The 7th Annual
Fall
Undergraduate Research Festival

Wednesday, November 30, 2016
4:30pm-6:30pm

University of Iowa
University Capitol Centre
2nd floor South Atrium
This event is hosted by the Iowa Center for Research by Undergraduates.

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

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The Fall Undergraduate Research Festival is proud to showcase nearly **100 visual presentations** given by the University of Iowa’s student researchers. Presenters work in over **40 different departments**, representing each of the senior, junior, sophomore, and freshman classes.

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

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

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

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

**Programs with full abstracts are available on the ICRU website.**

Many thanks to the over 100 graduate and professional students and postdocs who have volunteered their time to serve as poster judges for this event.
1 - Noelle Alkhawaja
Majors: Journalism, French
Mentor: Sarah Mitchell (Political Science)

Identity Claims Project

During my research, I worked with Professor Mitchell, a graduate student and one other undergraduate student to search through databases such as Lexis-Nexis, Historical New York Times, Keesing’s, etc., using key words to find articles related to identity claims. This means, two or more states that are trying to stake claims over a specific ethnic or indigenous group. This can involve the reformation of laws, as well as violence or mistreatment documented against these ethnic groups.

3 - Alexandra Bess
Major: Biochemistry
Mentor: Jennifer Fiegel (Chemical and Biochemical Engineering)

Lung Fluid Protein and Cellular Analysis for Aerosol Drug Delivery

When inhaling an aerosol drug, the drug particles travel through the throat and lungs on their way into the body. Using epithelial cells from the alveoli of human lungs and polystyrene particles to simulate drug particles”, cells were exposed to these simulated drug particles in a controlled environment, using saline, and a more natural environment, using a dilute lung fluid called broncheolalveolar lavage fluid (BALF). The difference in these experiments is the proteins present in the exposure fluid, which in BALF consist of the protein composition of a typical human lung. Proteins are macromolecules that serve important molecular functions in the body. Different parts of the body, such as fluids from different organs, have somewhat different protein compositions that help that particular organ serve its purpose on a molecular level. Analysis of the effect lung proteins will have on the interactions between lung tissue cells and a simulation drug particle describes how that drug particle may
interact within the body, and what interactions in particular can be attributed to the proteins alone.

5 - Cormac Broeg
Major(s): History & Political Science
Mentor(s): Leslie Schwalm (History)

*Killing Butler’s Bloodhounds: Iowa Soldiers and an Act of Political Violence in Reconstruction South Carolina*

A month after the end of the Civil War, at a plantation near Hamburg, South Carolina a band of Iowa soldiers killed twenty dogs which they believed had been used to track escaped enslaved people and prisoners of war. My research deciphers the sociopolitical motivation for this act through the study of the letters and memoirs of Iowa soldiers, contemporary newspapers, and other sources.

7 - Katherine Boyd

*Partial Suffrage in Iowa: 1894*
Major: History
Mentor: Landon Storrs (History)

*Partial Suffrage in Iowa: 1894*

My research has to do with the partial suffrage in Iowa, which was awarded to Iowa women in 1894 and allowed them to vote in municipal and school issues and elections. I am primarily concerned with assessing how an Iowa periodical, the Woman’s Standard, used partial suffrage to create a platform for full and equal voting rights later on. I look at how the Women's Standard used partial suffrage as a way to work within the current political framework, and how the Women's Standard championed partial suffrage as a way to normalize the idea of female voters.

9 - Grace Coleman, Todd Johnson
Majors: Music, International Studies; Music, Biology
Mentor: Trevor Harvey (Music)
Society for Ethnomusicology Podcast

The research we do explores the use of media technologies, specifically podcasts, to broaden public engagement with scholarly ethnomusicological research and the wide global impact of musical traditions. The podcast seeks to convey ethnomusicological concepts and research to a broader audience in an engaging and accessible way using stories and interviews surrounding a variety of ethnomusicological issues. We do this by creating short 15-20 minute podcast episodes featuring research, interviews, and narration. The episodes we have produced thus far study ethnomusicological issues from around the globe in a wide variety of social settings. Many aspect of culture and society are impacted by musical traditions and practices, and how these traditions are expressed differs widely across the globe. The podcast we create explores the impact of music and musical traditions on issues of racism, sexism, gender issues, economic influences, government policies, copyright laws, and many others. Through the production of a public podcast for the Society for Ethnomusicology that is online and freely accessible to anyone, we hope to convey the effects of ethnomusicological research studies more broadly in a global arena, and how this research is understood within a cultural context.

11 - Frank De Stefano
Major: Biochemistry
Mentor: Jessica Sieren (Radiology)

Positron Emission Tomography (PET) for the Assessment of Malignancy in Neurofibromatosis Type 1

Neurofibromatosis Type 1 (NF1) is a genetic disease affecting 1/4000 of the population. This disease causes a wide variety of neurological, cosmetic, and skeletal problems that greatly range in severity and typically first present in childhood. 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. These non-cancerous growths can transform into cancerous growths, called malignant peripheral nerve sheath tumors (MPNST). Due to nerve involvement in neurofibromas, surgical resection of tumors can result in loss of function and negatively affect quality of life therefore, accurate diagnosis of MPNST is important. Positron emission tomography (PET), a form of medical imaging, is the current tool used clinically to inform if a tumor of interest is cancerous or not. In this study, we examined the literature to inform on the optimal PET signal intensity threshold to distinguish MPNSTs from PNs, also taking into account specifics of how the image data was collected. We studied the performance of the PET based threshold to accurately distinguish malignant from benign tumors in a retrospective patient cohort of 26 NF1 patients.

13 - Patrick Dey
Major: Chemistry
Mentor: Johna Leddy (Chemistry)

*Effect of Thin Layer Sonoelectrochemistry on Palladium Hydride Storage*

Hydrogen is an excellent alternative fuel source because it is naturally abundant, easy to synthesize, and does not degrade significantly over time. However, hydrogen is not widely used as a fuel source currently because of the problems associated with storage. Problems such as gaseous and liquid hydrogen being volatile, combustible, highly flammable, and difficult to compress into a small volume even under intense compression prevent it from being a commercially available alternative fuel source. Hydrogen can also be stored in solid-state in metals such as palladium that stores hydrogen as metal hydride. This is a known electrochemical mechanism but it is a kinetically limited process. Thin layer sonoelectrochemistry is an electroanalytical technique that efficiently harvests acoustic energy from ultrasound in electrochemical processes. This technique physically catalyzes slow electrochemical reactions and processes using the acoustic energy from low energy ultrasound. The objective of the project was to overcome the kinetic limitation of palladium hydride storage by introducing ultrasound. Using thin layer sonoelectrochemistry, we have ob-
served an increased efficiency in the amount of adsorption/absorption into the metal and desorption of hydrogen from the metal.

15 - Caroline Emory
Majors: Speech and Hearing Science, Psychology
Mentor: Inyong Choi (Communication Sciences and Disorders)

Auditory Selective Attention Training

To communicate effectively in noise and reverberation, listeners must selectively attend to a target voice and ignore other sounds. Hearing-impaired listeners often have difficulty in such settings, but even listeners with normal-hearing thresholds differ widely in how well they can understand speech when there are competing sounds. Understanding these individual differences, and the mechanisms underlying them, is critical for developing new devices that could aid hearing-impaired listeners. Using electroencephalography (EEG) we will test normal hearing subjects to examine cortical activity during selective attention. This will enable us to estimate when activity occurs with great precision, and what brain regions are involved with some specificity. Based on previously published results, we expect EEG measures to reveal large inter-subject differences in brain activity that correlate with differences in behavioral ability. We believe that insight into the interplay between subcortical and cortical encoding of sound will be an important step towards being able to diagnose specific hearing deficits that currently fall under the broad, non-specific category of “auditory processing disorders” and might someday be beneficial in training hearing-impaired listeners to improve their selective attention abilities.

17 - Laura Fischer
Major: Biochemistry
Mentor: Marc Wold (Biochemistry)

Creating Hybrid Proteins to More Efficiently Study Huntington’s Disease

Huntington's disease is a degenerative brain disorders caused by expansion of certain DNA sequences. Replication Protein (RPA) is a protein that works to stabilize DNA and prevent expansions that cause
Huntington's. Humans also have a second type of RPA called Alternate RPA (Alt-RPA). Our lab has evidence that these two proteins, RPA and Alt-RPA, interact differently with DNA and may function differently in Huntington's repeat expansion. Mouse model systems are often used to study Huntington's disease, but mice do not have Alt-RPA. To study this human protein in mice, I am making mouse-human hybrid RPA complexes. Currently, I am purifying the hybrid proteins and evaluating how they function compared to non-hybrid human and mouse RPA. Understanding the functions of Alt-RPA will allow us to gain insights into the origins of Huntington's disease and potentially develop novel treatment or prevention strategies.

19 - Caroline Garske  
Majors: History, Political Science  
Mentor: Keisha Blain (History)

*Crack in the System*

My research focuses on the racially biased media panic regarding the crack cocaine scare of the mid-1980s and the following legislation that was passed in attempt to "defeat" the "war on drugs." The 1986 Anti Drug Abuse Act included a statute punishing crack cocaine 100 times more harshly than the substance it is derived from, powder cocaine. The media coverage and political rhetoric in the midst of the 1986 midterm elections employed racially tinted statements and imagery that fueled racist sentiments in the citizenry. These racial fears stirred up a moral panic in the public, demanding harsh punishment for these "crack heads" who were apparent menaces to society. The consequence became the Anti Drug Abuse Act of 1986 which has overwhelmingly led to disproportionate arrests, convictions and prison sentences for those in the black community.

