the size of the cortex was smaller in volume at both embryonic day 18 and seven days after birth. Currently, we are measuring the morphology of a specific type of brain cell called microglia in mice born to mothers injected with both AVP and IL-17 compared to Saline and have found that there is an increase in microglia density in the AVP and IL-17 offspring and differences in the types of microglia between the three groups.

25 - Anna Crawford
Major: Nursing
Mentor: Stephanie Gilbertson-White
Effects of perceived social support on cancer symptoms in advanced cancer patients

Literature suggests that individuals with cancer who receive social support experience less distressing cancer symptoms, have fewer side effects related to cancer, lower levels of anxiety and depression, and report a greater quality of life. It is possible that cancer patients who receive social support from family, friends, and other networks, will have better health outcomes than those who do not. The purpose of this study was to explore the relationship between perceived social support of cancer patients and cancer outcomes, specifically how social support buffers severity and distress levels of cancer symptoms. This study uses the Buffering Hypothesis as a theoretical framework. Participant demographics, social support, and symptom severity were analyzed. Descriptive statistics were conducted to characterize the sample. Associations between social support and symptom severity were evaluated. N=10 patients with advanced cancer have participated to date. The sample is 60% male, mean age of 63 years, 100% white, and 70% currently married. Mean social support score and mean severity scores for 13 common cancer symptoms will be presented. Correlation statistics between social support and symptom severity will be evaluated. It is critical for clinicians to evaluate cancer patients' social support as it may impact symptom severity. Future research is needed to evaluate how changes in social support and symptom severity interact over time.

27 - Lin Di
Major: Biomedical Engineering
Mentor: James Ankrum (Biomedical Engineering)

Optimization of TNF-α Detection Assay for Measurement of Macrophages Suppression by Mesenchymal Stromal Cells

Inflammation is an important process that helps kill pathogens and clean up diseased tissue. However, in certain conditions, including diabetes or heart disease, excessive inflammation can damage healthy tissue. One type of white blood cell that causes inflammation in these diseases is macrophages. Our lab studies human cells called MSCs, which can prevent unwanted inflammation. To test the effectiveness of our MSCs on suppressing inflammatory macrophages, we optimized an assay for measurement of TNF-α, an inflammatory protein, which is secreted by macrophages. We hypothesized that if we could cause TNF-α to build up
inside macrophages instead of being secreted, we could detect this accumulation using light emitting antibodies that bind TNF-α. Therefore, based on the cell’s brightness, the quantity of TNF-α in the macrophages can be detected. One drug, which prevents proteins, like TNF-α, from being secreted, is Brefeldin A. We tested several factors including number of cells used, amount of Brefeldin A, length of time to allow TNF-α accumulation, amount of antibody used, and time to allow antibody-protein binding. We identified a set of parameters, which allowed us to detect inflammatory macrophages. In future experiments, we will test if addition of our MSCs suppresses production of TNF-α in macrophages.

29 - Abigail Dockum
Major: History and Sport Studies
Mentors: Thomas Oates (Sport Studies/Journalism); Alyssa Park (History) “Upon the Fields of Friendly Strife”: The Role of Sport at the Iowa Pre-Flight School, 1942-1945

During World War II, the United States Navy commissioned five Pre-Flight Schools - one of which was located on the University of Iowa campus - in order to physically and mentally prepare naval aviation cadets for combat. Operating on the preceding century’s belief that sport was a crucial means of developing tough, honorable men, the program placed a heavy emphasis on athletics. This paper investigates the nurturing of a sport-military ethos in the Navy Pre-Flight Program. Specifically, it focuses on the objectives of the athletic curriculum and the Iowa Pre-Flight School’s varsity football team, which allowed cadets and officers to play against other military and NCAA college teams. In order to explore why the Navy invested so many resources in athletic training in the midst of a global war, this paper draws on primary sources including naval administrative documents; correspondence from cadets; and articles from the Pre-Flight School, the University of Iowa, and the Iowa City community. By the time it closed, the Iowa Pre-Flight School had successfully trained 17,000 cadets, helped maintain the momentum of college sports, and reinforced existing beliefs about the value of sport in preparing men for war.

31 - Taylor Dunn
Major: Biology
Mentor: Arlene Drack (Ophthalmology)
The Electronegative ERG

Introduction: The electroretinogram (ERG) records the electrical activity of retinal cells in the back of the eye. If the retina is not properly functioning, different patterns of the ERG can help figure out what the problem is. One type of abnormal ERG is the electronegative ERG, which means the up going b-wave is lower than the down going a-wave.

Purpose: The reason for this project was to find out how many patients with electronegative ERGs were seen in our eye department and what their diagnoses were.

Methods: We looked at all ERGs performed at the University of Iowa Hospitals and Clinics from April 2001 through January 2017.

Results: Of 793 ERGs studied, 58 patients (7%) had electronegative ERGs. 38 patients (66%) with electronegative ERGs were males, while only 20 (34%) were female. 33 (56%) of the electronegative ERGs appeared to be since birth or inherited, while 7 (12%) were acquired. 18 (31%) of cases had no specific diagnosis; of these 11 were adults and 7 were children.

Conclusions: In summary, the electronegative ERG abnormality was more common in boys than girls during childhood, but was equally common in male and female adults. Most children had a genetic cause, and many were X-linked which explains why more boys were affected. Most adults had an acquired disease, meaning it developed later in life.

33 - Isabella Dutra
Major: Psychology
Mentor: Jan Wessel

Surprise Improves Action Stopping Through Inhibition

Motor inhibition is a cognitive control ability that allows humans to rapidly stop actions even after initiation (ex. rapidly stopping when crossing a street after realizing a car is approaching). In previous studies we found that surprising, task-unrelated sounds improve stopping success. In the current study, we investigated the neural mechanisms underlying this effect by testing whether these stopping improvements are due to a genuine surprise-related increase in motor inhibition.

35 - Abby Fronk
Major: Cellular and Developmental Biology
Mentor: Shujie Yang (Obstetrics and Gynecology)

A New Tool to Track Progesterone Receptor Expression by Red
Fluorescence in Endometrial Cancer Cells

Endometrial cancer is the most common female reproductive cancer. While there has been tremendous progress in the treatment of many cancers, the prognosis for endometrial cancer has actually worsened in the past few decades. The endometrium, the inner layer of the uterus, is extremely sensitive to hormone regulation. Estrogen promotes cell growth, while progesterone counteracts this effect to induce cell differentiation. Progesterone needs the progesterone receptor to function as a tumor suppressor, but PR is known to be low in endometrial cancer. Progesterone therapy has over 60 years of history in treating endometrial cancer with relatively good outcomes for low grade cases due to high PR expression, but the outcome is less promising for high grade and recurrent cases due to low PR expression. To track PR expression, we have devised a way to visualize it using a protein called mCherry. mCherry allows us to watch the PR expression after treatment of different drugs, dosages, and time intervals. Our plan is to use the mCherry cells to screen the FDA 1018 drug library to find better drugs to increase PR expression. Our project is focusing on restoring the functional PR expression to sensitize endometrial cancer to progesterone therapy.

37 - Salma Haider
Major: Psychology
Mentor: Hanna Stevens (Psychiatry)

Preeclampsia

Preeclampsia is a condition of pregnancy involving excessive secretion of a hormone called vasopressin (AVP), which results in elevated maternal blood pressure and risks to the pregnancy. Preeclampsia may alter brain growth and has been linked to increased rates of autism and learning disabilities in prenatally-exposed kids. We use a mouse model where pregnant females are infused with AVP throughout pregnancy to study the brains and behavior of offspring. This model imitates human preeclampsia’s effects and results in elevated blood pressure in the mice. We are also interested in examining infusion with IL-17, a pro-inflammatory cytokine that is elevated in preeclampsia and in individuals with disorders such as autism, is sufficient to induce the same abnormalities we see in offspring exposed to our model. We hypothesized that IL-17 would recapitulate the effects of prenatal AVP exposure on offspring. We tested offspring on various tasks including the
y-maze, three-chamber social test, and the elevated plus maze. Our results suggest that, while AVP-exposed animals have altered behavior across all three tasks, only social behavior is altered in IL-17-exposed mice. AVP exposure does not appear to alter brain size in offspring. Future steps include analyzing the adult brain for changes IL-17 exposure.

39 - Eric Hale  
Major: Finance  
Mentor: Amrita Nain (Finance)  
*Characteristics of Mergers & Acquisitions - A Survey on Value Creation, Synergies, and Market Cyclicality*

This paper identifies and explains pervasive themes in existing research surrounding mergers and acquisitions (M&A) and posits potential topics for future research. A primary goal of conducting an M&A process is to increase shareholder wealth. Thus, value creation lies at the heart of the debate surrounding the legitimacy of M&A as an avenue for corporate growth. Further, in order to generate positive returns for shareholders, the transaction must achieve synergies - either operational or financial. The sources and relative importance of these synergies will be explored. Historically, the M&A market has been cyclical. The paper aims to summarize causes for merger waves and their impact on shareholder returns through an extensive review of existing theoretical and empirical research on the mergers and acquisitions. Finally, because M&A transactions often include additional aspects (e.g. restructuring, bankruptcy, etc.), I suggest future research target the impact of any added complexities to an M&A transaction.

41 - Cameron Hauser  
Major: Human Physiology  
Mentor: Gordon Buchanan (Neurology)  
*Investigation into a role for norepinephrine-containing neurons in locus coeruleus in CO2-induced arousal from sleep*

CO2-induced arousal from sleep is a vital protective mechanism involved in multiple diseases including obstructive sleep apnea, sudden infant death syndrome, and sudden unexpected death in epilepsy. The brain signaling molecule serotonin (5-HT) plays a significant role in CO2-induced arousal, but the specific mechanisms are unknown. We
hypothesize that 5-HT neurons sensitive to changes in CO2 in the blood within the midbrain of the brainstem activate neurons in the locus coeruleus, which contain the signaling molecule norepinephrine (NE) and signal for arousal. Adult, male and female C57BL/6 mice were treated twice with neurotoxin specific for NE-containing neurons of the LC (DSP-4; 50 mg/kg i.p.; n = 3 per condition) or saline one week apart. Mice were instrumented for electrical recording from the brain and neck muscles to determine sleep state, allowed to recover, and challenged with room air (21% O2/79% N2) or CO2 (21% O2/79% N2; 7% CO2/21% O2/72% N2) during sleep to assess arousal latency. An increase in arousal latency in DSP-4 treated mice compared to controls would implicate LC NE-containing neurons as a downstream mediator of CO2-induced arousal.

