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

*Does the market overreact when firms miss earnings targets?*
Contrary to traditional momentum theory and post-earnings drift theory (Ball and Brown, 1968), I predict that companies with large drops in stock price at their earnings announcement experience return reversals 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 market overreacts to the earnings news, especially when the initial stock decline is significant. That is, these 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, encephalopathy, cortical blindness, 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. Retrospective clinical data was obtained and thoroughly analyzed 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. Imaging and EEG results were used to exclude the original differential diagnoses of ischemic stroke or seizure. 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-accrative, 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)

*Exploring Actinide Chemistry in Environmentally Relevant Systems: Th(IV), U(VI), & Np(IV,V,VI) Bound by Macrocyclic Ligands*

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 rudimentary knowledge of the intermolecular interactions between actinide metals and organic molecules in environmentally relevant systems is lacking. The chemical and physical properties of organic ligands bound to the equatorial plane of the radioactive metal center largely influence the resulting actinide species in aqueous solutions which are vital for the understanding of the mobility of these radioactive elements in the environment. This study focuses on the differences in reactivity between thorium(IV), uranium(VI), and neptunium(IV,V,VI) through the characterization of macrocyclic crown ether compounds. 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 ligands. Single crystal X-ray diffraction reveals structural information of each synthesized compound to shed light on the subtle differences of actinide chemistry.
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 decision-making individual differences between adults with characteristics of Autism Spectrum Disorder and adults with neurotypical characteristics. While most research on autistic traits focuses on young children up to approximately age 12, uses a very small sample size, and is performed in person, our study used recruitment and screening procedures through Mturk survey platforms to reach a large sample size of adults. We found high differences in reported difficulty of making everyday decisions, consumer decisions, and interpersonal decisions. Data suggest a continuous spectrum of change rather than a cut-and-dry classification.

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
Mentor: Beth Walker (Communication Sciences and Disorders)

*Cochlear Implant Limitations on Bicycle Riding in School Age Children*
Cochlear implants (CIs) support auditory access and communication development for children who are deaf. CIs support social engagement but may also limit participation in daily activities. Specifically, participation in bicycling may be reduced because a CI cannot fit comfortably under a typical helmet. 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. Results also indicated that children with CIs began biking without training wheels at an older age. Fifty-eight percent of parents believe 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)

*SUMOylation in Anaplastic Thyroid Cancer*
Anaplastic thyroid cancer (ATC) carries the highest mortality of all thyroid cancers. ATC differs from other thyroid cancers in that standard treatment modalities are largely ineffective, and it has a large cancer stem cell (CSC) signature. CSCs are responsible for recurrence, metastasis, and chemotherapy-resistance in ATC, triple-negative breast and colorectal cancer, exposing a serious deficiency in cancer therapy targeting the CSC population. Epithelial-mesenchymal transition is associated with acquisition of CSC properties. The AP2 family of transcription factors (TFs) plays a large role in maintenance of the CSC population. A post-
translational modification called SUMOylation (addition of ubiquitin-like modifications to target proteins) controls many of the TFs involved in EMT including the AP2 family. Studies show that inhibiting the SUMO pathway induces AP2A activity that represses expression of CD44, a stem-cell marker. We sought to evaluate the effects of inhibiting the SUMO pathway in ATC 8505C cells, which demonstrate elevated levels of SUMO-conjugated AP2A. Significant decrease in CD44 expression is seen in both in-vitro and in-vivo treatments of 8505C cells after inhibition of the SUMO pathway and knockdown of PIAS1, a protein involved in the SUMO pathway. 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 oncogenes and is coordinately down-regulated in endometrial endometrioid adenocarcinoma.

The microRNA-503 cluster, composed of six microRNAs (miR-424, miR503, miR-542, miR-450a-1, miR450a-2 and miR-450b), is located on the human X-chromosome at Xq26. This location is very close to the gene encoding placenta-specific protein 1 (PLAC1) that we have shown is significantly over-expressed in several gynecologic cancers. We examined expression of the miR-503 cluster in a panel of endometrial endometrioid adenocarcinomas (EEAs) and found that all of the miRNAs are significantly under-expressed compared with benign tissue.

Expression of the miRNAs is highly correlated suggesting that they are regulated from a single promoter. We have used DNA editing (CRISPR) of the miR-503 cluster promoter to down-regulate the entire cluster in concert. In addition, validated targets of cluster members includes a number of important oncogenes. Thus, suppression of miR-503 cluster members contributes to the establishment and maintenance of endometrial cancer. We have further shown that decreased miR-503 cluster expression is due to hyper-methylation of the promoter in tumor cells. Thus, we conclude that the miR-503 cluster is a potential therapeutic target in endometrial cancer.
Intraocular Gene Therapy in RS1 Mice

Juvenile X-linked retinoschisis (JXLR) is a condition that begins in childhood and occurs almost exclusively in males. JXLR is caused by mutations in the RS1 gene of the X chromosome, which codes for the protein retinoschisin. Affected individuals suffer low vision and the presence of intraretinal cysts (“schisis”). The goal of this experiment was to test the effect of a gene therapy treatment on a mouse model of JXLR. 12 affected mice and 14 unaffected mice were injected with a human AAV2/4 CMVRS1 vector. 13 mice were injected subretinally, and 13 were injected intravitreally. Electroretinogram (ERG) and Optical Coherence Tomography (OCT) were obtained after the treatment. Results showed a higher ERG b-wave in the treated eye compared to the untreated eye. The ERG b-wave from treated wild type eyes were not significantly lower than untreated eyes, showing that the vector was not toxic. OCT scans showed a decrease in intraretinal cysts in the treated eye compared to the untreated eye for some mice. Though further tests are needed to obtain more conclusive results, the use of a human vector means clinical trials are on the horizon.

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

Preeclampsia, a medical condition during pregnancy characterized by hypertension and proteinuria, affects 4-10% of women in the United States. Preeclampsia has also been linked to psychiatric illness in children who are prenatally exposed. Past experiments have shown us that infusing pregnant mice with Arginine Vassopressin (AVP) continuously throughout pregnancy is uniquely able to cause elevated blood pressure, fetal growth restriction, renal glomerular endotheliossis, and an increase in the pro-inflammatory cytokine, IL-17. We wanted to test whether IL-17 is sufficient to recapitulate the effects of AVP on offspring neurodevelopment and microglia. To do this, we inserted subcutaneous...
pumps into mice to release IL-17, AVP, or saline throughout gestation and then collected offspring at embryonic day 18 and postnatal day seven. We found that IL-17 did not recapitulate adult weight changes due to AVP but it did recapitulate the intrauterine growth restriction and maternal proteinuria. We also looked at the cortex and found decreased volume at E18 and P7 in AVP animals. Ongoing and future work includes examining microglia morphology in E18 mice. Thus far, we have found an increase in microglia density in the AVP and IL-17 E18 offspring and differences in the types of microglia between all the three groups.

25 - Anna Crawford
Major: Nursing
Mentor: Stephanie Gilbertson-White (Nursing)

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

Macrophage co-culture with mesenchymal stromal cells (MSCs) is a way to assess suppression potency of MSCs through measurement of intracellular macrophage TNF-Î±. TNF-Î± is a pro-inflammatory cytokine secreted by macrophages. It plays a key role in early inflammatory events and MSCs are known to suppress macrophage secretion of TNF-Î±. In this study, macrophages were cultured with MSCs in defined ratios, with or without lipopolysaccharides (LPS). Macrophages were treated with varying concentration of Brefeldin A, which blocks proteins trafficking from the ER to the Golgi, inhibiting protein secretion. The accumulation of intracellular TNF-α± was then quantified by antibody detection through flow cytometry. Through an iterative optimization process, we found multiple experimental parameters were critical to our ability to detect TNF-α± production by activated macrophages. In our final protocol, we found a 1 million THP-1 macrophage seeding density, 50 ng/mL LPS, 5 μg/mL Brefeldin A incubation for 18 hours, and 1:200 antibody dilution with a 2 hour incubation yielded optimal results. Deviation from these parameters led to poor assay performance.