21 - Ashley Gilbert  
Major: Chemistry  
Mentor: Betsy Stone (Chemistry)

*Characteristic Emissions of Indonesian Peat Burning*

Peat is a soil-like substance consisting of decomposed plant matter.
Around the world, peatlands are being burned in order to use the land for agriculture or development. As a result of this burning, the carbon in peat is released into the atmosphere. This increase of atmospheric carbon in the form of particulate matter (PM) causes problems with health and visibility. In this study, organic compounds in fine PM (PM2.5) released during peat burning were analyzed to determine molecules that are characteristic of peat burning. The molecules emitted during peat burning are also emitted during biomass burning. These molecules are plant decomposition products such as levoglucosan (Lev), mannosan (Man), galactosan (Gal), vanillin, vanillic acid (VA), syringaldehyde, and syringic acid (SA). Because these compounds are common to all biomass burning emissions, this study focuses on the different ratios of these compounds to determine if the ratios are characteristic of peat burning. Through data analysis, it was determined that the VA/SA ratio of 2.27±0.64 was characteristic of peat along with the ratios of 55.8±41.1 and 423±254 for Lev/Man and Lev/Gal, respectively. By identifying characteristics of peat burning other researchers can use this information to determine the contribution of peat burning emissions to PM among other sources in polluted regions of the world.

23 - Callie Ginapp
Major: Neurobiology
Mentor: Gordon Buchanan (Neurology)

_Midbrain serotonin receptors 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. Directly activating serotonin receptors in the midbrain of mice did
not cause arousal, whereas blocking these receptors did not inhibit arousal in response to elevated CO2 within the midbrain. These data suggest serotonin neurons in the midbrain must activate receptors in a different region of the brain to cause arousal to increased CO2.

25 - Elizabeth Helfenberger  
Majors: Physics, Mathematics  
Mentor: Usha Mallik (Physics & Astronomy)

_Evaluating New Timing Detector at Large Hadron Collider_

This summer I traveled to CERN's Large Hadron Collider (LHC) to study the potential benefits of adding a small timing detector to a large experiment at the LHC called ATLAS. At the LHC, protons travel in bunches (composed of \(10^{11}\) protons) along two circular pipes and intersect at a point called the "bunch crossing." Every time the bunches cross, there are about 15-20 collisions. Of these, only the most energetic collision, called the hard scatter, is analyzed. This is because it is most likely to produce interesting physics. The rest of the collisions are noise, termed "pileup". It is essential to separate the pileup from the hard scatter so that particles can be properly identified. The ATLAS detector is shaped like a cylinder, and near the flat faces of the cylinder it is especially difficult to eliminate pileup. A timing detector placed in these outer regions could improve physics analysis by comparing the expected arrival time of hard scatter particles to the actual arrival time of all particles, thus providing a way to filter out pileup. My work focuses specifically on how timing information might improve identification and energy resolution of electrons.

27 - Titus Hou  
Major: Biochemistry  
Mentor: Ernesto Fuentes (Biochemistry)

_Defining Interactions Between Proteins Involved in Metastasis of Cancer Cells_

Proteins play a crucial role in living organisms. Understanding how proteins interact with each other and their environment can provide
insight in describing diseases at a molecular level and drug development. Scribble and SGEF are two proteins that have recently been identified as proteins that interact through a very uncommon mechanism and have also been implicated in cancer cell migration. Understanding their interaction can provide useful information in understanding metastasis and potential drug therapies. We used an array of standard structural biological techniques to characterize and visualize the interaction between Scribble and SGEF protein.

29 - Holly Isbell
Major: Chemistry
Mentor: Madeline Shea (Biochemistry)

Pain Perception and Weight Regulation How is it Regulated?

Pathologies in voltage gated sodium channels (Nav) can lead to serious diseases affecting movement, heart rhythm, and pain perception. There are nine different types of NaV one of which (NaV1.7) plays a role in pain perception and weight regulation. A protein called calmodulin (CaM) is one of the proteins responsible for regulating NaV. CaM does this by binding to a region on all of the NaV called the IQ motif (IQp) and regulates the function of the NaV in a calcium dependent manner. However, how this regulated the function of NaV1.7 is not well understood. There are five structures of apo (free of calcium) and calcium saturated CaM bound to the IQP of NaV1.2, NaV1.5, and NaV1.6. They show that NaV primarily contacts one portion of CaM called the C-domain. NaV1.7 has not been explored. Does it behave in the same manner as NaV1.2, 1.5 and 1.6 when bound to CaM or is there a different response? To study this NMR was taken of the NaV1.7 IQP bound to CaM in both the apo and calcium saturated conditions. The NMR analysis can be simplified by labeling only the peptide or the protein. To analysis NMR in this manner the separation of peptide and protein was studied.

31 - Forest Johnson
Majors: Ancient Civilization, History
Mentor: Michael Moore (History)
Though Gustavus Adolphus, the legendary King of Sweden during the Thirty Years War, has been well remembered by historians since his death, few remember Axel Oxenstierna, his chancellor. While Gustavus roamed the battlefields of Europe, fighting the enemies of Sweden and her allies, his chancellor played multiple roles: he conducted diplomacy and trade with other states, saw to the recruitment and payment of troops, and administered taxation and the every-day governance of Sweden itself. Thus, when Gustavus died in 1632 (16 years before the war came to an end), and left only a six-year old daughter as his heir, Oxenstierna became almost singularly responsible for the administration of a state which had grown greatly in influence and power since he assumed his position in 1612. From 1632-1644, at which point Gustavus' daughter Christina reached the end of her minority and ascended to the throne, the Swedish state was administered and governed by its dutiful Chancellor. Though he initially reigned (if his control can be so called) as he believed his friend and king would have wished, he was confronted with unforeseeable challenges, which only solidified his power, and engendered loyalty both in his soldiers and subjects and in other heads of state through Europe. Even after his queen came of age, Oxenstierna retained his position, and wielded great influence over both the peace negotiations which ended the war, and Sweden itself, for the rest of his life.

33 - Kallin Khan

Majors: Computer Science, Mathematics
Mentor: Jasper Halekas (Physics & Astronomy)

MARS: Transformation to a Barren Wasteland

Mars is a barren planet without life. However there is evidence that there was once water on the planet, and it may have been able to sustain life. It is clear that Mars' atmosphere is much weaker than Earth's. This allows solar wind, which consists of charged particles from the sun, to pass through Mars' atmosphere. While there is a satellite currently orbiting Mars, some of the data is hard to read and thus needs to be cleaned up. This will be done so
that we can better see the energy levels and the velocity of the solar wind particles that penetrate the Martian atmosphere.

35 - Eric Knapp  
Major: Chemical Engineering  
Mentor: Julie Jessop (Chemical and Biochemical Engineering)

_Ultraviolet Light Curing Effects in Polymer Properties_

Changes in a polymer’s physical and mechanical properties can greatly impact performance. For example, small changes in the molecular weight distribution can drastically effect polymer strength and shrinkage. Understanding how processing conditions and monomer chemistry influence molecular weight distribution is critical to producing polymers with desired properties. This fundamental study investigates the effect of exposure time and light intensity on ultraviolet (UV) initiated polymerizations. Developing a relationship between monomer chemistry, process conditions, and polymer properties will allow more industrial polymerizations that are initiated by UV light.

37 - Aishwarya Kothapalli  
Major: Human Physiology  
Mentor: Arlene Drack (Ophthalmology)

_Development of Visually Guided Assay for Mice Models of Eye Disease_

The goal of this experiment was to develop a visual test that could differentiate between visually impaired and normally sighted mice. These visually impaired mice are models for retinal degeneration diseases such as Bardet-Biedl Syndrome and Aniridia. The development of this assay is especially important due to the lack of specificity in other types of visual testing methods. In order to assess how well different types of mice could see in both the light and dark, a children’s swimming pool was filled with water and the mice were dropped from a specified drop location and made to locate a randomly placed platform. Four groups of mice models were used, two that were visually impaired and two that served as sighted controls. The results showed that visually impaired mice, on average, required more time to locate
the platform than normally sighted mice. It can be concluded that this assay allows for a more holistic approach in assessing the visual acuity of mice.

39 - Evan Lamb
Majors: Microbiology, Human Physiology
Mentor: Diane Slusarski (Biology)


Rare genetic disorders are difficult to analyze in human patients. Many syndromes are complex and affect many body organs and tissues which make observation complicated. As such, model organisms are used to examine genetic disorders in ways which are not possible in humans. Zebrafish have proven to be an excellent model system for eye disorders due to the similarity of the fish and human eye anatomy and functions. The zebrafish were mutated so that their genetics resembled those of human patients for the disease in question. The resulting mutants had varying levels of abnormal gene expression and cellular products depending on the degree of mutation within their genes. The altered fish were tested for visual capabilities and compared to unmutated fish. Testing in the model organism showed that the fish with two altered copies of the gene were significantly more visually impaired than those with only one abnormal copy or those with correct genetics.