43 - Morgan Hebert
Major: History
Mentor: Alyssa Park (History)

*Subjected to Science: the Children of the “Monster Study” and the Evolution of Modern Child Experimentation Standards*

My thesis topic covers the University of Iowa’s 1939 “Monster Study”, conducted by Mary Tudor under instruction by Wendell Johnson, and how this study reflects wider societal ideas regarding state orphans subjected to scientific experimentation. The so-called “Monster Study” was a speech pathology experiment to determine if stuttering is conditioned or genetic - children from an Iowa orphanage were subjected to negative reinforcement therapy in an attempt to induce a speech impediment. No correlation was discovered, but psychological upsets were recorded in the children. This research examines the ethical implications of the study based on public reaction to an eventual press release contrasted with the justifications made by researchers claiming that ethical limitations were different before the Nuremberg Trials and the later creation of the Belmont Act. Through examination of child experimentation before the Belmont Act, it becomes apparent that disenfranchised children on the edges of society (particularly orphans and mentally disabled children) were often used in early scientific experiments because of their lack of agency and adult protection. My thesis argues this point through the application of the Mary Tudor as a case more relevant to our university and also calls on similar cases of the decade.
**45 - Michael Kegel**  
Majors: Biochemistry; Horn Performance  
Mentors: Dale Abel (Internal Medicine); Eric Weatherford (Internal Medicine)  

*Loss of IRS1 in the adult heart does not protect against heart failure*

Diabetes and elevated insulin levels are major risk factors for the development of heart failure. We hypothesize that chronic high activation of insulin-related signal pathways is one underlying cause of this increased risk. Insulin receptor substrates (IRS1 and IRS2) are important intermediate messengers in the insulin signaling pathways. Our lab has previously demonstrated that deleting IRS1, but not IRS2, during the embryonic stage of development in mice slows down progression to heart failure after heart pressure overload. It is unknown whether the deletion of IRS1 protects against heart growth due to changes during development of the heart, or whether deleting IRS1 in adulthood would still protect against heart growth. An antibiotic-induced IRS1 deletion system was used for heart-specific deletion of IRS1 at 8 weeks old. We then subjected mice to transaortic constriction (TAC), a model of pressure overload. Echocardiography scans indicated that heart contractile function was similar in control and IRS1-deleted mice. Heart weight and lung weight were similar as well. Additionally, insulin-related signaling was not significantly different. Our results suggest that inducible deletion of IRS1 in adulthood does not protect against heart failure, and the protection shown previously is more likely due to changes during development of the heart.

**47 - Daniel Kelly**  
Major: Mechanical Engineering  
Mentor: Fatima Toor (Electrical and Computer Engineering)  

*The Effects of Multiscale Texturing on Light Absorption and Reflection in Silicon*

Solar cells are a promising alternative to the use of fossil fuels, but to become widely adopted they first need to become cheaper and more efficient. Silicon is a cost-efficient material for making solar cells, but it has a low level of light absorption. When light comes into contact with a silicon surface, some is absorbed, some is reflected, and some passes through the surface. To increase absorption, we focus on decreasing the reflection. This is typically done using a process called etching, which
makes very small scale textures on the surface of the silicon. These textures trap light and reduce reflection. Our group’s research explored combining micro-texturing, texturing on the level of millionths of meters, with nano-texturing, texturing on the level of billionths of meters, and its effects on the reflection of silicon. This combination is called multiscale texturing. We first etched silicon wafers to have only micro-textures, only nano-textures, and both nano- and micro-textures. We then measured the reflection of light of each of the differently textured samples. Our data show that multiscale texturing results in lower reflection of light compared to the reflection of just micro- or nano-textured silicon, and thus results in higher absorption.

49 - Paige Kies
Major: Microbiology
Mentor: Craig Ellermeier (Microbiology and Immunology)
Sensing Extracellular Stress: Key Features of the Anti-Sigma Factor RsiV in Sensing Lysozyme
Bacillus subtilis is a soil dwelling organism that uses alternative extracytoplasmic function (ECF) sigma factors that induce defense mechanisms against compounds threatening cellular membrane integrity. One such factor, sigmaV (V), is utilized by B. subtilis to induce resistance to lysozyme. In the absence of lysozyme the anti-sigma factor, RsiV, inhibits V activity by binding to V. We have shown that RsiV binds to lysozyme which allows for cleavage events that destroy RsiV and release V. Free V then binds RNA Polymerase, allowing for transcription of lysozyme resistance genes. In order to better understand how RsiV avoids cleavage in the absence of lysozyme, we defined which amino acids constitute the transmembrane domain of RsiV using a substituted cysteine accessibility method (SCAM). We also recently hypothesized that RsiV contains an amphipathic helix which helps protect RsiV from cleavage in the absence of lysozyme. Once lysozyme binds the amphipathic helix is proposed to undergo a structural change, revealing a cleavage site. We sought to define the domains of RsiV needed for protection from cleavage.

51 - Ariel Kopel
Major: Biochemistry
Mentor: Sheila Baker (Biochemistry)
Characterization of Cone Cells

Cone cells are very important to human vision, so when they are damaged by genetic mutations, this can cause sight to be lost. By using a mouse model, with only cones in their retina, to simulate these mutations we can try to better understand what these mutations are doing to the eye, how they make cone cells and retina look compared to normal eyes, and how they affect vision. To answer these questions we use a technique that uses light to view the retina, fluorescent markers that can highlight different proteins in the cone cells, and, finally, we use a swim test so we can observe whether or not the mice can see. With this data, we hope to continue working towards understand what the mutations are doing to better understand them and find a way to improve or restore the vision.

53 - Alison Kramer

Major: Geoscience
Mentor: Emily Finzel (Earth and Environmental Science)

Isopach Maps of the Pennsylvanian lower Cherokee group in Southeast Iowa

~300 million years ago, southeast Iowa may have been located on the margins of an ancient Amazon-scale river system resulting in a drastically different landscape than that of today. The goal of this research is to map and interpret the distribution of ancient river channels, which may have shaped landscapes across the continent during this time. This study uses geological data such as strip logs, core images, and core description logs that are stored within the Iowa Geological Survey’s online repositories (GeoSam and GeoCore). This study focuses on designing formation thickness maps, which are referred to as isopach maps that can be used to contour sedimentary deposit thicknesses of specific intervals within rock cores. Formation thickness data may contain gaps, which stem from relative amounts of ancient river erosion, times of non-deposition, and periods of recent glacial erosion. This research classifies those gaps in the rock record, providing constraints for isopach maps that display relative changes in thickness produced by ancient river erosion. Isopach maps are an important component of this project because they will guide further research of sediment transport through the midcontinent during this time.
55 - Kylie Krier
Major: Interdisciplinary Science
Mentor: Madeline Shea (Biochemistry)

*Two-Step Mechanism for Calmodulin Binding to Calcineurin: Pairing Greasy Hands and Gloves*

Calcineurin (CaN) is a serine/threonine phosphatase that is necessary for physiological processes such as heart development, skeletal muscle growth, T-cell activation, learning, and memory. CaN is also the target for immunosuppressant drugs. When these drugs are administered they can interfere with embryonic heart development and lead to birth defects. If we understand the mechanism of activation of CaN at the molecular level, we may be able to determine ways to help organ transplants be successful without endangering a developing infant.

57 - Renae Kurpius
Major: Chemical Engineering
Mentor: Julie Jessop (Chemical Engineering)

*Curing Dose Rate Effects: Predicting Polymer Properties in Electron Beam Polymerization*

Electron-beam (EB) curing has many benefits over traditional thermal curing such as lower energy requirements, faster cure time, and ability to cure thick and pigmented coatings. EB curing is commonly used for inks and coatings in the food packaging industry. However, use of EB curing is limited because there is a lack of knowledge on how physical properties of the coatings differ when they are run on a small-scale (slow energy delivery rate) versus a large industrial sized process (fast energy delivery rate). The properties of the coatings can change based on how quickly energy is delivered. Only certain formulations change properties based on the speed of energy delivery. To help understand what causes these changes, a series of five formulations were studied. Coatings were made by delivering energy at different rates, and conversion (the amount of sample that has cured) and glass transition temperature (the temperature at which the coating converts from hard and brittle, to soft and rubbery) were measured. Both properties are important to the overall performance of the coating. Results from this study led to the ability to predict if a formulation will change properties when energy delivery rate is changed.

59 - Yahang Li
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 a mitochondrial fusion protein called optic atrophy 1 (OPA-1) and it has been shown that insulin can influence mitochondrial metabolism of cardiomyocytes through OPA-1. However, it is not known how this process works in skeletal muscle. Through various tests, we found that 2 hours and 4 hours of insulin treatment can increase the amount of OPA-1 protein and can improve mitochondrial respiration in skeletal muscle cells. Mitochondrial respiration is also known as a set of metabolic reactions and processes requiring oxygen in mitochondria to transform energy stored in macronutrients to adenosine triphosphate (ATP), the common energy supporter in the cell. However, when we remove OPA-1, we found that mitochondrial respiration decreases and that the mitochondria have dampened metabolic responses to insulin in skeletal muscle cells.

61 - Mikaela Mallin
Majors: Biomedical Science; Dance
Mentor: Robert Cornell (Anatomy and Cell Biology)

Kctd15 and Tfap2 work together to co-regulate melanocyte development. Melanoma is the cancer of pigment-producing cells (melanocytes). Melanoma arises from mutations that happen while a melanocyte is developing. Many proteins monitor this process, so there are a lot of possibilities for mutations to happen. We must understand the role of each protein involved in order to achieve a holistic understanding of genetic causes of melanoma. A protein called Tfap2 has been shown to aid in melanocyte development. We believe that Tfap2 is actually very important in the developmental process. To find out, we asked what would happen if active Tfap2 is depleted during melanocyte development. By altering the amount of a second protein, Kctd15a, present in a cell, we can manipulate the activity, or “on/off” status of Tfap2, so that it can no longer help with melanocyte development. We performed an experiment to express extra Kctd15a in melanocytes and
found that it severely worsened their quality, suggesting that Tfap2 is important for melanocyte development. Other experiments show that Tfap2 and Kctd15 interact directly during development, leading us to believe that they co-regulate each other. Further investigation of this co-regulation is our future area of study.

63 - Kyle McCarthy
Major: Chemical Engineering
Mentor: Julie Jessop (Chemical Engineering)
Predicting Change in Films produced with EB-Curing

Many materials, like dental fillings, are solidified using some form of curing, like ultraviolet light. Electron Beam (EB) curing has seen application in printing and coatings but has been found to be inconsistent sometimes between a small test sample and a large production of the same material. Moving the curing up from a smaller to a larger scale often involves delivering the same amount of energy, by the electron beam, at a different speed or rate, the differences noticed in properties of the final product that are experienced when dose changes are called dose rate effects (DREs). DREs are especially problematic when moving to a large scale industrial process, because one bad curing batch can cause the company hundreds even thousands of dollars. Minor differences in the starting molecule have been shown to cause large differences in DREs experienced after curing. The number of hydrogens attached to two similar starting molecules was compared with the effects experienced by both molecules after cooling and used to determine what relationship is seen between number of removable hydrogens and DREs. Further testing should be done comparing other differences in the starting molecules makeup and those effects bringing even less uncertainty to EB scaling and application.

