The 12th Annual Spring Undergraduate Research Festival

Wednesday, April 20, 2016
4:30pm-6:30pm

University of Iowa
University Capitol Centre
2nd floor South Atrium
Iowa City, Iowa

Program of General Audience Abstracts
This event is hosted by the Iowa Center for Research by Undergraduates (ICRU), which promotes undergraduate involvement in research and creative projects at the University of Iowa, serving students, staff, and faculty.

The Spring Undergraduate Research Festival is proud to showcase poster presentations given by the University of Iowa’s student researchers. These students work in over 40 different departments and represent each of the freshman, sophomore, junior, and senior classes.

**Students will stand by their posters for either the first or second hour and are free to visit fellow presenters’ posters during the other hour.**

Odd numbered posters will present from 4:30-5:30PM  
Even numbered posters will present from 5:30-6:30PM

*Please note that at 5:30, all of the boards will be turned around to show the even numbering and the second hour presenters’ posters*

We hope that you enjoy talking with these outstanding students and will see you again in Fall 2016 for the 7th Annual Fall Undergraduate Research Festival!

Many thanks to the over 100 graduate and professional students and post-doctoral fellows who have volunteered their time to serve as poster judges for this event. Their commitment to the undergraduate research community at the University of Iowa is largely what makes these festivals so successful.

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ICRU Associate Director  
Lindsay Marshall  
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First Hour Presenters
4:30-5:30PM
(odd numbers only)

1. Preston Anderson

Major(s): Biochemistry, Human Physiology
Mentor(s): John Engelhardt (Anatomy and Cell Biology), Kalpaj Parekh (Cardiothoracic Surgery)

**Myoepithelial Cells are Stem Cells for The Airway**

- In many degenerative lung diseases like cystic fibrosis, adenocarcinoma, asthma, and obliterans bronchitis there is dysregulation of stem cells in the submucosal glands (SMGs) of the airway. SMGs harbor essential serous and mucous fluid to help fight off infections and hydrate the surface airway epithelium (SAE). We investigated a specific stem cell of the SMG, called a Myoepithelial Cell (MEC), which are the contractile cell that expels fluid to the SAE. We hypothesized that MEC were stem cells based on the stem like phenotype. Using an inducible transgenic mouse model we were able to lineage trace (follow) these cells following an injury to the SAE. We discovered that MEC are able to migrate to SAE, adapt a SAE phenotype, differentiate into entire SMG, and are highly proliferative cells. We concluded that MEC only become stem cells following injury, and are able to differentiate into multiple different cell types thus making them facultative multipotent stem cells. We also investigated how lymphoid enhancing binding (Lef-1) influences MEC function and we discovered that Lef-1 is essential to MEC maintenance and regeneration. We are currently translating our findings to creating stem cell therapies that can be used to fight degenerative lung diseases.

3. Terryl Bandy

Major(s): Geoscience
Mentor(s): Brad Cramer (Earth and Environmental Sciences)

**Using a handheld laser to gather high-resolution data from the global rock record in the field**

- Identifying the positions in any given outcrop or core is critical in determination of how many samples and their locations are while out in the field. Many of the chemical events in the rock record are preceded by significant variations in redox sensitive elemental abundances (e.g Mo, V, Cr, etc.), and recognizing these variations can be used to help determine the rough position of events in the rock record. The availability of the portable X-ray fluorescence (pXRF) provides the opportunity for rapid and inexpensive determinations of the redox-sensitive trace metal abundances in the field or from a core repository. To test this methodology we used the pXRF to obtain elemental abundances from the Schlamer #1 core which was deposited between about 443 Myr to 416 myr ago. The core was drilled by the Illinois State Geologic Survey from SW Illinois. The first step in this proof-of-concept approach is to demonstrate the reliability of pXRF
data by comparing ICP-MS data from identical sample positions. Preliminary result demonstrates that the pXRF is a useful tool to help determine where higher resolution sampling practices should be done.

5. Carl Beranek

Major(s): Biomedical Engineering  
Mentor(s): William Hedgcock (Marketing)

Emotions in Gambling

- People make decisions countless times every day. Decisions can be based on emotion, logic, or some other factor. The Behavior Research lab in the Tippie School of Business aimed to study two aspects of decision making. We collected electrodermal activity (hand sweat) data during an investment task. Electrodermal activity has been shown to indicate emotional arousal. This physiological data was then be used to analyze patterns and motives behind decision making, specifically a decision to gamble. In this study, participants were given the option to gamble on twenty fair coin flips. If they invested, the coin would be flipped. Tails would result in a win with payout of $7.50, heads would result in a payout of $5.00, and choosing not to gamble would result in a payout of $6.00. We are interested in the subject’s emotional responses when making these decisions and the strategy they adopt throughout the task. Preliminary analysis has indicated that when emotionally aroused, people tend to be less inclined to gamble. Results such as these may provide valuable insight into human decision making.

7. Lauren Boncosky

Major(s): Speech and Hearing Science  
Mentor(s): Elizabeth Delsandro (Speech and Hearing Science)

Pilot Data of Mother-Preschool Age Child Interactions During Shared Book Reading

- Mother-child interactions are key components in early development and maturation of functional skills in a child. Many important interactions occur between a mother and her child while book sharing. It has been documented that language modeling, imitations, expansions, pointing, eye contact, and physical manipulation while book sharing positively affect a child’s overall development. Many children with autism present with learning differences or differences in attention behaviors that may impact their ability to book share. Since book sharing is so important for a child’s development, it remains critical to investigate if the challenges children with autism face impact their ability to book share. This study was designed as a pilot to capture interactions between mothers and their children with autism during shared book reading. Mothers of children with autism were interviewed by phone or in person regarding their child’s functional communication skills and emergent literacy skills. The mother and child engaged in a video recorded book sharing session at the Wendell Johnson Speech and Hearing Center. The sessions were coded for type and frequency of interactions between mothers and their children.
with autism. We hope to identify skills that can be enhanced between mothers and children during shared book reading.

9. Jennifer Chavez-Rivera

Major(s): Political Science and Ethics Public Policy  
Mentor(s): Rene Rocha (Political Science)

Immigration in the United States: Attitudes, Behavior and Enforcement.

- As immigration continues to be an important topic within everyday politics and society in the United States, it is essential that we become more familiar and knowledgeable regarding the different aspects of this phenomenon. Not only must we take into consideration the initial decision of an individual to migrate to the United States, and the factors that shape that decision, but also evaluate how immigration enforcement agencies operate and also influence immigration. For this presentation, I have focused on Iowa enforcement, more specifically, whether or not there is a direct relationship with Iowa residents’ public attitudes on immigration enforcement. Additionally, throughout my research I have looked at differences and patterns in immigration enforcement and resource allocation along the border, and how that may affect the initial decision to migrate. This research is of great significance as it is crucial to recognize that designing legal “solutions” or reforms to the current immigration system in this country, may be more effective with the integration of social science findings on patterns in migration behavior and enforcement.

11. Yiwen Chu

Major(s): 3D design  
Mentor(s): Monica Correia (School of Art and Art History)

Packaging for Products

- Every product needs packaging when it enters the market. To design a proper packaging for a designer’s lamp that can be disassembled, we use computer modeling software to draw the blue print of the package, and then we use the CNC (Computer numerical controlled) laser machine to cut out the material we want for the lamp package and test the model. Because the thickness of each lamp pieces is 0.25”, we use the same thickness card board as the nesting material to match the thickness of the piece while we still use single-fluted card board to make the box of the lamp. We started with quarter-sized model to test the arrangement and the sequence of the lamp pieces in the box and then we go full size to understand how much tolerance we need between the lamp pieces and the nesting material of the packaging. We are having a hard time to design a way to place the lamp pieces in the order of assembling them and fully using the space of the box at the same time, and that is our next goal.
13. Erica Cole

**Major(s):** Chemistry  
**Mentor(s):** Tori Forbes (Chemistry)

**Cu(II) Assists in Making 2D Uranium Compounds Into 3D Structures**

- Crystal structures containing uranium as the metal are complex materials because of the vast number of variables which lead to unpredictable coordination. Often, crystals containing only uranium as the metal turn out to be infinite chains and sheets. The addition of transition metals adds to the complexity, but can assist in increasing dimensionality, taking these chains and sheets and turning them into 3-dimensional frameworks. In this presentation, we can see that the same uranium-containing unit forms different crystals in the presence of different organic ligands, or connectors, that bond with the Cu(II) cation. This means that in the future, the structure of the ligand bonded to the Cu(II) cation could be the key to designing materials containing uranium units.

15. Daniel Coulthard

**Major(s):** Geoscience, Environmental Science  
**Mentor(s):** David Peate (Earth and Environmental Science)

**Using Mineral Chemistry to Infer Depths of Crystallization Underneath an Atypical Icelandic Volcano**

- The Búðahraun flow is located in western Iceland far from where volcanism usually happens. Furthermore, the rock comes from a cinder cone which is also unusual since most volcanism on Iceland comes in the form of fissure eruptions. The reason these lavas are erupting where they are in the manner that they are is not as well understood in comparison to the lavas erupted from the main rift zone to the east. The rock has large crystals of olivine, clinopyroxene, and plagioclase feldspar. These minerals also appear in the microcrystalline groundmass where the naked eye cannot tell minerals apart. We analyzed the clinopyroxene crystals since we can calculate depth of crystallization based on chemistry. We found that the crystals we analyzed started to form at depths of 21-24 km beneath the surface. These depths were geophysically determined to be where the crust meets the mantle by Darbyshire et al. (2000). We also analyzed a clinopyroxene that displayed an optical feature called sector zonation. This zonation indicates non-equilibrium growth. When we analyzed zones of the crystal out of equilibrium with the core we obtained depth calculations that averaged 6-7 km shallower than when we analyzed zones in equilibrium with the core.

17. Devon Dawson
   Conner Wharff

**Major(s):** Psychology; Spanish
**Mentor(s):** Michelle Voss (Department of Psychological & Brain Sciences)

**Cardiorespiratory Fitness is Associated with Learning Rate of Executive Function Tasks in Older Adults**

- Most older adults will experience decline in cognitive abilities that help us process complex information and make decisions, known as executive functions (EF). These abilities are crucial in maintaining independence in later life, and this decline creates a public health concern to our growing elderly population. Research examining EF in humans has primarily focused on outcomes of learning rather than learning rate (LR), or the ability to improve performance on a task over time. In contrast, animal models have depicted significant effects of exercise on brain processes that specifically support LR. In older adults, new research has identified greater cardiorespiratory fitness (CRF) as being associated with maintained EF; additionally, data suggests that exercise can increase levels of CRF. Thus, we predict CRF would also be related to LR in human populations. To test this, we examined the relationship between CRF and LR on a battery of neurocognitive tasks measuring EF. We hypothesized that higher CRF would be related to greater LR in each task, and that this would be distinct from the relation with overall performance. This research is important in exploring the development of non-pharmacological behavioral interventions for older adults to preserve cognitive abilities as they age.

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**19. Frank De Stefano**

**Major(s):** Biochemistry  
**Mentor(s):** Jessica Sieren (Radiology & Biomedical Engineering), Eric Hoffman (Radiology & Biomedical Engineering)

**Developing a Clinical Database to Improve Medical Imaging Protocols for Neurofibromatosis Type-1 Patients**

- Neurofibromatosis Type 1 (NF1) is a genetic disease affecting about 1/4000 of the population. This disease causes a wide variety of neurological, cosmetic, and skeletal problems that greatly range in severity from patient to patient. A common occurrence in NF1 patients is the appearance of non-cancerous neurological growths, called neurofibromas. These growths can occur on or underneath the skin with more problems arising with growths existing deep in the internal tissues. Although most patients do not end up having serious complications, these non-cancerous growths can transform into cancerous growths, called malignant peripheral nerve sheath tumors (MPNST). These cancerous growths are extremely difficult to diagnose and are very aggressive. The purpose of this study was to collect retrospective data from patients diagnosed with NF1 at the University of Iowa Hospitals and Clinics (UIHC). The database was constructed using electronic health records (Epic Systems, Verona, WI) to collect demographic and healthcare related information. Forty-one patients (34 non-cancerous, 7 cancerous) constituted our clinical database, with a total of 1141 clinical imaging studies conducted between, 1998-2015. Using this database, we will examine medical imaging data of the patients to both further improve imaging procedures and assessment of image data for NF1 cases with neurofibromas.
NANOSCALE SURFACE MODIFICATION AND IT’S EFFECT ON BIOFILM FORMATION AND PROPOGATION

- The National Institute of Health estimates that 80% of all human infections are caused by biofilms, accounting for billions of dollars in healthcare annually. These biofilms form on almost every implanted medical device (i.e. stents or catheters) in some form or another. Our research aims to reduce or eliminate the adhesion and propagation of these films by using chemical and/or physical surface modification techniques. These modifications would prevent the chemicals in the biofilm from being able to stick to the surface of the medical device. This poster presents our results for polyurethane films on solid supports that model an implanted medical device. These model surfaces are immersed in a solution of proteins known to cause bio-fouling, and evaluated in real-time for accumulation of protein. The mass of protein accumulation is monitored by several analytical techniques, and data are compared across several surfaces to examine effects of hydrophobicity, surface roughness, and surface charge. Our conclusions outline potential approaches for the developing improved surfaces that will reduce or eliminate microbial adhesion and biofilm colonization.

Effects of Break-Induced Replication in G1 phase of the cell cycle

- Break-Induced replication (BIR) is a DNA repair pathway that repairs double stranded DNA breaks (DSBs). This repair pathway is known to lead to high mutation rates and chromosomal rearrangements which are hallmarks of oncogenesis and other genetic related diseases. For this project, I am to study the effects of BIR in G1 of the cell cycle. With the model organism Sacharomyces Cervisiae, and with the use of different Genetic techniques I am currently determining the mechanism of BIR in G1. After the initiation of a DSB I can determine the phase of the cell cycle the cell is in with the use of Fluorescent Activated Cell Sorting (FACS). Then with the use of Pulse Field Gel Electrophoresis (PFGE) I can determine intermediates and track repair of the broken chromosome. With the combination of FACS to show the cell is in G1 of the cell cycle, and PFGE showing the intermediates and repair that is occurring is a very powerful technique to elucidate what is occurring in G1.
The Allocation and Reuse of Objects by Roman Elites

- Augustus utilized both public art and the art of private spaces as tools to display his power and authority. By researching publications and other media we are able to separate the private spaces from public and identify which have been relocated or reused. The data is entered into our database of 530 objects and growing and will be used to create a comprehensive case study about the reuse of objects in the Roman Empire. This case study is made up of images, measurements, primary (ancient) sources, and bibliographies. Although the main focus of the research is reuse by Augustus we also collect data on the looting and collecting by other emperors and generals. I also spend time exploring the private sphere of Augustan art by researching and maintaining a comprehensive bibliography about the Villa Farnesina and House of Augustus in order to create a future case study. The artistic motifs in both houses allude back to the Battle of Actium and his defeat of Marc Antony and Cleopatra, which took place just 10 years before. These houses also include images of Apollo, whom Augustus affiliates himself with. These artistic programs help to display the emperor’s power and authority even in a domestic space.

27. Kelli Fowler

Major(s): Psychology
Mentor(s): Catherine Chenard (Internal Medicine)

Dietary Compliance Score Development for the Wahls Elimination™ and Swank Diets in Subjects with Multiple Sclerosis

- People with Multiple Sclerosis look to diets, such as the Wahls Elimination™ and Swank, to relieve symptoms of the disease. The Wahls Elimination™ omits grains, dairy, legumes, and eggs while the Swank restricts fats. Due to the elimination of comfort foods, compliance was a concern, so scores were constructed and validated to determine individual participant compliance. Each diet had separate equations for food groups that were required, encouraged, not encouraged, and allowed in moderation. Complete compliance is the maximum score for each diet, 40 points for Wahls and 80 for Swank. Seven-day sample menus for each diet were used to determine equation accuracy. Menus had close to perfect scores, with a Wahls score of 39.7(99% compliant) and 72.1(90%) for the Swank. We then assessed changes in participant compliance using two 7-day food records for each diet, one before the diet began and one after. The scores were higher while on the diets, Wahls 11.4(6.32);29% before and 32.0(3.1);80% after, and Swank 22.6(10.0);28% before and 53.4(14.6);67% after. Based on these results, the compliance equations were determined to be suitable to calculate individual participant compliance.
Nutritional Adequacy of WahlsTM and Wahls Paleo PlusTM diets for Individuals with Multiple Sclerosis

- Many individuals with Multiple Sclerosis (iwMS) turn to changes in diet, including the WahlsTM and Wahls Paleo PlusTM Diets, to reduce symptoms. Both diets include nutrient-dense vegetables and organ meats but eliminate gluten, eggs, and dairy. The Wahls Paleo Plus TM is a modified ketogenic diet high in fat that restricts high carbohydrate fruits and vegetables. Because of the strict nature of these diets, the amount of nutrients individuals consume is of interest. We thought nutrient intake would increase in WahlsTM and Wahls Paleo PlusTM diets compared to their usual diet because of increased consumption of nutrient-dense vegetables and organ meats. To assess diet quality, the mean adequacy ratio (MAR) and healthy eating index 2010 (HEI2010) were calculated for fifteen subjects assigned to one of the diets, or a control group following their usual diet. Food intake data was collected before and after following the diets. MAR and HEI2010 increased slightly in the WahlsTM group, a positive trend. No change was seen in the diet quality of the Wahls Paleo PlusTM or control groups. Therefore, despite food restrictions, iwMS utilizing the WahlsTMDiet consumed higher nutrient levels, while Wahls Paleo PlusTM diet followers consumed nutrient levels similar to their usual diet.