41 - Olivia Lewis
Major: Human Physiology
Mentor: Hanna Stevens (Psychiatry)

Effect of prenatal stress on placental gene expression and long-term telomere length in offspring brain and blood cells

Prenatal stress increases risk for neuropsychiatric disorders such as autism and schizophrenia and may influence cellular function in the brain and other systems through telomere shortening - children exposed to prenatal stress have shorter leukocyte telomeres. Telomeres cap the
ends of DNA and protect the chromosome from cellular damage. We previously found changes in brain telomere length (TL) in a mouse model of prenatal stress - shorter in females but longer in males. In this study, we are interested to see if TL changes continue into adulthood and whether placental gene expression also changed. We measured placental gene expression of Idh2, a mitochondrial enzyme involved in the citric acid cycle affecting redox biology, but found no differences with prenatal stress. Changes in other genes may be a source of offspring telomere changes. The spleens from adult mice were collected to examine TL in white blood cells, which serves as a marker in many human studies for biological aging, stress, and altered cellular function. Adult mice had longer TL even months after prenatal stress. This was the same as brain TL changes in males but opposite in females, suggesting different long-term cellular changes depending on the type of cell.

43 - Sheng Hao Lu
Major: Microbiology
Mentor: Michelle McQuista (Dentistry)

What Predicts Dental Students’ Willingness to Treat Underserved Populations?

Many people in the United States have a difficult time obtaining dental care. This may be due to a person’s lack of money, language barriers, or dentists’ unwillingness to treat some populations. We previously found that dental students’ willingness to treat 13 underserved populations changed as they progressed through dental school. We used the same data for this study to determine which dental student characteristics were most likely to predict who would be willing to treat underserved populations after graduation. Students who reported previously interacting with people who displayed the specific queried characteristics were more willing to treat patients with those characteristics in the future. Similarly, students who reported feeling comfortable and perceived themselves to be competent in treating patients with specific characteristics were more willing to treat patients with those characteristics in the future. In contrast, dental students’ demographic and
personal characteristics (e.g. whether the student was male or female, students’ political views) were less likely to predict whom they would treat after dental school. This suggests that opinions about treating underserved populations can be formed during dental school. By providing dental students with multiple opportunities to treat underserved populations, students may be more likely to treat them post-graduation.

45 - Zachary Luppen  
Major: Physics & Astronomy  
Mentor: Cornelia Lang (Physics & Astronomy)  

_Hawkeyes in Space Exhibit_

The Hawkeyes in Space exhibit is a museum exhibit currently on display at the Old Capitol Museum, curated over the summer by Cornelia Lang and Zachary Luppen, alongside university libraries and museum staff. The exhibit covers the entire history of the University of Iowa’s Department of Physics & Astronomy, split into three distinct sections. The first covers the history of the department, from its very beginnings, through the life of Iowa professor and world-renowned space scientist James Van Allen and his team’s work on the first US satellite Explorer 1 which led to the discovery of the Van Allen Radiation Belts, to the point where the university was manufacturing entire spacecraft. The exhibit then transitions to the science of space, examining the actual work that’s been done on so many of the missions. It makes use of a plasma-generating “planeterrella” to simulate radiation belts and aurora, and also teaches plasma-wave physics by using real data that has been translated into sound. Lastly, the exhibit details the continuing legacy of the department, how with even such a rich history, there are still so many Hawkeyes in Space heavily-involved in current and future spacecraft missions, astrophysical research and space science.

47 - Carter Madler  
Major: Chemistry
Fine particles 2.5 micrometers or smaller in diameter (PM2.5) are hazardous to both human health and the environment. These particles can be emitted as a primary aerosol, directly from a source as particles such as dust or smoke, or as a gas that reacts in the air to form a secondary aerosol. By looking for molecules known as tracers, the original source of a primary or secondary aerosol can be identified. Tracers are well researched for primary aerosols, but not for secondary aerosols. This study uses these established primary tracers to measure the day and night variance of human activity at a location in Houston, Texas to aid in the identification of possible tracers for anthropogenic secondary aerosols. Air samples were collected every 12 hours from May 5-27, 2015 and analyzed in the laboratory. Results show that during the night there is a strong variation in the concentration of tracers that mark incomplete combustion and fossil fuels, indicating that there will also be a strong variation in potential tracers for the secondary aerosols emitted by the same sources.

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

Tfap2 is essential for normal melanocyte differentiation: Potential relevance to melanoma

Melanoma is the deadly cancer of pigment-producing cells that is very difficult to treat and whose incidence is on the rise in the US. Melanoma arises from mutations that happen while a melanocyte is developing into its final form. Many proteins monitor this growth process, so there are a lot of possibilities for mutations to happen. We must fully understand the role of each protein involved in this developmental pathway in order to achieve a holistic understanding of the genetic causes of melanoma. A protein that has been shown to mildly facilitate melanocyte development is known as Tfap2. We hypothesize that
Tfap2 is actually utterly essential for melanocyte development. To learn Tfap2’s specific role, we ask what would happen if active Tfap2 is depleted during melanocyte development. However, this is difficult because there are five different versions of Tfap2. Using a second protein, known as Kctd15a, we can inactivate, or “turn off”, Tfap2 so that it no longer can help develop melanocytes. By manipulating the amount of Kctd15a present in a cell, we can manipulate the activity, or “on/off” status of Tfap2. We performed an experiment to express extra Kctd15a in melanocytes and found that it severely worsened the quality of these melanocytes. This suggests that Tfap2 is important for normal melanocyte development. The clinical implications of these findings include therapies to elevate Tfap2 levels in melanoma tumors in order to impede their progress.

51 - Amy Meehleder
Major: Art History
Mentor: Julie Hochstrasser (Art History)

Tea Time in the Digital Age: Collaboration and Creativity in Publishing an Online Exhibition Catalogue

In the Fall 2014 semester Dr. Julie Hochstrasser’s course Themes in Baroque-Era Art addressed the subject, “Life and Still Life in the Dutch Golden Age: Crafting an Exhibition”. The result was Tea Time: Going Dutch, a collaborative art exhibit crafted by the students and their instructor in the University of Iowa’s IMU Black Box gallery. Visitors to the gallery were able to see the contents of the exhibit shift and take shape from week to week. However, the collaboration did not end when the exhibition concluded. Instead, work has continued through multiple ICRU fellowships, allowing more students the opportunity to make their mark on Tea Time as they create an online catalogue for the exhibition. Fall 2017 represents the culmination of that effort as final touches are made to the digital catalogue format of Tea Time: Going Dutch prior to its publication on the University of Iowa Museum of Art website.

53 - Alexandria Miller
Majors: Psychology, Music
Mentor: Leyre Castro-Ruiz (Psychology)

A Musical Melody's Impact on Learning and Memory

In this project, college students will listen to several complex sentences. In the initial learning phase, half of the participants will be presented with speech sentences and the other half with sung sentences. In the second phase, participants in the speech condition will be divided into two groups: Speech-Restudy (they will keep listening to the speech sentences) and Speech-Retrieval (they will listen to the first part of the sentence and they will have to produce the second half). Similarly, participants in the singing condition will be divided into two groups: Song-Restudy (they will keep listening to the sung sentences) and Song-Retrieval (they will listen to the first part of the sentence and will have to sing aloud the second half). All participants will be tested on their memory for the sentences after 10 minutes and after 1 week. We predict that the Song-Retrieval group will show the best memory, whereas memory will be the worst in the Speech-Restudy group. Comparisons among groups will allow us to determine how retrieval practice and singing interact. These results will help advance both the study of memory and its application to educational practice.

55 - Camille Mumm
Majors: Biology, Informatics
Mentors: Rob Cornell (Anatomy and Cell Biology), Albert Erives (Biology)

Identifying orofacial cleft risk loci using zebrafish model.

Cleft lip with or without cleft palate (CL/P) is a common birth defect affecting nearly 4,500 babies born in the United States per year. To date, we only know the genes causing approximately 50% of orofacial clefting. Interferon Regulatory Factor 6 (IRF6), is a well-studied gene that is expressed highly in the embryonic skin (periderm) and known to cause CL/P. Recently, a mutation in a non-coding DNA region nearby the IRF6 gene has been implicated in a CL/P syndrome. Therefore, we need to have a better understanding how non-coding DNA contribute
to oral periderm development and consequently CL/P. We have developed bioinformatic methods to identify such regions in the zebrafish genome. Testing these regions using a fluorescent marker in the zebrafish, we were able to determine if they function in the periderm. Of three regions tested, one of such region nearby the gene periplakin; ppl, was shown to be active in the zebrafish periderm. Going forward, we are attempting to identify transcription factor binding sites and delete them. An improved knowledge on the function of these enhancer regions, even in zebrafish can assist us in finding genetic and non-coding DNA contributors to CL/P.

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

*Replication Protein A and The Regulation of DNA Repair*

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

59 - Claire O´Connell  
Major: Biomedical Engineering  
Mentor: Michaels Schneiders (Biochemistry)
The Importance of Computers to Designing Cures: A Focus on Protein Therapeutics

Protein modeling is a developing field that has the potential to revolutionize protein design. For years, many design fields such as prosthetic or circuit design have been aided by computer design methods, however, the field of molecular design has lagged due to the cost of simulations and lack of efficiency. The goal of our work is to overcome these challenges using a new approach that calculates the thermodynamic energy between normal and mutated protein structures. The sampling begins in a highly accurate, expensive molecular physics model, but path independence of thermodynamics allows 95% of calculations to be computed in a faster, less accurate model. This process significantly reduces the cost per simulation while maintaining the accuracy of the advanced simulation model. The accuracy of the calculations has also been aided by the implementation of new integration methods that segment the numerical integral into 2-, 3-, or 5-point curves that better reflect the curvature of the data. These methods have been established in the context of studying pharmaceutical crystals, while current work is focused on scaling the approach to large protein systems. In the future, these algorithms will form the basis for designing protein therapeutics to cure diseases such as cancer and renal disease.