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**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

Background: The full-field electroretinogram (ERG) records the electrical activity of the light-sensitive cells of the retina. An electronegative ERG response is defined as having a positive b-wave amplitude less than the negative a-wave amplitude. In rare cases with inner retinal dysfunction, an electronegative ERG response is measured during the Dark Adapted 3.0 Standard Combined Response.

Purpose: The purpose was to evaluate the incidence of electronegative ERGs in a tertiary care ophthalmology department, and characterize disorders associated with an electronegative ERG.

Methods: A retrospective chart review of all ERGs performed at the University of Iowa Hospitals and Clinics from April 2001 through January 2017.

Results: In total, 793 ERGs were completed during the study period. 58 patients (7%) displayed 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 congenital while 7 (12%) were acquired. 18 (31%) of cases had no definitive diagnosis; of these 11 were adults and 7 were children.

Conclusions: The most common diagnoses associated with the electronegative ERG in our series were inherited eye diseases in 56% of cases. Most children had a genetic cause, and many were X-linked which explains why more males were affected. Most adults had an acquired disease, and do not have a molecular diagnosis.

33 - Isabella Dutra
Perceptual surprise improves action stopping by non-selectively suppressing motor activity via a neural mechanism for motor inhibition. Motor inhibition is a cognitive control ability that allows humans to rapidly stop actions. We found that presenting surprising, task-unrelated sounds improves stopping success. We investigated the neural underpinnings of this effect by testing whether surprise-related stopping improvements are due to a genuine surprise-related increase in motor inhibition. In Experiment 1, we measured motor inhibition in human primary motor cortex by quantifying cortico-spinal excitability (CSE) via transcranial magnetic stimulation and electromyography during a hybrid surprise-Go/NoGo task. We found a non-selective suppression of CSE on NoGo- vs. Go-trials - i.e., CSE was suppressed during successful stopping, even in task-unrelated motor effectors. Unexpected sounds lead to CSE suppression on both Go and NoGo-trials to a degree that was directly related to behavioral improvements in stopping. In Experiment 2, we used scalp-encephalography to investigate whether unexpected sounds increase motor inhibition-related activity in the central nervous system. After identifying a well-characterized fronto-central low-frequency EEG component that indexes motor inhibition, we measured activity of this component in the surprise-Go/NoGo task. We found that this activity was increased on NoGo-trials that were followed by unexpected sounds. These experiments provide converging evidence suggesting that unexpected events improve motor inhibition by automatically triggering inhibitory control.

35 - Abby Fronk

A Novel Tool for Monitoring Endogenous Progesterone Receptor Expression by mCherry using CRISPR-Cas9 Genome Editing Technique

Endometrial cancer is the most common gynecologic cancer with incidences and deaths increasing over the past 30 years, likely due to the ineffectiveness of standard treatments. Progesterone therapy has over 60 years of history in treating endometrial cancer with relatively good outcomes for primary endometrial cancer, but less promising for
metastatic and recurrent disease. Literature supports high PR expression in correlation with better clinical outcomes. We have designed a PR reporter gene with mCherry and inserted it into the PR gene by homologous recombination after CRISPR-Cas9 generated the DNA double strand break at the end of exon8, to monitor the endogenous PR expression. Two endometrial cancer cell lines, Ishikawa and Hec50, were used to test the effect of various drugs on PR and illustrated through the red fluorescence of mCherry. We have validated a PR expression increase in parallel with mCherry expression after treating PR reporter gene transfected Ishikawa cells with histone deacetylase inhibitor, Romidepsin. The PR reporter gene transfected Ishikawa cells will be used to screen the FDA-approved 1018 library in search of more drugs effective in increasing PR expression. We hope a new FDA drug can restore functional PR expression and further sensitize endometrial cancer to progesterone therapy.

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

Preeclampsia

Our focus in this project is to study preeclampsia as a possible risk factor for developmental disorders in children. The development of preeclampsia during pregnancy involves irregular hypothalamic secretion of vasopressin (AVP), maternal hypertension and proteinuria. To examine this, we use a mouse model which recapitulates these clinical features, where pregnant females are infused with AVP throughout pregnancy. We are also interested in examining whether continuous prenatal IL-17 exposure, a pro-inflammatory cytokine that is elevated in preeclampsia and individuals with psychiatric disorders such as autism, is sufficient to induce the same behavioral and adult brain abnormalities that we see in offspring exposed to our model. We hypothesized that IL-17 would recapitulate the neurobiological effects of prenatal AVP exposure on offspring, which we predicted would include behavioral and brain changes. We tested the adult mice on 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 cortex or prefrontal cortex size or cellular density in
offspring. Future steps include analyzing the adult brain for developmental and immune changes after prenatal IL-17.

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)

*Role of noradrenergic neurons of locus coeruleus in CO2-induced arousal*

CO2-induced arousal is a vital protective mechanism involved in multiple diseases including obstructive sleep apnea, sudden infant death syndrome, and sudden unexpected death in epilepsy. Serotonin (5-HT) plays a significant role in CO2-induced arousal, though the network mechanisms are unknown. We hypothesize that chemosensitive 5-HT neurons of the dorsal raphe nucleus project to and activate noradrenergic (NA) neurons of the locus coeruleus (LC) to signal higher-order brain regions to cause arousal. Adult, male and female C57BL/6 mice were treated twice with LC NA neuron specific neurotoxin DSP-4 (50 mg/kg i.p.;
n = 3 per condition) or saline one week apart. Mice were implanted with epidural electroencephalographic (EEG) and nuchal electromyographic (EMG) electrodes, allowed to recover, and arousal latency from NREM following gas challenges [Room Air (RA; 21% O2/79% N2)] -RA; RA -CO2 (7% CO2/21% O2/72% N2) was assessed. An increase in arousal latency in DSP-4 treated mice compared to controls would implicate LC NA 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 â€“ 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)

Cardiac specific deletion of IRS1 in adulthood does not prevent pressure overload-induced cardiac dysfunction

Diabetes and hyperinsulinemia are major risk factors for the development of heart failure. We hypothesize that sustained activation of insulin signal transduction pathways is one underlying cause contributing to this increased risk. Insulin receptor substrates (IRS1 and IRS2) are important secondary messenger proteins for insulin receptor (IR) and insulin-like growth factor (IGFR). Our lab has previously demonstrated that embryonic deletion of cardiac IRS1, but not IRS2, in mice provides protection against heart failure after cardiac pressure overload. It is unknown whether the knockout of IRS1 protects against cardiac hypertrophy due to changes during development of the heart, or whether IRS1 knocked-out in adulthood still protects against cardiac hypertrophy. A doxycycline-inducible system was used to cardiac specifically knockout IRS1 at 8-weeks-old. We then subjected mice to transaortic constriction (TAC), a model of pressure overload. Echocardiography indicated that heart contractile function was similar in control and knockout mice. Gravimetric measurements of heart weight and lung weight were similar as well. Additionally, insulin related signaling was not significantly different. Our results suggest that inducible knockout 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 Effect of Multiscale Texturing on the Optical Properties of 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 (Si) is a cost efficient material for making solar cells, but it suffers from low absorption. Our research is focused on improving the efficiency of silicon by investigating how the combination of micro- and nano-texturing of silicon wafers, called multiscale texturing, affects the silicon surface’s absorption. Our group first etched silicon wafers to have only micro-texturing using a potassium hydroxide solution. We then
measured and recorded the reflection of these samples. Next, we used copper in metal-assisted catalyzed etching (MACE) to add a nano-texture to our micro-textured samples and remeasured their reflection. Finally, we used the copper MACE on planar silicon wafers, wafers with no micro-texturing, and measured the reflection of these samples. By comparing the reflection of these differently textured silicon samples, our group was able to show that multiscale texturing does lessen the reflection of photons and enhance absorption in silicon when compared to micro- or nano-textured silicon.