31. Timothy Fuqua

Major(s): Biology
Mentor(s): Albert Erives (Biology), Elizabeth Stroebele (Biology)

Flies, hedgehog, and the study of gene regulation

- The DNA inside our cells consists of two components: genes and regulators. Genes are sequences of DNA your cells read as a template to create proteins, which help the cell grow and develop. The regulators of DNA, however, control when, and in which cells, the genes are expressed. One type of regulator DNA is the enhancer, and its DNA contains unique sequences that binding proteins called transcription factors (TF’s) attach to. The combination, orientation, or spacing of TF’s bound to an enhancer determines when and where genes are expressed. The logic behind enhancers and how they function to pattern genes is poorly understood. Using a fruit fly model, our lab studies enhancers using a subset of TF’s to decode their logic. This project specifically focuses on an enhancer for a gene called hedgehog – which is highly important for the development of flies and humans. We found this enhancer helps "clean up" the Hedgehog expression pattern into robust, and partitioned compartments within the fly. Through these findings, we hope to gain a better understanding behind how enhancers function, and how hedgehog is regulated in both flies and humans.

33. Sarah Gardner
**Major(s):** Biochemistry  
**Mentor(s):** Sheila Baker (Biochemistry)

**Restoration of Vision in a Mouse Model of Congenital Stationary Night Blindness**

- One type of vision loss, known as congenital stationary night blindness, can be caused by the malfunction of a protein called Cav1.4. Cav1.4 is needed for vision because Cav1.4 is used to build the photoreceptor synapse and then it controls when messages are sent from the photoreceptor synapse to other neurons in the retina. The purpose of this project was to test if synaptic development and function could be rescued in a mouse that has congenital stationary night blindness. Our results show that using a gene therapy-like technique to restore normal Cav1.4 protein expression does rescue synaptic development. Furthermore, we setup a behavioral test of mouse vision and found that the treated mice could see. These results can be used to further study how photoreceptors are formed and function, and it indicates that this approach could be adapted to restore vision for people afflicted with this disease.

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**35. Ashley Gilbert**

**Major(s):** Chemistry  
**Mentor(s):** Betsy Stone (Chemistry)

**Analysis of Suspended Air Particles in Kathmandu, Nepal**

- Due to increased populations and vehicle ownership, air quality in the Kathmandu, Nepal has been decreasing rapidly. The focus of this research project was determining levels and chemical composition of particulate matter in the atmosphere. Particulate matter samples collected in the Kathmandu region over eleven hour increments twice a day (one day and one night sample) from April 11 to April 24, 2015. During this time, the average total suspended particles for the 11 hour periods were approximately 3 times greater than the World Health Organization guidelines for a 24 hour period. Elemental carbon and organic matter were the dominant components and contributed approximately 14% and 41% of the total particle mass respectively. An additional 30% of the total mass was due to water soluble inorganic ions. Identifying these ions helps identify the sources of particle pollution in the area. For example, secondary ions, such as sulfate, nitrate, and ammonium, indicate pollution formed from gaseous precursors. High calcium concentrations suggest pollution from re-suspended dust. Determining the sources of pollution will aid in improving air quality.

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**37. Haviland Gilbert**

**Major(s):** Music Performance  
**Mentor(s):** Erin Wehr (Teaching and Learning)

**A New Ensemble in Music Education**
As music education is advancing, ensembles are changing how they are designed and purposed. An example of a culturally relevant ensemble is a studio orchestra. A studio orchestra is typically a professional ensemble that has varied instrumentation. This descriptive study includes a review of literature on the use of non-traditional groups and styles in string music education, and observational case studies on each of three studio orchestras in varied educational settings. The purpose of this study was to explore the concept of studio orchestra as applied in elementary, secondary, and tertiary music education settings to answer the following questions: 1) What defines a studio orchestra; 2) What roles can the studio orchestra take in various music education settings; 3) In what ways can a studio orchestra uniquely meet music education goals; 4) In what ways does a studio orchestra not meet music education goals; 5) Can studio orchestra provide culturally relevant music education for students with varied backgrounds?

39. Callie Ginapp

Major(s): Biology (Neurobiology)
Mentor(s): Gordon Buchanan (Neurology)

Serotonin-mediated mechanisms in CO2-induced arousal from sleep

- Obstructive sleep apnea affects up to 14% of American adults and is associated with increased risk for cardiovascular disease, diabetes, and stroke, increased daytime sleepiness, and reduced fine motor and cognitive function. Currently there is no cure and limited treatment options. This project aimed to understand the biological processes leading to arousal in sleep apnea in order to lead to better treatments and diagnoses. Sleep apnea is caused by airway relaxation during sleep which blocks airflow and leads to CO2 buildup in the bloodstream. This increase of CO2 is detected by nerve cells in the midbrain which then release the chemical messenger serotonin. Serotonin affects other cells by binding to their receptors, leading to arousal. The purpose of this study was to begin to understand where in the brain serotonin might act. Mice were implanted with EEG and EMG electrodes, and cannulae directed towards the serotonin neurons in the midbrain. Directly activating serotonin receptors in the midbrain caused arousal, whereas blocking these receptors did not inhibit arousal in response to elevated CO2. These data suggest activation of serotonin neurons in the midbrain is sufficient to cause arousal, but activation elsewhere is required for arousal to CO2.

41. Lisa Gordon
   Shane Nielsen

Major(s): Communication Sciences and Disorders
Mentor(s): Melissa Duff (Communication Sciences and Disorders)

Aging and learning: The effect of age on statistical learning
• Starting at as young as eight months of age, our brains are able to sort incoming information by picking up on statistical regularities within it. The ability to recognize these regularities is called statistical learning (SL). SL plays a role in language and grammar acquisition, facial recognition, and mirror reading. It is unclear which part of the brain is associated with SL. Previous studies have demonstrated that statistical learning relies on the hippocampus. As adults age, their hippocampus shrinks in size and shows lower levels of activation. If SL does rely on the hippocampus, then it should be negatively affected by these age-inflicted changes. This study examined the effect age has on the performance of an auditory perceptual task that measures SL. 20 individuals aged 21-26 years and 20 individuals aged 75-81 years participated in the study. Participants were matched on education level and screened for any sensory or cognitive impairments. We predict that the younger cohort will perform significantly better on the SL task. Data collection is ongoing. If our prediction is correct, this study will be among the first to connect SL abilities with age. This finding would provide insight as to how the elderly learn new information.

43. Bailey Hadnott

Major(s): Environmental Engineering
Mentor(s): Keri Hornbuckle (CEE), Andres Martinez (CEE)

Polychlorinated Biphenyls (PCBs) in New Bedford Harbor

• New Bedford Harbor is an 18,000-acre urban estuary with sediment contaminated with polychlorinated biphenyls (PCBs) and heavy metals. Due to this high level of contamination, the harbor in Massachusetts was placed on the EPA’s list of Superfund cleanup sites and is considered to be one of the nation’s largest PCB contaminated sites. Immediately adjacent to the Site is the city of New Bedford. It is considered to be an environmental justice community. EPA Region I has been monitoring air in this area during dredging since the 1990s and has found elevated air concentrations of PCBs. This project uses meteorological data as well as PCB property data to determine emissions of PCBs from the water in New Bedford Harbor (NBH) to the air surrounding NBH. Predictions from the model that uses the properties previously mentioned will then be compared to measured data to determine the model’s validity and predictive applications. This project is a collaborative effort between: Iowa Superfund Research Program (ISRP), Boston University Superfund Research Program (BUSRP) Community Engagement and Research Translation Cores and their partners Alternatives for Community & Environment (ACE) and Toxics Action Center (TAC).

45. Amanda Hart

Major(s): Art History
Mentor(s): Robert Bork (Art and Art History)

The Architectural Patronage of Emperor Charles V in Spain
The striking diversity of architectural production associated with the patronage of Emperor Charles V in Spain suggests both the cultural complexity of the kingdom during his reign, and the competing interests and agendas that builders working for the Emperor had to consider. The distinctive formal elements of the three styles of architectural monuments and their corresponding political connotations, as well as the advisors and rulers who influenced their construction, will be considered in this analysis which will further delve into the disputed burial plans of Charles V. The pointed patronage of Charles V’s reign is particularly exemplified in his palace, the Royal Chapel, and the Cathedral in the Spanish city of Granada. Each of these structures will be topics of discussion for what they demonstrate about his political agenda and that of those around him.

47. SHIQIN HE

Major(s): chemical Engineering
Mentor(s): Julie Jessop (Chemical Engineering)

Let’s Get Started: Comparing Electron-Beam- and Light-Initiated Polymerizations

- Electron beam (EB) polymerization is difficult to characterize due to the fast line speeds and ionizing radiation. In contrast, light-initiated polymerization is well understood. Both EB- and light-initiated polymerization reactions are types of radiation polymerization that differ only in their respective initiation mechanisms. This project aims to better understand the EB-initiation mechanism by comparing the properties of EB- and UV-cured polymer films. A protocol was established to estimate equal initiation energies, and polymer conversion was calculated using Raman spectroscopy.

49. Kathryn Heffner

Major(s): English
Mentor(s): Amy Chen (Special Collections)

Women Edited Science Fiction Little Magazines

- Women editors of 20th century Science Fiction fanzines shaped and contributed to the dialogues within fan communities through their creation and editorial work of fanzines. These independently published ‘little magazines’ became a site of resistance against patriarchal science fiction communities, creating a space for their voices. My research examines the significance of three female-edited fanzines, and how they were used as a feminine material object of resistance to limiting publishing platforms.

51. Melody Hines

Major(s): Anthropology
Mentor(s): James Enloe (Anthropology)

Animal Presence at Woodpecker Cave Archaeological Site

- Woodpecker Cave is an archeological site located near North Liberty, Iowa. At this site, many different archaeological artifacts were recovered, including animal bones. These bones, which are often fragmented, require identification of which part of the skeleton they represent, what animal species the bone remains belong to, and the weight and length of the bone. The condition of the bone fragment is also required, as well as information regarding any changes to the bone that may have happened as a result of outside forces. By identifying the bone siding, right or left, the minimum number of animals of a specific species can be estimated for the site. This, along with the age of the animal at the time of its death, can give us insight to the season in which the site was occupied.

53. Hannah Infelt

Major(s): Mechanical Engineering
Mentor(s): Jessica Goetz (Orthopedics and Rehabilitation)

The Effects of Fractionated Irradiation on Bone Morphology and Strength

- When treating cancer, irradiation therapy delivered through X-rays is a common option to control tumors in a specific area of a body. However, the radiation affects the area surrounding the tumor which often includes the bones of a patient. It has been found that radiation can severely weaken bone, putting the patient at risk for a fracture. The goal of this work was to study resulting damage to bone structure and strength after varying the way irradiation treatment was given to the bones. The design of this study was to give a group of mice a single strong dose of irradiation and to give another group five smaller doses that were as a total equivalent to the larger dose. The bones from these groups were then scanned to determine possible deterioration within the bones and then twisted until they broke to determine their strength and stiffness. Understanding any correlation between the bone structure and strength, or changes in the structural/mechanical measures due to the various irradiation treatments, could potentially help minimize the side effects of irradiation on bones in clinical settings.

55. Josh James

Major(s): Neurobiology (B.S.)
Mentor(s): Joshua Weiner (Biology)

The choroid plexus in normal brain development and function

- The choroid plexus (CP) is a non-neuronal tissue inside the brain that plays critical roles in maintaining healthy brain function. It produces cerebrospinal fluid, which cushions and controls the environment of the brain, while simultaneously regulating the passage of nutrients and cells between the circulating blood and the cerebrospinal fluid. A group of 22 neuronal proteins that
mediate cell–cell interactions, the gamma-protocadherins, were previously found in the CP and implicated as regulators of cerebrospinal fluid regulation and entry of immune cells into the brain during inflammation. This new research focuses on identifying other typically-neuronal genes that may contribute to the CP’s specialized functions, as well as determining if immune cells also express the γ-protocadherins. Indeed, we find several neuronal and synaptic genes are expressed in the CP, suggesting a novel role for neuronal gene expression in this epithelial tissue. We also find that several of the γ-protocadherins are expressed in immune cells (T-lymphocytes), suggesting that γ-protocadherin interactions might regulate inflammatory responses in the brain, such as those seen in multiple sclerosis. Together, our research lays the groundwork for future studies testing such hypotheses.

57. Tamar Kavlashvili

Major(s): Biology
Mentor(s): Shujie Yang (OB/Gyn), Kimberly Leslie (OB/Gyn)

Inverse Relationship between Progesterone Receptor and Myc in Endometrial Cancer

- Endometrial cancer, which is a cancer that arises in the lining of the uterus is the most common gynecological disease. It is hormonally regulated which means hormones Estrogen and Progesterone have growth and differentiation roles, respectively. Progestin therapy is often used in endometrial cancers however its success rate depends on whether the particular cancer is hormone receptor positive or negative. Many advanced tumors lose PR expression. We recently reported that the efficacy of progestin therapy in advanced cancers with the loss of hormone receptors can be significantly enhanced by combining progestin with epigenetic modulators, which we term “molecularly enhanced progestin therapy. Mechanism of action through ER (Estrogen Receptor) however remained unclear. ER is a principle inducer of PR and necessary for its functional expression. Therefore we modeled advanced endometrial cancer by generating ER-null endometrial cancer cell lines. Our data demonstrated that treatment with certain types of epigenetic modulator drugs was sufficient to restore functional PR expression. We also found a negative correlation between PR and the oncogene Myc. PR acts as a negative regulator of Myc, an oncogene that is over-expressed in many cancers. Overall our findings demonstrate that cells with successfully restored PR can be treated with progesterone and this treatment will decrease Myc levels which will be beneficial for many endometrial cancer patients.

59. Clarice Kelling

Major(s): Theatre Arts and Elementary Education
Mentor(s): Katie Hassman (University of Iowa Libraries)

Design of Pop-up Libraries and Student Engagement

- The University of Iowa libraries designs pop-up libraries are used as student engagement tools and opportunities. for students and other patrons through the University of
We focused on how to increase student engagement with pop-ups by designing spaces that would attract patrons to participate. In the beginning we looked at other pop-up libraries and similar design spaces to see their effects on attracting participants. We then used this information to design various spaces for pop-up library events including a Break from Busyness event and themed semester events that were put on this past fall and are going on currently throughout the spring semester. We continue our development of the design of spaces by reviewing participants’ opinions and responses to the event they participated in by conducting surveys and interviews. Our upcoming project will be setting up a pop-up library in the Lindquist Teaching Center where we can observe how students interact with a pop-up library outside the formal library setting.