61 - Maureen O’Connor
Major: Biochemistry
Mentor: Lori Wallrath (Biochemistry)

Molecular basis of rare types of muscular dystrophy

Mutations in the human LMNA gene cause rare forms of muscular dystrophy, including Emery-Dreifuss muscular dystrophy that affects an estimated 1 in 100,000 people. The LMNA gene makes proteins called lamins that are important for the structural integrity and shape of the
nucleus of a cell, as well as the organization of the genomic DNA. To understand how mutations in the LMNA gene alter lamin protein function we developed a fruit fly model. We discovered that mutant lamins mislocalize and aggregate in muscle cells. Our studies provide insights on the molecular basis of lamin-associated muscular dystrophy and suggest that drugs that destroy aggregates might be an avenue for therapy.

63 - Janel Orton
Major: Accounting
Mentor: Amy An (Accounting)

The Financial and Tax implications of the Affordable Care Act on United States Lower and Middle Class Residents

I examine whether the Affordable Care Act (ACA) is as beneficial as predicted to the United States’ lower and middle class participants. I will not narrowly focus on quantitative information, but will also expand the research to include qualitative information. The intent of the Affordable Care Act was to make affordable health care available for all U.S. residents who could not previously afford to purchase independent health insurance and did not have it offered through an employer-based plan. I am suggesting that there was significant cost increases to lower and middle class residents that had health insurance coverage when the ACA went into effect. 9.66 percent of household income for a single person health insurance plan was the only limit set to determine if an insurance plan meets minimum essential coverage. The insurance companies could adjust premiums, deductibles, etc. without a set cost limit for all other plans. I am using a survey of 100 people to try to discover if the ACA was beneficial to the lower class that previously did not have insurance, without harming the lower and middle class residents who already had insurance in the period from the beginning of 2013 through 2014.

65 - Margaret Preigh
Major: Biology
Mentor: Rob Cornell (Anatomy and Cell Biology)
Investigating the regulation of sox10 expression in the neural crest

A population of embryonic cells known as the neural crest develops into facial bones, sensory brain cells, pigmentation cells, and more necessary structures. A network of genes triggering each other in a complicated domino effect controls development of neural crest cells. The mechanism described is known as a gene regulatory network. This research uses Zebrafish as a model to determine which areas of the zebrafish genome enhance the expression of a gene involved in neural crest development, sox10. When candidate regions for these enhancers are tested in Zebrafish, activity of the enhancer is indicated by the presence of green fluorescent protein, or a glowing cell. When we observe green cells, this indicates that the enhancer is actively working to drive expression of the gene in that cell type. At this time, only two candidate regions have been tested, and preliminary results have not shown any enhancer activities.

67 - Alexandra Redfern

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

Children who are Hard of Hearing: Are They Getting the Services They Need?

For children with disabilities, the school day can bring about more problems than those contained in a math workbook. For children with hearing loss, these problems arise from decreased access to speech sounds. Unfortunately, when problems arise early, they tend to continue throughout school and into adulthood. To combat these access problems and avoid persistent struggles, service providers may implement Individualized Education Programs (IEPs). In the past, children with mild-severe hearing loss were an underserved population, and thus were termed “forgotten children”. The present study sought to investigate 2nd grade IEP goals of children with mild to severe hearing loss by comparing IEP goal areas for 40 2nd grade children with hearing loss to analogous test scores to determine if goal targets matched need areas. Areas with analogous test scores included grammar, vo-
cabulary, mathematics, production, listening, and literacy. All scores except production were standardized, and “need” was determined by a standardized score of 78 or below. Nearly all students with needs had goals in the analogous areas, but some students had goals for areas in which they had no need. Based on current educational practices, it appears that these students are no longer forgotten in the educational setting.

69 - Ravan Ross
Major: Art
Mentor: Loyce Arthur (Theatre)

Artists work of art and the public eye

Research study on what influences artists to create and publicly display their work. Is the work artists create influenced by the public eye? How does this influence the subject matter on their art.

71 - Andrey Sazonov
Major: International Relations
Mentor: Brian Lai (Political Science)

Examining Russian Foreign Policy Attitudes

The research project I engaged in together with Professor Brian Lai and Professor Nicholas Martini examines what influences Russian foreign policy attitudes. Drawing on the existing literature which focuses on the degree of nationalism and anti-Americanism, this paper argues that how Russians form attitudes is based on which heuristic (nationalism or anti-Americanism) is triggered. Given the strong control of the media by the government, how foreign policies are framed are likely to trigger one of these frames. Specifically, we suggest that attitudes towards foreign policy issues that lend themselves to a nationalist media frame are likely to be driven by nationalist views, while those that are not nationalist in scope are likely to be framed in regards to the US. In these cases, anti-American views will drive the attitudes towards that issue. We hypothesize that attitudes about the Ukraine will be driven by national-
ism, while those about Syria and Iran will be influenced by anti-Americanism.

73 - Callie Shannon
Major: Psychology
Mentor: Susan Assouline (Psychological and Brain Sciences)

Comparing rural, high-potential middle-school students' self-efficacy and psychosocial outcomes

The STEM Excellence and Leadership program is an extracurricular STEM intervention for high-ability middle school students in rural school districts across Iowa. In the spring of 2016, we completed the first year of the program, at which point students were given a survey which asked questions concerning self-efficacy in school and learning. Students were also given the ACT Explore test, as a high-level test to gauge their achievement in math and science, and the ACT Engage test, to measure psychological and social factors in education, such as relationships with school personnel, and thinking before acting. For this portion of the study, we looked at a variety of combinations of the measures from the survey, determined how many times each option was selected for each question (e.g., how many times students said they were better than most boys their age in math), and then compared those numbers by gender. We then did analyses to determine if there were any associations between students’ responses on the survey and their scores on the Explore or Engage tests. We hypothesized that students who rated themselves with higher self-efficacy and who said their success was attributed to hard work would have higher scores on the Explore and Engage tests than students who rated themselves lower. We are currently in the process of finishing these data analyses.

75 - Carley Stewart
Major: Biomedical Engineering
Mentor: Alejandro Pezzulo (Internal Medicine)

Mucus Overproduction in Human Airways
The human body sustains life through an interconnecting network of organ systems and biochemical pathways. These pathways provide a balanced distribution of energy and nutrients to specific portions of the body and allow for proper function. When these pathways malfunction, often it initiates a domino effect and results in larger issues upstream.

In the case of an individual with cystic fibrosis (CF), there is a malfunction in how their cells produce mucus, sweat, and other fluids. A large population of mucus-producing cells is found in the lungs. These cells are known as goblet cells, and they overproduce mucus in CF patients. The overproduction of mucus causes airways to be blocked and bacteria to be trapped in the viscous fluid. These two components of the disease often lead to infections and a decline in quality of life. An understanding of the mechanism behind overproducing goblet cells is needed in order to develop therapeutic drugs to relieve patients of disabling symptoms. In order to discover an appropriate drug, experiments have been completed on human airway cells inducing and quantifying goblet cell progression or regression.

77 - Ryan Theis
Major: Anthropology
Mentor: Jim Enloe (Anthropology)

*Ceramic Sherd Thickness at Woodpecker Cave*

Ceramic body sherds in Woodland Period contexts have been notoriously difficult to analyze for useful information. This study looks at body sherds from Woodpecker Cave, a Middle to Late Woodland Period seasonally occupied rock shelter in Johnson County, Iowa. From about 200 BCE until at least AD 1000, and perhaps later, Woodland peoples increasingly exploited starchy seed-based food resources, and processing these resources demanded ever thinner pots in order to improve thermal conductivity and resistance to heat induced fracture. This study analyzes whether chronological change can be measured by sherd thickness in different excavation levels and uses thickness to refine and solidify typological classification.
79 - Sevantha Thenuwara
Major: Biology
Mentor: Kris DeMali (Biochemistry)

*Integrin-dependent mechanism for sensitizing melanomas to chemotherapy*

Cancer is a disease where the body experiences uncontrollable cell growth. Clusters of these cells, called tumors, can break off and spread to the rest of the body through the blood stream, a process called metastasis. I study a very specific kind of cancer called Melanoma, the most dangerous type of skin cancer. It can be caused by excessive exposure to UV rays, like spending a lot of time in the sun or using tanning beds. This is why it’s important to always wear sunscreen and to avoid tanning beds. Melanoma is the most fatal of the skin cancers, and once it’s metastasized, it’s very resistant to therapies. It causes more than 10,000 of the about 13,000 skin cancer deaths each year. Currently, my lab is trying to find a way to make Melanoma cells more sensitive to therapy, since there is no known cure for Melanoma. Our lab figured out that increasing a certain protein in the Melanoma cells will make them more likely to be receptive to therapy, but we don’t know how exactly that is done. So, that’s my project. I am looking at how exactly that increase in protein affects the cell. It’s important to figure not only if the cells can be made more receptive, but also how so an effective drug can be made.

