

**Erik Anderson (14), Brock Gunderson (14), Eric Talus (14), Nevada Wendlandt (14), Paul Young (14), Mark Zorrilla (15)**

**Sponsor: Brenda Kelly, Chemistry**

Board Room, Session A

*"The Optimization of a Method for Myohemerythrin Purification"*

Myohemerythrin (myoHr) is a monomeric oxygen-binding protein found in marine invertebrates. The oxygen binding event is facilitated by two iron atoms, and is easily observed and quantified via a color change based upon the iron atoms' oxidation states. The color change is quantified by means of UV/Vis spectroscopy and this methodology is well understood. This characteristic makes myohemerythrin an ideal model for studies on protein binding and folding events due to the fact that the protein emits varying fluorescence signals (in addition to absorbance of UV light) from oxidation state changes depending upon whether oxygen is bound and the oxidation state of the irons. The laboratory research of Dr. Brandy Russell centers upon the binding and folding events of myoheme. To obtain purified myohemerythrin for these studies, they have utilized a purification protocol that includes a freeze/thaw lysis, anion-exchange chromatography and size-exclusion chromatography. Quantitative assessment of the purification has shown shortcomings, including low values for specific activity and percent yield. The aim of this study is to optimize a purification protocol that produces myohemerythrin samples with higher purity and yield for use in the Russell research laboratory. We hypothesize that introducing a differential centrifugation step in the beginning stages of the purification protocol will improve the efficacy of this method.

**Matthew Baker (15), Jackson Eliason (15)**

**Sponsor: Janine Wotton, Psychological Science and Neuroscience**

Board Room, Session B

*"Salicylate-Induced Tinnitus: Fear and Anxiety Effects on Exploratory Behavior"*

Tinnitus is a widespread condition that affects 10-15% of the population. In 1-2% of cases it has debilitating effects on normal daily function for those suffering from it. The amygdala is important for storing memories of aversive events and is thought to play a major role in severe tinnitus cases. Salicylate is commonly used to induce tinnitus temporarily in animal models and is known to activate the part of the brain associated with fear and anxiety. We tested to see if salicylate-induced tinnitus resulted in behavioral signs of this activated fear and anxiety. To determine this we measured exploratory behaviors of Long Evans Rats in the novel environment of the standard elevated plus and zero mazes and compared them to the control group.

**Samantha Banks (15), Lindsay Ortlip (15)**

**Sponsor: Janine Wotton, Psychological Science and Neuroscience**

Board Room, Session B

*"Effects of salicylate (aspirin) on motor function in Long Evans rats"*

Strong doses of salicylate are known to cause temporary tinnitus in mammals. The effects of tinnitus on anxiety have been widely studied, but the effects on motor function have not previously been tested. In this study, rats were injected IP either with 0.9% sodium chloride solution as a control or with 300 mg/kg sodium salicylate (Sigma) two hours prior to rotarod and dark open field tests. The rats were placed on the rotarod three times at 4 rpm with acceleration up to 40 rpm in a one-minute time interval. The time they slipped off was recorded. There was no significant difference between the experimental and control groups in the amount of time they ran on the rotarod. The rats were then placed in a 16" x16" dark open field box for 5 minutes, measuring their total movement, rest time and rearing. In the dark open field tests, the experimental group rested for significantly more time than the control and they moved and reared significantly less than the control group. These results indicate that salicylate reduced the amount of movement but did not affect coordination.

**Kit Baumer (15)**

**Sponsor: Terena Wilkens, Theatre & Dance**

Board Room, Session A

*"Lighting Design, Trojan Barbie"*

This past fall I was given the opportunity to design the lighting for the Theatre and Dance Department's production of Trojan Barbie by Christine Evans. Trojan Barbie was preformed in Anderson Theater which let me design on the departments main stage theater for the first time. I began my design by researching the Mediterranean, refugee camps, and Ancient Greece. Two images from my research became my color inspiration, one image of a tropical sunset and another of a soldier silhouetted against a raging fire. These two images together represented the core of what Trojan Barbie meant to me. Through the use of warm colors I was able to portray the heat of a Mediterranean desert and the suffering of the women refugees. Through the contrast of cooler colors I created the separate, safer environments. With collaboration with the production team I was able to help create a world that could be both beautiful and terrible. I will be presenting a concept statement, research images, and production photographs for my lighting design of Trojan Barbie.