61. David Kessler

**Major(s):** Speech and Hearing Science  
**Mentor(s):** Elizabeth Walker (Communication Sciences and Disorders)

**Factors that Improve Speech Recognition for Children who are Hard of Hearing**

- Speech recognition is a complicated task that involves perceiving acoustic speech sounds and attaching meaning in the brain. This is especially difficult for children who are hard of hearing (CHH) who wear hearing aids. Unfortunately, we know little about how factors such as vocabulary size, grammar skills, and working memory interact with hearing loss to affect speech recognition performance for CHH. The current study asked three questions: 1) Do CHH need more acoustic information on a speech recognition task than children with normal hearing (CNH)?, 2) Do CHH use sentence predictability to facilitate performance?, and 3) Do vocabulary size, grammar skills, and working memory span influence speech recognition performance for CHH? We found that CHH performed worse than CNH at 3rd grade, but performed similarly to CNH at 1st grade. This suggests that CNH improve with age while performance for CHH stays the same as they age. Furthermore, both CHH and CNH were able to use sentence predictability to help them perceive speech. Lastly, vocabulary was the only variable that influenced performance on the speech recognition task. This study suggests that therapies which focus on improving vocabulary size and providing context for CHH may improve speech recognition.

63. Nicholas Koehn

**Major(s):** Human Physiology  
**Mentor(s):** Jessica Sieren (Department of Radiology)

**Comparison of Four Clinical Mathematical Prediction Models Evaluating Lung Cancer Tumors**

- The National Lung Screening Trial demonstrated that preemptive evaluation by computed tomography (CT) imaging in individuals at risk for lung cancer could reduce the risk of dying from lung cancer by 15-20%. However, 95% of suspicious solitary pulmonary nodules (SPNs), or tumors, identified on precautionary CT scans were found to be benign, or noncancerous. In an
effort to reduce the frequency of false positive diagnoses in lung cancer screening, various Mathematical Prediction Models (MPMs) have been created to offer clinicians an objective assessment of the SPN as cancerous or noncancerous. We compared four independently developed MPMs (Mayo, VA, PU, and Brock) by retrospectively assessing medical history information and CT imaging reports of 50 individuals found to have SPNs. Results were tabulated from a total of 110 CT scans and analyzed to identify the MPM that showed the greatest reduction in the frequency of false positive predictions. When considering the time point closest to diagnosis, the Brock model accurately identified all cancerous SPNs and roughly half of the noncancerous SPNs. The PU model yielded the highest accuracy of 84% when considering the time point closest to diagnosis but failed to identify each malignant nodule present.

65. Kayla Ladd

**Major(s):** Biochemistry  
**Mentor(s):** John Kirby (Microbiology)

**Restored Motility in the Absence of an Essential Regulator in Myxococcus xanthus**

- Myxococcus xanthus is a soil-residing bacterium, that feeds on other bacteria and develops spores when nutrients are low. M. xanthus is capable of moving within the soil and this movement is critical for both predation and sporulation. One form of this motility requires cellular appendages called type IV-pili (T4P). T4P extend and retract from the cell body, allowing for “Spiderman” like motility. Importantly, T4P are composed of the PilA protein and production of PilA requires the essential regulator protein, PilR. Without PilR, there is no PilA production, and therefore no T4P or motility. However, in this study we show that a mutant M. xanthus strain lacking the regulator PilR demonstrates restored capability to move after prolonged growth on agar plates. These new strains display characteristics comparable to the “wild-type” M. xanthus strain that produces PilR. Whole genome sequencing revealed unique mutations in these new strains, including in another regulator that shares similarity to PilR. We hypothesize that these mutations are responsible for the restored production of T4P and motility. We are investigating the mechanisms behind this phenomenon.

67. Brian Leal

**Major(s):** Health and Human Physiology  
**Mentor(s):** Jason Ulloa (Community and Behavioral Health)

**Latino Men’s Health Literature survey**

- Latino men suffer from disproportionate rates of depression, substance abuse, and in Men who have sex with men (MSM) higher risks of HIV contraction. We conducted a literature review to find all the articles in Pub Med related to Latino Men’s health behavior. Out of 1732 articles only nine were related to behaviors that contribute to Latino men’s health. Of those nine, all found
varying degrees of influence that acculturation and culture have on aforementioned health issues. The literature review highlights both literature and health disparities that a segment of the largest growing population (Latinos) face. More research is needed to understand the effects that culture has on health behaviors.

69. Ryan Lee

**Major(s):** Biology  
**Mentor(s):** Kelly Messingham (Dermatology), Janet Fairley (Dermatology)

**Fewer Langerhan’s cells and Tregs present in human skin biopsies from patients with blistering disease**

- Autoimmunity results from the inability of the immune system to discriminate between self and non-self. Bullous pemphigoid (BP) is an autoimmune disease targeting epidermal attachment proteins resulting in inflammation and blistering of the skin. Recent studies suggest that immune responses to skin antigens are generated by skin resident immune cells. Several different types of skin immune cells are needed to generate productive immune responses to bacteria and other pathogens. However, autoimmunity can occur when these responses are not adequately regulated. Two key populations known to prevent autoimmune responses in the skin are Langerhans cells (LC) and regulatory T cells (Treg). In this study, we compared these two cell populations in skin biopsies taken from patients with BP or healthy controls. Biopsies were cut into thin sections and stained with cell-specific fluorescent antibodies that could be visualized using a confocal microscope. Overall, both LC and Treg cell populations were decreased in skin of BP patients and these populations return when the patients achieve remission. Ongoing studies are examining these same populations in skin from different phases of disease to better understand whether these changes cause disease or if they result from the inflammatory conditions in the skin.

71. Danny Linggonegoro

**Major(s):** Human Physiology  
**Mentor(s):** Justin Grobe (Pharmacology)

**Vasopressin Protein in Early-pregnancy Initiates Preeclampsia**

- Preeclampsia is a life-threatening condition during pregnancy characterized by hypertension, excess protein in the urine, and eventually seizures. This disorder occurs in 5-10% of all pregnancies, and complicates roughly 4,000 pregnancies per year in Iowa alone. The cause of the disease is not known and the only cure is the delivery of the baby and placenta. Our lab found that a protein arginine vasopressin (AVP) is elevated in preeclamptic women as early as 6 weeks into pregnancy, months before clinical symptoms appear. Additionally, AVP infusion in pregnant mice throughout pregnancy causes key symptoms of preeclampsia: elevated blood pressure, excess protein in the urine, acute kidney injury, and poor fetal growth in the womb.
These data, along with the known actions of AVP in vascular and renal tissues in the non-pregnant state, lead us to hypothesize that elevated AVP in early pregnancy represents an initiating factor in preeclampsia. Indeed, female mice infused with AVP only during early pregnancy exhibited the full development of symptoms. Overall, these data suggest AVP exposure only in early gestation is sufficient to initiate preeclampsia; thus we hypothesize pharmacological interference of AVP to prevent human preeclampsia will have to be initiated as early in gestation as possible.

73. Lu Liu

**Major(s):** Chemical Engineering  
**Mentor(s):** Julie Jessop (Chemical and Biochemical Engineering)

**Conversion Quantification in Epoxides Annealed after Cationic Photopolymerization**

- Annealing, a baking process, is widely used in industry because of its ability to improve the film quality of polymer films. This research looks at the effects of annealing time and temperature on photo polymerized films of different kinds of epoxide monomers. Each film was held at a temperature for a specific time period. Because epoxide monomers experience dark cure, annealing was done at 0, 1, or 2 days after curing. A differential scanning calorimeter was used to anneal the polymer, and Raman spectroscopy was used to determine the monomer conversion before and after annealing.

75. Jessica Macaluso

**Major(s):** Anthropology, Biology  
**Mentor(s):** Robert Franciscus (Anthropology)

**Is Man the Only Toolmaker?**

- Biological sex differences in stone tool manufacture have hardly been addressed in archaeology, especially in the context of the Oldowan industry, which dates back 2.6 million years ago. Westernized perceptions of gender roles have led to the idea of “man the toolmaker,” assuming that ancient women were not participants in stone tool production. This study is intended to investigate the role that biological sex plays in flintknapping (stone tool manufacture). We conducted an experiment in which 8 female and 8 male novice flintknappers participated in individual sessions where they produced simple stone tools, similar to the Oldowan industry. The resulting tools were evaluated by their termination (end shape), maximum length, and mass by a blind analyst. Preliminary results using a Chi-square analysis for the termination of flakes yielded a p-value greater than 0.05 (p = 0.716), indicating there is no significant relationship between sex of the flintknapper and termination type of the flakes. If differences between the products of males and females cannot be found, they cannot identify the sex of the flintknapper, both in modern and archaeological contexts.
77. Ross McCurdy

**Major(s):** Astronomy, Physics  
**Mentor(s):** Philip Kaaret (Physics & Astronomy)

**End to end test of the Polarimeter for Relativistic Astrophysical X-ray Sources (PRAXyS)**

- The Polarimeter for Relativistic Astrophysical X-ray Sources (PRAXyS) is a proposed NASA small explorer mission selected as one of three missions for Phase A study. PRAXyS uses the photoelectric effect to measure the polarization of X-rays. Polarimetery is a widely unused diagnostic in X-ray astronomy because there haven’t been instruments sensitive enough to measure it. PRAXyS will measure the polarization of X-rays from the most extreme environments in the Universe. These include the gravitational fields around black holes and the magnetic fields from neutron stars. Measurements were made at Goddard Space Flight Center’s 100-meter beamline to test the polarimeter and the X-ray mirror, which will be used on the spacecraft to focus X-rays into the detector. The main objectives of the test were to verify that the mirror doesn’t affect the polarization of a source, and to measure the unknown polarization of the X-ray source. Our measurements show that the polarization introduced by the mirror is less than the mission requirement, and the source polarization is approximately 12%.

79. Victoria Mendoza

**Major(s):** Neurobiology  
**Mentor(s):** Gordon Buchanan (Neurology)

**Co-occurrence of Depression and Epilepsy alters levels of the neurotransmitter serotonin in the brain**

- An estimated 3 million Americans and 65 million people worldwide currently live with epilepsy. Epileptic patients have depression at a rate of 20% to 50% higher than the general population. Our lab seeks to understand basic mechanisms of epilepsy and its interactions with depression. When depression and epilepsy are simultaneously present in patients, they worsen the impact of each other and make each other more difficult to control. Currently, the mechanism behind the association between the two is not clear. However, the chemical messenger serotonin is implicated in both depression and epilepsy. This study compared serotonin levels in a particular brain region, the hippocampus, in epileptic, depressed, and depressed epileptic mice. We found that the highest level of serotonin was present in the stressed mice followed by depressed epileptic mice. We hypothesized that epilepsy alters serotonin transporters and receptors. The image analyses are currently in progress, but preliminarily, we have found that the levels of the enzyme that creates serotonin is consistent with the microdialysis chemical measurement of serotonin in these areas. Better understanding mechanisms for the epilepsy-depression comorbidity may lead to better therapies to reduce morbidity from these diseases.

81. Astrid Montuclard
Iowa Caucus and Compassion: Why Republicans and Democrats display different levels of compassion

- Why is there a political gap in compassion between Democrats and Republicans? On February 1st, 2016, the Iowa Morality Lab conducted a field study investigating whether Democrats and Republican active political community members displayed differences in compassion levels, and, in the case differences did arise, the reasons for the discrepancy. Voters from both parties completed in two precincts of North Liberty a questionnaire that assessed how they view compassion, how much compassion they felt in everyday life, how much compassion they felt for Syrian refugees, how inclined they were to support Syrian immigration to Iowa, and how motivated they were to avoid feeling compassion. The results of the study showed that conservatives tend to feel less compassionate than liberals, to be less inclined to view compassion as a positive value, and to be more likely to avoid compassion in front of the Syrian case. The present study sheds light on the reasons why Republicans are less compassionate than Democrats: they are more likely to avoid feeling compassion.

83. Laura Mueldener

Major(s): Speech and Hearing Sciences
Mentor(s): Shawn Goodman (Communication Sciences and Disorders)

Medial Olivocochlear Reflex and Changes in Middle Ear Reflectance

- The inner ear amplifies incoming sounds as they pass through the auditory system. The medial olivocochlear reflex (MOCR) reduces this amplification. Research in animals has suggested that the MOCR improves the ability to detect sounds in background noise. In humans, the correlation between MOCR strength and hearing in noise has been weaker than expected. This lack of correlation may indicate a different role of the reflex in humans. Alternatively, it may simply be a result of how the MOCR has been measured. The establishment of valid measurement techniques is a key step in clarifying the role of the MOCR in humans.

The MOCR is activated in the presence of noise. A second reflex, the middle ear muscle reflex (MEMR), is also activated by noise, and can confound the interpretation of the MOCR. Previous research has been conducted using relatively low-level noise to avoid the effects of the MEMR. However, these low levels result in MOCR effects that are small and somewhat variable. It may be possible to use higher levels of noise by taking advantage of the variability in MEMR activity across frequency. By constraining analysis of the MOCR to frequencies where MEMR activity is minimal, the confounding effects of the MEMR may be avoided. This strategy could allow for the measurement of larger, more stable MOCR effects. Recordings were obtained using noise levels ranging from 36-84 dB SL. Results suggest that larger, uncontaminated MOCR effects can be measured using this method.
**85. Sungha Nielsen**

**Major(s):** Psychology  
**Mentor(s):** Jason Clark (Psychological and Brain Sciences)

**Stereotype Validation and Intellectual Performance: An Extension to Positive Stereotypes**

- Recent research has discovered stereotype validation: A phenomenon that occurs when post-performance activation of stereotypes confirms a person’s evaluation of his or her stereotype-relevant performance. For example, when women are made aware of the negative gender stereotype about math ability after performing poorly on a math test, they are more certain of their poor performance relative to women for whom the stereotype is not made salient. Furthermore, this increased certainty produces harmful consequences including lower beliefs in their math ability, less interest in math-related careers, and worse performance on a subsequent math test. Although past stereotype validation research has focused exclusively on the influence of negative stereotypes, the current study examined the effects of positive stereotypes. Asian participants were given an easy math test, meant to produce positive performance perceptions. Then, the stereotype that Asians are good at math was either activated or not before participants reported their performance certainty and took a second math test. I hypothesize that participants who were reminded of the stereotype will report higher certainty in their positive performance than participants who were not reminded of the stereotype. Furthermore, I predict that participants high in performance certainty will perform better on the second math test.

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**87. Nicole Nitschke**

**Major(s):** Biomedical Engineering  
**Mentor(s):** Christopher Benson (Internal Medicine), - (-)

**Acid-Sensing Ion Channels (ASICs) Contribute to Thermoregulation During Exercise**

- Acid-Sensing Ion Channels (ASICs) are pH sensitive ion channels found both in the central and peripheral nervous systems. In sensory neurons that innervate skeletal muscle, ASICs sense lactic acid within exercising muscle and trigger reflexes to increase heart rate, blood pressure and respiration. Preliminary studies show that mice lacking ASICs are not able to exercise as well as wild-type mice. Another important reflex associated with exercise is skin vasodilation to cool body temperature. We hypothesized that thermoregulation during exercise would be altered in ASIC -/- mice. We first measured radiant heat using infrared (IR) imaging while the mice were exercising on a treadmill. Our preliminary results suggest that ASIC3 -/- mice have far less radiant heat during exercise than wild-type mice. Next we will measure core-body temperature during exercise using a temperature transponder that is injected into the back of the mice. We anticipate that ASIC -/- mice will have diminished radiant heat and increased body temperatures during exercise, which would support our hypothesis that ASIC -/- mice are not able to properly regulate their temperature while exercising, thus preventing them from being able to exercise as well as wild-type mice.
89. Maureen O’Connor

**Major(s):** Biochemistry  
**Mentor(s):** Lori Wallwath (Biochemistry)

**The relationship between heart function and fat accumulation**

- Mutations in the human LMNA gene cause a collection of diseases called laminopathies. These diseases have common features such as heart problems and altered fat metabolism. The LMNA gene encodes proteins that normally localize to the nucleus, the cellular substructure that houses genomic DNA. To understand how mutant lamins cause heart and fat abnormalities, we made a fruit fly model. We found that mutant lamins aggregate and do not localize to the nucleus, which correlates with loss of heart function and fat accumulation. We used genetic tools to destroy the protein aggregates that resulted in lowered fat levels. Our data suggests that patients with LMNA mutations might be helped by drugs that increase the destruction of protein aggregates.

91. Neel Patel

**Major(s):** Human Physiology  
**Mentor(s):** John Dagle (Department of Pediatrics - University of Iowa Hospitals and Clinics)

**Delayed Umbilical Cord Clamping in Preterm Infants**

- Delayed umbilical cord clamping in preterm infants has been shown to have many benefits including improved brain development. Our lab seeks to determine how effective this recently implemented protocol has been for children born at the University of Iowa Hospital and Clinics. We conducted a retrospective analysis and looked at a variety of factors while the babies were in the hospital. Some of these factors included length of hospital stay, need for blood transfusions, hemoglobin levels, and retinopathy. We found that babies having their cord clamping delayed had higher levels of hemoglobin and less occurrences of retinopathy. Therefore, we have evidence that delayed cord clamping provides benefits for preterm infants while they are in the hospital.