65 - Maisarah Mohd
Major: Psychology
Mentor: Wayne Jacobson (Office of the Provost)
In Their Own Words: Students' Most Significant Learning Experiences Related to Self-Awareness

To gain a better understanding of undergraduate experiences, the Student Experience in the Research University (SERU) asked, “What is one of the most meaningful learning experiences you have had at UI?” More
than 2400 students responded to this question, and the most frequent kinds of learning experience they described were related to connecting classroom learning to other contexts, increased self-awareness, and development of interpersonal skills. This poster will describe student responses related to increased self-awareness.

Our purpose in this study is to comprehend how and what students acknowledge about their self-awareness through their different kinds learning experience. To evaluate the students' comments and assure reliability, we identified themes in student responses, and also identified common characteristics within and across themes. We discovered that students are aware of their maturity, their own learning processes, motivations to change, and feelings. Also, students displayed their self-awareness through cultural competence and leadership in different types of learning experience. In conclusion, these findings have allowed us to recognize significant learning experiences at UI, which could be used to help students, staff, and faculty better understand the broader student learning and development that takes place alongside student learning in classes.

67 - Elissa Monteiro
Major: Psychology
Mentor: Molly Nikolas (Psychological and Brain Sciences)

*Does Executive Functioning Mediate Links Between Childhood Attention-Deficit Hyperactivity Disorder Symptoms and Substance Use and Related Problems in Adulthood?*

Previous research suggests that childhood attention deficit hyperactivity disorder (ADHD) is associated with an elevated risk of substance use and, as a result, increased risk for developing substance related problems in young adulthood. However, few studies have explored reasons why this relationship might exist. My project will use a multiple mediation model to determine whether deficits in executive functioning, a common symptom of ADHD, mediates this association between ADHD and substance use and related problems. Findings suggest that there is a direct relationship between ADHD and later substance use and related problems. Indirect effects were nonsignificant for neurocognitive measures of executive functioning, however, mediating effects emerged for self- and informant- ratings of executive function. The conclusions of this project could provide direction future research, allowing for further
exploration on the relationship between ADHD and substance use and related problems. This project has possible long-term implications for developing preventions to train children with ADHD on ways to avoid situations where they may be tempted to engage in risky behavior and how to impede harmful behaviors if children find themselves in a risky situation.

69 - Jane Nguyen
Major: Biochemistry
Mentor: Marc Wold (Biochemistry)

*Replication Protein A and the Regulation of DNA Repair*

Cancer is a disease caused by mutations in the genes that control cell growth. Most chemotherapies used to treat cancer, kill cancerous cells by causing DNA damage. Understanding the cellular processes that prevent mutations and how cells respond to DNA damage has the potential to improve current chemotherapy methods. Replication Protein A (RPA) is a protein essential for DNA repair. Deficiencies in RPA cause elevated mutation rates and DNA instability. Currently, the mechanisms that regulate RPA function are not fully understood. The goal of my studies is to define the interactions of a region within RPA that is thought to regulate DNA repair processes. My hypothesis is that this region interacts directly with DNA to help position RPA at sites of DNA damage and increase the efficiency of DNA repair. Understanding the regulation of RPA can lead to developing methods for modulating DNA repair to either reduce mutations or enhance the efficacy of chemotherapy.

71 - Chibuzo Nwakama
Major: Computer Science and Engineering
Mentor: Thomas Casavant (Center of Biostatistics and Computational Biology)

*Filling in the Gaps*

Machine Learning is a technique that creates robust models. These can be used to predict possible outcomes, given specific features. These models are created with a large amount of data, while it is split between training, cross variation, and testing data. The data acquired was open-source containing plenty of samples from patients from different hospitals. This sample will allow us to predict outcomes that a patient would possible has an appropriate treatment. However, even with a huge amount of
data, it lacks in consistency where there are missing features. These features are used to describe the data and make general predictions. This leads to an issue in creating a robust model is looking at the data and see nothing useful for a model. However, manipulating the data could lead to creating accurate models. Therefore, the data needs to change before a model can be created. Different software and techniques are implemented to see if there something more to the data that could not be seen previously. Looking at all sides of the picture can lead us to new trends in the data being analyzed.

73 - Chioma Onuigbo
Major: Psychology; Health and Human Physiology
Mentor: Teresa Treat (Psychological and Brain Sciences)

*Does Alcohol Consumption Increase Perceived Justifiability of Male-Initiated Unwanted Sexual Advances?*

Studies have demonstrated that sexual aggression is a factor in the lives of too many college students, and also that alcohol is playing a role in the perpetration of violence. Further research has worked to determine the pathways through which alcohol affects the likelihood of sexual aggression, and one mediator seems to be the misperception of a potential partner’s sexual interest that intoxication fosters. A measure has been developed called the Heterosocial Perception Survey, which presents participants with situations about a couple engaging in different levels of intimacy, and asks them to judge when one member of the couple is uncomfortable enough that the other member should stop making advances. The version that is currently being revised introduces different amounts of alcohol into the situations, with the couple drinking no alcohol, a small amount of alcohol, or a large amount of alcohol. Using this measure, along with tools gauging the participants drinking history, preference for casual sex, and their history with sexual aggression, we want to examine how perceptions about alcohol consumption affect when participants decide someone should stop making sexual advances.

75 - Pooja Patel
Major: Biomedical Sciences
Mentor: Sarit Smolikove (Biology)

*Analysis of DNA repair in mutant C. elegans*
Meiosis is an important event that occurs in all sexually reproducing organisms. It is the mechanism that enables the production of new organisms due to its production of gametes. The major event that takes place in meiosis, which helps increase the amount of diversity, is called crossing over. Crossing over is the exchange of DNA between homologous chromosomes. This exchange occurs through the breakage and repair of DNA. If the DNA is not repaired, then abnormalities can arise within the gamete, which can result in the formation of mutations or cancerous cells. The DNA is repaired through homologous recombination (HR). If HR has been deactivated, then non-homologous end-joining (NHEJ) can be used, but this often leads to the imperfect joining of the strands of DNA. NHEJ was the pathway examined in this experiment. In this experiment, Caenorhabditis elegans (C. elegans) is used as the model organism due to its easily manipulable genome and fast rate of reproduction. Three mutants were examined: rpa-2, polq-1, and ku70. Wild type was used as a control. These mutants were then observed under a microscope to view their chromosomes to see if the repair was present and whether or not the chromosomes were fragmented.

77 - Joann Pfeiffer
Major: Anthropology
Mentor: Matthew Hill (Anthropology)

Early Human Fire Creation
The creation of fire has been hypothesized to have occurred using the methods of wood-on-wood friction, stone percussion, or a combination of the two. Though friction methods are generally accepted by paleoanthropologists as the likelier of the possible methods, there is less potential for friction than for percussion to create fire accidentally. My research examines the possibility of non-intentional percussion fire origins through stone tool creation. I hypothesize that accidental fires created from percussion in flintknapping are a viable possibility for humans shift from fire-control to fire-creation. Methodology for this investigation included the use of Olduwan flint-knapping, the same technique used by humans at the accepted time of first fire creation. The sparks created in this manner were graded on a four-point scale to quantitatively determine the likelihood of accidental fire creation during flint-knapping. These experiments were performed on a limited number of rock types, and further study will need to be done on additional rock
types to rocks to determine if flint-knapping percussion fires are a viable possibility for the origin of human fire creation.

79 - Julia Poska  
Major: Journalism and Mass Communication  
Mentor: Donna Parsons (Music)  
'It's Only Rock 'N' Roll': Violence, Decadence, and the Mythic Status of the Rolling Stones  
The Rolling Stones have defined our modern understanding of rock ‘n’ roll. Throughout the 1960s, their rising influence over young adults threatened the conservative foundations of society. The establishment’s detestation thrilled the media, who fed the fire of youthful defiance by presenting Rolling Stones fandom as a form of protest. Over time the band became tangled in scandals that seemingly should have derailed their career. Instead, such events as the Redlands drug bust in February 1967, lead guitarist Brian Jones’s mysterious death in July 1969, and the Altamont free concert in December 1969 contributed to the mystique in the band’s story. Both British and American media outlets sensationalized the details of the drug bust, made a spectacle of Jones’s death, and accentuated the dark side of their performances through firsthand accounts of Altamont. This reportage created a lore that came to define the band. However, the mythology has exaggerated the notoriety of the Rolling Stones’ image. My research investigated how the press’s portrayal of the band helped solidify their rebellious image as the Rolling Stones came to embody the most forceful currents of the 1960s.

81 - Adisa Salesevic  
Major: Cell and Developmental Biology  
Mentor: Arlene Drack (Ophthalmology)  
Three blind mice-- See how they swim  
Bardet-Biedl syndrome (BBS) is a rare genetic disorder that is associated with blindness, obesity, and learning difficulties in individuals. Mice are often used to model the human BBS disease. The goal of this experiment was to test the functional vision in three different genetic subtypes of BBS mice (Bbs3-/-, Bbs4-/-, Bbs7-/-) and compare them to unaffected mice of the same age using a modified swim assay. The swim assay was
used to measure the time it took for the mice to swim to a platform that was above the water in random locations; being able to see the platform helps the mice find it faster. The mice were tested by swimming in normal light conditions for four days and in dark conditions for four days. It was predicted that the affected BBS mice would have slower swim times than the normal mice because of their poor vision. The experiment showed significantly longer swim times in the affected mice in comparison to the unaffected mice for all three genetic subtypes of BBS mice. This shows the effectiveness of this testing procedure to test the functional vision in mice. This will be useful to track the progression of disease and also to look at the effectiveness of various treatments.

83 - Olivia Sandvold  
Major: Biomedical Engineering  
Mentor: Mathews Jacob (Electrical and Computer Engineering)  
Cell-Sorting Algorithms for Single-Photon Calcium Ion Imaging  
As much as we understand about the human mind and how it works, we still have gaps in knowledge about how the brain itself is wired and how it can forge connections from the environment into a permanent memory or reflex. One technique for examining neuronal activity and neural networks is to use two photon calcium imaging; by placing an imaging endoscope into mice brain, we can observe neuron firing patterns with fluorescent markers. Various blind source separation algorithms have been developed to analyze these images taken from various outer regions of the brain. To observe deeper structures, such as the amygdala or hippocampus, researchers must use single photon imaging, which uses a smaller endoscope. Issues arise from this image modality, however, as there is more background noise from surrounding neurons and greater motion within the images themselves. To denoise and remove motion from the images, I use a variety of deblurring and registration algorithms in the computer software MATLAB to produce clearer images to process. From there, I use a combination of principal component analysis (PCA) and independent component analysis (ICA) to extract distinct neurons and their individual activations over a given time.