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 to induce mechanisms resistance against compounds which threaten cellular integrity. One such factor, sigmaV (V), is required by B. subtilis for resistance to lysozyme. In the absence of lysozyme, V is inhibited by the anti-sigma factor RsiV, which is a transmembrane protein that has an extracellular lysozyme sensing domain. We have shown that RsiV binds lysozyme, allowing multiple proteases to cleave RsiV in a sequential order that results in destruction of RsiV. The rate limiting step in degradation of RsiV is site-1 cleavage performed by signal peptidase. Once RsiV is degraded it releases V, allowing V to bind RNAP and transcribe lysozyme resistance genes. We sought to understand how RsiV avoids signal peptidase cleavage in the absence of lysozyme. We began by defining the transmembrane domain of RsiV using a substituted cysteine accessibility method (SCAM). To define the amino acids required for protecting RsiV from signal peptidase cleavage, we fused various lengths of RsiV to GFP and analyzed its degradation via western blotting. Using these methods, we have identified a putative amphipathic helix which protects RsiV from cleavage by signal peptidase.

51 - Ariel Kopel
Major: Biochemistry
Mentor: Sheila Baker (Biochemistry)

Characterization of Cone Synapse Development in the Absence of Cav1.4 or a2d-4

Our research project has been looking at the Cav1.4 KO and a2d4 KO mutations only in cones. To do this we are using a mouse model that has NRL -/- and R91W+/+ to get a functioning conefull retina. The 3 lines being tested are the conefull line (our control), conefull:Cav 1.4 KO, and conefull:a2d4 KO. The tests that we are running are a mix of OCT, IHC, and swim tests. OCT is being used about every 2 months on each line to see if either of the mutations are degenerating the retina faster than normal. We are also doing OCT on the conefull mice to see if the all cone retina is causing early degeneration. IHC was used on the conefull eyes to ensure that all the important protein structures are there and functional compared to WT. The swim tests are our best method of checking if the mice can see. The ultimate goal with this project is to better understand both mutations and their effects to cone cells. Moving forward we will be continuing the OCT trials and finishing the swim test data.

53 - Alison Kramer
Major: Geoscience
Mentor: Emily Finzel (Earth and Environmental Science)

Isopach Maps of the Pennsylvanian lower Cherokee group in Southeast Iowa

This research aims to produce isopach contour maps of the three lowest Pennsylvanian (~300 Ma) formations of the Cherokee group to better understand the distribution of a potential continental-scale sediment dispersal system during this time. This continental-scale river system likely passed through the eastern margins of the Forest City Basin during the earliest Pennsylvanian. Data collected for this study are stored on the Iowa Geological Survey’s online repository (Geosam) and comprise fluvial successions that are recorded as strip logs, core logs, and core images. Maps for this portion of the study display thicknesses of the Kilbourn, Kalo, and Floris formations from eighty-nine different rock cores located throughout southeastern Iowa. Based on thickness data and a few assumptions about the rock formations, relative amounts of fluvial channel incision, times of non-deposition, and periods of recent glacial
erosion can be interpreted from this dataset. Interpretation and classification of these different styles of erosion is crucial to this study because the aim is to map paleosurfaces that highlight erosion representative of fluvial channel incision. Interpreting the distribution of paleo-river channel deposits during the earliest Pennsylvanian may provide insight to paleo-climate and tectonic processes 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

CaN is activated by the direct binding of calcium ions and by the essential calcium-binding protein calmodulin (CaM). CaN has two subunits: the enzymatic subunit CaNA (60kDa) and the calcium-binding regulatory subunit CaNB (20 kDa). The phosphatase activity of CaNA is suppressed by an autoinhibitory domain (AID) at the C-terminal tail of the subunit that occludes the active site. CaNA is partially activated by calcium binding to 4 “EF-hand” sites in CaNB. The AID can be fully pried off the enzymatic site by CaM binding to a site near the AID. CaM (17kDa) is similar to CaNB, having two domains (CaMN and CaMC) that each contain 2 “EF-hand” sites. Calcium binding to these opens greasy (“hydrophobic”) clefts in CaMN and CaMC. They bind to the greasy surfaces of a domain near the AID of CaNA and help pry it off the enzymatic site. Our goal is to determine the distinct roles of CaMN and CaMC to release the AID. We perturbed both sides of the interface: studying mutations of CaM (the “hands”) and of CaNA (the “glove”) and how they interact. We used fluorescence spectroscopy to monitor binding and showed that the interaction between the CaMC and the N-terminal side of the CaM-binding domain in CaNA is an essential first step in anchoring CaM near the AID. The second step depends on interactions between CaMN and residues in CaNA closer to the AID region. These studies will be compared to enzymatic activation properties to integrate binding and kinetics.

57 - Renae Kurpius
Electron beam (EB) polymerization has many benefits over thermal and photopolymerization such as faster cure time, no photoinitiators, and the ability to cure thick coatings containing pigments and fillers. Despite these advantages, use of EB polymerization is limited due to lack of knowledge regarding industrial scale-up. Specifically, changes in polymer properties occur when the process is scaled up from pilot line to production scale. These changes in polymer properties are termed dose rate effects (DREs) and can be controlled by changing the dose and belt speed. DREs are unpredictable as they only occur in certain chemistries. To better understand DREs, a series of five phenyl acrylate monomers were analyzed in this study. This research is focused on determining the correlation between monomer chemistry and DREs experienced during EB polymerization. To analyze the DREs, conversion and glass transition temperature were measured using Raman Spectroscopy and dynamic mechanical analysis, respectively. These variables were analyzed due to their industrial significance. Analysis of glass transition temperature and conversion led to a predictive relationship that can determine the magnitude of DREs experienced by changing dose and belt speed of a given formulation.

59 - Yahang Li

Optic atrophy 1 (Opa-1) is the mitochondrial GTPase responsible for inner membrane fusion. Insulin has been shown to increase mitochondrial fusion in cardiomyocytes. OPA-1 also mediates cristae remodeling to enhance mitochondrial bioenergetics, by forming oligomers. Oligomerization of OPA1 is independent of its ability to increase mitochondrial fusion, however, it is unknown if insulin signaling increases OPA1 oligomerization. We hypothesize that insulin stimulation will increase OPA-1 protein levels, increase mitochondrial respiration, and
increase OPA-1 oligomerization in primary skeletal muscle cells. To determine this, we used primary OPA11 fl/fl myoblasts and myotubes and gave insulin stimulation after starvation to determine mitochondrial respiration, protein levels of OPA-1 and pAKT. We showed that insulin stimulation increased Opa-1 and pAKT levels and increased mitochondrial respiration. We also demonstrated that depletion of OPA-1 using adenovirus cre (AAV-cre) decreases mitochondrial respiration and increases ER stress markers and FGF-21 protein levels in primary myoblasts and primary myotubes. Furthermore, we demonstrated that down-regulation of OPA-1 decreases mitochondrial respiration after insulin treatment in primary myotubes. Lastly, we showed we can detect oligomers in primary myoblasts and myotubes. Together we have demonstrated that insulin increases OPA-1 protein levels and that down-regulation of OPA1 alters metabolic responses to insulin.

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

Kctd15 and Tfap2 regulate melanocyte development via a negative feedback loop

Development of melanocytes from neural crest (NC) is regulated by gene regulatory networks (GRNs). Disturbances in GRNs are responsible for melanoma. Previous work shows that Transcription factor activator protein 2 (Tfap2) acts in the GRNs governing both NC induction and melanocyte differentiation. Despite the mild phenotype in tfap2 mutants, we believe that Tfap2a activity is essential for melanocyte differentiation. Other studies in zebrafish have identified Potassium channel tetramerization domain containing 15a (Kctd15a) as an inhibitor of NC induction, including NC derived melanocytes. To inhibit the function of Tfap2 specifically in the melanocyte lineage, we made use of Kctd15a. First, we used CRISPR/Cas9 to knock-out kctd15a in zebrafish. Second, we cloned kctd15a with a C-terminal α±V5 tag into melanocyte-specific vector miniCoopR. Melanocytes expressing kctd15a appeared small and dendritic. Immunostaining with an α±V5 antibody verified presence of kctd15a in these cells. These results suggest that Tfap2, via regulation by Kctd15 is required for differentiation of melanocytes. Other data including results of ATAC-seq and ChIP-seq experiments on Tfap2 and Kctd15 enhancer regions suggest these two elements regulate each
other via a negative feedback loop. Further investigation of this loop is our future area of study.