93. Charlie Rupp

**Major(s):** Human Physiology  
**Mentor(s):** Nicole Becker (Chemistry), Allie (Brandriet)

**Analyzing students’ reasoning and ability to explain chemical kinetics topics.**

- For many students, introductory chemistry courses are the gateway to their future in STEM fields and their major courses. General chemistry courses aim introduce students to the practices that
scientists actually engage in the real world, such as analyzing and interpreting data, constructing and revising models, and the application of the science practices to new situations. Despite this focus, many students struggle with these practices even after instruction. The question remains: How can we enable students to more successfully engaged in these science practices? In this study, we examined students’ ability to analyze and interpret data in order to construct mathematical chemical models known as rate laws. Fifteen second-semester general chemistry students participated in interviews intended to explore their reasoning as they determined the reaction order, an important component of a rate law, from data. The students’ responses were analyzed and categorized based on increasing level of sophistication in their reasoning. A variety of findings from this study will be discussed including the methods students used to construct their rate laws and obstacles that students faced.

95. Chelsea Ryan

Major(s): Psychology
Mentor(s): Ryan LaLumiere (Department of Psychological and Brain Sciences)

The Effects of Optogenetics on Cocaine-Seeking Behavior in Rats

- The infralimbic cortex (IL), a region of the medial prefrontal cortex, plays a role in the suppression of cocaine-seeking behavior and extinction learning. When inactivated or activated, the IL has been shown to impair or enhance retention of extinction learning, respectively. The temporal relationship between lever pressing, extinction learning, and IL activity, however, is relatively unknown. This study investigates the effects of optogenetic stimulation on cocaine-seeking behavior. IL inhibition immediately after unreinforced lever presses enhances ongoing lever pressing and potentiates later cocaine-seeking behavior. These results suggest that activation of the IL immediately after an unreinforced lever press plays a role in suppression of ongoing cocaine-seeking behavior. IL activation also contributes to the suppression of future cue-induced reinstatement.

97. Kaitlin Schlotfelt

Major(s): Anthropology
Mentor(s): Tiffany Adrain (Earth and Environmental Science)

Coal Ball Collection Conundrums: How to Protect and Care for an Iowa Pennsylvanian Coal Ball Collection

- The Pennsylvanian Period lasted from roughly 320 to 286 million years ago. During this time there were widespread swamps where plants of various sizes were and when the plants died they would fall into the swamp then with thousands of years of pressure being applied to the organic material, it became coal. This is why this geologic time period is nicknamed "the Coal Age" seeing as most of the world’s coal supply can be traced back to these large, numerous coal swamps. However, these coal balls have fossilized organic materials from the plants stored
within them as well. Today the coal balls in the collection at the University of Iowa are in severely poor conditions. The main problem is that these coal balls have been stored in an area that has little to no air or humidity control as well as pest issues. Both of these aspects have lead to crumbling of these coal balls. A few decades ago, coal ball research was much more exciting and it was popular to create cellulose acetate peels of the sides of cut coal balls. Both the coal balls and their peels need to be protected from further damage and decay.

**99. Matthew Schoenberger**  
Xavier Ferrer

**Major(s):** Pre-Pharmacy  
**Major(s):** Biology  
**Mentor(s):** Maurine Neiman (Biology)

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

- Natural selection typically reduces variation in a population by favoring only the traits that allow an individual to maximize its probability of survival and reproduction. This phenomenon results in the evolution of populations where individuals feature very little variation in traits that are especially important for their survival or reproductive success. A good example of these types of traits is provided by life history traits: those traits associated with timing of and investment in important life events like reproduction and growth. Numerous populations in nature feature extensive life history variation and thus violate this expectation that life history traits should instead be relatively invariate. One potential answer to the question of why life history traits are so variable might come from parasites, which could plausibly generate selection favoring relatively rapid growth and early maturation in populations where infection risk is relatively high. *Potamopyrgus antipodarum*, a freshwater snail native to New Zealand, provides an ideal organism to study the relationship between parasitism rate and life history variation because it exhibits extensive life-history variation and is commonly parasitized by the small trematode *Microphallus*. The effect of parasites on life history traits can be obtained by comparing the growth rates and size at maturity of snails originating from different lakes that have varying parasite infection rates.

**101. Maria Seltz**

**Major(s):** Finance and Management  
**Mentor(s):** Erin Johnson (Management & Organizations)

**A Case Study Examining Women in Entrepreneurship**

- The case analysis identifies three countries, Sweden, Nigeria, and the United Kingdom that have been given scores in various entrepreneurship criteria. The United Nations endorsed a scorecard analyzing 5 factors for women in entrepreneurship that this case study focuses on. The United Kingdom excels in giving women equal access to education and technology, the current
business environment, leadership and rights for women, and the potential for entrepreneur leaders, but they fall short in their pipeline for women entrepreneurs. The business environment, gendered access, leadership and rights for women, and potential for entrepreneur leaders should be the “keys to success”, but the United Kingdom falls short. Nigeria lacks in the four “keys to success”, but rank first in pipeline for women entrepreneurs. This case study analyzes other factors that influence the pipeline for women entrepreneurs. The case study concludes that the countries with women starting businesses at equal rates to men have cultures that foster and encourage women to start businesses with less chance of failure.

103. Lara Shema

Major(s): Elementary Education
Mentor(s): Laurie Croft (Belin Blank International Center for Gifted Education)

Globally Aware and Gifted: Themes from Ten Years of the Global Awareness Network of the National Association for Gifted Children Conferences

- Conference presentation data between the years of 2001 and 2010 from the National Association for Gifted Children’s ‘Global Awareness’ Network will be analyzed for recurring themes and topic trends. This information can be used to help inform teachers who work with gifted students, and gifted students themselves, of what can be considered ‘hot topics’ in the world of gifted education. Understanding these hot topics has the potential to help guide future instructors in the support and guidance of gifted students in and out of the classroom. The Global Awareness Network is a group of members of the National Association for Gifted Children whose purpose is, “...to respond to the concerns of the gifted and talented about the future and the world they live in by giving them opportunities to grow in understanding of different cultures and global interdependence...” (“Global Visions”, 2014). The information presented by members of this Network includes both educators and others selected to provide peer-reviewed conference sessions regarding what they believe to be the most critical issues for gifted children in terms of their academic and social-emotional needs in terms of cultural/global awareness. Studying the thematic trends has potential to help inform future educators of the gifted.

105. Jamie Smuskiewicz

Major(s): Psychology
Mentor(s): Teresa Treat (Psychology), Marianne Rizk (Psychology)

Enhancing Healthiness Perceptions

- Background: Improving our understanding of food-related healthiness perception may help people who suffer from eating and weight-related problems, as well as the general public. Purpose: The purpose of this study is: 1) to re-examine college-aged women’s use of fat, fiber, sugar, and protein when judging the healthiness of different foods, and 2) to investigate
whether women’s reliance on sugar and protein can be increased. Methods: One hundred thirty-nine college-aged women judged the healthiness of 104 foods that differed in fat, fiber, sugar, and protein content. Prior to judging food healthiness, half of the participants completed an engaging, interactive healthiness education module. It provided information regarding the four nutrients, and how they contribute to foods’ healthiness. Results: When judging food healthiness, participants mostly used fat and fiber, but slightly used sugar and protein, consistent with prior work. There were no significant differences between reliance on fat, sugar, and protein for those who did and did not receive healthiness education. However, there was a significant difference for use of fiber. Conclusions: National nutrition campaigns should continue to encourage college-aged women to consume enough protein. College-aged women should also be reminded that high-sugar foods, especially those lacking healthy nutrients, are troublesome.

107. Emily Solsrud

Major(s): Biomedical Engineering  
Mentor(s): Nicole Grosland (Biomedical Engineering), Nicole Watson (Center for Computer Aided Design)

Modeling the Cervical Spine with 3D Printing

- The goal of this project is to 3D print a cervical spine that a lab could use for testing in place of a cadaver spine. The materials that the 3D printer was able to print were first analyzed. Materials were then chosen based on rough estimates of how they would model the cervical spine; the materials were printed and material testing was performed on them to collect data that was not known. The data from the material tests were entered into a finite element model which accurately simulates the cervical spine. The annulus and nucleus of the intervertebral disc were then designed for printing. One level of the cervical spine was printed and mechanical testing was performed on it. Based on the outcomes, the project will either re-evaluate the materials chosen to print the spine with or it will expand to print different spine levels.

109. Sarah Splittgerber

Major(s): Psychology/Pre-med  
Mentor(s): Kensuke Tsushima (Internal Medicine)

Regulation of t-tubule development through insulin-AKT signaling

- Because cardiomyocytes lose proliferative capacity just after birth, postnatal heart growth is primarily achieved by hypertrophy of individual myocytes. The problem is that if the cells keep growing, ion exchange cannot reach inside the whole cell, which prevents calcium signaling. The solution to this dilemma is the formation of t-tubules during the perinatal period, which are invaginations in the cardiomyocyte surface that increase the surface area and allow calcium to reach all parts of the cell. Insulin is important in maintaining cardiac physiological hypertrophy.
From our recent study, insulin signaling proved to also be important for t-tubule maintenance in adult cardiomyocytes, so we hypothesized that insulin signaling might be involved in the development of t-tubules. Our result clearly showed that the time course of insulin signaling activation was almost parallel with t-tubule formation in perinatal heart. This research is important because the t-tubule morphology in cardiomyocyte plays a vital role in cardiac function. Disruption of t-tubules is a likely cause of heart failure due to the prevention of calcium ion transfer into the cell’s matrix. Further research on insulin’s effect on t-tubule formation will spark medical advancement on the maintenance of t-tubule structure.

111. Victoria Utter

Major(s): Computer Engineering
Mentor(s): Juan Pablo Hourcade (Computer Science)

Development of Interactive Software Story Authoring Tool to Improve Executive Function in Preschoolers

- Findings show a significant portion of children in the United States face barriers transitioning to Kindergarten. Typically the gap between actual and expected abilities persists as children continue their education, making this a pressing problem. Many of these gaps can be traced back to poor executive function skills including working memory, flexibility, planning, and attentional and emotional control. To address this gap, we propose an interdisciplinary approach using character and story-based transmedia (print, software and interactive toy materials) to teach preschool children executive function skills. Interactive stories will enable children to understand when and how to make use of executive function skills. These interactive stories all follow a similar form – repeating audio scenes followed by the presentation of a choice. Writing the software to produce each story can be very time consuming, but the simplicity of the story outlines and consistent presentation makes each story’s code similar. Story authors may not be computer programmers – so our goal is to develop a graphical authoring tool to allow anyone to quickly create an interactive story. This tool will make use of a drag-and-drop interface allowing users to outline and customize a story and then automatically generate the corresponding code.

113. Yaqiong Wang

Major(s): B.S. Psychology & B.A. Engaged Social Innovation
Mentor(s): Grazyna Kochanska (Department of Psychological and Brain Sciences)

Early Parent-Child Emotional Bond and Children’s Future Positive Affect Expressed in Various Contexts

- Young children express different forms of positive affect (PA) that may have different developmental predictors. We examined children’s security of attachment—the enduring emotional tie or affectional bond that forms in the early parent-child relationship—to mothers
and fathers as the predictor of children’s PA when they were aged 3 and 4 ½ years. Children’s
attachment with both parents was measured in a standard behavioral assessment paradigm at
age 1 year and using reports by parents and observers at age 2. We observed children’s PA in
scripted joy-eliciting laboratory procedures and naturalistic parent-child interactions, and
obtained parents’ ratings of the child’s enjoyment of highly stimulating (corresponding to PA in
laboratory procedures) versus quiet (corresponding to PA in parent-child interactions) activities.
In general, a secure affectional bond between the child and the parent did not predict children’s
PA in laboratory procedures, but predicted children’s higher PA in interactions with the given
parent. For father-child dyads, security of attachment predicted less high-intensity pleasure and
more low-intensity pleasure. For mother-child dyads, security of attachment predicted more
low-intensity pleasure. Children’s secure emotional bond appears to promote a relational form
of PA, expressed in interactions with parents, and enjoyment of quiet rather than highly
stimulating activities.

115. Katelyn Wheeldon

Major(s): Finance and Accounting
Mentor(s): Jaron Wilde (Accounting), Anand Vijh (Finance)

Inversion Aversion: How Upcoming International Tax Changes will Impact U.S. Corporations

- The U.S. is viewed as having an uncompetitive corporate tax policy, taxing corporations on
worldwide income at the highest corporate tax rate among developed nations. Corporations
have undergone inversions, in which the corporation is acquired by a smaller foreign
corporation to access the more favorable tax environment of the nation the foreign acquirer is
headquartered in. Inversions have been scrutinized not only in the U.S., but around the world.
Nations compete on the basis of tax policy. As corporations shift profits across nations,
countries with a more favorable policy attract more investment while countries with a more
unfavorable policy lose tax base, causing more burden to be placed on individual citizens. The
Organization for Economic Development and Cooperation (OECD) has joined with the G20 to
develop a set of standards and tools to avoid tax-based competition and the loss of tax
revenues. While the U.S. has worked with the OECD to develop the standards, the standards
have both positive and negative effects on U.S. corporations. The focus of this paper is to
identify the main impacts that OECD’s standards will have on U.S. corporations in the short,
medium, and long term.

117. Jason Wong

Major(s): Physics
Mentor(s): Janice Robertson (Molecular Physiology and Biophysics)

From Cell to Solution: The Journey of a Single Peptide via Fluorescent Imaging
pH low insertion peptides (pHLIPs) are a group of peptides which exist in three separate states, depending on the pH. They exist either in solution (state I), attached to the surface of a membrane (state II), or buried into the membrane (state III). At low pH, pHLIPs favor state III and bury through the membrane surface. This may allow pHLIP to be able to deliver cell-impermeable molecules, such as dyes, into the cell. Through TIRF, a form of fluorescent imaging, single molecules may be observed allowing its behavior to be analyzed. This includes how the peptide diffuses across the surface of the membrane, by tracking its path as it moves. By comparing different pHs, two populations of peptides can be identified at $0.05 \pm 0.05 \mu m^2 s^{-1}$ and $2.0 \pm 0.2 \mu m^2 s^{-1}$. As pH is lowered there is a shift from 70% to 20% with the slower population, which may represent a change in state.

119. Hang Yin

Major(s): Biochemistry
Mentor(s): Adrian Elcock (Biochemistry)

Simulating Sugars: Steps Toward Improved Modeling of Glycobiology

Computer simulations can give a picture of biological systems at the molecular level. However, the usefulness of these simulations depends on the accuracy of the parameters that define the interactions between molecules in a system. Currently, parameters used to describe sugars produce unrealistic behavior in simulations. Since sugars are crucial in biological systems, our research group is interested in accurately modeling interactions of sugar molecules with themselves and other molecules. Recently, our group has developed parameters that correct the behavior of a small set of sugars. However, this correction has yet to be tested with a much wider range of sugars. In this study, we extend that work to include additional sugars in order to determine whether our approach is likely to be generally applicable to the sugars typically encountered in biology. Our simulations suggest that the modified parameters are generalizable; interactions of a variety of sugars closely resemble those described experimentally.

121. Kasra Zarei

Major(s): Biomedical Engineering, Biochemistry
Mentor(s): Michael Abramoff (Ophthalmology, BME, ECE), Todd Scheetz (Ophthalmology, BME)

Developing a Mobile-Phone Application (eyeFusion) for Universal Vision Screening

Blindness and visual impairment is a major public health problem affecting an estimated 285 million people worldwide. The increasing prevalence of vision disorders can be combatted through vision screening. However, current means for vision screening are generally expensive, restricted to established clinics and non-universal, and invasive. In the era of mobile computing and the phrase “there’s an app for that”, I designed a novel vision test and implemented it as a mobile-phone application, called eyeFusion, and performed various preliminary validations of
the test and app on human subjects. The app can quantify individual visual function, in an accessible manner similar to a hear-rate monitor or fitbit. The long-term goal of this project is to ultimately provide a universal, low-cost solution to vision screening and cognitive impairment.