85 - Burhanudin Syed  
Major: Biomedical Engineering  
Mentor: Eric Taylor (Biochemistry)
Role of the MPC in Tumor Spheroid Growth and Formation

Pyruvate is an important fuel source for hepatocytes. Carbon from pyruvate can ultimately be used to produce energy, build lipids and sugar, and used to scavenge oxidants. Recently, the mitochondrial pyruvate carrier (MPC) was discovered as the transporter of pyruvate into the mitochondria. Subsequent research indicated that MPC expression is increased in hepatocellular carcinoma (HCC). We hypothesize that impairing the function of the MPC could diminish the development of hepatocellular carcinoma. To test this hypothesis, we deleted the MPC from Hepa1-6 mouse hepatoma cells using gene editing technology called CRISPR. The cells were also tagged with green fluorescent protein (GFP) to measure the efficiency of the CRISPR vectors. The cells were then grown as 3D spheroids to mimic tumor growth. Additionally, a drug blockings the MPC, UK5099, was used in our experiments, as well as a drug, BSO, inhibiting the synthesis of glutathione, a key cellular oxidative stress molecule. Initially, findings contradicted our hypothesis as impaired conditions with MPC-KO, BSO treatment, and UK treatment, lead to increased growth of the spheroids compared to WT and control conditions. However, subsequent investigations into the density of spheroid formation by cross-sectioning indicates denser spheroid formations in WT and control conditions. Further investigations to confirm UK5099 and BSO treatment effects on spheroid density are needed.

87 - Morgane Tatchoum
Major: Nursing
Mentor: Brinda Shetty (Iowa Biosciences Academy)

Investigating the Time Course of Fear Generalization
Organisms readily acquire fear conditioning, and this tends to generalize to stimuli that are merely related to those present during an initial fearful event, but are not themselves inherently fearful. When excessive, “overgeneralization” serves as a core feature of anxiety-related disorders, such as PTSD. Previous research has suggested that overgeneralization may actually increase with the passage of time. This has critical treatment implications, as individuals typically receive treatment weeks or months after experiencing an anxiety or fear-provoking event. Here, we investigate how the time interval between training and testing interacts with fear generalization in humans. This experiment took place
over two testing periods (one day, one week, or one month apart). Participants were shown seven circles of increasing size with the largest and smallest serving as cues for danger (CS+, associated with electric shock) or safety (CS-), respectively. Typically, individuals show increased fear to circles closest in size to the danger cue, and this response decreases as stimuli become more dissimilar following a generalization gradient. We hypothesized that fear generalization would increase as the interval between training and testing increased. A better characterization of the time course of fear generalization could help inform treatments for individuals suffering from anxiety-related disorders.

89 - Rebekah Truhan  
Major: Anthropology  
Mentor: James Enloe (Anthropology)  

*Mapping the Correlation between Habitation Sites and Burial Sites in the Woodland Period in Iowa.*  
This project is focused on looking at the possible correlation between burial sites and settlements when discussing the Woodland Period of Iowa’s Native American history, which lasted from 500 B.C. to 1000 A.D. This time period is separated into three sub time periods, the Early, Middle, and Late. This project will focus on how the placement of these sites change over time in these three time periods. This can give us a glimpse into how native tribes change over time socially and economically, as well as seeing the increase in the population by looking at the number of sites in each time period.

91 - Emma Weddle  
Major: Religious Studies  

*The Evolution of Shi‘i Political Theory*  
While today, Ayatollah Ruhollah Khomeini’s doctrine of wilayat al-faqih (guardianship of the jurist) may be seen as representative of Shi‘i political theory, early Imami Shi‘ism regarded temporal powers - including the caliphs - to be illegitimate rulers who usurped political authority from the house of the Prophet, the sole rightful heirs to leadership of the Muslim community. During the period of the Occultation, however, the Shi‘a were left without a functioning Imamate, and were thus forced to seek consolidation in issues of authority and legitimacy absent the guidance of an infallible political and religious leader. Through this consolidation, the
Imami Shi‘i clergy brought Shi‘i political doctrine from a decree of quietism to an understanding of the clergy as the rightful holders of political and religious authority in the absence of the Imam. This research utilizes texts from Al-Shaykh Al-Mufid, Al-Sharif Al-Murtada, Al-Shaykh Al-Tusi, Al-Muhaqqiq Al-Hilli, Al-‘Allama Al-Hilli, and Shaykh ‘Ali Al-Karaki - Shi‘i jurists from the 5th/11th century to the 10th/16th century - to further understand the evolution of political authority and legitimacy in Shi‘i thought.

93 - Xueying Zhao
Major: Psychology
Mentor: Edward Wasserman (Psychological and Brain Sciences)

Integrability and Separability of Visual Dimensions in the Pigeon

For animals to survive, it is crucial that they discriminate perilous factors from other similar, harmless situations and make the appropriate response. When animals have to discriminate between stimuli that vary along multiple dimensions, sometimes these dimensions interact with each other to affect perception. In one hand, humans perceive circle size and the orientation of its drawn diameter as separable; the judgment of one dimension was not affected by variations in the other. On the other, humans perceive the width and height of rectangles as integral; the judgment of one dimension was affected by variations in the other.

Following previous findings in non-human animals, we studied whether three dimensions, the height, width, and length of a cube, are processed by pigeons as integral or separable dimensions. Our results showed that some, but not all pigeons perceived the dimensions as integral. Furthermore, this finding was found to be relatively invariant across different discrimination tasks. These findings constitute the first demonstration of integrability along three visual dimensions in a non-human species. Future studies will survey human perception of these dimensions, and how integral and separable dimensions facilitate or impair different learning tasks.

95 - Ryder Fink
Major: Human Physiology
Mentor: Toshihiro Kitamoto (Anesthesia)

Genetic modifiers of a Drosophila model of sodium channelopathies
97 - Olivia Lewis  
Major: Nursing  
Mentor: Hanna Stevens (Psychiatry)  

*Effect of N-acetylcysteine on prenatally-stressed mouse placental redox biology*

Prenatal stress (PS), a risk factor for neuropsychiatric disorders like autism and schizophrenia in offspring, may influence cellular function in utero through oxidative stress, an imbalance of reactive molecules. We examined the effect of one day of PS on placental gene expression on the antioxidant genes glutathione peroxidase (GPx) and thioredoxin reductase (Trx) in embryonic mice. Some were exposed to the antioxidant N-acetylcysteine (NAC) prior to the stress conditions, while some were only exposed to the stress conditions without exposure to NAC. NAC plays a role in glutathione synthesis. We wanted to see how changes in cellular function related to PS may arise initially, as the effects of PS must be passed from mother to offspring through the placenta, and how these effects change with exposure to NAC. In non-NAC exposed animals, GPx increased in males while Trx increased in both males and females. NAC increased GPx expression and decreased Trx gene expression overall, as compared to non-NAC expression. The NAC-induced upregulation in GPx and downregulation in Trx indicates that NAC may increase production of glutathione which eliminates the need for the high levels of expression of Trx seen in non-NAC animals.

99 - Sarah Steuve  
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 confirmed that the mice had a reduced level of UCP-2 in their platelets. Platelet activation
studies revealed that male mice without UCP-2 in their platelets showed less activation than those with UCP-2. A model of deep vein thrombosis showed that mice without UCP-2 were less likely to form blood clots than those with UCP-2. These data support the conclusion that reduction of UCP-2 levels in platelets reduces platelet activation and blood clotting.

5:30-6:30 Presenters (even numbers only)

2 - Serif Bacevac
Major: Health and Human Physiology
Mentor: Antentor Hinton (Internal Medicine)

Deletion of OPA-1 alters calcium homeostasis and leads to an increase in MCU protein levels

Optic atrophy 1 (Opa-1) is the mitochondrial GTPase responsible for inner membrane fusion and mediates cristae remodeling. It has been shown that loss of cristae morphology disrupts calcium levels. Here, we examined if there is a link between calcium levels and calcium associated proteins and FGF-21 protein levels after the deletion of OPA-1. We were able to find that after OPA-1 is deleted from skeletal muscle cells, a protein called fibroblast growth factor 21 (FGF-21) increases, ER stress markers, also known as specialized proteins that tell the cell there are too many proteins being made, and that there was an increase in mitochondrial calcium uniporter (MCU), a protein that allows calcium to be pumped inside mitochondria. We also recapitulated these findings in a skeletal muscle specific mouse model lacking OPA-1. Next, we were able to look at calcium levels using a specialized plate reader called FlexStation and we found that inhibition of MCU in cells that were deficient in OPA-1 compared to their control cells had increased calcium levels in the cytoplasm. Together we found that OPA-1 may be important for regulating calcium levels and that this maybe the intracellular signaling that mediates the increase in FGF-21 after OPA-1 loss.
**4 - Evan Bittner**  
Major: History, English  
Mentor: Colin Gordon (History)  
*The Socialization of Socialism: Leftist Periodicals in Iowa, 1900-1920*

This thesis surveys local socialist periodicals published and circulated in Iowa and their connection to the larger-circulation periodicals being published in the Midwestern United States from 1900 to 1920. This paper examines the role of the periodical in socialist movements of this time and in nineteenth-century US socialist movements. While these periodicals primarily functioned as print-vessels for socialist rhetoric and the promotion of party platforms, they also served many non-political ends, such as providing entertainment for readers and advertising space for local, sympathetic businesses, and created a community of like-minded individuals centered around a particular periodical. This thesis will draw distinctions between larger, wider-circulation papers such as the ISR and local socialist periodicals, and how this difference mirrors the fractured nature of the larger US socialist movement. It will also detail the decline of large-circulation, Midwestern periodicals following WWI and the perseverance of Iowa papers well past 1920. By analyzing their periodicals, this paper hopes to analyze the integration of socialist ideas in communities that printed a socialist periodical, by examining local elections of the time and histories of local socialist parties. It argues that socialist periodicals played a significant role in developing and maintaining Iowa’s socialist communities.

**6 - Audrey Brock**  
Major: History  
Mentor: Douglas Baynton (History)  
*“She’s Lost Control”: Portrayals of Mentally Ill Women in Mid-20th Century Popular Culture*

Mental illness has always been a common topic in American popular culture, but throughout the mid-20th century, as women gained a greater platform for telling their stories, popular media portrayals of women’s struggles with mental illness changed to become more sympathetic to and representative of women’s experiences. At this time, that accuracy and sensitivity was paramount; most women did not have access to mental healthcare resources and it was still a taboo subject, so their
understanding of mental illness came from the media they consumed. My thesis explores the historical and cultural events which brought this change about, how women’s portrayals of mental illness differed from men’s, and how all these portrayals compared with women’s real-life experiences like undergoing mental health treatments, raising a family while dealing with mental illness and navigating the complex struggle of being both a woman and a mentally ill person. I’ll be looking at the biographies of famous women from this period who struggled with mental illness, as well as four movies, two novels, and one song, all of which achieved notoriety in the mid-20th century and informed popular conceptions about women with mental illnesses.