81 - Tracy Vo
Majors: Biology, Anthropology
Mentor: Kelly Baker (Occupational and Environmental Health)

*The effectiveness of cloth filtration in the removal of fecal contamination in drinking water in rural Gambian villages*

Cloth filtration is a simple technique used in areas where technologies to improve the quality of drinking water are extremely limited by removing dirt, pathogens, and other unwanted matter. The purpose of this study is to assess how effective cloth filtration is and to learn more
about general drinking water habits in rural villages in The Gambia with a survey and by analyzing fecal contamination in water. This study was conducted with 30 rural households and the following samples were taken from each household: the main source of water, water filtered through the household’s own filter, and water that was already stored inside the household. Overall findings show that all three categories of water samples were equally contaminated with fecal bacteria. This suggests that filtering drinking water with a cloth does not decrease fecal contamination. These findings can help refocus water intervention programs to rural areas in The Gambia.

Second Hour Presenters
5:30-6:30PM
(even numbers only—boards will be turned around)

2 - Brittany Allendorf
Major: Health and Human Physiology
Mentor: Kelly Messing (Dermatology)

*Epidermal Autoantibody Modulation of Skin Cell Function*

Typically, the cells and antibodies of the immune system identify invading pathogens, such as bacteria and viruses, so that they can be destroyed. Autoimmunity occurs when the immune system mistakenly recognizes healthy cells in the body. Antibodies that recognize self are called autoantibodies. Bullous pemphigoid (BP) is a disease where autoantibodies recognize your skin cells, known as keratinocytes, which decreases cell attachment and results in severe blistering of the skin. The goal of this study is to study the different types of autoantibodies found in patients with BP and see if they affect keratinocytes in the same way by examining what happens on both the outside and inside of the cell. On the outside, we will see if these antibodies disrupt cellular adhesion and, on the inside, we will see what signals are sent from the cell surface to the nucleus, which then change cell behavior. Understanding these steps will help to develop specific targets that can be
used in drug development to treat autoimmune skin diseases.

4 - Emily Beltz
Major: Psychology
Mentor: Ryan LaLumiere (Psychological and Brain Sciences)

*The role of the infralimbic and prelimbic cortices in cocaine-seeking behavior*

Cocaine addiction is a major detriment to addicts, their loved ones, and society. The infralimbic cortex (IL) is a region of the medial prefrontal cortex that has been shown to play a role in extinction learning and the suppression of cocaine-seeking behavior. When inactivated or activated, the IL has been shown to impair or enhance the retention of extinction learning, respectively. Using an animal model of self-administration, we applied this knowledge to examine the precise temporal relationship between active lever pressing, extinction learning, and activity in the IL and prelimbic (PL) cortices. This study shows that inhibiting the infralimbic (IL) region of the prefrontal cortex in the rat brain leads to impaired extinction learning, and thus increased cocaine-seeking behavior. Inhibition of the prelimbic (PL) region of the same cortex leads to decreased cocaine-seeking behaviors. The results of this study further our understanding of the mechanisms underlying cocaine addiction.

6 - Christina Blomquist
Major: Speech and Hearing Sciences
Mentor: Bob McMurray (Psychology)

*Spoken language is linked to reading at the word level in children*

There is general agreement that the development of reading relies on spoken language skills. The present study investigates how spoken language and written language may be linked at the word level. We used eye-tracking to compare the processing of spoken words and written words in beginning readers (7 to 12 year-olds). As we perceive a word, we are actively trying to anticipate what that word is. In order
to measure this predictive process, we tracked eye gaze to various pictures representing words while a participant perceived a word. We found that word recognition has some differences but is largely similar in speech perception and reading. For each child, the processing of spoken words predicted the processing of written words. This suggests that there is a common factor between understanding words in spoken language and written language. Our results also show that the relationship between written language and spoken language differs across age groups, which suggests that this association may change across development.

8 - Trevor Cline, Gustav Lundberg
Majors: Psychology; Psychology, Sociology
Mentor: Andrew Todd (Psychology)

_Perspective-Taking: One's Own Point of View Can Interfere with the Perception of Another's (if They are Similar)_

Reasoning about others’ mental states (i.e., their thoughts and emotions) is essential for navigating social life, yet even typical adults can make errors when engaging in perspective-taking. Perspective-taking, which can be understood as inferring others’ mental contents, is vulnerable to various biases that can interfere with one’s ability to recognize another’s perspective or to quickly identify their own. Examples of biases that affect perspective-taking include egocentric interference (i.e., the interference of one’s own perspective when inferring someone else’s) and altercentric interference (i.e., the interference of another’s perspective when responding from one’s own point of view). In our experiment, we used a computer-based visual perspective-taking task that required participants to respond from their own perspective or the perspective of an ingroup or outgroup avatar to investigate how group membership affects perspective-taking processes. We found evidence that egocentric interference was stronger when the task involved an ingroup avatar than when it involved an outgroup avatar, suggesting that it is when we are reasoning about the minds of similar others that our own perspectives may most intrusively get in the way.
**Emission of Particulate Matter from Biomass Burning Sources in Kathmandu, Nepal**

The air quality of Nepal, and other developing countries, suffers from high levels of particulate matter in the air. In order to improve air quality, air pollution needs to be decreased. The emission of pollutants from biomass burning was studied to identify sources that could be targeted in order to reduce their effects on human health and the climate. Biomass sources were found to emit more pollutants that dissolve in water than fossil fuels. Dung was found to emit more water-soluble pollutants than hardwood and twigs. In addition, servicing motorcycles was found to reduce their emission of pollutants. The burning of waste produces large amounts of pollutants. The findings from this research provide insight to reduce pollution in Nepal and other developing countries by decreasing emissions from cooking and heating sources, servicing motor vehicles, and finding better ways to dispose of waste.

**Determining Properties of Stellar Atmospheres from Radio Data**

Understanding the nature of stellar magnetic fields is essential to learning how stars evolve and behave. Many stars, like our Sun, have fairly weak magnetic fields. Even so, the effects of the Sun’s magnetic activity are felt here on Earth, potentially causing satellite and communications disruptions. Our project seeks to characterize the properties of stellar magnetic fields and deepen our general understanding of magnetic activity in stars. One way to estimate stellar magnetic field properties is by analyzing radio emission from stars. Electrons spiraling
in coronal magnetic fields emit radiation in the radio frequency range.
There are two main groups of electrons that emit radio emission: 1) mildly relativistic electrons which radiate gyro-synchrotron emission (GS) and 2) thermal electrons which radiate thermal gyro-synchrotron emission (TGS). The latter group’s emission is highly dependent upon magnetic field strength and temperature. Using radio data from the Very Large Array, we analyzed eight stars for evidence of TGS radiation, two of which may exhibit features characteristic of TGS. We are currently developing models to determine whether these stars are actually showing TGS radiation and put tighter constraints on the magnetic field strength and coronal temperature.

14 - Riley Deutsch
Major: Biomedical Engineering
Mentor: Jessica Sieren (Radiology)

A web based data collection tool to track system use and parameter settings for a shared resource micro-CT imaging system

Micro-computed tomography, or micro-CT, is an imaging technology that allows for very fine resolution images to be taken of samples using X-rays. While not valuable for whole-body scanning, this tool offers many advantages in research settings. The high resolution machine has uses in imaging samples, without destruction of the sample as opposed to other high resolution imaging methods, such as histopathology. The types of samples imaged using the shared resource micro-CT system are highly diverse with regards to size and composition: including fixed biological samples, electronics, materials etc. In order to efficiently use the micro-CT scanner to its full potential, it is necessary to develop robust imaging protocols that will reliably produce quality images. However, many of these machines are not programmed to automatically store relevant parameters for image acquisition. In order to collect these parameters, an online data collection tool was developed using a web application called REDCap. This collection tool allows the imaging technologist running the system to enter all relevant information during the system setup. The data will be stored in a database that will allow the management team to easily analyze it and generate reports on
total system usage and/or project specific reports for individual re-
searchers.

16 - Joshua Dunigan
Major: Genetics and Biotechnology
Mentor: Madeline Shea (Biochemistry)

Separable Roles of 4-Helix Bundle that Activates Calcineurin

In humans, embryonic heart development, immune rejection of organ
transplants and maintenance of neuronal plasticity all depend critically
on calcium-activated calcineurin (CaN). CaN is a heterodimeric serine/
threonine protein phosphatase consisting of an auto-inhibited large
catalytic subunit (CaNA) and a small regulatory subunit (CaNB) that
binds calcium. Two isoforms of CaNA (±, ²) are abundant in the brain
and heart, and tightly bind calcium-saturated calmodulin (CaM); this
lets them achieve full enzymatic activity. CaM is similar to the intrinsic
CaN subunit CaNB; both have two homologous 4-helix bundle do-
mains that adopt an “open” tertiary conformation after binding calcium
ions cooperatively at paired EF-hand binding sites. We hypothesize
that calcium-dependent regulation of CaN activity is linked to a 3-step
mechanism mediated by calcium binding to sites of CaNB, followed by
association of calcium-saturated C-domain of CaM (CaMC) with CaNA
and then binding of calcium to the N-domain of CaM (CaMN) that
triggers it to relieve auto-inhibition. This study focuses on determining
how CaMC and CaMN interact to regulate CaN activity. Understanding
how the domains of CaM act in concert and independently will suggest
ways to provide more precise allosteric control of CaN and the subse-
quent nuclear signaling that occurs when CaN dephosphorylates the
transcription factor NF-AT to induce its transfer to the nucleus where it
regulates transcription from multiple genes.