123. Anthony Zhang

**Major(s):** Electrical Engineering  
**Mentor(s):** Aju Jugessur (Optical Science and Technology Center)

**Using Teflon to help create features smaller than a Hair**

- Commercial electronics continue to shrink in size and increase in processing power as we continually find ways to manufacture chips smaller. Nanoimprint lithography is a relatively recent process to create features as small 10 nanometers wide by operating similar to a highly tuned stamp press, with carefully modified polymers at the interface of the mold and sample. The polymer is heated and sandwiched under pressure to cause it to flow into the features of the mold. After cooling and depressurization, the polymer is attached to the sample, and released from the mold. Unfortunately, this process requires proprietary polymers and release layers. In our research we use Teflon and AZ1518 (a common polymer in the semiconductor industry) to create comparable processing with sub-micron gratings, and continue to refine the process. Additionally, the process we have been developing preserves the photolithographic properties of AZ1518 - after the nanoimprinting process, we can still large-scale pattern the sample device with UV light to create channels, contacts, and various other parts of devices.

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**Second Hour Presenters**

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

*(even numbers only – each board will be turned around)*

2. Patrick Adrian

**Major(s):** Physics and MAthematics  
**Mentor(s):** Scott Baalrud (Physics and Astronomy)

**Neutral Particles in Ionized Gases**

- The northern lights are the most iconic examples of plasmas, however they do not last forever, indicating there exists processes that can disrupt the plasma state of matter. These disruptions, or instabilities, are a significant topic of research because we need characterize the stability of plasmas as we try to implement them in our technology. Our research focuses on instabilities that can occur in plasmas made from two different gases near a boundary between the plasma and a conducting metal. These two component gases are normally found in manufacturing
computer chips, where the plasma is in contact with a solid surface, etching circuit designs for use in phones and computers. Understanding the pressure, temperature, and density conditions under which disturbances appear can aid manufacturers in designing techniques to assemble chips more reliably.

4. Maya Amjadi

**Major(s):** Biology, Spanish  
**Mentor(s):** William M. Nauseef (Internal Medicine), Mallary Greenlee-Wacker (Internal Medicine)

**Particles that are released from white blood cells that have consume staph bacteria induce inflammation**

- Staph are a bacteria that typically cause mild skin and soft tissue infections, but can also manifest as more severe diseases such as pneumonia and sepsis. In the human, a specific type of white blood cell is the first responder to the infection. The white blood cells eat the staph bacteria, and during this time particles are released from the surface of the white blood cells. These particles are tiny, 50-200 nanometers in size. We hypothesize that these particles contribute to local inflammation. We isolate the particles and look for specific markers that indicate that they indeed came from the white blood cells, such as membrane proteins and lipids. We also look for intracellular granule proteins. The particles also induce other immune cells to release pro-inflammatory signaling molecules, supporting the hypothesis that the particles from the white blood cells that have eaten staph are pro-inflammatory and contribute to exuberant inflammation during a staph infection.

6. Kayleigh Applegate

**Major(s):** Anthropology for Health Sciences  
**Mentor(s):** Erica Prussing (Anthropology)

**The Allotment of Maternity Leave**

- Becoming a new parent is a time filled with lots of expectations, strong emotions and adjustments that can be stressful. Anthropologists Carolyn Hough and Erica Prussing conducted interviews with 20 women in Eastern Iowa both prenatally and postnatally, to capture a snapshot of what it is like to become a parent for the first time. During the interview participants were asked about a variety of subjects, with a focus on understanding how these women’s postnatal realities fit with their prenatal expectations about managing paid work alongside new parenthood. My focus within this study is the allotment of maternity leave. Each of the women within the study had a unique story involving their maternity leave. Despite the existence of federal policies like the Family and Medical Leave Act (FMLA), the variability of what was awarded to each individual was striking, reflecting differences in workplace climates and policies. These findings help to further ongoing discussions in the US today about how maternity leave is allotted and whether current levels of variability are appropriate.
8. Dena Baughman

**Major(s):** Human Physiology  
**Mentor(s):** Rhonda Souvenir (Endocrinology), E. Dale Abel (Endocrinology)

"The Role of UCP-2 in Platelet Mitochondrial Function"

- Cardiovascular diseases (CVD) can often be characterized by thrombosis, or clot formation. This formation is due to increased activation of platelets within the blood, as is often observed in diabetic and obese individuals. It has recently been revealed that levels of the RNA for a mitochondrial protein, UCP-2, is increased in individuals with heightened CVD risk. These proteins function to make mitochondria less efficient in terms of energy production, but may reduce levels of reactive oxygen species (ROS) within cells, which cause stress if they get too high. This process is termed uncoupling. Stress causes platelet activation, and so an increase in these proteins should reduce the ROS imbalance and the risk of clot formation. This project aims to understand the relationship between UCP-2 and platelet activation and thrombus formation. We removed the UCP-2 gene from the platelets of a mouse model in hopes that it will reveal the relationship. Platelets were separated from the blood and analyzed. The UCP-2 deficient mice had a lower platelet count and exhibited increased oxygen consumption in the presence of a chemical uncoupler, FCCP. These results may indicate that the absence of UCP-2 could result in dysregulation of ROS, leading to stress, platelet activation, and thrombosis.

10. Asher Bergman

**Major(s):** International Studies, Linguistics  
**Mentor(s):** Stephen Vlastos (History)

Role of Press in Territorial Dispute Between Japan and South Korea

- Japan and South Korea have a troubled history, and there are several issues originating from Japan’s period of colonial rule over Korea that remain points of contention today. One of these issues is the ambiguity over the ownership of a small cluster of islets between the two called the Liancourt Rocks (or Dokdo or Takeshima). The islets, though only .18745 km2 in total area, have consistently been a point of conflict between the two since the end of World War II. This project focuses on South Korean president Lee Myung-Bak’s visit to the islets in 2012, which reignited tensions between the two nations and brought international recognition to the dispute. In particular, this focuses on the rhetoric and framing that the national press of each nation uses to manipulate public perception of the issue. This was done by analyzing editorials/articles around Lee’s visit in Japanese newspapers as well as how the Japanese response was characterized in Korean newspapers. What was found was a consistent rhetorical pattern across the national dailies of demonizing the other side or depicting them as the aggressor. This indicates that the national presses themselves are a factor in the dispute; depending on how the press portrays the other nation during a dispute, the more skewed the public’s perception of the dispute will be as well.
12. Claire Castaneda

**Major(s):** Biomedical Engineering  
**Mentor(s):** Charles Jennissen (Emergency Medicine, University of Iowa Hospitals and Clinics), Gerene Denning (Emergency Medicine)

**Variability in Youth ATV Seat Design Demonstrates Need for Standardization**

- Carrying passengers is an independent risk factor for crash and injury on single rider all-terrain vehicles (ATVs). Optimal seat design would allow for safe vehicle operation while decreasing the likelihood of multiple riders and use by underage operators. The objective of the study was to determine the variability in seat length characteristics among youth-size ATV models utilizing a previously validated method through Adobe Photoshop. Seat characteristics were compared by the age of the intended rider, manufacturer, and ATV type (sport vs. utility). Our data suggest that the seat lengths of youth-size ATVs were very similar to those of adult models, with little difference in seat length and placement for youth models that were designated for children of various ages. It is likely that these seat lengths allow and potentially encourage the carrying of passengers. Additionally, the seat front to handle grip distance was quite short for many youth models, possibly allowing operation by children younger than which the vehicle is designated. Regulations are needed to standardize safe seat design for ATVs.

14. Wanhua Chen

**Major(s):** ACCOUNTING; BUSINESS ANALYTICS  
**Mentor(s):** Samuel Melessa (Accounting)

**Determinants of Annual Report Length**

- The disclosure effectiveness of annual reports facilitates the informed decisions of investors. Recently, discussions about disclosure overload have been held by regulators such as The Securities and Exchange Commission (SEC) and the Financial Accounting Standards Board (FASB), as well as major accounting firms. In order to better address disclosure overload, we discover determinants of annual report length. We kept track of the changes in annual reports as a whole and several specific sections over time to discover the determinants of annual report length.

16. Kathryn Classon

**Major(s):** Chemical Engineering  
**Mentor(s):** Julie Jessop (Chemical and Biochemical Engineering)

**Taking the Light Out of Photopolymerization: Using a Central Composite Design to Optimize Transferable Shadow Cure**
The mobility of long-lived active centers in cationic ring-opening photopolymerization facilitates polymer formation in areas never exposed to light (shadow cure). A new method has been discovered which allows for increased polymer properties and applications (transferable shadow cure); however, current understanding of this new transferable method is limited. Using a central composite design of experiments, four key experimental parameters (effective irradiance, sample depth, exposure area, and exposure time) were explored to optimize curing conditions in a commercially available epoxide by measuring conversion. Conversion was found to be an accurate predictive measure within the design parameters.

18. Rae Ann Corrigan

Major(s): Biomedical Engineering
Mentor(s): Michael Schnieders (Biomedical Engineering & Biochemistry), Nancy Downing (Nursing)

Computer-Based Modeling of Chemotherapy Drugs

- This project focuses on understanding how chemotherapy drugs interact with cancer-causing proteins. PolType is a program that determines the chemical features of small biomolecules, however, it lacks the ability to analyze large biomolecules, such as drugs. The program, Stitch was designed to help overcome PolType’s size constraint when evaluating large molecules. Stitch takes two inputs: 1) PolType files from molecular fragments of the desired drug and 2) a mapping that draws connections between the overall drug molecule and each of the fragment molecules for analysis. It outputs a chemically complete model for the drug as a whole. Such drug models can then be used to help predict drug-protein interactions.

20. Ari Craven

Major(s): Theatre & Studio Arts
Mentor(s): Jon Winet (School of Art and Art History)

The Passport Project: Exploring Iowa & Iowa City

- Beginning in spring of 2013, The Passport Project is a highly encouraged first-year seminar to help students engage with the University of Iowa and Iowa City’s rich cultural offerings. For the course, students attend large group lectures, small-group discussions, and 12 events of student’s choice on or around campus. Students attend one to three events in each of the following categories: Performing Arts, Visual Arts, Humanities, Science + Engineering, Social Sciences, and Life @ Iowa. Class activities include presentations covering a range of topics and the ability to further build relationships with other first-year students. Four “Green Rooms” will bring distinguished leaders in their fields for special in-class presentations. In addition to brief homework assignments, student create 100-word or short video reflections on the events they attend and post them in an online website. Since inception, The Passport Project has been offered 4 times and is continuously evolving for each new semester. Lead by School of Art and Art History’s Intermedia Head Professor, Jon Winet, The Passport Project has assisted in
assimilating over 400 students to the unique events around Iowa City and seeks great success for its future students.

22. Chloe Daniel

**Major(s):** Anthropology, Psychological and Brain Sciences  
**Mentor(s):** Robert Franciscus (Anthropology)

**The Role of Handedness in Stone Tool Analysis**

- Humans are unique among our primate relatives in that approximately 90% of the species population is right hand dominant. Since handedness is linked to the lateralization of the classic language centers in the brain, this unique phenomena is assumed to be a significant event in human evolution, particularly in pinpointing when language evolved in our ancestors. Previous studies have attempted to establish methods to determine handedness preference of early human populations through experimental stone tool studies; however, due to the varied results and inconsistent methods it is still questionable whether handedness can be determined from the features observed on the stone tools. This experimental study investigates these previous methods by analyzing, and video recording the stone tool manufacturing and resulting stone flakes of 9 left-handed and 9 right-handed novice flintknappers. The footage was used to code the gestures used to produce the flakes to test whether these gestures produce the features analyzed in previous handedness studies. A Chi-squared test revealed that right-handed individuals were more likely to hold the stone in a horizontal position than left-handed individuals (p < 0.001). We explore the possibility that these gestures, rather than the dominant hand, are responsible for the flake features that previous studies have attributed to handedness.

24. Daniel Davies

**Major(s):** Chemical Engineering  
**Mentor(s):** Amanda Haes (Chemistry)

**Enhanced Drug Identification Using Gold Nanostars**

- Every drug possesses a unique chemical fingerprint based on its specific chemical structure as well as its chemical environment. For medical professionals and police detectives, methods that facilitate the detection and identification of the drugs quickly in unknown drug samples are needed. One method for attaining this chemical information is Raman spectroscopy, which allows for the generation of a molecular “fingerprint” for each molecule. When samples contain low concentrations of a drug, this technique can be used to enhance the drug signature if the molecule can adsorb to the surface of a gold nanostar. Upon synthesis, gold nanostars are coated by small molecules that stabilize the stars (good) but can interfere with drug detection (bad). Herein, this problem is addressed by better understanding how the stabilizing molecules sit on the star surfaces thus providing a better understanding of the adsorption process of the
target molecules. All in all, this leads to better enhancement of these molecular fingerprints and allows for more sensitive drug detection.

26. Patrick Dey

**Major(s):** Chemistry  
**Mentor(s):** Johna Leddy (Chemistry)

**Thin Layer Sonoelectrochemistry in Aqueous and Non-Aqueous Systems**

- Sound waves can be used to increase the rates of oxidation-reduction (redox) reactions in water (aqueous) or organic (non-aqueous) solutions. Electrochemical cells that can harvest the sound energy more efficiently are used in the experiments. Increasing reaction rates have many applications in academically interesting and technologically important reactions. In these experiments, a few academically interesting redox probes were studied. Increased efficiencies up to 50% were observed. This information will be helpful to understand the exact fundamental mechanism of thin layer sonoelectrochemistry.

28. Stephen Estelle

**Major(s):** Biomedical Engineer  
**Mentor(s):** Michael Henry (Physiology), Benjamin Krog (Biomedical Engineering)

**Separating Benign and Malignant Cells**

- Inside an organism cancer cells have the ability to move from one organ to another. Cancers cells are able to do this by traveling from one organ to another with the help of blood streams. When a cancer cell leaves one organ and is circulating through the blood stream it is called a circulating tumor cell (CTC). CTCs are malignant cells, which are deadly to the body. If a blood sample is taken, CTCs and benign cells, which are not harmful in effect, will make up some of the sample’s composition. CTCs have the capability to spread and grow tumors on organs. If the tumor is malignant, this leads to the weakening of the organs, which can ultimately lead to the organ failing. To combat against this, finding a way to separate out the malignant cells so that tests and measurements can target only malignant cells would be beneficial. This is what my research is on. We understand that malignant cells have a better resistance to shear stress. With this, we are devising a procedure to separate malignant cells simply based off of its resistivity to shear stress.

30. Noah Gavin

**Major(s):** Chemical Engineering  
**Mentor(s):** Johna Leddy (Chemistry), Matthew Lovander (Chemistry)

**Porous Rotating Disk Electrode for Research on Gas Producing Particles**
Currently, electrochemical research on gas producing particles has been limited due to created gas forcing the particle film from the electrode surface. A porous rotating disk electrode (PRDE) was designed, developed, and electrochemically tested to allow gas to be released while testing the particles. A well-established redox couple was used to electrochemically test the behavior of carbon paper, carbon cloth, and vitreous carbon, a foam-like carbon structure. Vitreous carbon, being conducive and sufficiently porous, was employed to examine gas producing particles bound to the electrode with a polymer film. Voltammetric experiments were performed on metal phosphides to determine catalytic behavior towards gas producing reactions, oxygen reduction, oxygen evolution, and hydrogen evolution. Metal phosphide experimental results were compared to electrodes cast with a platinum standard as platinum catalysts have shown the highest catalytic activity in the previously mentioned reactions.

32. Haviland Gilbert

Major(s): Music Performance  
Mentor(s): Erin Wehr (Teaching and Learning)

A New Ensemble in Music Education

- As music education is advancing, ensembles are changing how they are designed and purposed. An example of a culturally relevant ensemble is a studio orchestra. A studio orchestra is typically a professional ensemble that has varied instrumentation. This descriptive study includes a review of literature on the use of non-traditional groups and styles in string music education, and observational case studies on each of three studio orchestras in varied educational settings. The purpose of this study was to explore the concept of studio orchestra as applied in elementary, secondary, and tertiary music education settings to answer the following questions: 1) What defines a studio orchestra; 2) What roles can the studio orchestra take in various music education settings; 3) In what ways can a studio orchestra uniquely meet music education goals; 4) In what ways does a studio orchestra not meet music education goals; 5) Can studio orchestra provide culturally relevant music education for students with varied backgrounds?