External Presentation: United States Institute for Theater Technology Annual Conference and Stage Expo 2014, Fort Worth, Texas, March 26-29, 2014

**Kate Belschner (16), Kyle Chambers (Psychological Science), Allison Conrad (15), Caroline David (16), Sam Fransen (14), Madison Heckel (14), Maren Kind (15), Alyssa Maxson (16), Gretchan Menze (15), Brooke Meyer (14), Andrea Rosenberg (14), Taylor Sommers (15)**

**Sponsor: Kyle Chambers, Psychological Science**

Board Room, Session B

*"Factors Influencing Motor Imitation "*

Children are taught novel skills through demonstration, but they are not always successful

at imitating the action. What factors influence their success or failure? When imitating an actor's movements, children have been shown to prioritize the ultimate goal of the action over the sequence of the actor's movements (Loucks & Meltzoff, 2013). This behavior may be a result of the indirect mapping between perception and action (Perra & Gattis, 2008). Instead of having an observed action activate a corresponding motor action in the observer, more complex cognitive processes may mediate imitation (Perra & Gattis, 2008). The present study sought to examine the development of imitation accuracy for motor actions. Participants (children ages 3-10) observed an actor performing either contralateral or ipsilateral movements with their hands, their feet, or both and were asked to imitate the movement. Imitation accuracy was compared across ages and examined alongside factors that may influence imitation success such as mental rotation ability and prior experience with imitation (e.g., gym class).

**Estee Elle Berg (14), Grace Laureen Henke-Raatz (14)**

**Sponsor: Bruce Van Duser, Health & Exercise Science**

Board Room, Session A

*"Relationship among Leg Strength and Core Strength and Agility in Female Collegiate Soccer Athletes"*

Agility is essential element to the sport of soccer, but it is unknown what training technique has the greatest effect on its increase. The purpose of this study is to examine if core strength or leg strength is more beneficial to agility in female collegiate soccer athletes. The study included all volunteered participants from the Gustavus Adolphus women's soccer team (N=15). Each subject was an active athlete on the team and between 18 and 23 years old. Participants were completely voluntary and based on their willingness to complete the study. The study examined the relationships among leg strength, core strength and agility in female collegiate soccer athletes. Subjects were tested for agility using the Illinois Agility Test, ACSM abdominal curl, the YMCA one-minute sit-up test, 1RM squat, and 1RM incline leg press. The four tests were completed in a maximum of a one-week period with a preferable two-day period. Data was collected after the soccer season. A Pearson Product moment correlation analysis determined no significant relationships among the agility and strength variables ( $p < 0.05$ ). The results indicate no significant correlation in leg strength and agility compared to core strength. This may have been due to our small sample size. In conclusion, based on the results of this study, further research should be conducted to know if coaches could consider strength training to improve their athlete's agility performance.

External Presentation: ACSM Northland Chapter Meeting March 28th, 2014

**Kammie Beyer (16)**

**Sponsor: Beatriz Torres, Communication Studies**

Heritage Room, Session B

*"Cyberethnography Of 43 Things: An Online Goal Setting Community "*

I conducted this cyberethnography to document the communication of members on an online goal setting site called 43 Things. I wanted to understand how members could achieve goals with the help of people they do not know. I looked specifically at a forum for people who want to stop procrastinating, which has over thirty-thousand members. Many of these members post on the site regularly and have created a supportive community. I was able to identify several patterns that helped the members work toward their common goal, including disclosure, feedback, and self-efficacy. My findings matched closely with the psychological Theory of Goal Setting. I discovered that even in an online setting, people are able to use shared experiences and positive feedback to give each other confidence and work together to achieve their common goal.