18 - Fidel Estrada
Major: Geography
Mentor: Marc Linderman (Geography)

Classifying Land Cover in the Aravalli Hills of Rajasthan, India
I analyzed four satellite images from the Aravalli Hills area in Rajasthan, India. I conducted research on several topics associated with remote sensing technology such as using geometric relationships between points on an image to transform it to a geographically correct position, as well as using software that breaks up objects in an image in order to then classify them as different types of land cover. I used geographic information systems and remote sensing software in order to create these images. These results will be helpful in identifying forms of change to the land cover that might have occurred from the period of 2007 to 2014. This could potentially reveal deforestation, soil erosion, wildlife habitat loss, and other environmental change.

20 - Eastyn Fitzgibbon
Major: Chemical Engineering
Mentor: Allan Guymon (Chemical and Biochemical Engineering)

Enhancing Properties of Polyurethane

Polyurethane is a widely used polymer material found in synthetic clothing fibers, construction materials, electronics, automobile parts, and various other applications. The polymerization reaction used to create polyurethanes can be modified to enhance desired properties in polyurethanes, such as toughness, strength, and vapor permeability. This can be accomplished through use of a chain transfer agent, which allows a polymer to form more slowly and in a more uniform fashion. When a force is applied, polymers made with the chain transfer agent are up to 17 times tougher than their unmodified counterparts. In addition, polymers modified with the chain transfer agent show decreased vapor permeability, meaning that a significant degree of control in the amount of water vapor that passes through a film can be accomplished by varying amounts of chain transfer agent. These results showcase the use of chain transfer agents as a method of dramatically changing polymer properties.

22 - Lander Geadelmann
Major: Biology
Mentor: Chi-Lien Cheng (Biology)
Expression of WOX Genes in Ceratopteris Richardii

The fern Ceratopteris richardii exists in two life cycles. While the fern cannot reproduce asexually in nature, it can be induced to reproduce asexually in the lab. This ability, as well as the ability to exist in two life cycles, makes it a good organism to study development. In order to initiate the development of each different life cycle, certain genes, the traits of organisms, must be expressed. When a gene is expressed, it is shown in in the physical characters of an organism. Our lab has identified genes that are involved in the initiation of each life cycle. After identifying these genes, we are confirming that they are expressed in our ferns and are isolating them. This will allow for further testing on the expression of these genes.

24 - Katherine Giles
Major: Chemical Engineering
Mentor: Julie Jessop (Chemical and Biochemical Engineering)

Ultraviolet Light Curing Effects on Polymer Properties

Changes in a polymer’s physical and mechanical properties can greatly impact performance. For example, small changes in the molecular weight distribution can drastically effect polymer strength and shrinkage. Understanding how processing conditions and monomer chemistry influence molecular weight distribution is critical to producing polymers with desired properties. This fundamental study investigates the effect of exposure time and light intensity on ultraviolet (UV) initiated polymerizations. Developing a relationship between monomer chemistry, process conditions, and polymer properties will allow more industrial polymerizations that are initiated by UV light.

26 - Katherine Hauck
Major: Economics
Mentor(s): Nicholas Ziebarth (Economics)

Effects of Tornados on Midwestern Towns, 1880-1940
Disaster relief and local planning after a disaster need to be informed as to the long-term consequences following the tragedy. The effect of tornado disasters on the population growth of Midwestern towns from the period 1880 to 1940 was examined. The growth rate of towns struck by a tornado was compared to neighboring towns within a 50 mile radius. Surprisingly, in some cases, the tornado-struck towns grew faster than their neighbors. This research suggests that the original population size of the town struck by the tornado the original population size of the town struck by the tornado is important to the subsequent growth rate, with towns that start out with a population of at least 1000 surpassing the growth rate of their non-tornado-struck neighbors. The decade in which the tornado occurred was also important, with towns effected by tornadoes occurring in the 1880’s and 1890’s growing more rapidly compared to nearby towns. Region of the country had no effect on growth rate of the towns. Although this is only one aspect of disaster recovery, it could have important implications for long-term disaster mitigation.

28 - Emma Hawk
Major: Electrical Engineering
Mentor: Ananya Sen Gupta (Electrical and Computer Engineering)

Constrained Signal Reconstruction Methods for Underwater Acoustics

Underwater acoustic signal processing aims to reconstruct the shallow water acoustic channel from both direct arrival and delayed multipath reflections. This enables accurate acoustic communications in shallow water, such as between underwater autonomous vehicles (UAVs), which are essential for coastal surveillance and other applications. In this work, we take a previously implemented algorithm for channel estimation and apply practical constraints motivated by shallow water acoustic physics. We base our estimation constraints on the physical properties of the rapidly fluctuating reflections from the moving sea surface and rough sea bottom. Our work aims to reduce the computation time and prediction error in the channel estimation using our constraints for real time applications.
30 - Jonah Heskje
Major: Biology
Mentor: Daniel Tranel (Neurology)

An Automated Method of Mapping Damage in the Human Brain

The lesion method is a time-honored tradition in cognitive neuroscience that requires groups of cases to understand how the brain works. When a group of patients present with a similar cognitive deficit, it is inferred that the damaged region of the brain is necessary to produce the lost function. Importantly, all brains are different and must be registered to a standard space in order to compare the damage in multiple subjects. Current manual ‘lesion mapping’ techniques require considerable expertise and are time-intensive. Recently, a number of software packages have been developed that are capable of automatically aligning an individual subject’s brain scan with a standard brain space. This process can also be used to transfer damage traced on the subject’s anatomical image into the same standard brain space. The present study compares a manual method (MAP-3) of mapping brain damage with automated methods from four common neuroimaging software packages. It appears that the methods are all roughly similar to one another and would likely yield the same results in studies using the lesion method. Thus, the adoption of automated lesion mapping techniques could substantially increase the pace of cognitive neuroscience research without sacrificing the accuracy of its findings.

32 - Emma Husar
Major: English
Mentor: Barbara Eckstein (English)

Writing The Peoples' Weather Map

The Peoples’ Weather Map is a creative, interactive, digital map of Iowa initiated by my professor in the English Department, Prof. Barbara Eckstein. The project strives to connect Iowans’ stories of severe weather events to scientific research on climate change. We invite the user to explore all 99 clickable counties to read severe weather stories and
share their own. We hope to share stories that incorporate minority populations to offer a more complete picture of the people of Iowa. I research severe weather events that have impacted the state and its people. I compile the research into a written story that invites the reader to question Iowa’s relationship to climate. My research begins as early as 1840 and continues to the present day. It is not only the weather events that are central to this project, but the historic human relationship to severe weather, whether it be Native American, settler, or immigrant. These stories are presented alongside climate change information to invite skeptics and believers to think about the history, severe weather, and people in this state, and lead them to question how these components all relate to the weather we all experience.

34 - Claire Jacobson
Majors: French, Arabic
Mentor: Natasa Durovicova (International Writing Program)

Snapshots of Syria: A Short Story in Translation

Stories have a unique capacity to help people of different cultures to understand one another. This story, taken from a collection by Syrian author Haifa Bitar, is a snapshot of pre-revolution Syrian society translated from Arabic into English. Arabic literature is not commonly read, which is a lost opportunity for cultural interaction and understanding. But there are significant barriers to translation between Arabic and English, including the vastly different grammar structures and cultural presuppositions. An example of grammar differences is the sentence structure: In classical Arabic there is no punctuation, and a certain stylistic tendency to have two-hundred-word sentences remains even in the 21st century. It’s difficult to know where to break up sentences and ideas in an English translation. An example of cultural presuppositions is the narrative structure: While in English stories tend to have a cohesive plot with clear development and a conclusion, in Bitar’s story there is no resolution, no overcoming of conflict, no heroic action. The “heroine” is a victim and either can’t or won’t do anything about it. This translation is an attempt to bridge a gap in understanding between two cultures, hoping that there are readers willing to cross it.
Popular music informs Pop Art as a consequence of the two being distinct ways to find entertainment and aesthetic pleasure in Great Britain and the United States. The media that has been created as a result structures and explains the ways in which people express themselves as individuals and as members of a community. I argue that the Beatles’ Sgt. Pepper’s Lonely Heart’s Club Band is one of the best examples of a collaborative artistic work that acts as an artifact of Western identity. The inspiration for the iconic cover, designed by Pop artist Peter Blake, who specializes in art related to fandom and identity, came from the Beatles themselves. It is an eclectic collection of people who influenced them their own set of fan badges that expresses who the four musicians are as individuals. The intersection of the Beatles’ musical talents with the graphic interpretation of the band members’ personalities, provided by Peter Blake’s perfected skills in the visual representation of fandom, created an all-encompassing Pop Art piece that a mass audience can both join and enjoy. This album acts as a permanent relic to British and American identity and has been both enjoyed and contemplated since its release.

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
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.

40 - Stephen Kruse  
Major: Biomedical Engineering  
Mentor: Gordon Buchanan (Neurology)

*Norepinephrine and Serotonin in Seizure-Induced Respiratory Arrest and Death*

Epilepsy affects an estimated 3 million Americans and around 1/3 of these cases will not respond to treatment. Most current research is focusing on the importance of serotonin, a chemical messenger in the brain, in seizure recovery. Serotonin is thought to prevent death through the recovery of breathing after the seizure by preventing seizure-induced respiratory arrest (S-IRA). The focus of our study was to see how depletion of norepinephrine, another chemical messenger, plays a role in mediation of seizure response. We used pharmacological agents to manipulate the levels of both serotonin and norepinephrine in wild-type and genetically altered mice without serotonin. We also developed and utilized a model for depleting norepinephrine-producing neurons within a specific brain region. Within these conditions, mice underwent an artificially created seizure while breathing, heart rate, and brain activity were recorded. We found that an increase in norepinephrine reduced S-IRA and death while pretreatment with a norepinephrine blocker extinguished this effect. An increase in serotonin was not sufficient to prevent S-IRA and death in mice with depleted
noradrenergic systems. We hope that these results will highlight the importance of norepinephrine in recovery of post-seizure breathing and be a basis for further studies involving norepinephrine in seizure.