34. Ashley Goll

Major(s): Biochemistry  
Mentor(s): Lori Wallrath (Biochemistry)

Mutant lamins that cause muscular dystrophy are mislocalized in muscle fibers

- Mutations in the human LMNA gene cause rare forms of muscular dystrophy. The LMNA gene makes proteins called lamins that form a network inside the nuclear membrane. The nucleus houses the genomic DNA of a cell. Lamins are important for the structural integrity and shape of the nucleus. In addition, they organize the genomic DNA. To study how mutant lamins cause muscle disease, we developed a fruit fly model. Using this model, we show that mutant lamins
aggregate in the cytoplasm and the nucleus, which causes muscle dysfunction. Our studies shed light on the molecular pathology caused by mutations in the LMNA gene.

36. Anuradha Gore

Major(s): Human Physiology  
Mentor(s): Vinit Mahajan (Ophthalmology and Visual Sciences)

Disrupted intermediate filament assembly leads to formation of scar tissue in the retina

- Autosomal dominant neovascular vitreoretinopathy (ADNIV) is a rare eye condition resulting in complex symptoms that seem to mimic other eye diseases such as diabetic retinopathy, which leads to blindness. As of now, the conditions are treated separately but there is no way to treat the disease as a whole. Recently, our lab identified a mutation in CAPN5 (gene that codes for a protein that can alter the function of other important proteins) as the underlying cause of ADNIV. We believe that finding out how mutated CAPN5 affects these other proteins will give us insight into how the mutation actually causes the clinical symptoms that appear in ADNIV. We found that GFAP, an intermediate filament protein, is one of these proteins that is affected by CAPN5 activity. GFAP is involved in cell structure and communication in the eye, and we hypothesize that CAPN5 activity causes GFAP’s structural role in the retina to be compromised. This could potentially lead to the formation of scar tissue in the eye, a condition that is seen in ADNIV. To test this hypothesis, we modeled GFAP filaments with and without CAPN5 activity using transmission electron microscopy.

38. Sangwoo Han

Major(s): Human Physiology, Neurobiology  
Mentor(s): Nandakumar Narayanan (Neurology)

Projections of Dopaminergic Neurons from the Prefrontal Cortex

- Dopamine and its role as a signaling molecule is important in the brain. Its dysfunction can lead to Parkinson’s disease which is characterized by lack of dopamine production while in schizophrenia too much dopamine is produced. In these diseases, patients often suffer from cognitive deficits amongst other symptoms. The prefrontal cortex (PFC), the center for executive function in the brain plays an important role in the signaling of dopaminergic neurons. Type 1 dopamine receptor (D1DR) neurons, a certain type of neurons which receive signal from dopamine are implicated in these diseases. However, very little is known about the pathology and neural circuitry of D1DR neurons in the PFC. This study used a genetically modified mouse and a viral marker to trace where these D1DR neurons in the PFC project to within the brain. Many previously undiscovered targets were discovered. Understanding of the basic neural circuitry of D1DR neurons will help better understand the pathology and discover novel treatments of diseases related to dopamine dysfunction.
40. Tanner Hartsock

**Major(s):** Geoscience  
**Mentor(s):** Ingrid Ukstins-Peate (Earth and Environmental Science)

**Utilizing Askja, Iceland as a Geologic Analog for Mars**

- My research topic involves utilizing Earth analogs for studying the alteration of igneous rocks on the Martian surface. Askja is a caldera volcano located in the central highlands of Iceland. Like Mars, this remote region of Iceland is a cold desert environment dominated by wind-blown sediment transport. Mars basalts are compositionally different from most terrestrial eruptions, with high iron as well as high magnesium. Few places on Earth have iron-rich basaltic volcanics being reworked by eolian processes in a cold desert environment, and for this reason Askja is among the best terrestrial analogs for Mars. The Askja region was also used as a training site for the Apollo Lunar missions in the 1960s. The main goal of this study is to quantify the evolution of iron-rich basaltic materials during eolian transport in a cold desert environment. My research is focused on the geochemistry and petrography of igneous rocks in the region, specifically basalts from the 1961 fissure eruption. Samples were collected from the 1961 flow and prepared for analysis on the induced coupled plasma mass spectrometer (ICP-MS) at the University of Iowa. The preliminary data obtained using the ICP-MS is consistent with previous work, revealing basalts with high iron content. My geochemical data will be used in a larger study to source wind-blown sand deposits and link them with potential protoliths.

42. Madison Hunke

**Major(s):** International Studies (Islamic and Middle Eastern Track), French (Arabic Track)  
**Mentor(s):** Ahmed Souaiaia (Religious Studies)

**Effects of Media on the Arab Spring**

- In 2011 the Arab Spring swept across the Middle East, resulting in the overthow of dictators in Egypt, Tunisia, Libya and Yemen. I have assisted Dr. Ahmed Souaiaia for the past eight months in collecting screenshots of online news headlines covering the Arab Spring and other current events. We collect these headlines from global news networks (i.e. New York Times, Al Jazeera, BBC) in multiple languages. We then do a qualitative analysis of the screenshots by noting the specific words used in headlines, photos used, and stories covered. These details provide an insight into the networks' biases and the effects they have on readers. Over time, these screenshots allow a qualitative analysis through trends and their evolution. Dr. Souaiaia has been compiling these screenshots for six years and plans to write a book on his findings and to create a database for these primary documents for use by scholars and the general public. This work is creating a first-hand account of what could be the most important conflict of the twenty-first century, and by the time this conflict has come to a close, it will have spanned more years than any of the wars in the twentieth century.
44. Casey Inman

Major(s): Human Physiology
Mentor(s): Chun-Fang Wu (Biology)

Social interaction in fly model of Huntington’s disease: a longitudinal study of survival and motor coordination

- As your body converts food to usable forms of energy via normal metabolism, harmful byproducts known as reactive oxygen species (ROS) are released and can damage important cellular structures. Luckily, there are mechanisms to protect cells from the oxidative stress inflicted by dangerous ROS involving the enzyme superoxide dismutase (Sod). Mutations in the Sod gene encoding superoxide dismutase have been extensively studied in the fruit fly Drosophila melanogaster, and have been shown to drastically reduce lifespan in flies. Interestingly, partial rescue of this lifespan deficiency was achieved by co-housing Sod mutants with healthy, active wildtype flies. We tested for the presence of a similar phenomenon in flies expressing a mutant transgene linked to Huntington’s disease (HD). HD is a neurodegenerative disease caused by a mutation in Htt, the gene encoding Huntingtin protein. We selectively expressed the pathogenic human Htt gene in targeted cell types in Drosophila to create two experimental conditions: Htt expressed only in glia and Htt expressed only in neurons. The varying effects of social interaction were characterized via lifespan and longitudinal climbing ability assays. Preliminary data suggests that co-housing Htt flies with active wildtype flies may actually be detrimental to longevity and locomotion in the disease phenotype.

46. Nathaniel Johnson
Brandon Johnson

Major(s): Human Physiology
Major(s): Human Physiology
Mentor(s): Charles Jennissen (Emergency Medicine)

Moped-Related Injuries in the United States

- Very few studies have investigated moped-related injuries in the United States. A recent Swedish study found moped riders have a 20-fold higher injury risk per kilometer traveled as compared to automobile occupants. The goal of our study was to better understand the demographics, mechanisms and injury patterns of moped-related injuries. We utilized the National Electronic Injury Surveillance System, which collects injury data from a stratified sampling of emergency departments from across the nation, to identify moped-related injuries between 2002 and 2014. Our study found that moped-related injuries have nearly doubled in that time frame. One half of the injuries occurred during the summer months of May, June, July, and August, and 75% of the injured riders were male. Only 9% of the injured patients were documented in the crash narratives as having been wearing a helmet. About 25% of the emergency department patients had head injuries, and these patients were significantly more likely to be admitted or transferred to a different hospital. There were significant differences in the number of injuries over time by
age group, with 18-59 year olds showing much greater increases in moped-related injuries. This may indicate mopeds have become a more popular option for commuting to work and college. It will be important to target these age groups with regards to safety messaging and injury prevention.

48. Jenny Juehring

Major(s): Political Science, Economics
Mentor(s): Vicki Claypool (Political Science), Bill Reisinger (Political Science)

The Relationship between Bureaucratic Corruption and the Voting Decision

- While much is known regarding voter turnout and vote choice, little research has been done on the effect of corruption on the two. The little work that has been done conflicts with what the researchers hypothesize the effect will be. Using survey data from Russia and Ukraine, I explore the relationship between voter's decisions and their experiences with and perceptions of corruption. Specifically, I look at the effect of bureaucratic corruption on vote choice in the 2012 presidential elections in Russia and the 2014 presidential elections in Ukraine. Bureaucratic corruption generally refers to informal payments, or bribes, citizens give to officials in exchange for favors. I hypothesize that voters will punish incumbents for corruption in society by voting for the challenger. To test this hypothesis, I work with faculty and a graduate student to test a multivariate model of vote choice that includes standard predictors such as age, education, issues and political knowledge, as well as measures of experiences with and perceptions of corruption. Preliminary results do indicate that bureaucratic corruption has a negative effect on incumbent support in presidential elections.

50. Michael Kegel (Now presenting during the first hour, Board #125)

Major(s): Biochemistry, Music
Mentor(s): E. Dale Abel (Internal Medicine)

Studying the Effect of Diabetes on the Heart

- Diabetes is a global challenge, with over 400 million people worldwide currently suffering from the disease. Out of every ten of these people, eight will die from heart- and blood vessel-related disease. In order for the heart to have energy to pump, sugar from the bloodstream enters the heart cells through a hormone called insulin. In patients with type 2 diabetes the body becomes increasingly insensitive to insulin leading to there being a lot of insulin in the bloodstream which can have unintended consequences. Too much insulin can lead the heart cells to grow to be too large. The specific signaling proteins, insulin receptor substrate 1 and 2 (IRS1 and IRS2), are believed to be involved in the disease-specific growth of the heart muscle. We study how and why insulin causes the heart to grow to be too large. Currently, we are developing a method that uses viruses to deliver genetic information to the heart cells of mice. This causes the heart cells to make more of the protein that we are studying, allowing us to figure out what other
proteins IRS1 interacts with. Once we know how the signals are sent we can design a therapy to treat heart disease in patients with diabetes.

52. Zehra Khan

**Major(s):** chemistry  
**Mentor(s):** Betsy Stone (Chemistry)

**Air Pollution at Its Finest: Analysis of Particulate Matter in Karachi, Pakistan**

- There has been increasing evidence pointing towards poor air quality in many of the mega-cities of South Asia. Specifically, Karachi, Pakistan has been suffering from diminished air quality due to increased private vehicle ownership, absence of public transport, high population growth, as well as having a large industrial base. This study focuses on detecting and measuring the organic components of PM2.5 (particulate matter of less than 2.5 micrometers in diameter) and identifying its sources in Karachi, Pakistan. Samples were collected daily from January 8-29th, 2006 in Karachi and were subjected to an extraction process followed by chemical analysis. It was found that the 24-hour average PM2.5 of 170.8μg/m3 exceed the WHO guidelines of 25μg/m3 by more than seven times. We found that day-of-the-week variation of PM2.5 demonstrate Sundays have significantly lower concentrations. Organic species, indicated the importance of emissions from motor vehicles, biomass burning, food cooking, as well as the presence of secondary formation of PM in the atmosphere. Additionally, a negative correlation between a wood burning tracer and temperature suggest biomass burning is being used as a heating source. Through this study, new insight into the chemical composition and sources of organic matter of PM2.5 in Karachi has been established, which helps us discover the causes of poor air quality.

54. Kathleen Kiesewetter

**Major(s):** English, Art  
**Mentor(s):** Donna Parsons (Music, Honors)

**‘In My Life’: Rock Stars, Memoirs, and the Beatles**

- The Beatles are considered one of the most revolutionary bands in history. They set the standard for songwriters and inspired a new phenomenon of crowd behavior with their performances. Numerous artists claim the Beatles as the band who inspired their own careers. Yet, with so many artists becoming popular in the sixties, what made the Beatles the standard bearer? Why are they still considered the band to beat? To answer these questions, I turned to the memoirs and autobiographies of artists who I believe are prominent figures in both music and popular culture. These memoirs contain specific recollections that highlight significant moments in their lives and careers, and provide firsthand perspectives on how the Beatles made their mark on music and society. From the data I have collected thus far, the key points in Beatles history—according to their musical peers—are their 1964 debut performance on the Ed Sullivan Show.
and the release of Sgt. Pepper’s Lonely Hearts Club Band in 1967. In addition to these moments, the musicians I have studied talk about the Beatles in ways that elevate them to a platform on which they are worshiped as both idols and musical heroes.

56. Alexis Koch

Major(s): Human Physiology
Mentor(s): Scott Moye-Rowley (Molecular Physiology & Biophysics)

Mapping the Network of Genes that Lead to Anti-Fungal Drug Resistance

- Candida is the leading cause of fungal infections worldwide and is the third most common bloodstream infection. A complicating feature of this type of infection is that these fungi can readily acquire resistance to drugs. This is especially problematic in the case of antifungal drug resistance and there are only 4 different drugs that are effective in the clinic. The second leading cause of candidemias is the pathogenic yeast Candida glabrata which constitutes 25% of all candidemias. In C. glabrata, the primary genetic cause for drug resistance comes from mutations in the PDR1 gene that encodes a positive regulation of gene expression. We know little about how the collection of Pdr1-regulated genes interact to produce the final drug resistant form of C. glabrata. My work is focused on analyzing a recently identified collection of genes that appear to be controlled by Pdr1. I have confirmed that half of these genes are regulated by the level of Pdr1 activity in the cell. My current efforts focus on determining the role for these Pdr1 target genes in the biology of C. glabrata, especially as it pertains to drug resistance.

58. Stephen Kruse

Major(s): Biomedical Engineering
Mentor(s): Gordon Buchanan (Neurology)

Role of Norepinephrine in Seizure-Induced Respiratory Arrest

- Epilepsy affects an estimated 3 million Americans and around 1/3 of these cases will not respond to treatment. Treatment resistant epilepsy is associated with a high risk of death, especially from sudden unexpected death in epilepsy (SUDEP). A major contributor to death in SUDEP is cessation of breathing during a seizure. However, mechanisms through which seizures cause breathing to stop are not clear. Our lab has identified a role for the brain signaling molecule, serotonin, in these mechanisms, but there are reasons to believe that other signaling molecules, such as norepinephrine, could also be involved. The goal of this project is to explore a role of norepinephrine in preventing the cessation of breathing after seizure. To do this we have begun to establish protocols to deplete the major population of norepinephrine containing neurons in the brain with a neurotoxin. Once we verify destruction of these neurons, we will optimize the protocol, and begin testing the effects of how norepinephrine depletion affects breathing after seizure. We will then determine whether recovery of these systems is sufficient to
restore breathing during seizures, or whether this system is dependent on the other aforementioned signaling molecule, serotonin.

60. Hannah Langenfeld

Major(s): Biology with an emphasis in plant biology
Mentor(s): Craig Just (College of Civil and Environmental Engineering)

Aerobic and Anaerobic Ammonium Oxidation in an Engineered Bioreactor

- Anaerobic ammonium oxidizing (anammox) bacteria play an important role in the nitrogen cycle by combining ammonium (NH4+) and nitrite (NO2-) into nitrate (NO3-) and nitrogen gas (N2). Other organisms, ammonium oxidizing bacteria (AOB) also known as nitrifying bacteria can oxidize NH4+ to NO2-. AOBs can be found in the same environments as anammox. The anammox process is incredibly important as it accounts for approximately 50% of the global recycling of N2 to the atmosphere, and active research on nitrogen removal during municipal wastewater treatment focuses on anammox. In the laboratory, biological reactors with controlled conditions, metered chemical feeding, and electronic sensors allow measurement of real-time anammox biochemistry, which can be inhibited by competing bacteria. During the course of the bioreactor operation, two competing bacteria were observed. The data collected from the period of the observed bacteria and compared with previous data from the bioreactor resulted in the conclusion that the anammox activity ceased sometime during the course of the bioreactor operation and AOB activity became dominant.