**Andrea K. Blom (14), Janine Wotton (Psychological Science and Neuroscience)**

**Sponsor: Janine Wotton, Psychological Science and Neuroscience**

Board Room, Session A

*“Word Placement and Sentence Context Impact Vowel Recognition In Noise”*

The influence of sentence context on the recognition of naturally spoken vowels slightly degraded by Gaussian noise (3 dB) was investigated. Target words were paired to have similar consonant sounds but different vowels (e.g. ‘pig/peg’) and were embedded in sentences which provided congruent, incongruent or neutral semantic context. All participants did multiple trials with the three different contexts. Participants were randomly assigned to listen to stimuli with the target word placed either at the beginning (n=17), middle (n=16) or end (n=17) of the sentence. Placement impacted vowel recognition with the most errors for end, followed by middle and least for beginning. The reaction time for correct responses was quicker than for errors and all responses were quicker when the target was at the end compared to other positions. The incongruent context produced the most errors followed by neutral with fewest for congruent, however this was strongly affected by interaction with placement. Only the target at the end group showed a significant improvement in error rate for congruent compared to neutral. Both the amount and type of semantic context impact the speed and accuracy of vowel recognition.

External Presentation: MidBrains 2013, Carleton College, October 5, 2013; Annual Scientific and Technology Conference of the American Auditory Society, Scottsdale, AZ, March 6-8, 2014

**Samantha Broeckert (14)**

**Sponsor: Barb Zust, Nursing**

Board Room, Session A

*“Perceived Anxiety of Junior and Senior Nursing Students”*

Anxiety may negatively affect student nurses’ academic performance, critical thinking skills, and ability to safely care for patients in the clinical area. Numerous studies establish junior student anxiety, but there is conflicting evidence whether anxiety increases or decreases as students progress through their senior year. The purpose of this study was to measure and

compare anxiety levels and perceived anxiety producing factors among nursing students in their junior and senior year. Spielberger's State-Trait Anxiety Inventory and a five-item questionnaire regarding the potential sources of student's anxiety in both the junior and senior nursing classes were used to gather the data. Findings indicated that junior nursing students reported higher levels of anxiety than senior nursing students and reported spending more hours on nursing homework each night. Findings also indicated that female students have higher levels of anxiety compared to their male peers. This study lends support for continued research in the area of nursing student anxiety.

**Jamie Brooks (14), Ben Orpen (14), Paul Young (14), Dwight Stoll (Chemistry), Scott Bur (Chemistry)**

**Sponsor: Dwight Stoll, Chemistry**

Board Room, Session B

*"Synthesis and Characterization of Fullerene-Modified Silica Columns for Reverse Phase Liquid Chromatography"*

This work focused on the preparation of Fullerene-Modified Silicas (FMS) packed columns for Reverse Phase Liquid Chromatography (RPLC). First, the reaction conditions for the silanization of the fullerene particles were optimized. In this reaction, the fullerene was reacted with the silica particles through the usage of an aminoalkyl tether. It was found that this reaction requires the usage of an inert environment, such as nitrogen gas. The inert environment helps reduce the amount of undesired radical reactions between the aminoalkyl tether and fullerene.

After the silanization was optimized, the fullerenes were reacted with the silanized silica particles, which produced the FMS materials. The results of these reactions helped identify a key fact about the procedure as a whole: the reaction could take place at a temperature just below reflux without compromising the molecular structure of the fullerenes or the chromatographic resolution of the column. Additionally, the high temperature reactions (24 hours) are much more time efficient compared to a room temperature reaction (~10 days). The resulting FMS materials were characterized by analyzing their retention of an array of compounds. Two columns were exposed to high temperature conditions (up to 100 C) while using an acidic mobile phase (pH 2) with the goal of evaluating the stability of the material under these conditions. These columns showed small but measurable changes in retention and efficiency between exposures. These initial results indicate that the FMS material is largely chemically stable under conditions of low pH and high temperature.