8 - Ashley Buksa
Major: Health and Human Physiology; Health Promotion
Mentor: Jodie Plumert (Psychology)

_Better Close than Far: How Young Children Code Relative Proximity to a Landmark_

Individuals can use location to differentiate between two objects, for example judging one cup as closer to a sink than another. The development of this skill, which requires making judgments of relative proximity (i.e., determining which of two objects is closer to a landmark), is not well understood because most previous research focused on how children code the proximity of a single object to a landmark. The current study examined how memory for relative proximity develops in early childhood. Sixteen 24-month-olds and sixteen 30-month-olds watched an experimenter hide two different toys in two identical containers placed 2 and 12 inches from a landmark. Four different trial types varied the placement of the target and non-target containers to the landmark. After a 10-second delay, children searched for the target toy. We found that both age groups successfully found the target toy when it was close to the landmark, but only search successfully on one of two trial types when it was far from the landmark. These results demonstrate that young children are typically better at remembering locations close rather than far from a landmark, and thus provide evidence for developmental change in the ability to code spatial relations involving relative proximity.

10 - Mackenzie Cross & Katelyn Kelly
Major: Anthropology & Anthropology; Psychology
During the summer, University of Iowa students ventured to the Coralville Reservoir to excavate a site called Woodpecker Cave. This site dates from the Archaic Period (7,000 or 8,000 BC) through the late Woodland Period (around 400 to 950 AD). Students excavated and recorded artifacts such as: animal bones, ceramic fragments, stone tools and stone tool fragments (lithics), burned rock (referred to as fire-cracked rock or FCR), and shell. The goal of Woodpecker Cave excavations wasn’t just to discover artifacts, but rather to record the location of each artifact and understand where each artifact was located compared to another artifact. At each level of excavation, a photo was taken. We pieced each of these photos together to form an image of the entire excavation site at a certain level. These mosaics show the location of each artifact in relation to each other and, therefore, allow us to better understand the layout of the site.

12 - Jacob Foubert
Major: Anthropology
Mentor: James Enloe (Anthropology)

Analysis of animal remains that prehistoric humans interacted with gives us direct evidence of a subsistence base of archaeological occupation. Woodpecker Cave is a Late Woodland rockshelter site used by the University of Iowa as a field school for student education. The site was first excavated by Warren Caldwell in 1956. In the years since, the university began excavations in 2012 with Jim Enloe supervising, students have expanded the excavation area horizontally leading to portions of levels being excavated throughout different years. The site is excavated by ten centimeters increments starting at the datum representing ground level from the 1956 excavation. To present, each year’s animal remains have been examined by numerous students for annual reports submitted to the Army Corps of Engineers. For research purposes, we chose to look at level five, excavated during three different seasons. Level five appears to have been occupied by prehistoric humans based on the presence of a fire pit feature, and various other classes of artifacts. This analysis combines several years’ collections of animal bones from level five to give
an integrated, coherent faunal assemblage. The results will be viewed in the context of the evident spatial structure of the level for interpretation.

14 - Seif El Deen Gaber
Major: Analytical Economics, Pre-Med Track

Teaching Countries to Fish
As the saying goes, give a man a fish, and you feed him for a day. Teach a man to fish and you feed him for a lifetime. The Keynes Project, focuses on the effect of “teaching countries to fish” instead of simply providing them with aid that has little to no long term effect. Or in other words, rather than funding programs that may potentially prolong the suffering that exists in a given nation, we intend to effectively allocate foreign aid in order to stimulate the country’s economy and allow GDP to continue rising even after foreign aid is withdrawn. We hope to do so by narrowing our focal point on job production and training. But the process by which underdeveloped countries become stabilized is essentially no different from the way leading nations continue to grow steadily and maintain power. This is an idea worth spreading because, as a nation, we are almost completely wasting our time, money, and energy on a foreign aid system that doesn’t work. Not only would this change the lives of those living in struggling countries, it would have a positive effect on residents of developed nations as well.

16 - Rebekah Gansemer
Majors: Anthropology; History
Mentor: James Giblin (History)

In November 1965, the colony of Southern Rhodesia unilaterally declared themselves independent from Britain. It was an extreme response to the British directive that there would be “no independence before majority rule.” The ruling political party during this time, the Rhodesian Front, feared the consequences of what relinquishing power would mean. Born out of imperialist beliefs and anti-communist sentiment, the ultra-conservative political party sought to maintain minority rule and asserted that Rhodesia would “never in a thousand years” be ruled by the Black majority. While many White Africans were in support of minority rule, my paper will focus on efforts of select groups within the White African community who attempted to subvert the
Rhodesian-Front led government and initiate majority rule within what would become the state of Zimbabwe. I am looking specifically at two groups of people who have different philosophies yet share the same goal of majority rule. My paper will focus on a notable member from each group. The people discussed will be Judith Todd, an equal rights activist and daughter of a former Prime Minister of Southern Rhodesia, and Bishop Donal Lamont, an Irish missionary who defied an emergency governmental order and assisted the Black resistance.

18 - Cindy Garcia
Majors: History; Journalism and Mass Communication
Mentor: Mariola Espinosa (History); Alyssa Park (History)

African American and Latino Interactions in Davenport

Although there is existing research on Latino and African American communities in Iowa, little has been written on the interactions between these two communities. If one finds relevant research, the interactions studied are often within the context of large cities. Therefore, this study will focus on the city of Davenport in Iowa. Although Latinos and African Americans usually lived in different neighborhoods, there was still a significant amount of neutral, if not friendly, interactions between them. Davenport was also the site of intense activism during the 1960s. Latinos and African Americans formed their own organizations, but were also brought together by those with a religious focus. This study will mostly analyze oral interviews with Latino members of LULAC. Particular emphasis will be placed on Ernest Rodriguez, a biracial leader in the Latino community. Rodriguez's career and writings show a willingness and yearning to unite both communities in the fight for civil rights in Davenport. An analysis of this history reveals: 1) Latinos and African Americans in Davenport often worked together informally, 2) formal collaborations took place under the umbrella of religious organizations, and 3) attempts to formally unite both communities without a religious focus were indirectly discouraged.

20 - Hannah Gulick
Major: Astronomy and Physics; English Creative Writing
Mentor: Philip Kaaret (Physics and Astronomy)

HaloSat - X-Ray Astronomy of the Hot Galactic Halo

Everything visible in the universe is made up of normal, luminous matter
known as baryonic matter. This baryonic matter makes up galaxies, the Earth, trees, and even your friends and family. It is the basis of astronomical and physical observations, but it poses a large problem for astronomers, as half of it is missing. From theoretical predictions of the percentage of luminous matter present in the early universe, astronomers can easily see that the observed percentage does not match up; fifty percent of this matter is just lost. HaloSat is a NASA funded cube satellite that will focus on finding this missing fifty percent. Led by Dr. Philip Kaaret of the University of Iowa, HaloSat will launch in the spring of 2018. From there, it will go into low earth orbit and point toward the galactic center to look for x-ray emission coming from extremely hot matter. With some data analysis, HaloSat will provide estimates of the percentage of total universal gas and dust contained within the halos of galaxies, yielding a definitive scientific answer; either there is an extended halo around the Milky Way Galaxy accounting for an enormous amount of missing matter, or there is not.

22 - Elise Heitmann & Arthur Wold
Major: Anthropology & Anthropology
Mentor: James Enloe (Anthropology)

What's for Dinner?: Molluskan Faunal Remains at Woodpecker Cave
Mussel shell at Woodpecker Cave, a late woodland rock shelter site in Johnson County, gives us evidence that mussels were a major part of the late woodland diet in the Woodpecker area. Analyses of these shells and their distribution can help us determine site layout, food-related behaviors, and how many people could have been living at the site at any given time. Molluskan remains are the most abundant artifact excavated at Woodpecker Cave, but are also the most fragile. The majority of shell from the site are small fragments with no identifying factors, but a fair amount are fragments with hinges that allow the species to be determined. Our analyses of the molluskan remains excavated from Woodpecker in the field season of 2017 will include the identification of the shells with hinges, the overall weight and the distribution of shell density within the site, the analysis of the few shells excavated that have holes drilled or punctured in them, and the variation of species popularity. Alone, shell is not particularly informative, but the distribution of shell within the site when mapped out with the other
artifacts can tell us what areas were used for food-preparation, cooking, and eating.

24 - Rana Hewezi  
Major: Biomedical Sciences  
Mentor: Renata Pereira (Internal Medicine)  

Adipose Tissue OPA1 Is Required for Proper Adaptive Thermogenesis in Mice

Mitochondria are the powerhouse of the cell. In a special subset of fat cells called brown fat, mitochondria is specialized in generating heat to maintain body temperature in response to cold. Here, we investigated the role of a protein present in the mitochondria, called optic atrophy 1 (OPA1) on the ability of the mice to properly respond to a cold stress. For that, we generated mice that lacked this protein specifically in fat cells (OPA1 KO). In a non-stressed environment, mice with the OPA1 deletion had similar body weight but increased brown fat (BAT) mass while white fat (WAT) was reduced. Protein involved in mitochondrial function, namely complexes I and III were decreased in fat cells, revealing impaired mitochondrial function. OPA1 KO mice had lower core body temperature after 3 days of a cold exposure. This impaired adaptation to cold correlated with reduced levels of UCP1, a protein that plays a key role in converting energy into heat in BAT and brown adipocytes, which are activated in WAT upon cold stress. Total fat mass was reduced in KO mice at thermoneutral conditions, but it was not further reduced after a cold exposure. Altogether, these data suggest that OPA1 deletion in fat tissue induces changes in brown fat function, impairing the body ability to generate heat in response to cold.

26 - Claire Jacobson  
Majors: French; Arabic  
Mentor: Natasa Durovicova (International Writing Program)  

Arabic at IWP: A History

Over the past fifty years, the International Writing Program has brought almost 1500 writers from nearly 150 countries to Iowa City for its annual Fall Residency. Of those writers, about 80 have been Arabophone writers from 13 countries around the Middle East and North Africa. This is an archival research project into the social and political contexts and effects of Arabophone writers participating in the Fall Residency, from Egyptian
writer Ali Shalash in 1976 until the present day, examining trends and making inferences about the Arabophone literary scene relative to the history of IWP. Important to the research are not only internal program records, including the writers’ original creative work and translations, but also documents in the IWP archives, maps of geographical data from the UI Libraries, administrative documents from the Paul Engle Papers in Special Collections and from the program’s electronic records since 2000, testimonials from past Arabophone participants in the program, and bibliographic information from UI sources.