42 - Tomas Lence
Major: Neurobiology
Mentor: Kumar Narayanan (Neurology)

*Neuronal activity during Parkinson’s disease treatment*

Parkinson’s disease is characterized by the death of dopamine-carrying neurons in the brain and physically manifested by motor function impairment. Current treatment of Parkinson’s disease consists of administration of a drug called Levodopa (L-dopa), which replenishes the lost dopamine in the brain caused by dopamine-neuron cell death. L-dopa treatment fully restores motor function, eliminating muscle rigidity and slowness of movement. However, 80% of Parkinson’s patients treated with L-dopa develop abnormal involuntary movements (AIMs), which are seriously debilitating and impair quality of life. It is unknown how or why these L-dopa induced AIMs develop and what happens in the brain at the moment of an AIM. Our study in the Narayanan lab consisted of inducing Parkinson’s disease in genetically modified mice and administering L-dopa to treat the disease. Electrodes were implanted into the brain to record neuronal activity. A 3D tracking system was coupled with the neuronal readings to see how brain activity changed during L-dopa treatment and what happened in the brain at the moment of an AIM once they developed. We found abnormal activity developing over the course of L-dopa treatment and at the moment of an AIM.

44 - Zesen Lin
Major: Chemistry
Mentor: Madeline Shea (Biochemistry)

*Regulation of Voltage-Dependent Sodium Channel NaV1.1: How Calcium Controls Calmodulin-IQ Motif Binding*
Voltage-gated sodium channels (NaV) are large, multi-domain transmembrane proteins that are found in neuron cell and muscle cells. There are many form of the NaV, namely from NaV1.1 to NaV1.9. The NaV is in responsible for propagation of neurological message between the brain and the muscle or sensory neurons. Malfunction in the NaV can cause sever diseases, for example, pain insensitivity is due to mutation in the NaV1.9 channel. The opening and closing of the channel is controlled by a protein called calmodulin (CaM). CaM can binds to an intracellular portion of the channel and alter channel's activity. The CaM can also bind to calcium and exist in in two forms: apo form and calcium saturated form. While in different form, CaM can bind NaV with different affinity. There has been previous studies suggesting that there might be a structural difference between apo-CaM-NaV1.2 and calcium saturated-CaM-NaV1.2. NaV1.1’s and NaV1.2’s IQ sequence is very similar. The structure of the particular complex is studied by NMR method, and the result shows that there is a change in the structure between apo-CaM-NaV1.1 complex and calcium saturated-CaM-NaV1.1 complex, just like NaV1.2 interaction with CaM.

46 - Olivia Ray
Majors: Chemistry, Biochemistry
Mentor: Leonard MacGillivray (Chemistry)

Modulating the Properties of Aspirin

Aspirin, a well-established active pharmaceutical ingredient (API) and NSAID, is commonly used to help with inflammation, fever, and pain. It is also utilized in the long-term to help prevent heart attacks and strokes in people that are at high risk for these problems. Issues arise when trying to form aspirin into a tablet due to its bulk properties. Other molecules are joined with aspirin to obtain a co-crystal that changes aspirin’s bulk properties. This research has implications in the pharmaceutical industry because by altering the physical properties of an active pharmaceutical ingredient like aspirin, tableting can be improved. Our research focuses on changing the molecules that are paired with aspirin. This approach gives us insight into how aspirin interacts with other molecules and how we can systematically improve the bulk prop-
erties of aspirin. We have successfully isolated an aspirin co-crystal, which has been confirmed using analytical techniques. This is academically significant because there is only one reported co-crystal with aspirin in the literature.

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

Sexual Health Knowledge in Young Adults with Intellectual and Developmental Disabilities

It is well known that persons with disabilities experience disparities in sexual education. The purpose of this project was to determine gaps in sexual health knowledge among young adults with intellectual and developmental disabilities. This study used a cross-sectional design using the Assessment of Sexual Health Knowledge (ASKh2). The measure was a paper and pencil version that was read aloud as individual participants read questions independently. A sign language interpreter was also used. Disability groups were categorized as intellectual disability (ID), autism spectrum disorder (ASD), attention deficit disorder (ADD)/ADHD), learning disability (LD), hearing impairment (HD) and physical disability (PD) that included a total of 52 participants. Overall the mean score was 46.8% (32.3 correct responses out of 69 questions) with the range of scores from 17.7 (HD) to 38.9 (ADD/ADHD). Further analysis of group differences is in progress. Results are expected to contribute to improving sexual education interventions in these populations.

50 - Eric Mittauer
Major: Human Physiology
Mentor: Fang Lin (Anatomy and Cell Biology)

Formation of Heart Tissue (And Other Organs) Is Regulated By Complex Gene Pathways

Embryonic formation of the heart, or cardiomorphogenesis, is one of the most complex organogenesis events in the body. Existing vascular
structures must migrate to the midline of the body and twist around each other in an extremely precise sequence of events. For this reason, congenital heart defects are the largest class of birth defects. A class of proteins called G-protein coupled receptors are important regulators of this process, acting as kinases, or proteins that activate other proteins. By activating regulators of cellular cytoskeleton, responsible for moving and placing the embryonic heart tissue, these G-proteins direct the migration and formation of the heart. One such protein, encoded by gene G13, interacts with a number of downstream effectors, and mutation of this gene has been shown to have multiple effects on formation of heart and other structures. Mutations in G13 and its upstream receptor mil show similar defects in heart structure and eye structure, both regulated by cytoskeletal and extracellular matrix remodeling in development. Very similar defects are caused by mutations in the natter gene, coding for extracellular matrix protein fibronectin. Analysis of mutational defects in model zebrafish indicates some level of interaction between the G13 and Natter pathways.

52 - Elissa Monteiro

Major: Psychology
Mentor: Megan Foley Nicpon (Psychology)

CogMed Working Memory Training

This research study will assess the effectiveness of an online working memory training program developed by Pearson Corporation called CogMed. Evidence suggests CogMed is helpful for improving the working memory ability with individuals who possess working memory deficits. Working memory deficits are commonly encountered with individuals diagnosed with ADHD. This study examines the effectiveness of the program within a subset of children diagnosed with ADHD who are also identified as gifted and/or talented through intellectual assessments. These children are often labeled “twice-exceptional”. Broadly, twice exceptional students are students who are considered gifted and/or talented but who are also clinically diagnosed with some learning disability. Working memory, or short term memory, is a system that allows for temporarily storing and managing information in present situ-
izations. Typically, individuals diagnosed with Attention Deficit Hyperactivity Disorder, ADHD, have working memory deficits. The study is split between two groups. The first group is comprised of twice-exceptional students, while the second is a control group of children diagnosed with ADHD who are not identified as gifted and/or talented through cognitive testing. Participants participate in the program for five weeks total, and complete the computer activities for fifty minutes each day for five days each week. This project is currently at the data collection and recruitment phase.

54 - Aaron Nessler
Major: Biomedical Engineering
Mentor: Krystal Parker (Neurology)

Analysis of timing and cerebellar functions in mice due to a mutation from autism

Autism spectrum disorders involve abnormalities across brain systems, resulting in a variety of symptoms including altered time perception, behavior, cognitive, learning, and social interactions. A common variant in the PRICKLE2 gene was present in individuals with autism. Disrupting this gene makes mice exhibit similar mannerisms to individuals with autism including social, behavioral, and learning impairments. Additionally, Prickle2 disruption has resulted in a reduction of neuron connections inside the brain. As Prickle2 is strongly expressed in specific cells in the cerebellum, this animal model presents a unique opportunity to investigate cerebellar abnormalities associated with autism-like phenotypes. We studied the performance of mice without the Prickle2 gene in interval timing, a task that requires subjects to estimate an interval of several seconds using a motor response that involves the cerebellum. These mice that trained in a fixed 12-second interval task were impaired during the first 3 days of learning. Over successive days of training they acquired accurate timing to the level of normal mice. Additionally, we explore structural abnormalities in animals with Prickle2 disruption using microscopic imaging. These data suggest a role of the cerebellum in cognition and could inspire novel cerebellar-targeted treatments for cognitive impairments in autism spectrum disorders.
Role of CaMKII in Reactive Oxygen Species Production by Vascular Smooth Muscle Cells

More than 330 million people worldwide suffer from diabetes, which causes increased risk of cardiovascular disease. This strong correlation between diabetes and heart disease is reported to be mediated by production of excess reactive oxygen species (ROS), which are extremely reactive molecules produced as byproducts of chemical reactions-including energy production-within cells. ROS is a major signal to vascular smooth muscle cells (VSMCs), which form the middle layer of blood vessels and contribute to vascular pathology in cardiovascular disease. Mitochondria are critical for vascular function, are a major source of ROS and perturbed by diabetes. The protein calcium/calmodulin-dependent kinase II (CaMKII) is expressed in VSMC, resides in cytoplasm and mitochondria and is activated by hyperglycemia. However, it is unknown what role CaMKII plays in ROS production by VSMCs. Using laser microscopy and specific fluorescent dyes, ROS production in VSMCs was measured following 48 hour high glucose (HG) treatment. ROS production was elevated from baseline in HG treated cells, but in cells where mitochondrial CaMKII was inhibited, this increase was not seen. Hyperglycemia for 48 hr increased expression of ETC complex I subunit NDUFB8 (Complex I is a primary producer of mitochondrial ROS); mitochondrial CaMKII inhibition lowers expression of this mitochondrial subunit. These data suggest a role for mitochondrial CaMKII in arbitrating increased ROS production with HG stimulation.