**Morgan Cassman (14)**

**Sponsor: Jill Locke, Political Science**

Board Room, Session A

*"An Arendtian Analysis Of The Patriot Act and Islamophobia In The United States"*

For my Senior Seminar, I am writing my thesis on how the United States has, through it's legislation, barred Muslims from citizenship and political participation. Specifically, I will be presenting how, through use of the Patriot Act, the United States has constructed laws that

have unjustly targeted and ostracized individuals of the Islamic Faith. In addition, I am arguing, using Political-Philosopher Hannah Arendt's definition of statelessness among other of her concepts, how the United States has made Muslims "stateless" people, in the Arendtian sense.

**Amy Christiansen (15), Alexa Peterson (16)**

**Sponsor: Amanda Nienow, Chemistry**

Board Room, Session A

*"Photodegradation Of Imidazolinone Herbicides And Pesticides"*

Imazapic, imazamox, imazaquin, and imazethapyr are herbicides commonly used on corn and soybean plants in the Midwest. Photolysis has been shown in previous studies of imidazolinone herbicides to be a major pathway of degradation in the environment. The purpose of this study was to determine the rate at which each herbicide degraded under different conditions and to propose photoproducts of the degradation. Two different systems were used for study: irradiation of the herbicides in aqueous solution as well as on the epicuticular waxes of corn and soybean leaves. Using ultraviolet light, these herbicides were irradiated at several pH values or at a constant pH with varying amounts of natural organic matter (NOM). The rates of degradation were analyzed using a high-performance liquid chromatograph (HPLC). To identify preliminary photoproducts, liquid chromatograph-mass spectrometer (LC-MS) data from previous research was used. Future work will include obtaining more data on the corn and soybean waxes, identifying photoproduct pathways, and observing how the herbicides degrade when analyzed on intact corn and soybean plant leaves.

External Presentation: 2013 Undergraduate Research Symposium in the Physical Sciences, Math, and Computer Science, University of Chicago, October 25-26, 2013

**Matt Collins (14)**

**Sponsor: Bruce Van Duser, Health & Exercise Science**

Board Room, Session B

*"Effects Of Traditional Stretching Versus Myofascial Release On Lower Body Range Of Motion"*

Today myofascial release, or foam rolling, has taken the place of traditional stretching for many active people as a way to stretch muscles or relieve soreness in muscles. Hanton and Chandler (1994) studied the effects of myofascial release versus isometric contract-relax stretching techniques and found that while both myofascial release and isometric contract-relax techniques are effective ways increase range of motion, isometric contract-relax techniques showed greater results. Clark et al. (1999) studied the effects of ipsilateral anterior thigh soft tissue stretching on passive unilateral straight-leg raise. The results of the study showed that sagittal plane hold-relax and passive prone stretching both significantly increase straight-leg raise range of motion. The purpose of this study is to examine the effects of traditional static stretching and myofascial release on lower body range of motion. Ten male students from Gustavus Adolphus College will participate in this



study. On the first day of the study subjects will first warm up at a moderate level on a stationary bike. Subjects will then stretch their lower body using traditional static stretches. After the stretches the subjects will perform a YMCA sit and reach test to test their range of motion. On a second day, after at least a day in between the first testing day, subjects will again come in to be tested. Subjects will again warm up for 10 minutes on the stationary bike but this time will perform myofascial release using a foam roller from the Athletic Training room in the Lund Center. Subjects will again be tested with the YMCA sit and reach test. The independent variables will be traditional stretching and myofascial release and the dependant variable will be the YMCA sit and reach test.