62. Zesen Lin

Major(s): Chemistry
Mentor(s): Madeline Shea (Biochemistry)

Study of Neuronal Sodium Channels In The Brain

- Alzheimer’s disease, pain hypersensitivity and epilepsy have an important molecule in common: they all can be caused by pathological activity of voltage-gated sodium channel (NaV) proteins. NaV activity can be controlled by multiple signals including changes in the concentration of intracellular levels of calcium that alters NaV activity. However, calcium does not interact with NaV directly. Calcium binds to a second messenger protein called calmodulin (CaM), and CaM binds to Nav. Without CaM, NaV will not respond to calcium. Apo (calcium-depleted) CaM and calcium-saturated CaM have different affinities for their binding sites in most sodium channels. This indicates that the binding interface between CaM and the sodium channel changes depending on calcium binding. Unlike the bricks with uniform spacing that form a LEGO structure, proteins have uneven surfaces, protrusions and cavities. To treat disease, it is essential to know how healthy proteins dock and dissociate. To aid the development of future medicines for neural disorder, we are trying to determine the calcium-dependent docking mechanism.
between healthy NaV and CaM. With repeated experiments, we are able to predict some local structural changes in CaM, and investigate calcium effects on the CaM-NaV complex.

64. Brooke Marshall

Major(s): Communication Sciences and Disorders
Mentor(s): Karla McGregor (Speech and Hearing Sciences)

Learning Vocabulary Through Gamification

- Vocabulary is important for academic and professional success. In this project, we examined vocabulary learning and its application to a specific goal, earning a high score on the Graduate Record Examination (GRE). The GRE is required for students who wish to pursue graduate education. The search for the most beneficial and engaging method of test prep often leads educational apps and websites to use games as their means of learning. This technique, known as gamification, can be described as the process of incorporating game principles into situations that traditionally do not involve games. Vocabulary.com is a website that capitalizes on gamification, and applies the use of competition, awards and point systems to vocabulary learning. This site allows you to select the type of words you want to learn, from academic vocabulary to standardized test vocabulary. This study looks at 38 undergraduate students who intend to take the GRE within the next year. Practice verbal GRE exams and a definition task, are used to quantify potential vocabulary gains. It is predicted that a 4-week, intensive training on a GRE words list via Vocabulary.com will increase the participants’ vocabulary knowledge and improve their score on a practice version of the GRE verbal exam.

66. Skylar McSorley

Major(s): Speech and Hearing Science
Mentor(s): Yu Hsiang Wu (Communication Sciences and Disorders)

Bridging the gap between what hearing aids can do in the lab and what they can do in the real world

- Our study aimed to test the effectiveness of an assessment for hearing aid users. The test we chose includes listening tasks that better reflect real world conditions than tests previously used to understand how hard people are working to listen. Our participants listened to speech played with noise in the background and then answered comprehension questions about what they heard. Some passages were played while hearing aids were off, some were played with hearing aids on, and a third group of passages were played with a hearing aid program that lowers noise levels. These results were compared to another test that measures how quickly participants react to hearing words and choosing them from four similar choices on a computer screen. The results of the two tests varied: when choosing isolated words, listeners showed less effort while wearing hearing aids, but their effort did not decrease when listening to longer passages. However, when participants rated their own effort on a scale of 0-100, they showed hearing aids...
were helpful with the noise reduction program turned on. This suggests that either participants’ own ratings of their effort are more useful, or that hearing aids are not as helpful in understanding conversations as they are in understanding words on their own.

68. Amy Meehleder

**Major(s):** Art History and Anthropology  
**Mentor(s):** Craig Adcock (Art History)

**Future Relics: A Gothic Exploration of David Altmejd’s Sculpture**

- The Gothic calls immediately to mind werewolves, cobwebbed castles, and other elements of lurking darkness. However, the now centuries old term is far more dynamic and complex than these immediate associations. This project looks at specific ways in which the elaborate sculptures of contemporary artist David Altmejd may be appropriately labeled Gothic. Research will be done into the Gothic as a late eighteenth century literary movement as well as the Gothic in medieval art and architecture. Altmejd’s work is also explored as part of the more contemporary Eco-Gothic approach which considers environmental implications of the Gothic in this time of ecological crisis. Combining historical understanding of the Gothic and more recent study, Altmejd’s sculptures are considered as potential future relics of a world post-environmental-apocalypse.

70. Alexis Miller

**Major(s):** Biomedical Engineering  
**Mentor(s):** Fayyaz Sutterwala (Internal Medicine - Infectious Diseases)

**Probing Caspase-1 with Cardiolipin**

- Caspases are a family of enzymes that degrade proteins by cleaving the peptide at a cysteine amino acid followed by an aspartic acid residue. Inflammatory caspases -1, -4, -5 and -11, when activated, result in the cleavage and activation of proinflammatory cytokines, or cell signaling molecules, interleukin-1β (IL-1β) and interleukin-18 (IL-18). Regulating mediators of inflammation (IL-1β and IL-18) is important for understanding and treating diseases in which these cytokines are inappropriately expressed. Such diseases include Alzheimer’s disease, Parkinson’s disease, atherosclerosis, age-related macular degeneration and metabolic syndrome. In order to understand inflammatory caspases, we must consider their domain arrangement. Inflammatory caspases consist of three domains; an N-terminus caspase activation and recruitment domain (CARD) and the catalytic domains p20 and p10. It has been shown that inflammatory caspases -4, -5, and -11 are activated by cytosolic lipopolysaccharides (LPS) through interactions with Lipid A, the innermost component of LPS, at the CARD. Caspase-1 was not shown to interact with Lipid A, but is known to be activated through NLRP3 inflammasome interactions with mitochondrial phospholipid, cardiolipin. Therefore, caspase-1 constructs with
specific mutations in the CARD and other domains were generated to determine the precise domain responsible for the binding of caspase-1 to cardiolipin.

72. Adam Moritz

**Major(s):** Geoscience, Computer Science  
**Mentor(s):** David Peate (EES), Ingrid Ukstins Peate (EES)

**Modeling the Volcanic Plumbing System of Berserkjahraun, Iceland using Geothermobarometry**

- The intersection of the Atlantic mid ocean ridge and the Icelandic mantle plume creates a dynamic magmatic environment in the western volcanic zone of Iceland. The Berserkjahraun volcanic field in Snaefellsness, Iceland is primarily composed of tholeiitic basalts produced by cinder cone and fissure vent eruptions. I use calcium partitioning in clinopyroxene to apply geothermobarometry algorithms (Nimis and Putirka et al.). I also use a volcanic glass geobarometer (Yang et al.) to apply to scoria and tephra samples constraining a three-phase (olivine, clinopyroxene, and plagioclase) crystal system. / A model of the crystallization depth of the field area’s volcanic plumbing system is built using these geobarometry techniques. I use depth calculations for over 220 data points to determine the depth of crystallization, and then cross-reference them with the latitude and longitude for each sample code, to create a three dimensional model for the field area. This shows a complex system with magma chambers near surface level (less than 4 km depth) in the northwest, and significantly deeper chambers (approaching 20 km) in the southeast of the field area. This research is important to understanding the relationships of geochemistry and subsurface geological structures.

74. Nick Mullen

**Major(s):** Biochemistry BS  
**Mentor(s):** David Price (Biochemistry)

**The Effects of Oxidative Stress on the Early Events of Human Gene Expression**

- The use of oxygen for the metabolism of food by aerobically respiring organisms is a double-edged sword. On one hand, it greatly increases the efficiency of food metabolism and thereby provides much more energy per amount of food consumed than could be achieved by processes that don’t use oxygen. On the other hand, oxygen and other chemicals that result from oxygen being in cells can damage DNA and lead to DNA mutation, which in turn can cause cancer. / Interestingly, there are current investigations that are exploring the possibility of inducing oxidative stress in malignant tumor cells as a way to treat cancer. This is because, in addition to its previously mentioned effects, oxidative stress inhibits certain processes that constitute early steps in gene expression, namely RNA Polymerase II transcription initiation and co-transcriptional mRNA capping. Here I present an investigation of how exactly oxidative stress affects these two processes, using an in vitro system with human cancerous cell extract. These experiments have yielded mechanistic insights that will inform future research efforts.
76. Ben Olson

**Major(s):** Math and Economics  
**Mentor(s):** Bill Hedgcock (Marketing)

**Do Physiological Responses Predict the "Shopping-on-an-Empty-Stomach" Effect**

- The purpose of this study is to determine whether physiological responses can predict projection bias when individuals choose snacks to consume in the future. Studies have found that hungry individuals wrongly predict the food they want to consume in the future. Most hungry people, when given many snack options, say they want unhealthy snacks in the future. Once the future arrives and these individuals make a snack choice again, most will choose a healthier snack if they are now satiated. This phenomenon represents projection bias. In the present study, researchers manipulate hunger levels of subjects and ask their willingness to pay (bids) for five healthy and five unhealthy snacks. We ask subjects to give their bids to consume each snack in one week’s time, and upon returning one week later, we ask subjects for bids to consume each snack that day. Physiological measurements are taken at the first lab visit, including heartbeat awareness, the speed with which subjects recognize snack images on a computer, pupil dilation when viewing the images, and distance to screen when viewing the images. We predict higher degrees of heartbeat awareness, faster fixation times, increased pupil dilation, and closer screen distance will predict projection bias.

78. Madalyn Rasor

**Major(s):** Human Physiology  
**Mentor(s):** Gary Pierce (Health & Human Physiology)

**Acute and Chronic Biological Effects of Copeptin on Vascular Function in Mice and Humans**

- Copeptin, the C-terminal segment of the precursor protein of arginine vasopressin (AVP), is secreted from the posterior pituitary in a 1:1 ratio with AVP in response to osmotic and hemodynamic stimuli. Copeptin is elevated in pregnant women with preeclampsia, and predicts the development of preeclampsia as early as the 6th week of gestation. However, whether copeptin itself has any independent biological effects on vasculature is completely unknown. Acute incubation of aortic rings with copeptin demonstrated a dose response vasodilation beginning at 1nM up to a maximum relaxation at 100nM. Co-incubation with the nitric oxide(NO) inhibitor of L-NG-Nitroarginine methyl ester significantly attenuated the max vasodilatory response, indicating that the acute vascular response to copeptin is largely NO-mediated. Incubation of aorta with copeptin caused a significant increase in protein kinase B phosphorylation vs. control tissue and a trend towards increased phosphorylation of eNOS. These data indicate that acute exposure of aorta of mice to high copeptin results in marked NO-mediated vasodilation. However, chronic exposure to high copeptin does not alter vascular endothelial or smooth muscle function in mice nor is circulating copeptin associated with endothelial function in males or non-pregnant females. This suggests that adverse vascular
effects associated with chronically elevated copeptin concentrations in preeclampsia are more likely a result of high AVP rather than copeptin

80. Eric Ruttenberg

Major(s): Business Analytics and Information Systems  
Mentor(s): Jeffery Ohlmann (Management Sciences)

Long-Term Major League Baseball Franchise Planning

- Baseball is one of America’s most popular sports. A successful team relies on the contributions of many players, each excelling at a different position. Our model provides the management of a baseball team with another tool to help them evaluate teams and plan out their roster in the long-term. Instead of focusing on just one game or one season, our model focuses on planning a team over multiple years. We evaluate players on a common metric, WAR, which evaluates how much better a player is over an average, replacement-level player. We limited the model from choosing all of the best players by limiting how many players of a given position could be chosen. We also instituted a salary cap and contract system. A player is also penalized for being placed in a position he is not comfortable playing. Our model also allows the user to choose which year they would like to maximize in terms of player performance, as a team focused on winning this year would build their team differently than a team focused on building for the future.

82. John Sagar

Major(s): Human Physiology  
Mentor(s): Sudhakar Subramani (Anesthesia)

Cardiac Output: Deciding Between Accuracy and Safety

- Cardiac Output (CO) is the amount of blood the heart pumps to the rest of the body in one minute. During cardiac surgery, CO is used to assess the function of the patient’s cardiovascular system. Currently, the most accurate method – the pulmonary artery catheter – of measuring CO requires the anesthesiologist to feed a catheter through a large IV in the neck and then into the right side of the heart. This technique involves several potentially serious risks due to its invasiveness, and a replacement would be a step forward in patient safety. We wanted to evaluate the ability of two minimally-invasive devices currently on the market for measuring CO during cardiac surgery. The first device, the LiDCORapid™, measures CO algorithmically using the pressure waveform obtained from a catheter in the radial artery of the wrist. The second device, a transesophageal echocardiography (TEE) probe, measures cardiac output with ultrasound while positioned in the esophagus. We enrolled 100 patients going on bypass during surgery and took measurements of CO from all three devices at five different points during their surgeries. Neither device was able to measure CO with comparable accuracy with the pulmonary artery catheter, however they both provide other useful measurements that should be explored.
84. Matthew Salzburg

Major(s): Business Analytics and Marketing  
Mentor(s): William Hedgcock (Marketing)

Perceived Control and Decision Making

- There are lots of variables that come into play when making a decision, one being control over the situation. We decided to study what effects an artificial sense of control has on an individual’s decision to gamble. We collected multiple physiological measurement in the study including heart rate, respiration rate, and skin conductance, all of which will offer insights into the participant’s decision to gamble. In the first part of this study, participants were given the option to gamble on twenty fair, virtual coin flips. If they invested, tails would result in a win with a payout of $7.50, heads would result in a payout of $5.00, and choosing not to gamble would result in a payout of $6.00. In the second part of this study, participants were again given the option to gamble on twenty fair, virtual coin flips. This time they had the choice of choosing between tails, heads, and not investing, so if they chose to invest they won if they coin matched their choice and lost if it didn’t. We are interested in how their decisions differ between the first part of the study and the second. A difference in the two tasks could provide insight into how humans make decision. The data collection for this study has concluded and the analysis is ongoing.

86. Monisa Saravanan

Major(s): Human Physiology  
Mentor(s): Hanna Stevens (Psychiatry)

Changes in Mitochondrial DNA after Prenatal Stress in the Developing Brain over Time

- Prenatal stress is correlated with an increased risk for psychiatric diseases including ADHD, autism, and schizophrenia. Our lab seeks to understand molecular aspects of early brain development due to prenatal stress and its relation to psychiatric illness by using a well-validated animal model of prenatal stress. In this study, we looked at mitochondrial DNA copy number in the brain and how it changes in response to stress, over time. Most of a cell’s DNA is found in chromosomes, however, mitochondria have a small amount of their own, called mitochondrial DNA. Studying mitochondrial DNA copy number changes can help with understanding how a cell may be changing its metabolism to cope with stress. We examined differences in mitochondrial DNA among the sexes and brain region at three different time points. Distinct differences were seen in these measures of the metabolic response of the brain to stress over time in males and females as well as in different brain regions. Our findings suggest that changes in mtDNA copy number and brain cell metabolism are repercussions of prenatal stress. These findings may be important for understanding how prenatal stress increases risk for psychiatric illness and developing future interventions to prevent or treat psychiatric illness.
88. Ryan Shellady

**Major(s):** Ethics and Public Policy  
**Mentor(s):** Celesta Albonetti (Sociology)

**Where Do We Stand Now? Current Landscape of Stand Your Ground Laws**

- In the past decade, few topics have sparked more passionate responses than the Stand Your Ground (SYG) laws. The goal of this research is multifaceted. First, this paper aims to show that, legally, the SYG laws are not controversial. I do this by examining English Common law as it pertains to American self-defense law, and by appealing to US Supreme Court cases. Second, this paper attempts to clarify the legal and political state of Stand Your Ground today. This is accomplished by showing the law's distribution, identifying recent suits brought forth against the law, acknowledging procedural and linguistic issues with current statutes, and by identifying contrasting political rationales for and against SYG. Third, this paper examines empirical data regarding Stand Your Ground's social consequences. Here, I show that controversy stemming from SYG is the result of political commentary and negative, real-world consequences seen and felt by the public. Finally, this paper summarizes and proposes various solutions to make these laws more effective and more consistent in the future. Using a broad approach, this paper seeks to tie together multiple perspectives to give a more comprehensive analysis of how Stand Your Ground has and continues to function in the US today.

90. Sarah Small

**Major(s):** Human Physiology  
**Mentor(s):** Matthew Potthoff (Pharmacology)

**A Novel Strategy to Improve Insulin Sensitivity**

- In Type II Diabetes, the cell signaling pathway for insulin is not functioning, the cells have become resistant to high levels of the circulating protein in the blood. Treatment with a hormone called Fibroblast Growth Factor 21 (FGF21) has been promising, it has insulin sensitizing actions that can essentially reverse Type II diabetes and obesity by allowing the body to properly utilize the fuel it has consumed. However, a similar problem has presented itself, FGF21 resistance, which like insulin resistance, is an impairment of the ability respond, not a complete inability to use it. My research focuses on this impairment on a molecular level and asks the question, "what genes and proteins are being activated or inactivated in order to become resistant to FGF21?" Knowing this information, future researchers can best figure out how to overcome these obstacles and more effectively treat type II diabetes and obesity, two problems that are so prevalent in our country and around the world.