63 - Kyle McCarthy
Major: Chemical engineering
Mentor: Julie Jessop (Chemical Engineering)

Predicting Dose Rate Effects during EB-Polymerization using Monomer Chemistry

Polymers form from monomers exposed to an initiation energy, such as heat or light, which drives the propagation of the large chains composed of these repeating monomer units. Electron-beam irradiation (EB) is used on an industrial scale for production of polymerized films, coatings, and inks. Conversion of monomers can be controlled by altering operation voltage and belt speed, thereby changing the dose rate. Dose rate effects (DREs) are changes in polymer properties (e.g., conversion, glass transition temperature, molecular weight, etc.) due to changes in dose rate. DREs do not occur in all formulation chemistries or under all processing conditions, which makes predicting their occurrence challenging. This lack of understanding is especially problematic when predicting final polymer properties during industrial scale-up from a pilot line. This project used dynamic mechanical analysis to determine and compare the glass transition temperature of several acrylate monomers polymerized at different dose rates. Monomer chemistry was carefully chosen to determine the impact of size and number of abstractable hydrogen on the magnitude of the DREs. Results show that increasing the number of abstractable hydrogen plays a key role in reducing DREs. Results from this study will allow formulators to more easily identify chemistries less prone to DREs, making industrial scale-up more predictable and reliable.

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 of learning experience. To evaluate the students' comments and assure reliability, we used an emergent coding system to identify themes in student responses, followed by integrative coding to identify common characteristics within and across themes. We discovered that students are aware of their maturity, metacognition, 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 integrative learning that takes place throughout and 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 literature has established robust associations between childhood attention-deficit/hyperactivity disorder (ADHD) and increased risk of substance use and related problems in adulthood. However, work has only begun to examine factors that may account for this association via mediation or moderation. The aim of this study was to determine whether deficits in executive functioning account for the relationship between childhood ADHD symptoms and substance use and related problems. Participants included 349 young adults ages 18-38 years (M=23.33 years, SD=4.79, 54.7% male). Participants completed a multi-informant assessment protocol, including self and informant retrospective measures of childhood ADHD symptoms and ratings of
substance use and related problems. Participants’ executive functioning was measured with a series of neurocognitive tasks and with self- and informant- ratings of executive functioning. A multiple mediation framework examined whether executive function deficits help to explain these associations. Significant direct associations between ADHD and increased substance use and related problems emerged. Indirect effects involving neuropsychological deficits were non-significant. However, indirect effects involving self- and informant- ratings did seem to mediate these associations via a specific subdomain, restraint.

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

Diverse Interactions of the Multifunctional, Regulatory Domain of Replication Protein A  
Replication Protein A (RPA) is a heterotrimeric complex composed of 70, 32, and 14 kDa subunits, or RPA1, RPA2, and RPA3 respectively. RPA is the major single-stranded DNA-binding protein in eukaryotic cells and is required for DNA replication, recombination, and repair. RPA functions by binding to ssDNA and coordinating the complexes that regulate DNA metabolism. The purpose of this study is to determine the function and the mechanism of a regulatory domain, DNA-binding domain F (DBD-F), found in RPA1. DBD-F is at the end of a long flexible linker and is known to regulate RPA function through interactions with both DNA and regulatory proteins. My studies will determine how DBD-F coordinates these diverse interactions and the mechanism of regulation. The diverse interactions coordinated by DBD-F will be investigated by characterizing DBD-F alone or combined with other domains of RPA (DBD-F+linker, DBD-F+linker+DBD-A). The interactions with ssDNA, dsDNA, and various protein partners will be determined. My hypothesis is that interactions between DBD-F and DNA will help position RPA to more efficiently coordinate the repair of damaged DNA.

71 - Chibuzo Nwakama  
Major: Computer Science and Engineering  
Mentor: Thomas Casavant (Center of Biostatistics and Computational Biology)
Filling in the Gaps - Getting More from Incomplete Data

In an age where everything in our lives is being collected. The data collected can be used to grasp a general confusion on scenarios where predictions can be made. Machine Learning allows us to make predicts by training a large amount of data. The data is trained to create models that are robust and can continue to improve by adding more data to be trained. However, there different ways to train data with different algorithms like Logistic Regression, Simple Logistic, and Random Forest. The question we are asking if a large set of data can be in use to us even if some features of the data set are unknown. How to solve this problem, we do some pre-processing to change the data to get more out of it.

Finding ways to change the data, but not. Using is transformations opens the data into a view fresh view, where accuracy at a general case will improve. This could lead to technique to improve accuracy and create models that doctor can use to prescribe treatment to patients, diagnosed with a disease.

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?

Contemporary theoretical models implicate a role for heavy alcohol consumption and misperception of women’s sexual-interest cues in acquaintance-initiated sexual aggression. In recently completed research, over 1900 college men completed the Heterosocial Perception Survey-Revised (HPS-R), which presents three written vignettes in which a man is alone with a woman with whom he wants to have sex. After each vignette, the participant reads seven descriptions of increasingly intimate sexual advances by the man paired with increasingly negative responses by the woman, and then judges the justifiability of the man’s continued sexual advances on a 100-point scale. Sexual-aggression history and rape-supportive attitudes predicted (a) reduced sensitivity to women’s negative affect; (b) more liberal response biases; and (c) greater perceived baseline justifiability of continued sexual advances when a woman responds non-negatively.

Current work evaluates the impact of the couples perceived alcohol consumption on the participant’s justifiability ratings. In a between-
subjects design, over 90 undergraduate males completed a modified version of the HPS-R in which the man and woman have consumed no alcohol, a small amount of alcohol, or a large amount of alcohol. Data indicates that participants in the high alcohol condition have higher baseline justifiability and bias ratings, and lower sensitivity ratings.

75 - Pooja Patel  
Major: Biomedical Sciences  
Mentor: Sarit Smolikove (Biology)  
*Analysis of non-homologous end joining pathway through the use of rpa-2, polq-1, and ku-70 mutants in 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. In the rpa-2 mutants, HR was inactive because the essential rpa-2 was missing, and therefore, fragments were hypothesized. In the absence of HR, the double strand breaks cannot be repaired, which causes the fragments of DNA. In the polq-1 pathway, the HR pathway still functions, and thus the normal amount of chromosomes (6) are expected to be seen.

77 - Joann Pfeiffer  
Major: Anthropology  
Mentor: Matthew Hill (Anthropology)  
*Shift to Fire Creation - Percussive Origins*
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 Oldowan 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 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
band gained mythic status through an examination of the media’s coverage of those pivotal events. I contend that 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, autosomal recessive disorder associated with retinal degeneration, obesity, and learning deficiencies. Regular vision tests such as Electroretinography (ERG) and Optical Coherence Tomography (OCT) are inadequate in testing functional vision. Swim assays have been used in the past to test memory and visual functions in mice. In this experiment, a modified swim assay was used to test functional vision in 3 different models of BBS mice (Bbs3-/-, Bbs4-/-, and Bbs7-/-). Three Bbs3-/- (7-8 months old), two Bbs4-/- (3-4 months old), and two Bbs7-/- (3-4 months old) mice were tested with their age matched controls. Testing was performed in both photopic and scotopic conditions, with four days of testing and five trials per testing per mouse. It was hypothesized that the affected mice would have significantly slower swim times than their age-matched control. In photopic conditions, Bbs3-/- mice were 30.97 sec slower (p=1.054E-15), Bbs4-/- were 5.83 sec slower (p=7.8E-4) and Bbs7-/- were 7.25 sec slower (p=1.4E-4) than their age matched controls. In scotopic conditions, Bbs3-/- mice were 17.49 sec slower (p=3.28E-9), Bbs4-/- were 18.31 sec slower (p=6.5E-10), and Bbs7-/- were 5.63 sec slower (p=8.56E-3) than their age matched controls. Swim times for all BBS mice were significantly delayed than their age matched controls. This allows for assessment of retinal degeneration in affected mice and the testing of 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*

To understand the underpinnings of memory formation, researchers need
to know the specific types of neurons involved and how the neurons communicate with each other to establish a memory or reflex. One technique to examine neuronal activity is to use single-photon calcium ion imaging; by placing an imaging endoscope into the deepest regions of the brain, such as the hippocampus or amygdala, we can observe neuron firing patterns with fluorescent markers. Various blind source separation algorithms have been developed to separate individual neurons from images and describe the activation of said neuron over a given amount of time. A downside of utilizing single-photon calcium imaging is that images are highly noisy and contain background information from surrounding neurons. Additionally, each frame experiences some shift from the previous, as the equipment and mouse is able to move during recording. To reduce this noise and create clearer images, I use a variety of deblurring and registration algorithms in MATLAB. From there, I use a combination of existing principal component analysis (PCA) and independent component analysis (ICA) to extract distinct neurons and their individual activations.