28 - Camille Jaime
Majors: Cell Biology; Microbiology
Mentor: Tina Tootle (Anatomy and Cell Biology)

Determining the functions of nuclear actin

Actin is one of the most abundant proteins found in the cell. It has critical roles in maintaining cell shape, helping cells to move and divide, and is essential for life. The functions of this protein largely come from its actions in the cell’s cytoplasm. However, actin also localizes to a subcellular compartment, the nucleus. The nucleus is responsible for housing the cell’s genetic material (chromatin). While the function of nuclear actin is elusive, we have found that as fruit fly (Drosophila) egg chambers develop, the frequency of abundant nuclear actin changes. Thus, actin’s localization is dynamic during development and is likely functionally important. Our ultimate goal is to understand the function of actin in the nucleus. Specifically, we hypothesize that nuclear actin alters chromatin organization, controlling whether specific genes are turned on or off. To examine this, we take advantage of position effect variegation (PEV), which utilizes Drosophila eye color as a read-out of chromatin organization. When we alter actin localization we observe changes in eye color, and therefore chromatin organization. These studies give us insight into function of nuclear actin in fruit flies, but ultimately informs us what actin may be doing in the nucleus of any cell.

30 - Nicholas Jones
Major: Physics and Astronomy
Mentor: Cornelia Lang (Physics and Astronomy)

Radio Data Calibration from the Galactic Center Radio Arc

The center of the Milky Way Galaxy is home to a number of phenomena
not seen elsewhere in the galaxy. One example is a region known as the Radio Arc, consisting of long filaments that shine brightly at radio frequencies. The Radio Arc has not been studied in detail since its discovery in 1987 by Morris and Yusef-Zadeh. Recent observations taken with the Very Large Array, a radio telescope interferometer in New Mexico, are the highest resolution observation ever made of the Radio Arc. We hope to gain some insight into the origin and nature of the filamentary structure in this region. I present work on the calibration of this high resolution data. I apply a "self-calibration" technique in order to increase the signal-to-noise ratio of Radio Arc images. The result of this technique is increased data quality, data with which detailed analysis of the Radio Arc can be done. A number of compact sources are also found in the region, which may also be investigated.

32 - Alethea Kapolas
Major: Environmental Science
Mentor: Emily Finzel (Earth and Environmental Sciences)
Sandstone:shale ratio maps of Pennsylvanian lower Cherokee group in southeast Iowa

This research aims to map the distribution of ~300 million year old river channel and floodplain deposits that may have shaped the ancient landscape of southeastern Iowa. This ancient landscape is thought to have been on the margins of an Amazon-scale river system. Geological data collected for this study consist of digital records of rock cores that are stored via an online database called GeoSam, which was compiled by the Iowa Geological Survey (IGS). A combination of strip logs, core images, and core description logs are used to estimate the relative proportions of sandstone and mudstone that occur within these rock cores. Percentages of sandstone and mudstone are displayed as pie charts at each map location, which are used to make inferences about potential ancient river channel locations. Sandstone deposits are interpreted as ancient river channels, whereas mudstone deposits represent ancient floodplains. This interpretation is used to estimate the locations of potential channels. These maps provide “snapshots” of southeastern Iowa’s landscape ~300 million years ago. This research project is important because these maps will be used to guide further research by providing constraints to the locations and movement of the ancient stream channels through time.
**Fidelity Monitoring in Symptom Management Intervention for Advanced Cancer Patients**

**Introduction:** Fidelity monitoring is a critical quality assurance procedure used to ensure similar and consistent delivery of an intervention to all research participants. For behavioral interventions, researchers should monitor for fidelity to make sure participants receive the same level of treatment and that all clinicians are providing the intervention in the same manner. Oncology Associated Symptoms & Individualized Strategies (OASIS) is a web-based behavioral symptom management intervention targeting patients with advanced cancer. Clinicians meet weekly via videoconference with patients to discuss symptom management. The clinicians use the Representational Approach (RA) to Patient Education as a guideline for framing their discussions with the goal to help patients change/improve their symptom management behaviors.

**Purpose & Methods:** The purpose of this study is to describe the fidelity monitoring procedures developed for OASIS and to assess the “dose” of the intervention that was delivered to participants. A nineteen item checklist was developed based on RA and OASIS protocol requirements for weekly sessions. Fourteen items were RA specific items and five items were intervention specific items tasks as well as general communication skills.

**Analysis:** Each clinician listened to visit recording of another clinic and scored the visit. The checklist response scores were 1=addressed, 0.5=partially addressed, and 0=not addressed or N/V=no visit. The lowest possible score per visit was 0 and 19 the highest scores possible. Scoring a minimum of 8 was considered acceptable. Individual visit scores were calculated for seven patients over the course of eight visits. Cumulative and average scores across the eight visits were calculated per participant. Average visit scores across patients were calculated.

**Results:** The individual patient score ranged from 4.5 to 13. The average score ranged from 7 to 10.3 with a total average of 8.59. The visit score ranged from 7.5 to 10.5, and the total average was 8.89. It is not known if certain items are routinely delivered or frequently missed during the
Conclusion: Fidelity monitoring is a critical component of behavioral interventions. Clinicians were generally consistent in meeting the intervention fidelity criteria and adhering to the RA framework. However, not every participant received the minimum expected components at every visit. Future work is needed to determine if certain aspects of the intervention are being routinely missed/skipped, and if so for what reason.

36 - Virginia Lamas Meza
Major: Environmental Chemistry
Mentor: Hans-Joachim Lehmler (Occupational and Environmental Health)

Analysis of an Environmental Contaminant in Transgenic Mice Brain
"Polychlorinated Biphenyls (PCBs) are environmental contaminants that are associated with adverse human health effects, including cancer and neurotoxicity. In this project, we hypothesize that knockout of certain family of enzymes could affect the metabolization of the PCBs. To test our hypothesis, we used one Polychlorinated Biphenyls (PCB136) as model compound to do research on the cytochrome P450 knockout mice. After the studied mice were exposed to PCB 136 for 3 days, the tissues were collected and analyzed for determination of PCB 136 and its metabolites levels. The PCBs and metabolites in brain tissue were extracted and analyzed on gas chromatography coupled with electron capture detector (GC-µECD). Here we are report the study results of the brain tissue. Our result showed that no hydroxylated metabolites were determined in brain tissues, and the parent compound, PCB 136, levels are similar among the three P450 isomers knockout, and PCB 136 levels in knockout mice is lower than that in authentic control mice. The results demonstrate that the individual P450 isoforms knockout, comparing with authentic mice, affects the PCB levels in brain tissue, but showed no significant difference among different isomer knockout."

38 - Rikki Laser
Major: Neuroscience
Mentors: Mark Blumberg (Psychology and Biology); Cassandra Coleman (Psychology)

Twitching may 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.

40 - Katie Lillis  
Majors: Human Physiology; Psychology  
Mentors: Ryan LaLumiere (Psychological and Brain Sciences); Vicky Ewald (Neuroscience)  
*Stimulation of the infralimbic cortex decreases cocaine-seeking behavior in rats*

Cocaine addiction continues to be a widespread issue that impacts its users and those close to them. While there are many programs aimed at discontinuing drug use, it is common to see relapses occur after periods of abstinence. Our lab studies the neurobiology of addiction using a rat model, especially as it relates to relapse after a period of extinction. Previous research has found an area of the brain, known as the infralimbic cortex (IL), that suppresses cocaine-seeking behaviors. Our lab uses lasers to activate light-sensitive viruses injected in the IL, allowing researchers to have more precise control over the area, a technique known as optogenetics. Through self-administration, rats learned that pressing an active lever results in an infusion of cocaine. This was followed by a period of extinction-withdrawal, where nothing happens following a lever press. Then the IL was activated, and the rats were then given cues and cocaine injections to model a relapse. There was a significant decrease in lever presses when the IL was activated as opposed to when it was not stimulated. This indicates the use of optogenetics to activate the IL can decrease cocaine-seeking behavior and highlight the importance of the rats experiencing extinction training.

42 - Jacob Locher  
Major: Chemistry  
Mentor: Ned Bowden (Chemistry)
Purification of Fish Oil with Polymers

This experiment is designed to facilitate the separation of singular oils from natural oil mixtures, such as corn oil and fish oil. These natural oils are mixtures of components, which are often desired in their pure form for consumption (such as EPA and DHA, the active ingredients of fish oil health supplements) or reactions (which require pure reactants). This research utilizes a polymer that has been shown to separate fish oil, and aims for the purification of large volumes of oil. This can be achieved via large surface area (increasing contact with solution), thin film membranes (to increase speed of diffusion through the membrane), and optimizing the polymer pore size to allow the desired solute to cross the membrane.

44 - Alex Marti
Majors: Health and Human Physiology; Chinese
Mentor: Dale Abel (Internal Medicine)

Glucose Metabolism is Required for Platelet Hyperactivation in a Mouse Model of Type 1 Diabetes

Type I diabetes mellitus (T1DM) is a condition where the liver little to no insulin, a hormone that allows glucose to enter cells. T1DM is accompanied by increased concentrations of glucose the bloodstream (hyperglycemia), and in vitro analysis of platelets demonstrates that low glucose reduces platelet activation while hyperglycemic conditions increase platelet activation. We therefore hypothesized that hyperglycemia increases platelet glucose utilization, which directly increases platelet activation to promote thrombosis. Platelets were isolated from mice with T1DM and revealed increased glucose uptake and glycolysis in concert with induction of glucose transporter 3(GLUT3), a protein in the membrane of cells that facilitates the movement of glucose across the membrane. Functionally, platelets from these mice exhibited increased activation following administration of platelet activators. In contrast, platelets unable to utilize glucose failed to increase activation in hyperglycemic mice. In addition, diabetic mice displayed decreased survival when blood clots were induced in the lungs (pulmonary embolism) relative to non-diabetic controls. In contrast, survival following pulmonary embolism was increased in diabetic DKO mice, relative to non-diabetic controls. Together these data reveal that in a model of T1DM hyperglycemia increases platelet GLUT3 protein expression, glucose metabolism, platelet activation and thrombosis.
Clinical evidence suggests that persons with Autism are disproportionately vulnerable to sexual abuse or exploitation, sexually transmitted infections, unintended and some persons may develop maladaptive sexual behavior (e.g. misinterpreted behavior or offending the law). These negative outcomes are compounded by disparities in opportunities for sexual education. Before sexual education interventions can be offered to promote health and ameliorate risks, levels and gaps in sexual health knowledge must be identified. The purpose of this project is to determine levels and gaps in sexual health knowledge among adolescents and young adults with and without Autism. Comparisons will be made between exam scores. One set of scores is data collected before sexual education measures were put in place, and the other scores are from data after education. Data for this project is being collected via an online survey as part of a larger study collecting data to validate a measure of sexual health knowledge. Approximately 200 subjects’ data will compose the sample for this project. Statistical analysis will be done in partnership with a trained statistician. All phases of this projected will be supervised by the PI of the larger study, Melissa Lehan Mackin PhD, RN and proposed mentor.