Properties of Novel Metal-Organic Crystals

Purifying water is necessary to conserve limited resources. In our lab, a
metal-organic nanotube (MON) has been made that, because of its properties, that could be used to purify water. However, this MON has uranium in the structure so the applications are limited. In our study, we try to make nanotubular materials that have similar properties to the MON but using less dangerous metals. We successfully made two metal-organic crystals; one using nickel and the second using nickel and lanthanum. Using single-crystal x-ray diffraction (XRD), structures of the crystals were determined to be [NiNa2(IDA)2(H2O)2].2H2O and [LaNi(IDA)2(HIDA)].H2O respectively. Powdered XRD confirmed that each crystal was pure. Analysis was done on the nickel crystal by heating it up while keeping track of the mass and at 75°C the material lost 25% mass and IR analysis of the gas confirmed that this weight loss related to water. At 300°C, the structure began to degrade so the crystal has a high thermal stability. Furthermore, the first crystal also had similar porosity to the uranium MON. Discovering how to make the metal-organic materials and exploring the properties of the crystals brings us closer making a more applicable MON.

60 - Alyssa Ray
Majors: Chemistry, Biochemistry
Mentor: Donna Santillan (Obstetrics and Gynecology)

Release of Vasopressin is Elevated in Humans Even Though the Plasma Osmolality is Suppressed

Preeclampsia is a serious condition that is only present during pregnancy. The most recognizable symptom of preeclampsia is uncontrol- lable high blood pressure. There is no cure for preeclampsia, except to deliver the baby. Even delivery of the baby and does not always improve the health of the mother. Globally, preeclampsia and other hypertensive disorders of pregnancy causes the most maternal and infant deaths of all pregnancy-related diseases. Globally, a mother or child dies every minute from preeclampsia. With the cause of preeclampsia not understood, the mechanism of control of preeclampsia needs to be studied. Our lab has shown that arginine vasopressin (AVP), a hormone that retains water and constricts blood vessels, is elevated early in pregnancy in women who later became preeclamptic. However, it is
unclear whether the release of AVP is due to the osmolality of blood plasma. Osmolality is a measure of the number of solute particles per kilogram. We found that the suppression of plasma osmolality was greatest in the women with preeclampsia, meaning that the AVP release is primarily due to non-osmotic control mechanisms. This is an important step in understanding the role of AVP in the development of preeclampsia.

62 - Angela Schab
Major: Cell and Developmental Biology
Mentor: Dawn Quelle (Pharmacology)

Modulating the Properties of Aspirin

Aspirin, a well-established active pharmaceutical ingredient (API) and NSAID, is commonly used to help with inflammation, fever, and pain. It is also utilized in the long-term to help prevent heart attacks and strokes in people that are at high risk for these problems. Issues arise when trying to form aspirin into a tablet due to its bulk properties. Other molecules are joined with aspirin to obtain a co-crystal that changes aspirin’s bulk properties. This research has implications in the pharmaceutical industry because by altering the physical properties of an active pharmaceutical ingredient like aspirin, tableting can be improved. Our research focuses on changing the molecules that are paired with aspirin. This approach gives us insight into how aspirin interacts with other molecules and how we can systematically improve the bulk properties of aspirin. We have successfully isolated an aspirin co-crystal, which has been confirmed using analytical techniques. This is academically significant because there is only one reported co-crystal with aspirin in the literature.

64 - Mary Elizabeth Snell
Major: International Relations
Mentor: William Reisinger (Political Science)

Norms of Everyday Corruption in Russia, Ukraine, and Georgia
his research looks at the beliefs and norms of the people in Russia, Ukraine, and Georgia to get a stronger sense of their individual “cultures of bribery”. While most corruption research looks at high-level government officials, this looks at the lower level of government that the average person interacts with more frequently, for example universities and their equivalent of state or county level officials. The analysis is broken up by country and the demographics of the people including age, gender, and level of education and the impact of each on behaviors. We found that many people in these countries believe that bribery is wrong but feel it is necessary to get by. The respondents state overall that most forms of bribery are unacceptable, but still participate for various reasons such as that it is demanded of them by the official or easier to do than honest methods. The findings of this research will contribute to the knowledge that we have about these countries to better understand the position its citizens are in when crises emerge.

66 - Brittany Stoll
Major: Human Physiology
Mentor: Jatin Vaidya (Psychiatry)

Mother-Child Agreement on Adolescent Impulsivity Ratings

Adolescence is known to be a period of change and further development. One of the issues that arise during this age is partaking in rash behavior and poor decision-making. To understand what is driving behavior, scales have been developed to identify personality traits. Because impulsivity is an overarching construct, many subcategories have been developed to try to better understand the trait. The UPPS-P scale was created in order to measure five facets of impulsivity. In the present study, 12-17 year olds and their mothers completed the UPPS survey based on the child’s personality to determine how similar child and mother ratings were on impulsivity. Our results showed that mother and child do not always agree on impulsivity traits. Further, one rater is not dependably the higher scorer, demonstrating inconsistency between raters. Our overall conclusion for this study is that the level of agreement between mother and child differs based on the sub-scale
being tested. In particular, scales that involve inferring internal emotional states in the adolescent children may show particular low levels of agreement.

68 - Maja Sunleaf  
Major: Anthropology  
Mentor: Tiffany Adrain (Geoscience)

*Curation and Installation: Renovating Exhibitions in Trowbridge Hall*

Trowbridge Hall, located on the University of Iowa’s campus, is not only home to the Department of Earth and Environmental Sciences, but is also the site of many exhibition displays, whose contents range from mineral and rock samples to various fossils. This research project centered around the re-curation of four of these cases in order to create more visually appealing and intellectually stimulating content for visitors to enjoy. Each exhibit space will display a different topic: Dinosaurs, Hominids, Paleontology Repository/Student Research, and Faculty Research. The updated dinosaur and hominids exhibits will allow the undergraduate labs “Evolution and the History of Life” and “Age of Dinosaurs” to study replicas of various specimens outside of the classroom. The Student Research and Faculty Research exhibits will highlight research being done by members of the department. The research process for creating these new cases involved consulting with University of Iowa faculty regarding information about various items on display and the study of web-based content. The gathered research was then compiled and edited for clarity and ease of understanding for future visitors to Trowbridge Hall. The process of repainting the display cases and installing the new text labels is currently underway.

70 - Sarah Thao  
Major: Microbiology  
Mentor: Mary Wilson (Internal Medicine)

*Flesh eating parasite sends messages to attract human cells to the infection site*
Inside a female sand fly, tiny parasites called Leishmania develop. They are transmitted to humans during an insect bite, and can cause the disease leishmaniasis. Different forms of leishmaniasis can cause scarring, deformation, or dissemination to visceral organs with deadly consequences. Upon infection, neutrophils are the first human white blood cells to arrive at the bite site. Recent studies have shown that the parasites benefit from infecting neutrophils by using it as a Trojan horse to enter undetected in the final host cell, the macrophage. But how can the parasites infect the neutrophils? Our lab found that parasites secrete a substance called Leishmania chemotactic factors (LCF), which sends signals to nearby neutrophils, attracting them to migrate towards the parasite. Little is known about these signals. In this study, we tested the interactions between LCF and human neutrophils. Our results showed that the parasites exploit important components on the neutrophils, called chemokine receptors, which stimulate them to migrate. Future studies will focus on the biochemical characteristics of the parasite-derived signals that attract neutrophils to the site of a sand fly bite. We hope this understanding will indicate how we could stop the parasites from infecting neutrophils, and thereby stop the disease.

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

*Burning Down the House: Technological Approach to Fire Cracked Rock*

Fire-cracked rock has traditional been mostly ignored as an archaeological artifact that can be used in analysis. This poster aims to show the usefulness of fire-cracked rock to archaeologists to help hypothesis how a particular site has been used. We do this by performing a color analysis, as well as a chemical analysis on the fire-cracked rock found during excavations at Woodpecker Cave. A controlled burning experiment was also performed to verify the results of the various analyses.

74 - John Walsh  
Major: Human Physiology
Mentor John Kirby (Microbiology)

ACE Inhibitors on the Microbiome and Host Energy Balance

ACE Inhibitors are a drug class used for lowering blood pressure and are widely prescribed for their high ability to treat high blood pressure with few side effects. The microbiome is the vast ecosystem of microbes that live in the large intestine and have been shown to affect host health in many ways, including the host metabolism. This study has shown that a certain ACE Inhibitor captopril, not lisinopril, causes a significant loss in weight. This weight loss is not attributed to a diet change or exercise change which may implicate the gut microbiome as a cause of the weight differential. This type of weight loss may be useful in the future as a treatment for overweight and obese individuals who cannot lose weight in the traditionally recommended guidelines.