IRB #1314-0188

**Susan Crane (14)**

**Sponsor: Mary McHugh, Classics**

Board Room, Session A

*"Preserving Memory In Ruins: An Archaeological Study of Cultural Memory"*

This paper studies archaeology in the Crimea as it has developed under social and political pressures. Historically, the Crimea has acted as a buffer zone for Russia, and has provided a home for many different populations, ranging from ancient Greeks to the Golden Horde. Each population has left behind physical pieces of memory in the form of artifacts and archaeological ruins, remnants of a culture that has come before. However, when these populations interaction, conflict may arise that threatens the preservation of these memories, physical and otherwise, of previous peoples. Political upheavals likewise affect the course of archaeology through changing the value of sites and artifacts. Indeed, the Crimea as a whole is crucial in examining how archaeology is changed by the movement of people and politics. Here, the development of archaeology concerns both the excavation sites and how each group of people treats what is left behind. What remains is a physical piece of ethnic or cultural memory, of how people have lived and interacted. As this peninsula exemplifies, the treatment of ruins by human groups directly impacts the successful preservation of cultural memory. Furthermore, acknowledging the preservation or destruction of a people is just as necessary, so that the memory itself is not degraded by reimagining or even ignoring cultural and political interactions. When the past is used to construct identity, archaeology and the memory it contains play key roles in establishing and maintaining such identity.

**Megan Crow (14), Kristian Hartmann (15)**

**Sponsor: Heather Haemig, Chemistry**

Board Room, Session B

*"Optimizing The Imidazole Elution Step In The Purification of His-tagged Fumarase from Baker's Yeast Using Affinity Chromatography "*

The primary enzyme studied in the lab of the CHE-255 biochemistry course at Gustavus Adolphus College is fumarase, a crucial enzyme in the citric acid cycle, which converts L-

malate to fumarate and the reverse reaction. The lab protocol involves the purification of His-tagged fumarase from yeast cells using affinity chromatography. This lab makes up a large portion of the curriculum and involves extensive data analysis. It is important for students to successfully obtain data to incorporate into the written report associated with the course. Results from 15 Fall 2013 CHE-255 lab groups showed the current method of eluting fumarase from the column with a one-step imidazole buffer to be insufficient. We predict that a portion of the fumarase is remaining attached to the Ni<sup>2+</sup>-NTA resin in the column after the imidazole elution step. In order to improve the yield of fumarase concentration and activity, we adjusted the molarity of the imidazole buffer to 500 mM, 750 mM and 1000 mM. We also carried out the purification with an imidazole gradient elution step, which increased the fumarase yield to 57%. Adjusting the concentration of imidazole used in the elution step of the purification will improve the results obtained by future biochemistry students.

**John Danforth (16), Anna Krieger (17)**

**Sponsor: Dwight Stoll, Chemistry**

Board Room, Session A

*“Synthesis and Characterization Of Carbon Nanoparticle Modified Silicas For Use In Analytical Liquid Chromatography”*

Over the past few years we have prepared a number of stationary phases based on high purity porous silica by deposition and/or bonding of a variety of carbon nanomaterials. Our interest in these materials is driven both by the attractive positive characteristics of similar, existing materials (e.g., Porous Graphitic Carbon), and the deficiencies of these same materials. Specifically, the unique selectivities of existing materials that enable isomer separations and enhanced retention of polar and polarizable compounds are particularly useful in two-dimensional liquid chromatography (2DLC) where stationary phase chemistries that are complementary to existing bonded phases are needed for successful 2D separations. However, existing materials have several weaknesses for separations of some compound classes that seem to be insurmountable in spite of decades of research, including: prohibitively high retention, poor peak shape, poor efficiency, and high substrate chemical activity.

In this presentation we will review the physical and chemical characteristics of the materials we have prepared, and demonstrate how they complement existing materials. We will present selectivity and efficiency data using simple probe molecules, and demonstrate the application of the recently prepared materials in 2DLC separations of molecules that cannot be analyzed using existing carbon-based stationary phases. In lieu of the ideal carbon-based stationary phase for HPLC, which remains elusive, a more complete understanding of the properties of old and new carbon-based phases continues to enable separations using these phases, and continues to inform the development of new stationary phase materials.