85 - Burhanudin Syed
Major: Biomedical Engineering
Mentor: Eric Taylor (Biochemistry)

Role of the MPC in Tumor Spheroid Growth and Formation
The Mitochondrial Pyruvate Carrier (MPC) transports pyruvate into the mitochondria making it an important node for anaplerosis and metabolism. The MPC is upregulated in human hepatocellular carcinoma (HCC) suggesting it could be a therapeutic target. We hypothesize that inhibiting the MPC will limit pyruvate-dependent mitochondrial metabolism, such as oxidation and anaplerosis, leading to impaired tumor development. Wildtype and MPC-knockout (MPC-KO) cell lines were generated by treating mouse hepatoma Hepa 1-6 cells with EGFP-expressing CRISPR lentivirus and grown in a 3D-spheroid model. In short, monolayer cultures were formed into cellular aggregates and allowed to grow into multicellular spheroids under different chemical treatments. The influence of MPC activity on spheroid formation and growth was studied by utilization of the MPC inhibitor UK5099. To study the effects of glutathione on spheroid formation and the MPC’s effect on glutathione production the inhibitor of glutathione synthesis, buthionine sulfoximine (BSO), was used. Initial findings indicate treatment with
UK5099 or BSO increased spheroid growth rate, especially in MPC-KO spheroids. Subsequent investigations into the density and cellular arrangement of spheroids by cross-sectioning and staining has indicated untreated WT spheroids have denser tumor formations. Further investigations to confirm UK5099 and BSO treatment effect 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)

The Grateful Dead: A GIS Approach to Determining the Correlation Between Habitation Sites and Burial Sites in the Woodland Period in Iowa.
A powerful function of GIS is to look at spatial distributions of different components of settlement systems. During the Woodland Period, there appears to have been fundamental changes in economic and social organization, during the transition from hunting and gathering to substantial dependence on maize agriculture. What is less clear is the relationship between the number of burial mounds and the decreasing prominence of elite burials. While there has been an abundant amount of research conducted in locating mounds and burial sites using Geographic Information Systems (GIS) technology, there has been very little research done in looking at the correlation between burial sites and habitation sites in the Midwest region of North America. This project focuses on the Woodland period in the state of Iowa, which lasted from 500 B.C. to 1000 A.D., and will look at how the spatial distribution of these sites changes from the Early, Middle, and Late Woodland periods. This will be done by using the program Arc GIS, and the 1412 distinct habitation and burial sites in Iowa.

91 - Emma Weddle
Major: Religious Studies

Imami Shi’a Consolidation of Political Authority from the 5th/11th Century to the 10th/16th Century

During the period of the Occultation, the Shi’a community was left without the guidance of an infallible ruler, and was thus forced to grapple with issues of authority and legitimacy, particularly in the area of governance. Quietism and disassociation from temporal politics were thus established in Imami Shi’i doctrine. Meanwhile, the ‘ulama sought consolidation between the issues of religious and political authority. While early scholars and pioneers of Imami Shi’i jurisprudence, such as Al-Shaykh Al-Mufid, Al-Sharif Al-Murtada, and Al-Shaykh Al-Tusi, primarily sought to formulate a system wherein the Shi’a would be able to participate in government in some form, Al-Muhaqqiq Al-Hilli and Al-‘Allama Al-Hilli began to develop an argument towards viewing the mujtahid as the deputy of the Imam and ultimate political as well as religious authority in his absence. Finally, as the Safavid Dynasty declared Shi’ism as the official state religion, Shaykh ‘Ali Al-Karaki further laid the foundations of legitimate political leadership residing within the ‘ulama. This research thus utilizes the texts of the aforementioned scholars, 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
When animals have to discriminate between stimuli varying along multiple dimensions, sometimes these dimensions interact with each other to affect perception. It has been shown that humans perceive circle size and the orientation of its drawn diameter as separable dimensions; the judgment of one dimension was not affected by variations in the other. However, they 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 how pigeons process three visual dimensions: the height, width, and length of a cube. We trained pigeons in both go/no-go and simultaneous discrimination tasks. Their generalization data were fitted using Soto & Wasserman’s (2010) spatial model, optimizing for Minkowski’s distance metric.

Our results showed that some, but not all pigeons perceived the dimensions as integral Minkowski’s $r = 2$). Furthermore, the metric used by each pigeon was found to be relatively invariant across the two 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.
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. We have demonstrated that depletion of OPA-1 using adenovirus cre (AAV-cre) decreases mitochondrial respiration, increases ER stress markers, and FGF-21 protein levels in primary myoblasts and myotubes and a OPA-1 deficient mouse model. However, we are unsure how the deletion of OPA-1 leads to an increase in FGF-21 protein levels and an increase in ER stress markers. Therefore, we hypothesize that deletion of OPA-1 disturbs calcium homeostasis through altering expression levels of mitochondrial calcium uniporter (MCU) in skeletal muscle which leads to an increase in FGF-21 levels. We used western blot, immunostaining, and FlexStation analysis to measure calcium levels and calcium associated proteins. We found that loss of OPA-1 in primary myoblasts, primary myotubes, and deletion of OPA-1 in skeletal muscle increased MCU protein levels, and that blockade of MCU in OPA-1 deficient primary myoblasts increased calcium levels in the cytoplasm. Together, we showed that calcium may increase in the cytoplasm after OPA-1 deletion and this alteration in calcium homeostasis may be due to an increased expression of MCU. We also showed that this increase in calcium and calcium associated proteins may mediate the increase in FGF-21.

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

My thesis is a historical analysis of representations of women with mental illnesses in media and popular culture from 1940 to 1970. This analysis will include four Hollywood films, two bestselling novels, and a popular song. It will attempt to prove that throughout the period studied, these representations became increasingly representative of women’s experiences, due to the fact that women gained a greater platform for telling their stories. It compares these artistic representations of mental illness to the reality of a woman suffering from psychological issues at this time. Do they reflect her experiences? How do they represent her to society? What information are they giving her about her condition? It will attempt to achieve this through comparing the content of these popular culture artifacts with the gender politics and developments in mental health technology of their day. I hope to
obtain a clear picture of not only women’s experiences with mental illness in midcentury America, but also how popular media portrayals of these experiences were influenced by the events of the day, a time when scientific information about mental illness was not widely available and women had not yet achieved social or legal equality with men.

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_

Remembering and communicating about location often requires making comparisons of relative proximity, which involves determining which of two objects is closer to a landmark (e.g., judging one cup as closer to a sink than another). Most previous research focused on how children code the proximity of a single object to a landmark. The present study instead 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 searched at levels significantly above chance when the target was close to the landmark but only searched significantly above chance for one of the trial types where the target container was far from the landmark. Search success was not significantly related to how quickly children searched for the toy for either age. These results are consistent with the proximal-to-distal shift observed in early development and demonstrate developmental change in the ability to code spatial relations involving relative proximity.

10 - Mackenzie Cross & Katelyn Kelly
Major: Anthropology & Anthropology; Psychology
Mentor: James Enloe (Anthropology)

_Mapping the Past: Photogrammetry and Spatial Analysis at Woodpecker Cave_

At the Coralville Reservoir, University of Iowa students excavated 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). Through excavation, students gathered and recorded various artifacts such as fire-cracked rock (FCR), lithic, ceramic, faunal bones, shell, and other historic artifacts. Photos were taken of each square at the end of each 10 cm level within that square. Using these photos, a mosaic was formed of all the squares at each level to produce Woodpecker Cave photogrammetry. Through this photogrammetry, there will be a greater understanding of the spatial relationship between the excavated artifacts and the implications which result from these spatial relationships.