92. Tatiana Smith
Contextual Congruency Effect in Pigeons

- We wanted to see whether the visual context affects object recognition and, if so, then what processes are involved. Top-down processing proposes that perceptions flow from the big picture to the smaller details, whereas bottom-up processing proposes that the individual components are noted before grasping the big picture. To find out, we studied the congruency effect, which contends that it should be easier to detect and identify target objects when the targets and backgrounds are congruent—either both natural or both artificial—than when they are incongruent. In our experiment, four pigeons were shown a target stimulus that was either an animal (natural) or a contrivance (artificial) placed on top of either a natural or artificial scene. Once the pigeon pecked the target, two choice buttons appeared on either the side of the display. The correct button to choose was contingent on whether the target was an animal or a contrivance. If the correct button was pecked, then food was delivered and the next trial was scheduled; however, if the incorrect button was pecked, then a correction trial was given involving the same target and context. The results showed that the pigeons were reliably more accurate on congruent trials than on incongruent trials. This finding suggests that context can affect object recognition in a top-down fashion.

Rapid forgetting in young rats

- For years, researchers have worked to uncover the mechanisms for memory. Memory can be explained in three stages: encoding, storage, and retrieval. Pavlovian fear conditioning is a learning paradigm used to measure retrieval. Rats are placed within a chamber where they receive an auditory white noise (conditioned stimulus) followed by an electric shock through the grid floor (unconditioned stimulus). The rats are then tested in a different context and only receive the auditory white noise. The fear response is the amount the rats freeze, the absence of movement beyond respiratory movement. P17 rats show comparable freezing to P24 rats with the same amount of CS-US presentations in immediate tests. However, P17 rats show rapid forgetting at long-term tests (2 day and 14 day) when compared to P24 rats. The fear response between P17 rats and P24 rats can be equated by increasing the number of noise and shock pairings at training for the P17 group. Understanding the mechanisms for rapid forgetting during development may help researchers to understand other forms of forgetting and memory, like spontaneous forgetting in adulthood or forgetting in Alzheimer’s disease. Ultimately, understanding mechanisms of forgetting will help form a more complete model of memory.
96. Robert Specht

**Major(s):** Chemistry  
**Mentor(s):** Scott Shaw (Chemistry), Radhika Anaredy (Chemistry)

**Ionic Liquids – The Next Wave of Green Chemicals?**

- One of the biggest challenges chemists and engineers face today is to develop new methods or materials that reduces waste and energy consumption. Ionic liquids (ILs) are a new class of materials with properties that have allowed them to be seen as ‘green’ chemicals. Chemically, ILs are organic salts with melting points below 100 ºC. They do not evaporate into harmful vapors, they are not flammable, they are electrical conductors, and they are thermally stable. These specific properties allow them to serve in applications such as solvents, sealants, and electrolytes. Because ILs are still fairly new materials, characterizing their properties is important to fully unlocking their potential for applications. My research focuses on measuring ILs’ chemical properties such as melting point, glass- transition temperature, and crystallization point. To measure these values I use an analytical chemistry technique known as Differential Scanning Calorimetry (DSC) which measures heat flow as the temperature of the IL is changed. The heat flow of the IL can tell us where the material changes behavior. I also use a technique known as Contact Angle Goniometry which helps to find the relative strength of solid- liquid interactions between the IL and a solid surface.

98. Richard Su

**Major(s):** electrical/computer engineering, computer science, music  
**Mentor(s):** Reinhard Beichel (electrical/computer engineering)

**3D Medical Image De-noising Using the Total-Variation L1 Primal-Dual Algorithm**

- Medical imaging plays a vital role in the diagnosis and treatment of various diseases such as cancer. However, medical images are often ridden with noise that can obscure the content used in making critical health-determinant decisions. In attempting to remedy this, we investigated the total-variation L1 (TV-L1) primal-dual algorithm and its image de-noising capabilities. The main concern with this algorithm is its high computational cost and complexity, demanding significant amounts of computing time and power to execute. Using an optimized linear algebra library and a renowned image analysis toolkit, we have successfully implemented a version of the TV-L1 primal-dual algorithm that can quickly de-noise 3D medical images.

100. Maja Sunleaf

**Major(s):** Anthropology  
**Mentor(s):** Tiffany Adrain (Earth and Environmental Science)

**Curating a Paleobotany Collection**
• The Quaternary Paleobotany collection of Dr. Richard Baker, comprised of over 3,500 samples, is currently housed in the University of Iowa Paleontology Repository. Though the collection has a home, unfortunately, it is undocumented, minimally labeled, and preserved in unsatisfactory conditions. Through my research, I have compiled known publications associated with the collection for future reference by researchers. Multiple inventories of the collection have been assembled with the ultimate goal of adding the entire collection to the University of Iowa’s Specify database. Along with cataloguing the collection I have also begun the process of organizing, and rehousing the collection based on the localities of the items, and using archive safe materials, which will help preserve the collection for future use. Both the rehousing of the collection and its inclusion in the Specify database will make Dr. Baker’s Paleobotany collection available to researchers worldwide.

104. Spencer Van Dorn
Alyssa Mendenhall

Major(s): Biomedical Engineering

Mentor(s): Edward Sander (Biomedical Engineering)

Effects of Aging on Rho-ROCK Gene Expression in Response to Mechanical Stimuli in Human Dermal Fibroblasts

• The skin is subjected to many mechanical forces. Over time, response to these stimuli gradually declines. One of the response pathways involved in this mechanical response is the Rho-ROCK pathway. To study the effect of aging on Rho-ROCK gene expression, collagen gels were seeded with human dermal fibroblasts from young and old subjects aged 16-26 and 66-93, respectively, and then stretched to apply tension. Collagen gels provide an environment for cell proliferation that is designed to be very similar to in vivo conditions. Gene expression was quantified within each age group, young and old, in response to the applied tension. A difference in gene expression was observed between the young and old factions, with the younger faction showing higher Rho-ROCK gene expression.

106. Brigitte Waldier

Major(s): Speech and Hearing Sciences

Mentor(s): Karla McGregor (Communication Sciences and Disorders), Katherine Gordon (Communication Sciences and Disorders)

What is this called?: Children’s long-term retention of word forms

• Understanding how language is learned is fundamental in understanding human development. In the past, researchers largely believed children were rapid word learners. However, researchers focused on children’s memory for words when tested immediately after training, and not children’s retention of words over time. Recent research suggests that learning and retaining
words is a long process. Additionally, to learn words children must encode the object, the word form and the link between the two. Past studies focused on children’s ability to recognize the object when given the form (e.g. Where is the dorb?), but not on their ability to retrieve the form when given the object (e.g., What is this one called?) In the current study we addressed these past limitations by testing children’s ability to retrieve the form when given the target object after a delay of 6 months to a year post-training. Results revealed that children can remember word-forms over a long period of time, but the longer the delay, the less children are able to retrieve.

108. Xiao Wang

**Major(s):** History, International Relations  
**Mentor(s):** Shuang Chen (History)

**Qing’s New Policy and How it Brought Qing to its End**

- During the late 19th century and early 20th century, Chinese Qing Dynasty was invaded by Western powers and Japan for many times, and it made Chinese elites nervous about the future of the country. For the sake of survival, Qing had undergone a series of political reform. Those political reform aimed to transfer China from an authoritative agricultural country into a constitutional industrial country. Chinese reformists took Western and Japanese political system as model of their political reform. However, there were many misunderstanding of Western and Japanese political system, and those misunderstanding caused many conflict. Finally, those conflict brought Qing to its end.

110. Laura Wang

**Major(s):** English (Creative Writing), Chinese  
**Mentor(s):** Kathleen Maris (International Writing Program), Natasa Durovicova (International Writing Program)

**Breaking Down Language Barriers at the International Writing Program**

- Each fall, the International Writing Program brings dozens of renowned writers from around the world to spend the fall semester in Iowa City. The Fall Residency is the IWP's premier activity. My work with IWP was two-fold: helping the organization run its daily operations and bringing its history with Chinese literature to the University of Iowa students. This work took shape in an anthology of the Fall Residents’ translations of a poem by IWP director Christopher Merrill, a bilingual creative writing workshop, and a screening of a documentary about Hualing Nieh Engle, co-founder of IWP.

112. Lauren Werner
Cortical Mapping with transcranial magnetic stimulation

- Stroke is a leading cause of adult disability (Mozzafarian et al, 2015). Survivors often have lasting physical and cognitive deficits. In this study, we will use transcranial magnetic stimulation (TMS) to activate cells in the brain and produce measurable responses in muscles of the upper limb. This procedure determines whether connections between brain cells and muscles are damaged or intact and can be used to study changes in brain organization that occur during recovery from stroke. We will identify the area of the brain surface from which TMS can produce responses in each muscle, thereby creating cortical maps. By studying muscles of the hand, wrist, elbow and shoulder at the same time, we will expand on previous methods of cortical mapping. Specific aims of this study include determining if these methods can test brain function early after stroke and to predict how much recovery will occur. In addition, we will look for patterns of brain reorganization after stroke, by looking for changes in each muscle’s cortical map. An overall goal of this study is to expand the use of TMS as a rehabilitation research tool so that scientists and health care professionals can better understand how to treat stroke survivors with upper limb impairment.

114. Kelsey Willardson

Major(s): Health and Human Physiology
Mentor(s): Christine Petersen (Epidemiology), Angela Toepp (Schneider) (Epidemiology)

Use of dried blood spots to assess prevalence of zoonoses in animal caretakers.

- Zoonotic diseases, diseases transmitted by animals to humans, account for more than 75% of new pathogens. The risk of infection is increased with amount of exposure to animals. Those who work extensively with animals are therefore at a higher risk. Hunting dog caretakers often come in contact with blood and other secretions from over 50 dogs during their job. Little is known about these caretakers’ risk of disease in the United States. A risk assessment survey and blot spots were obtained from hunting dog caretakers and those with similar outdoor exposure (bird watchers and county park employees). This was done to determine the risk of exposure and prevalence of animal-related disease in groups that both had outdoor exposure with only one group having extensive exposure to dogs. The blood spots were used to determine the prevalence of disease in these groups. They can be an advantageous way to obtain blood samples in the field with minimal resources. We have optimized a new testing protocol allowing us to utilize dried blood spots for testing for zoonoses using isolating DNA and serum. This provides a low-cost, feasible blood sample collection option for field studies.

116. Breanna Williams

Major(s): Psychology
Mentor(s): Michael O'Hara (Department of Psychological And Brain Sciences)

Anxiety, Parenting Stress, and Childhood Behavior in Early Motherhood

- The pregnancy and postpartum are periods in a woman’s life that are joyous but vulnerable for the development of psychopathology, especially anxiety. Psychiatric symptoms during this time can result in negative outcomes for the mother and child, including lower quality of life for the mother as well as difficult child behavior and temperament. This study was a longitudinal, prospective study that examined anxiety symptoms, parenting stress, and childhood behavior at sixteen months postpartum using questionnaires like the PSI-SF, ECBQ, and IDAS-II. It was predicted that increased anxiety would predict increased parenting stress, and increased anxiety would predict more difficult early childhood behavior and more difficult childhood temperament. The results showed that parenting stress appears to be associated with anxiety, especially with Social Anxiety symptoms. Certain groups of childhood behaviors appear to be associated with anxiety symptoms and anxiety is significantly associated with more difficult childhood temperament. These results help to untangle the relationship between specific types of anxiety, accompanying parenting stress, and subsequent childhood behavior. Understanding the effects of anxiety on women and their children could encourage clinicians to pay attention to anxiety symptoms during the pregnancy in addition to depressive symptoms.

118. Jenny Winberg

Major(s): Communication Sciences and Disorders & Spanish
Mentor(s): Meredith Saletta (Communication Sciences and Disorders)

Leveled Books for Adults with Intellectual or Developmental Disabilities: A Pilot Study

- There is a dearth of reading materials that are appropriate for adults with intellectual or developmental disabilities (IDD) such as Down syndrome or autism spectrum disorders. In most cases, either the book’s content is too immature, or the book’s reading level is too high and therefore inaccessible to these readers. We wrote and illustrated a series of books designed to be both interesting and accessible to adults with IDD. These types of books are known as leveled books. The books discussed grocery shopping, holidays and birthdays, and astronomy. Sixteen individuals with IDD, aged 18 or older, participated in the study. During two separate sessions, each individual read three different leveled books and responded to questions about each. We manipulated text-level factors in the leveled books including the sentence complexity, the use of symbol support, and the modality used to respond to questions. We explored which condition would best facilitate reading by measuring the number of reading errors and the number of comprehension questions answered correctly in each condition. Preliminary results indicate that these readers are heterogeneous in their response to our variables, and that there may not be a single text-level manipulation that uniformly facilitates reading for this population.

120. Ziling Xia
How Do Celebrity Apologies Affect Our Celebrity Relationships

- Apologies are common, they play a major roles in determining whether or not a social relationship can continue, and most of us give and receive them frequently. However, when celebrities apologize in public, situations get very complicated. Some researchers criticize celebrity apologies, observing that such apologies are often evasive, or that the celebrity’s behavior after the apology contradicts the sentiments of the apology itself. In this research, we focus on controversy apologies such as Justin Bieber, Chris Brown, Benedict Cumberbatch and Kristen Stewart. Also, our research will involve cross-culture element. For example, besides analyzing American celebrity apologies, we also explore celebrity apologies from different countries such as China, Korea, England, and Russia.

122. Jiawen Xu

Major(s): Finance, Information Systems and Business Analytics(IS track)
Mentor(s): Qihang Lin (Management Science)

High Frequency Trading In Commodity Markets

- Natural gas prices are determined by the fundamental operations management principle of matching supply and demand. The US Energy Information Agency (EIA) releases a weekly natural gas report at 10:30 am on Thursday with the latest storage level estimates which affect the supply for the upcoming week and hence the natural gas price. The purpose of this study is to analyze how the inventory level announcement relates with price volatility in seconds and how to apply this benefit to High Frequency Trading.

124. Hepeng Ye

Major(s): Chemistry B.S.
Mentor(s): Amnon Kohen (Chemistry)

Kinetic and Crystal Studies of Formate Dehydrogenase mutant from Candida boidinii

- Enzymes play important roles in people’s daily life, so it is very important to understand the mechanisms of enzyme functions. As a catalyst, enzyme undergoes variety of time scales of motions during the catalytic cycles. And it is necessary to understand how these motions assist the enzyme to complete its mission as catalyzing the reaction. The time scales span from second to picosecond, and our research is to decode the role of femtosecond-picosecond time scales motions in enzymatic reactions. Formate dehydrogenase from Candida boidinii (CbFDH) was found to be a unique model system to address this question. To understand the reaction characteristics at chemical step, we measure the mechanistic condition wherein isotopic molecules react at different rates and their temperature dependency on a series of CbFDH active
site mutants. And the difference mechanistic conditions can be revealed by their crystal structures.

126. Angela Zhang

Major(s): Statistics, Biochemistry
Mentor(s): Jacob Michaelson (Psychiatry)

Understanding the transcriptional regulation of schizophrenia

- Schizophrenia is a complex mental disorder that affects over one million people in the United States. Although the symptoms of this disease are well characterized, the etiology of schizophrenia is complex combination of both genetic and environmental factors. In the last decade, the Pieper lab has discovered the proneurogenic, neuroprotective chemical, P7C3. This compound rescues the deleterious effects of decreased hippocampal neurogenesis, or the growth and development of nervous tissue in the hippocampus, from a disruption in NPAS3, a transcription factor thought to be involved in the pathology of schizophrenia. We conducted computational analysis on a mice model in order to discover what effect P7C3 had in changing the genomic environment of those with mutations in NPAS3. Through gene enrichment analysis, a method that finds what kind of genes are over-represented, in a set, we found that P7C3 primarily affected genes whose functions involved the growth of neurons and other components of the nervous system, confirming the efficacy of P7C3 in returning neurogenesis to mice with mutations in NPAS3. Although we saw a significant difference in gene expression after treatment in mice, we did not see a change in neuron cell type composition between groups, suggesting that P7C3 works through a mechanism that does not affect the cell types in hippocampus of mice. Continued research from these results will add to our understanding of the complex genetic landscape of schizophrenia.