External Presentation: MN Private College Scholars at the Capitol, St Paul MN, 04/08/2014



**Dominic Delmont (15)****Sponsor: Hilary Christensen, Geology**

Board Room, Session B

*“Taphonomy of fossil bison in the Des Moines River”*

This project is focusing on the taphonomy of bison bones found in the Des Moines River. Taphonomy is the study of the process that living organisms go through after they die and become a fossil. By looking at how organisms become fossils we can find information on how the bones got to the river where they were found, as well as information on the climate, and possible behavior patterns of other organisms from the time when the bison were alive. I will be focusing on the physical state of the bones, looking at features such as teeth markings from scavengers, weathering from river transport and even ancient tool markings. With this information multiple hypotheses can be made about where these bones came from.

**Katie Diederichs (15), Emily Hamberg (14), Stefano Rosati (15), Beth Wiese (15)****Sponsor: Brenda Kelly, Biochemistry and Molecular Biology**

Board Room, Session A

*“Characterization of Monomeric and Dimeric Gamma-Glutamylcysteine Ligase”*

Gamma-glutamylcysteine ligase (gamma-GCL) is the enzyme that catalyzes the rate-limiting step in the synthesis of glutathione. Glutathione is necessary for the survival of bacterial cells, as it functions to detoxify cells. Therefore, identification of inhibitors of gamma-GCL could be utilized in the development of antimicrobial agents. In vitro, E. coli gamma-GCL exists in a monomeric and dimeric form, however the biologically significant oligomer has yet to be determined. The goals of this project were to analyze the role of disulfide interactions in the oligomerization process and to identify whether there are differences in the function of the enzyme in each of the monomeric and dimeric states in the presence of a known inhibitor, D-ethionine. Native polyacrylamide gel electrophoresis was used to monitor transitions between the monomeric and dimeric forms upon the addition of oxidizing and reducing agents. The addition of reducing agents dithiothreitol (DTT), beta-mercaptoethanol (beta-Me), and Tris(2-carboxyethyl)phosphine (TCEP) results in a transition from dimeric to monomeric gamma-GCL, however, TCEP does not cause a complete transition to the monomer, suggesting that disulfide bonds are not solely responsible for stabilization of the dimer. Initial results suggest D-ethionine is an uncompetitive inhibitor of the dimeric E. coli gamma-GCL, therefore it does not bind to the substrate active site of the enzyme. Knowledge about the structure of the enzyme, factors that stabilize the monomeric and dimeric forms, and impact of inhibitors on enzyme function is important to the development of pharmaceutical agents that may be used to address antibiotic resistance.

**Laura Celeste Dobler (15)****Sponsor: Stephanie Otto, Health & Exercise Science**

Board Room, Session B

*“Differences in Psychological and Physiological Factors Between Individuals Who Consume Caffeinated Soft Drinks Compared to Those Who Do Not”*

Caffeinated soft drinks are popular in the United States and around the world and questions are being asked about the psychological and physical effects of consuming these types of drinks. Smith et al. (1999) reported those given a typical dose of caffeine reported greater anxiety. Robertson et al. (1978) reported that mean blood pressure rose 14/10 mm HG one hour after caffeine ingestion. Information regarding physiological differences between caffeinated soft drink users and non-users has received less attention. The purpose of this study was to compare differences in a variety of physiological and psychological variables between caffeinated soft drink consumers, moderate consumers, and non-consumers. The independent variables were those who do drink, those who moderately do drink, and those who do not drink caffeinated soft drinks. Dependent variables included resting blood pressure, resting heart rate, body weight, perceived stress, anxiety, energy levels, and overall happiness. Subjects were self-selected from a small liberal arts college in Minnesota. Each subject completed a survey assessing each psychological variable. Physiological variables were measured in a controlled laboratory setting by a trained technician. Multiple ANOVAs ( $p < .05$ ), adjusting for family wise error rate were used to determine differences among groups. There were no significant results between groups ( $p > .05$ ). In conclusion there are no significant differences in the physiological and psychological variables measured between groups in this sample. Further research could be done looking at the health impact in individuals who stop consuming caffeinated soft drinks. IRB#1314-0157