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

*From Excavations to Occupations: Characterizing the Faunal Assemblage of a Late Woodland Site*

Analysis of a faunal assemblage 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 W. Caldwell after his initial surveying in 1956. In the subsequent years since, the university first began excavations in 2012 with Jim Enloe as supervisor, students have expanded the excavation area horizontally leading to portions of levels being excavated throughout different years. The site is excavated in arbitrary ten centimeter levels below datum. To present, each year’s faunal assemblage has been examined by a succession of students for annual reports submitted to the Army Corps of Engineers (CoE). For research purposes, we have chosen to look at level five, excavated during three different seasons, because it appears to have coherent spatial structure, anchored by a hearth with different tasks indicated by distributions of various classes of artifacts. This analysis combines several years’ collections of animal bones from level five to give an integrated, coherent faunal assemblage. This will be viewed in the context of the evident spatial structure for interpretation of site function.

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

On the Effective Allocation and Utilization of Foreign Aid

The research that I’m conducting focuses on how the wealthiest nations in the world allocate their resources towards aiding underdeveloped countries. And how we can improve our monetary distribution in order to positively affect those receiving our help. Named after the father of modern Macroeconomics, John Maynard Keynes, The Keynes Project hopes to use his originally proposed principles of Macroeconomics - Monetary/Fiscal Policy and the Business Cycle - to understand the most effective way to go about developing and stabilizing nations. According to Heidelberg University professor, Axel Dreher, Developed nations supplied more than $130 billion to official development assistance in 2014. And although developed countries from all over the world consistently provide billions of dollars of funding annually to underdeveloped nations. The countries that receive foreign aid do not see any significant change in their GDP.

Our analytics surround the correlation between a developed country’s GDP per capita and the foreign aid they provide and the respective underdeveloped country’s GDP per capita. We focus on monetary fluctuations over time and variance in aid allocation from nation to nation.

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
HaloSat is a NASA funded cube satellite mission led by Dr. Philip Kaaret
of the University of Iowa. Imagined, designed, and assembled at the university, HaloSat will launch in the spring of 2018 to answer the missing baryon problem by looking for baryonic matter within the Milky Way’s hot galactic halo. Equipped with three silicon nitride x-ray detectors, HaloSat will go into low earth orbit and point toward the galactic center to look for x-ray emission from ionized oxygen. From this, data analysis will yield a map of matter distribution and density within the Milky Way's halo, ultimately determining its mass and geometry. Accepting the halo of the Milky Way to be similar to that of other galaxies, HaloSat will provide estimates of the percentage of total universal gas and dust contained within the halos of galaxies. This will yield HaloSat's scientific mission with a definitive 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
Molluskan faunal remains are relatively uninformative, but when analyzed by overall weight and site distribution they can be helpful in researching food gathering, preparation, and consumption patterns. We will be analyzing shell remains found at Woodpecker Cave, a late woodland rock shelter site in Johnson County, during the 2017 summer field season. Most of the remains are fragments that do not allow the species to be identified, but a fair portion of the remains include the hinges we have used to identify the species of mollusks that were consumed at the site. We will be documenting the frequency of various species and mapping the shell density throughout the site to help us research food practices. We believe the mapping and analysis of the shell density in the site could help us determine which parts of the site were used for food preparation and consumption in comparison with areas of the site that would have been used for other purposes. In addition, several shells with circular holes were found during this field season and need to be analyzed. These holes appear to have been made by predatory snails, but our research will also include the analysis of these shells to determine if the holes were caused by animals or if they were a result of human behavior.
Adipose Tissue OPA1 Is Required for Proper Adaptive Thermogenesis in Mice

Mitochondrial dynamics is a conserved process by which mitochondria undergo repeated cycles of fusion and fission. The contribution of mitochondrial dynamics to adipose tissue adaptation to stress is incompletely understood. We hypothesized that altered mitochondrial dynamics may alter adipocyte metabolism and change thermogenic response. To test this hypothesis, we examined the role of the mitochondrial fusion protein optic atrophy 1 (OPA1) in adipose tissue, by crossing OPA1 floxed mice to mice harboring the Cre recombinase under the control of the adiponectin promoter, generating adipocyte-specific deletion of the Opa1 gene (OPA1Adipo-/-). Under basal conditions, young OPA1Adipo-/- mice had similar body weight, but increased brown adipose tissue mass (BAT) with increased lipid accumulation, while white adipose tissue (WAT) mass was reduced. Mitochondrial complexes I and III levels were reduced in BAT and WAT, consistent with impaired mitochondrial function. OPA1Adipo-/- mice had reduced core body temperature in response to 3 days of cold exposure, which correlated with impaired induction of UCP1 in BAT and in sub-cutaneous WAT. Total fat mass was reduced in OPA1Adipo-/- mice at thermoneutral conditions, but it was not further reduced after cold exposure. Altogether, these data suggest that OPA1 deletion in adipose tissue impairs adaptive thermogenesis.

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)

The role of importin 9 and exportin 6 on position effect variegation

Actin is a major component of the cytoskeleton of a cell and has functions involving cell structure, cellular motility, cell division, and other critical cellular processes. Furthermore, actin also localizes to the nucleus, where it likely contributes in gene expression. The Tootle lab has recently found that actin localizes to the nucleus during Drosophila oogenesis. We suspect that actin has essential roles in oogenesis. Specifically, the frequency of nuclear actin changes coincidingly with chromatin changes during this development. We hypothesize that nuclear actin affects the organization of chromatin, therefore affecting the expression of specific genes. Specifically, we are using positional effect variegation (PEV) to determine how loss of nuclear actin regulators alters chromatin status. PEV utilizes a gene that controls eye color phenotype to determine the chromatin structure at the position of that gene in various genetic backgrounds. Importin 9 and exportin 6 oversee bringing actin in and out of the nucleus, respectively. In order to advance our investigation, we utilize deficiency flies that result in loss of importin 9 or exportin 6 to determine the effect on heterochromatin. Our ultimate goal is to determine how whether nuclear actin alters chromatin structure.

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

Calibration of VLA Radio Data from the Galactic Center Radio Arc
The galactic center is host to a number of phenomena not seen elsewhere in the galaxy. One example is the Radio Arc, a region of radio bright filamentary structures which have not been observed in detail since their discovery in 1987. Recent Very Large Array observations of the Radio Arc are the highest resolution to date and may provide insight into the nature of these filaments. However, the obtained data must be calibrated before any meaningful analysis can be done. I present the results of data calibration on the raw data obtained from the VLA radio interferometer. I apply a delicate "self-calibration" technique using CASA in order to increase the SNR and remove any false structure appearing as artifacts from the telescope. The result of this is a high SNR mosaic image of the Radio Arc field at two frequency ranges, which can be analyzed to address the origin and nature of the filaments. A number of compact sources is also revealed, 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 Pennsylvanian-aged (~300Ma) fluvial channel and flood plain deposits to interpret the distribution of meandering fluvial systems on/near the eastern margin of the Forest City Basin during this time. The Forest City Basin was a topographic low during the Pennsylvanian, which allowed for sediments to accumulate. Previous research in the nearby Illinois Basin suggests there may have been an Amazon-scale river system passing through the mid-continent during Pennsylvanian time. This research builds on that concept by mapping the lowest Pennsylvanian deposits of the Cherokee Group because they may have been deposited by that same fluvial system prior to the first major continental transgression of this area. Sedimentary deposits of the Cherokee Group include three main formations: the Kilbourn, Kalo and Floris, which are re-evaluated for their relative proportions of sandstone to mudstone. The relative proportions, which are displayed as pie charts on the maps, are useful because they highlight the potential locations of sandstone channel deposits. This research project is important because these maps will be used to guide future research by providing constraints to the locations and movement of fluvial channels during the
earliest Pennsylvanian.

34 - Kendall Kikuts
Major: Nursing
Mentor: Stephanie Gilbertson-White (Nursing)

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 visits.