This thesis investigates U.S. intelligence about the killing of one million Indonesians who were labeled as Communist in 1965-1966. The United States knew of these killings as they were occurring. However, President Lyndon B. Johnson and his administration kept silent and offered support for the perpetrators of one of the worst massacres of the twentieth century. Thus, the United States helped topple President Sukarno and his anti-Western policies in favor of a Western-friendly authoritarian regime that ruled Indonesia until 1998. The paper seeks to
understand how and why the Johnson administration kept silent about the violence, supported the perpetrators of this “massacre” and even suppressed news about the incident in the media. The anti-communist purge that occurred in Indonesia from 1965-1966 and the United States response to the killings demonstrates the Cold War objectives of the United States in Southeast Asia. Thus, it is necessary to recognize the United States’ global outlook in the mid-1960s to understand the degree of their actions or inaction towards the conspicuous mass killings in Indonesia. Of particular interest in this paper is the degree that the government of the United States suppressed U.S. news coverage on the mass murder. It is necessary to look at Johnson administration memorandum, telegrams, and conversations relating to international politics. It is equally important to look at the contemporary news coverage of Indonesia in the United States.

50 - Sarah Mullen
Majors: Biochemistry; Microbiology
Mentor: Chris Stipp (Biology)

*Shapeshifters: Do Melanoma Cells Change Shape to Evade Targeted Therapy?*

Melanoma, the deadliest form of skin cancer, arises from specialized pigment-making cells called melanocytes. These cells sustain DNA mutations due to UV exposure from the sun or tanning bed use. In ~50% of cases, melanoma cells are found to have a DNA mutation in a gene encoding a protein called B-RAF, which normally switches on and off to promote cell proliferation in a controlled fashion. The mutation causes B-RAF to be "stuck on", driving uncontrolled cell proliferation. Drugs that target B-RAF can temporarily block the proliferation of B-RAF mutant melanoma cells. Unfortunately, drug-resistant melanoma cells almost always emerge within approximately 6 months. Therefore, we have been studying other proteins that may step in to drive proliferation when B-RAF function is blocked. Intriguingly, drug-resistant melanoma cells often have different cell shapes than drug-sensitive cells. Therefore, we have focused on two proteins, Rho and Rac, that control cell shape, and which have also been linked to cell proliferation. We found that targeting Rac can extend the period before drug resistance emerges in some, but not all, cases. We are now working to understand exactly how Rac is functioning and what other proteins it may be working with to promote
drug resistance.

52 - Camille Mumm  
Major: Biology; Informatics 
Mentor: Robert Cornell (Anatomy and Cell Biology)  
*Identifying orofacial cleft risk loci using the zebrafish animal model*  
Orofacial clefting (OFC) is a common birth defect affecting around 1 in 700 births worldwide. To date, we only know the genes causing approximately 50% of orofacial clefting. Interferon Regulatory Factor 6 (IRF6) is a well-studied gene that is highly expressed in the embryonic skin (periderm) and known to cause OFC. Recently, a mutation in a non-coding DNA region nearby the IRF6 gene has been implicated in an OFC syndrome. Therefore, we need to have a better understanding how non-coding DNA contribute to oral periderm development and consequently OFC. We have developed bioinformatic methods to identify such regions in the zebrafish genome. Testing these regions using a florescent marker in the zebrafish, we were able to determine if they function in the periderm. We identified a region near the periderm gene periplakin that has expression in the periderm. To further investigate this region we are deleting regions we hypothesize to be important for the function of this enhancer and looking at the expression change in the same florescent assay. An improved knowledge on the function of these enhancer regions, even in zebrafish, can assist us in finding genetic and non-coding DNA contributors to OFC.

54 - Thomas Osborne  
*Using the Vector Space Model to Predict Regulons and EGC Expression in S. aureus*  
Major: Microbiology; Computer Science 
Mentor: Wilmara Salgado-Pabon (Microbiology)

56 - Crystal Padilla  
Major: Biology; Pre-Pharmacy 
Mentor: Martine Dunnwald (Anatomy and Cell Biology)  
*Evaluating the Effects of a Patient-derived MAFB Mutation on Murine Craniofacial Development*
Cleft lip and palate (CL/P), a failure of orofacial structure fusion, is among the most common birth defects. Its cause stems from genetic and environmental factors. Recent studies of the genetic influences of CL/P have identified a site on chromosome 20 in which mutations of MAFB increase the risk for CL/P. MAFB is a gene that encodes the transcription factor protein MAFB, which is expressed in the craniofacial region. To determine the function of MAFB in orofacial clefting, a human mutation found in patients with CL/P was modeled in a mouse, resulting in the allele MafbH131Q. Heterozygous MafbH131Q mice were mated, then their embryos harvested for analysis at time points critical for craniofacial development. To do so, embryos are sectioned and put onto microscope slides for staining. Our preliminary data indicate that, in MafbH131Q animals, oral structures may be sticking together aberrantly during the dynamic process of palate formation. Furthermore, one MafbH131Q/H131Q mouse had a cleft palate at e18.5. These data suggest that the H131Q mutation may have a role in the cause of CL/P. We are currently investigating the phenotype further to come to a conclusion about the effects of MafbH131Q.

58 - Sam Ponnada
Major: Physics, Astronomy, and Mathematics
Mentor: Philip Kaaret (Physics and Astronomy)

**Effects of Metallicity on High Mass X-ray Binary Formation**

X-ray binaries, systems of stars accompanied by an accreting black hole or a neutron star, may have helped ionize and heat the early Universe. Galaxies in the early Universe were scarce in elements heavier than lithium, which astronomers denote as ‘metals’, and recent studies suggest that low metal content (metallicity) considerably enhances the production and luminosity of X-ray binaries.

We will determine whether the correlation in the X-ray properties of these galaxies is due mainly to metallicity. Hypothesizing metallicity-dependence in the X-ray luminosity function (XLF), we study a sample of blue compact dwarf galaxies (BCDs) that range in metallicity by more than an order of magnitude. Using a single galaxy type, we eliminate potentially contaminating factors in the study.

This study will develop our understanding metallicity's role in the X-ray properties of star-forming galaxies.
60 - Julia Rohn

Major: History
Mentor: Alyssa Park (History)

*Creating the Encomium: The Progression Emma of Normandy’s Political Career*

This thesis analyzes the political role of queenship in 11th century Anglo-Saxon England and how she wielded power using complex notions of femininity and power. Emma of Normandy was the queen of England twice over from 1002 to 1016 and 1017 to 1036 C.E. Behind Emma’s political exertions, she tried to conform to an ideology of queenship that had transformed into a system blended with Christian ideas of virginity and motherhood, intermingling with submission, and Germanic customs that placed the queen in the forefront of government. Through the use of the surviving charters, which Emma signed and witnessed, this paper explains why Emma commissioned the *Encomium Emmae Reginae*, a revisionist history of her queenship that sought to popularize Danish rule in England, against popular opinion. This analysis will shed light on why Emma considered the Encomium the next necessary step in her reign.

62 - Megan Ryan

Major: History
Mentors: Landon Storrs (History); Alyssa Park (History)

*Herbert Hoover & the American Relief Administration’s Efforts In Soviet Russia, 1921-1923; Anti-Soviet Sentiment Stymies Success*

This project examines the role of political enmity within Herbert Hoover and the American Relief Administration’s efforts to quell an extensive famine in Soviet Russia from 1921 to 1923. ARA members claimed that relief efforts were solely humanitarian, not an attempt to sway the USSR from its socialist ideological views. Portraying the relief program as a humanitarian effort left open the possibility of a friendship between two countries with diametrically opposing ideologies. This paper argues that it was, in fact, anti-Soviet sentiment in the Hoover administration that directed the conception and actions of the ARA mission in famine-stricken Russia. It also shows how the ARA’s anti-Soviet sentiment reinforced Soviet official’s own anti-American views, and ultimately hindered the deployment and efficacy of the mission. The paper makes use of ARA personnel’s oral histories and memoirs, materials not yet widely utilized by historians, precisely because they trace the
development of this anti-Soviet sentiment among those actually administering food aid. The atmosphere of mutual distrust, predating the Cold War, hinted at the beginnings of a longstanding ideological rivalry between the US and USSR.

64 - Ashley Segura-Roman
Major: Biochemistry; Psychology
Mentor: Brandon Davies (Biochemistry)

*A new player in regulating good cholesterol?*
One in four people will die from heart disease, the leading cause of death in the United States. One of the contributing factors to heart disease is buildup of cholesterol plaques in the arteries of the heart. High-density lipoprotein (HDL) is a circulating particle that carries cholesterol away from these plaques, reducing the risk of heart disease. Thus, HDL cholesterol is often call the good cholesterol. The protein ANGPTL3 increases HDL levels by blocking endothelial lipase, a protein that breaks down HDL, reducing circulating HDL levels. We have previously discovered that another protein, angiopoietin-like 8 (ANGPTL8), is required for some of ANGPTL3’s activities, but it is not clear if it is required for regulating HDL. The goal of my studies is to determine how ANGPTL8 affects HDL metabolism, with an eye towards treating and preventing heart disease. Our current findings suggest that ANGPTL8 may not be required in regulating HDL metabolism.

66 - John Sheeley
Major: Finance
Mentor: Samuel Melessa (Accounting)

*Do CFOs with Investment Banking Backgrounds Make More Acquisitions?*
Numerous academics studies question the effectiveness of large acquisitions on the performance of acquirers, often lending the opinion that company purchases are largely dilutive or bad for the buyer’s future performance. Concurrently, a number of authors and finance professionals propose that investment bankers tend to oversell a buyer’s ability to harness revenue and cost synergies to effectively integrate acquisitions. It begs the question: Are those individuals with experience in the investment banking industry more optimistic about potential acquisitions? Throughout my thesis, I test whether executives (primarily CFOs) of publicly traded technology companies that previously worked in
investment banking are more likely to make acquisitions than their peers who do not have work experience in transaction advisory. I predict that CFOs with professional backgrounds that include investment banking experience are more likely to participate in acquisition activities due to increased confidence in their ability to integrate purchases.

68 - Aaron Silva
Major: Biomedical Engineering
Mentor: Fatima Toor (Electrical and Computer Engineering)

Using Silver Nanoparticles to Improve the Light Capturing Properties of Nanowire Textured Silicon

Black silicon (bSi) is a silicon wafer that has a nanowire array on its texture. These nanowires cause more light to be absorbed because the nanotexture enhances absorption within the silicon. Our group added silver nanoparticles (NPs) on top of the bSi to see if the amount of light that is absorbed changes. Silver NPs capture more light at a specific wavelength because the electrons in silver oscillate at those specific wavelengths. We tested how the size of NP, number of NPs, and texture of nanowire array affect the light capturing properties of bSi. We noticed a greater increase in light capturing when more silver is present.