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 2,2',3,3',6,6'-HexachloroBiphenyl (PCB 136) and its Hydroxylated Metabolites present in Transgenic Mice Brain

Polychlorinated Biphenyls (PCBs) are environmental contaminants that are associated with adverse human health effects, including cancer and neurotoxicity. PCBs are metabolized by cytochrome P450 enzymes in the liver to hydroxylated metabolites (HO-PCBs). In this project, we hypothesized that the knockout of specific cytochrome P450 isoforms affects the metabolism of PCB 136 in mice. To test this hypothesis, Cyp1a1, Cyp1a2 and Cyp1b1 knockout mice and congeneric wildtype mice were exposed to a single oral dose of PCB 136 (30 mg/kg body weight). Tissues were collected 72 hours after PCB exposure and levels of PCB 136 and four metabolites, including 2,2',3,3',6,6'-hexachlorobiphenyl-5-ol (5-OH PCB 136), 2,2',3,3',6,6'-hexachlorobiphenyl-4-ol (4-OH PCB 136), 2,2',3,3',6,6'-hexachlorobiphenyl-4,5-diol (4,5-diOH PCB 136) and 2,2',3,4',6,6'-hexachlorobiphenyl-3'-ol (3'-OH PCB 150) were measured in the brain using gas chromatography with electron capture detection. PCB 136 levels were higher in the brain from wildtype compared to all three cytochrome P450 knockout mice. No hydroxylated metabolites were detected in the brain from any exposure group. Further studies are needed to determine if the differences in PCB 136 levels in the brain are due to differences in the metabolism of PCB 136 in the liver and/or differences in the fat composition of the brain.

38 - Rikki Laser
Deficits in REM sleep twitching indicate developmental delay in a mouse model of autism

Autism is a neurodevelopmental disorder that affects approximately 1% of the population. Although primarily known for producing deficits in social behavior, autism is also characterized by motor deficits. As social deficits are not noticed until children begin school, these motor deficits may be the key to earlier diagnosis. Previous studies have shown abnormalities in rolling, crawling, and walking, which are expressed from a few months of age to a year. In contrast, myoclonic twitching begins in the womb. Here, in order to see if myoclonic twitching can be a sensitive indicator of motor deficits in autism, we compared the twitch activity of infant 16p11.2 del/+ mice “thought to provide one model of autism” to the twitch activity of wild-type littermates. Through the use of high-speed videography and motion tracking, we found lower rates of twitching and altered twitch-burst organization at postnatal days 4 and 6 in the 16p11.2 del/+ mice. Our findings suggest that, early in development in this mouse model of autism, twitching can be used to detect subtle sleep-related differences in motor behavior. This approach may prove useful for detecting risk in autism and other neurodevelopmental disorders.

40 - Katie Lillis

Stimulation of the infralimbic cortex using stable step-function opsins decreases cocaine-seeking behavior after extinction training

Given the widespread issue of cocaine addiction in humans, our research seeks to understand the underlying neurobiology of addiction using a rat model, especially as it relates to relapse after a period of extinction. Previous research has indicated that the infralimbic cortex (IL) is involved in the suppression of cocaine-seeking behavior in rats. In addition, it is thought to aid with consolidating the rat’s ability to learn extinction. In the past, pharmacological techniques have been used to stimulate the IL; however, using an optogenetic technique allows for a more precise,
reversible, and easily controlled manipulation. By using a stable step-function opsin (SSFO), we are able to potentiate IL activity without disrupting normal activity. Rats underwent self-administration and learned that the press of an active lever would result in an infusion of cocaine. This was followed by a period of extinction-withdrawal where nothing happens when the lever is pressed. After stimulating the IL, there was a significant decreased in cocaine-seeking behavior with cue-induced and cocaine-primed reinstatements with extinction-withdrawal. These results suggest that 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)

Separation of Midsize Organic Solutes Utilizing Polyvinylidene Fluoride Membranes and Their Derivatives

Discussion of the use of one or two polymers based on the chain (CH2F2)n in the separation of midsized (100-500MW) organic molecules dissolved in an organic solvent. Choice of the polymer was determined from literature showing potential to slightly purify fish oil, concentrating large oils in the mixture. This is a kind of separation that is typically difficult as industrially utilized ionic methods cannot be utilized with sparingly polar solutes such as oils. Membranes have the capability to be reused, and a large enough effective surface can make membranes a high volume purification technique, both desired for real world use. For these reasons, thin film Polyvinylidene Fluoride (PVDF) and Poly(vinylidene fluoride-co-hexafluoropropylene) (HFP-PVDF) polymer membranes will be synthesized and utilized to separate solutes from organic mixtures, ideally at a flux which lends them use in the industrial sector.

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

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

Patients with type 1 diabetes mellitus (T1DM) have increased thrombosis
and platelet activation. T1DM is accompanied by hyperglycemia, hyperlipidemia, and increased inflammation. 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 treated with streptozotocin (STZ), to induce T1DM and revealed increased glucose uptake and glycolysis in concert with induction of glucose transporter 3 (GLUT3). Functionally, platelets from STZ-treated mice exhibited increased activation following administration of PAR4 peptide and convulxin. In contrast, platelets isolated from glucose transporter 1 (GLUT1) and GLUT3 double knockout (DKO) mice lacking the ability to utilize glucose, failed to increase activation in hyperglycemic mice. In addition, diabetic mice displayed decreased survival in a collagen/epinephrine induced pulmonary embolism model 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.

46 - Maren McNees
Major: Nursing
Mentor: Melissa Lehan-Mackin (Nursing)

Sexual Health Knowledge in Young Adults with Intellectual and Developmental Disabilities

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 project will be supervised by the PI of the larger study, Melissa Lehan Mackin PhD, RN and proposed mentor.

48 - Brian Miner
Major: History
Mentor: Stephen Vlastos (History); Alyssa Park (History)

U.S. Involvement in Indonesia’s Anti-Communist Purge
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)

Opposing Roles of Rac and Rho small GTPases in the Emergence of Drug-Resistant B-Raf Mutant Melanoma

Our research focuses on understanding the mechanisms of drug resistance in BRAF-mutant melanoma. The current standard combination treatment regimen for these melanoma patients is vemurafenib, a B-RAF inhibitor, and cobimetinib, a MEK inhibitor. These drugs target different components of the MAPK pathway that is the primary driver of proliferation and advancement of these cancers. However, within 6 months of combination therapy many melanomas become resistant to this treatment. Resistance mechanisms may involve multiple, interconnected signaling pathways, including pathways that control apoptosis, cell adhesion and cytoskeleton rearrangement. For example, resistant cells often display increased F-actin characteristic of increased activity of small GTPases Rac and Rho, which signal towards the actin cytoskeleton. To understand if Rac or Rho drive drug resistance, we used retroviral RNAi to stably knocked down different Rho or Rac expression in A375 melanoma cells. We then tracked Rho or Rac-deficient A375 cell population doublings over time, both in the presence and absence of vemurafenib or vemurafenib/cobimetinib. Remarkably, decreased Rho expression promoted the emergence of drug-resistant cells, while decreased Rac expression tended to suppress acquired resistance in a number of cases. Thus, Rho and Rac may exert opposing effects on acquired resistance in B-RAF mutant melanoma.

52 - Camille Mumm

Major: Biology; Informatics

Mentor: Robert Cornell (Anatomy and Cell Biology)

Investigating the cis-regulation of periplakin, a relevant zebrafish periderm gene

Orofacial clefting (OFC) is a common birth defect affecting around 1 in 700 births worldwide. The genetic underpinnings of OFC are still largely unknown. Interferon Regulatory Factor 6 (IRF6), is an important transcription factor that promotes periderm (embryonic epithelia) during embryogenesis and has been associated with OFC risk. Recently, a distal IRF6 enhancer was implicated in the pathology of an OFC syndrome and drove GFP expression in stable transgenic zebrafish periderm. The aim of this project is to better understand how periderm enhancers function in
the periderm gene regulatory network (GRN) and to identify upstream transcriptional regulators. We have identified candidate enhancers based on H3K27Ac, transcription factor ChIP-seq, and ATAC-Seq genomic signatures. One candidate includes a region near the zebrafish periderm expressing gene periplakin. To understand the regulation of this candidate enhancer, we have used GFP reporter assays to compare expression of several transcription factor deletion constructs with wild-type enhancer. We are also investigating a region near the human Periplakin gene which displays a similar expression pattern. An improved understanding of enhancer elements and their interaction with transcription factors aid in describing the periderm GRN structure and can ultimately inform us of candidate OFC risk loci.

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
**Evaluating the Effects of a Patient-derived MAFB Mutation on Murine Craniofacial Development**
Cleft lip and palate (CL/P) is among the most common birth defects. Its etiology stems from a combination of genetic and environmental factors. Recent studies of the genetic influences of CL/P have identified MAFB as a novel gene in which mutations increase the risk for CL/P. MAFB (MAF BZIP Transcription Factor B), a single-exon gene of 3.3kb, encodes the protein MAFB, which is a transcription factor expressed in the craniofacial region. To determine the function of MAFB in orofacial clefting, a human mutation found in patients with CL/P was knocked-into the mouse Mafb, resulting in the allele MafbH131Q. Heterozygous MafbH131Q mice were crossed, then their embryos harvested for serial sectioning and histological characterization at time points critical for craniofacial development. At embryonic day (e) 13.5, our preliminary data indicate the presence of oral adhesions in MafbH131Q/+ and MafbH131Q/H131Q mice that were absent in wildtype animals.
Furthermore, one MafbH131Q/H131Q mouse had a cleft palate at e18.5 (N = 11). These data suggest that the H131Q mutation may have a role in the etiology of CL/P. We are currently increasing our numbers and investigating the phenotype of heterozygous mice to fully characterize what effect MafbH131Q has on craniofacial development.

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 of 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)

Identifying the role of ANGPTL8 in regulating endothelial lipase and HDL levels

The buildup of cholesterol plaque in the walls of arteries leads to
atherosclerosis and cardiovascular disease by obstructing blood flow or causing ruptures in the artery wall. Studies have shown an inverse relationship between plasma high-density lipoprotein (HDL) and the risk of atherosclerotic cardiovascular disease. HDL is a lipoprotein that specifically transports cholesterol from tissues, including cholesterol deposited in blood vessels, to the liver. Increasing plasma HDL could potentially decrease the risk of atherosclerotic cardiovascular disease. An enzyme called endothelial lipase (EL) regulates HDL by hydrolyzing the phospholipids of HDL, thus decreasing the levels of plasma HDL. Inhibiting EL could therefore increase plasma HDL levels. A previous study discovered that angiopoietin-like 3 (ANGPTL3) is an endogenous inhibitor of EL. ANGPTL3 also inhibits another lipase called lipoprotein lipase (LPL). Our lab has previously found that ANGPTL3 requires another protein called ANGPTL8 to efficiently inhibit LPL. In this study, we investigate the role of ANGPTL8 in the inhibition of endothelial lipase by ANGPTL3. We find that ANGPTL8 does not significantly alter the binding or the inhibition of EL by ANGPTL3, indicating that ANGPTL8 is specific for LPL, but not EL.

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)

*The Impact of Plasmon Resonance on Black Silicon’s Optical Properties*
Black Silicon (bSi) is a nanotextured surface fabricated using metal-assisted catalyzed etching (MACE) of silicon. bSi demonstrates broadband absorption of light that makes it black in color. Our group sought to improve the optical properties of bSi by coating bSi samples with silver nanoparticles (NPs). Silver NP experience the phenomenon of plasmon resonance which describes that electrons in the silver absorb more light at the 400 to 530 nm due to a collective oscillation of the electrons. Our group investigated how the size of NP, the quantity of NPs, and texture of bSi affected the optical properties of bSi. From our current investigation, we have found that greater plasmon resonance occurs when greater amounts of silver NP are present.

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

*Effect of Normative Feedback on College Women’s Self-Evaluations*
Recent research in our lab has documented marked individual differences among college and community women in what they report impacts their self-evaluations, with body shape and weight having a stronger influence on the self-evaluations of women with eating- and weight-related concerns. Moreover, college women display normative misperception of what influences the typical college woman’s self-evaluation. College women overestimate the extent to which body shape, facial attractiveness, and romantic relationships influence the typical college woman’s self-evaluation, and they underestimate the extent to which intelligence, family relationships, and being a good person do. Studies unrelated to eating- and weight-related concerns have shown that presenting participants with accurate information about social norms (i.e., normative feedback) can motivate behavioral change (e.g., reducing alcohol consumption and risky sexual behavior among college students). Thus, the current work will examine the impact of normative feedback about what really influences the typical
undergraduate woman’s self-evaluation versus what the participant thinks influences the typical undergraduate woman’s self-evaluation. We expect that participants who receive normative feedback will be more motivated to change what affects their own self-evaluation than the participants who do not.

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.
Leon Sun
Major: Human Physiology
Mentor: Daniel Eberl (Biology)

*Investigating the Role of Ion Pumps in Auditory Sensation*

The mammalian ear and the drosophila melanogaster auditory system have many parallels, including homologous genes, functional similarities in the involved neurons, and a similar concentration of ions in the cochlear endolymph and the receptor lymph of drosophila. These similarities make drosophila melanogaster a suitable model organism to investigate human hearing. The focus of this project is to investigate the role that specific vATPase pumps play in the establishment of the ion concentration of the receptor lymph. Loss of this ion concentration has been linked to the collapse of the endolymphatic compartment and subsequent 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.

Emily Vaughan
Majors: English and Creative Writing; Cinematic Arts

*Massive Online Open Courses and Accessibility*

For the past six months, I've been evaluating how well received the International Writing Program’s online courses have been among our MOOC (massive online open course) users. I have scoured through three classes worth of surveys, customizing questions for our most recent class in order to learn about people's learning habits and how our website can be improved for those with disabilities. Our MOOCs are aimed at people who are seeking to learn English as a second language, and our students of all ages, educational backgrounds, and from across the globe. My research 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.

Kaitlyn Vote & Allison Woitte
Major: Undeclared & Theatre Arts
Mentor: Russell Ganim (French)

The Representation of Women in Star Trek

Over the past 51 years, the Star Trek franchise has produced seven television series, each distinct from one another regarding specific characters and plot points. At the same time, similarities in the series exist in that in the fact that they take place within a utopia, i.e., a progressive place that one would think would be free of racism and misogyny. While an obvious effort was made by the creators of the Star Trek universe to include diversity, they still lived in a world where racism and misogyny was prevalent, especially in the entertainment industry. Because of these countervailing influences, the Star Trek franchise contains both feminist and anti-feminist themes. The quality of female representation in the series over the years cannot be charted as a positive linear trend, but rather as a zigzag of ups and downs. Even with all its steps forward and backward, the Star Trek series has always been a pioneer when it comes to the inclusion of women. From The Original Series, which is considered revolutionary in the field of representation for its time, to Voyager, which featured the first female captain, to Discovery, which includes an African-American female as first officer, this project covers the portrayal of women in Star Trek in its multiple and sometimes contradictory forms.

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.
Tsun Ming Yuen
Major: Chemical Engineering
Mentor: N. Charles Harata (Molecular Physiology and Biochemistry)

Analyzing spatial localization of neuronal Golgi apparatus as continuous distributions

Spatial localization of intracellular organelles dictates where their function is localized. Quantitative analysis of spatial localization based on microscopy often requires segmentation, i.e. classification of pixels based on a threshold for staining intensity, and description of the location of segmented structure(s), e.g. distance from a landmark such as the nucleus. This process is challenging for organelles, such as the Golgi apparatus, that can be discontinuous and/or whose components vary extensively with respect to size, shape and staining intensity. In such cases, small differences in threshold can drastically affect measurements of the number and size of the organelle; Even when segmentation is successful, it can be difficult to define the distance when the components are scattered. Here we describe an image analysis method that does not entail intensity thresholding or distance measurement. Images from individual neurons are aligned according to two morphological features: the center of soma and the position of the thickest dendrite. Signal is then averaged, and the organellar intensity and distribution are quantified as lumped parameter. This method converts discrete behaviors of individual organelles in a cell to continuous behaviors across multiple cells, is complementary to existing methods, and is applicable to any organelle, marker or cell type.

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 PedsQL® 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.

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**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.

regarding cognitive problems followed by procedure anxiety.

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?