70 - Phoebe Snydersmith
Major: Psychology
Mentor: Teresa Treat (Psychological and Brain Sciences)

Effect of Normative Feedback on College Women’s Self-Evaluations

Past work in our lab has shown that college women overestimate how much physical appearance and romantic relationships influence the typical college woman’s self-esteem, and they underestimate how much intelligence, family relationships, and being a good person influence the typical college woman’s self-esteem. The current work attempts to reduce this misperception by providing college women with feedback on the accuracy of their assumptions. This feedback compares what the participant thinks influences the typical college woman’s self-esteem to the data we have previously obtained about what really does. We expect that college women who receive this feedback will be more motivated to change what affects their own self-esteem than college women who do not receive this feedback.
72 - Megan Sorenson  
Major: History  
*Summer Internship with the Swedish American Museum*  
Near the turn of the century, Chicago boasted the largest population of Swedish people outside of Stockholm in the world. Owing to my internship this summer at Chicago’s Swedish American Museum, as well as my personal familiarity with Swedish culture imparted to me by family members, I wanted to research what life was like for the many thousands of Swedes that left their home country to start over in Chicago. Using sources from local universities, civic organizations and neighborhood associations, churches and other institutions with a Swedish history, as well as the museum itself, I analyzed what led so many Swedes to immigrate in the first place and what the new lives they were able to build in Chicago looked like. Additionally, they were able to develop a thriving community in Andersonville, Chicago’s historically Swedish neighborhood, that is the site of the Swedish American Museum today, and still retains many reminders of its Swedish settlers.

74 - Joe Steinbronn  
Major: History  
Mentor: James Giblin (History)  
*The Kenya Coastal Strip Commission*  
Drawing on historical precedent and ongoing marginalization by the central government, nostalgia for coastal autonomy in Kenya manifests in both dreams and separatist political organizations. This paper will examine the 1961 Kenya Coastal Strip Commission headed by Sir James Robertson, a British Foreign Service officer with over forty years of governing experience in Africa, and the reasons he recommended the incorporation of the coastal territory with the remainder of the Kenya Colony after independence in 1963. This paper delves closely into the unique legal, ethnic, and cultural status of the coast, which has yet to receive sufficient scholarly attention. In particular, attention is paid to the complex constellation of factors, such as the fate of the strategically important Port of Mombasa, coastal ethnicity and identity, international pressures, and the broad context of the decolonization movement in Africa. The paper also analyzes the degree to which popular sentiment and extraneous pressures influenced Robertson’s recommendation.
Though Kenya experimented with federalism after independence, it reverted to centralized and ethnically dominated politics, which had lasting implications for the Kenyan coast. While separatist organizations on the coast have been targeted, continued desires for autonomy demonstrate the lasting effects of the Kenya Coastal Strip Commission’s decision.

76 - Josh Stringer
Major: History
Mentor: Colin Gordon (History)
*The Greatest American Comeback: Harry S. Truman and the 1948 Election*
This thesis examines how President Harry Truman pulled off one of the greatest comebacks in American electoral history with his victory in the 1948 Presidential Election. The goal is to determine what aspects of Truman’s strategy from November 1947 to November 1948 led to the president securing support among his own divided party and winning the national election. Those objectives included fending off Henry Wallace’s Progressive Party, Strom Thurmond’s Dixiecrats, and the Republican challenger Thomas Dewey. Documents from Truman’s campaign team, articles covering his campaign, oral histories, and previous research are viewed to understand the themes of his strategy and how Truman executed them. Researching these documents reveals that Truman sought out specific interest groups, especially agricultural labor, organized labor, and progressives who wanted greater civil rights. Adding to this, Truman’s campaign team advised the president to direct the negative economic issues aggressively towards the Republican led 80th Congress and use his position as president to maintain public support for him with the Cold War budding. The research will reveal not only the key aspects that led to Truman’s surprising victory in 1948 but will also reveal how subsequent American campaign strategies have been influenced from Harry Truman’s success.

78 - Leon Sun
Major: Human Physiology
Mentor: Daniel Eberl (Biology)
*Investigating the Role of Ion Pumps in Auditory Sensation*
The human and drosophila melanogaster ear have many parallels, including genetic linkages between the two, functional similarities in the
neurons of the fly and human ear, and ion similarities between mammalian cochlear fluid and receptor lymph in drosophila. These similarities make drosophila melanogaster a suitable model organism for the study of human hearing. The focus of this project is to investigate the role that certain ion pumps play in the establishment of the ion concentration of the receptor lymph. Loss of this ion concentration has been linked to hearing loss in mammals, thus understanding the mechanisms of its establishment can open the door to new targets in gene therapy and a deeper understanding of the mechanisms of hearing loss.

80 - Emily Vaughan
Majors: English and Creative Writing; Cinematic Arts
Reaching Broader Educational Audiences via the Internet
My research for the International Writing Program was originally aimed to find improvements we can make in terms of the video production of our lectures (how to make them more effective and engaging), but quickly turned into how we could improve our site features to be more ADA compliant and easier to access as well as how we could gear our assignments toward a wider audience. I have found that our users could be learning more from our classes if the course's feedback systems were revised, and if there was a clearer way to get in contact with classmates. We have been working with the site NovoEd in order to address these problems, and as we head into our next MOOC in 2018, we are going to revise our classes by narrowing our topics and assignment focus and our site layout in order to meet ADA compliance and user needs.

82 - Kaitlyn Vote & Allison Woitte
Major: Undeclared & Theatre Arts
Mentor: Russell Ganim (French)
Star Trek: Where no Woman Has Gone Before
Star Trek is a television series that began in the 1960s and has expanded into fourteen movies, seven television series, and multiple novelizations. The massive franchise has survived and thrived for over fifty years, with a new television series that premiered one month ago. One attractive aspect of the show has always been the inclusion of minorities, from Nichelle Nichols in The Original Series to Sonequa Martin-Green in Discovery. While there have always been roles reserved for minorities, the
characters do not always break stereotypes. This project focuses on how Star Trek producers have handled and mishandled the roles of women in the series and how those roles evolved throughout the series. Our project examines, among other topics, the costumes worn by women, the positions assigned to them, and the storylines surrounding female characters. These subjects will be discussed in parallel with the feminist movement in the U.S. to demonstrate the moments when the series took a bounding leap forward for the representation of women and when the show seemingly retreated from these representations. In addition to marking notable moments of the series, such as the depiction of the first female captain, the project will explain how Star Trek has created certain female roles, sometimes for better, and sometimes for worse.

84 - Taylor Wingert  
**Majors: Finance; Economics**  
**Mentor: Jeffrey Hart (Finance)**  
*Do U.S. presidential election attributes affect the performance of U.S. equity markets?*

This research paper investigates whether specific attributes of a U.S. presidential election affect the performance of U.S. equity markets, or more specifically, the S&P500. These attributes can be split into two broad classifications: market attributes and election attributes. Immediately before and after presidential elections the stock market oftentimes experiences dramatic fluctuations presumably due to investors’ uncertainty of the outcome and how it may or may not affect the future market as a whole. I predict that lagged market performance attributes have a much greater effect on market performance during a presidential election than election-specific attributes.

86- Tsun Ming Yuen  
**Major: Chemical Engineering**  
**Mentor: N. Charles Harata (Molecular Physiology and Biochemistry)**  
*Localizing signals within neurons*

Cell biologists often need to identify signals and to describe their specific locations within cells. Such information is important for understanding changes in cellular structure and function. The conventional method for such analysis involves first measuring a signal of interest in individual cells, and then statistically analyzing such measurements from multiple
cells. This can be difficult when a signal is weak or present in a cell compartment that is either dispersed or irregular in shape. We propose to use the reverse approach, averaging signal from images of multiple cells following their alignment according to a certain set of rules, and then measuring the collective signals. This suppresses slight variations in individual cells while capturing the overall features of the signal and facilitates its analysis. We apply this approach to analysis of the neuronal Golgi apparatus, a cell compartment that regulates the ability to transport signaling molecules. The location of the Golgi apparatus within a neuron is critical because the cell extension (dendrite) that lies closest to the Golgi develops into the thickest of many such extensions. Importantly, this method will be applicable to any marker of any cellular organelle, and to both non-disease and disease conditions.

88 - Christine Buchanan
Major: Spanish; Human Physiology
Mentor: Mariko Sato (Hematology/Oncology)

Analyses of Quality of Life Survey of patients and parents with Pediatric Brain Tumor

Introduction: The outcome of patients with pediatric brain tumor (PBT) has improved last two decades due to advances of imaging, surgery technique, and intensified treatment. However, patients experience various complications. Long-term consequences can affect patient well-beings and caregivers negatively. Studies about Quality of life (QOL) of these children has been reported and showed a poorer QOL in patients with PBC.

Objective: To understand QOL of patients with PBT at University of Iowa Stead Children’s Hospital in order to improve care for patients and caregivers

Method: We conducted the QOL survey using PedsQLâ”¢ Cancer Module Version 3.0 for patients and family members with PBT. Patients and parents were asked independently at 3-6 months and 1 year post therapy completion.

Results: 53 patient and 59 parent QOL surveys were analyzed. 16 patients answered the survey at 2 different time points, with a total of 108 surveys analyzed. Both patients and parents scored the highest in the questions regarding cognitive problems followed by procedure anxiety.
Conclusion: Higher scores in cognitive problem questions were expected and it will be interesting to combine QOL scores with future neurocognitive assessment. Our QOL survey revealed the important and frequent QOL matters among off therapy patients with PBC that were not usually discussed in the clinic visit. PBT clinic is a multidisciplinary clinic that in future could provide resources for concerns.

90 - Joshua Dunigan
Major: 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 (α, β) 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 Ca2+-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. By probing this with site-specific mutations in the ca2+ 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. This understanding of how the domains of CaM act in concert and independently will suggest ways to provide precise allosterics.

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92 - Vijayvardhan Kamalumpundi & Kara Misel
Major: Human Physiology & Biochemistry
Mentor: Eric Taylor (Biochemistry)

Differential gene expression across mouse liver lobes
The mouse liver is the largest internal organ consisting of six anatomical lobes. It is known that differential intra-lobular gene expression exists in the liver thanks to the liver’s functional units known as the portal triads. It has however, not been investigated that these same intra-lobular differences can be observed between whole lobes of the liver. Our research analyzes the expression levels of key metabolic genes across mouse liver lobes via qPCR, a powerful assay that can inform us of relative changes in gene expression levels across samples. This data was then collected and analyzed in many ways such as by lobe, type, and sex to show certain patterns that exist across liver lobes. This research has the potential to address previous inconsistencies or reproducibility issues in future liver experiments.

94 - Marissa Roseman
Major: Biology; Environmental Science
Mentor: Maureen 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, size and age at when they first had babies was recorded. Results showed that snails that grew at a faster rate also tended to have babies sooner, though the time it took them to have babies was not linked to their adult size. Lake of origin was a better predictor of life history traits than level of lake infection (high or low). This suggests that adaptations to each particular 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?

Thank you!

We hope that you have enjoyed seeing the ground-breaking work occurring at the undergraduate level at the University of Iowa.

ICRU would like to offer one last “Thank you” to everyone involved in undergraduate research and creative work - students, mentors, the Provost’s office, and the Office of the Vice President for Research and Economic Development. Your hard work and dedication to undergraduate research is why we look forward to FURF and SURF each year!