External Presentation: National Conference on Undergraduate Research (NCUR), University of Kentucky, Lexington, KY, April 3-5, 2014

**Will Doeblar (15), Joshua Wolanyk (15)**

**Sponsor: Jessie Petricka, Physics**

Faculty/Staff Lounge, Session A

*“The Gustavus AMO Lab: Time of Flight Mass Spectrometer and Coulomb Crystals”*

Utilizing a linear quadrupole Paul ion trap which suspends ions created from laser ablation, a Time of Flight (ToF) Mass Spectrometer was built and calibrated. A high power Nd:YAG laser intensely focused on a ceramic plate composed of  $\text{SrF}_2$ , and the ablated ions were trapped in the oscillating electric field created by the Paul trap. These ions were then subjected to rapid acceleration toward the ToF ion detector. The flight time for each ion mass packet to reach the ToF detector determines the mass to charge ratio of the ion packet. The ToF calibration was done theoretically with assistance from computer simulation. By ablating many compounds, the calibration curve was verified. The signal strength of the arriving ions will be measured over time and recombination reaction rates can be measured.

By forcing the trapped ions to move close together, a crystalline structure is formed. When this Coulomb crystal forms, each ion's dipole moment aligns. Exciting these trapped

ions with a laser allows manipulation of the dipole moment direction and magnitude, since each atomic state has a different dipole moment. The orientation and magnitude of the dipole moment can be used in a similar manner to the 0 and 1's of classical computing, but with more than two states. This is why quantum computing has the potential to be much more powerful than classical computing. Thus, this experiment will result in a proof of principle experiment for quantum computing, and is in the initial stages here at GAC.

External Presentation: Midstates Consortium for Math and Science Undergraduate Research Symposium at the University of Chicago, IL on October 26, 2013.

**Kelly Dumais (14)**

**Sponsor: Jill Locke, Political Science**

Faculty/Staff Lounge, Session B

*"Where does Freedom Come From?"*

Hannah Arendt posits that Freedom is the ability to act in a public way; to be seen and heard and recognized. The way in which our economic and political system distributes environmental burdens inhibits entire communities from accessing their freedom. The importation of goods and the exportation of waste into affluent communities means that privileged communities do not see, hear, or feel the effects of their pollution, consumption, and waste. The victims of those actions are invisible so that the perpetrators of global crime do not even usually recognize the consequences of their actions. The solution to both environmental degradation and the loss of freedom for invisible people dealing with that degradation, is an embrace of a local rather than a global economy.

**Rebecca Eastwood (14)**

**Sponsor: Jill Locke, Political Science**

Faculty/Staff Lounge, Session A

*"Statelessness in the United States: The Politics of Post-Incarceration"*

With 5% of the world's population and 25% of the world's prisoners, the United States' rates of incarceration continue to skyrocket. Deemed mass incarceration, this phenomenon stems from a multitude of racial, economic, social, and legislative inequities. Beyond producing the world's largest prison population, this meteoric rise in incarceration rates has also produced a population of people living in a state of post-incarceration. While we imagine that once one serves their imposed sentence, they have effectively 'done their time'. This is not the case. A class of policies recently labeled as 'collateral consequences' affect those in states of post-incarceration for the rest of their life. These collateral consequences affect everything from one's ability to vote, get a job, and an education. In order to better understand the effects of such policies, I explore the concept of statelessness as developed by political theorist Hannah Arendt. She applies the term statelessness to those who are no longer members of the nation and so have lost the protections of the state. I take this concept and apply it to those in the United States who are living in states of post-incarceration. I argue that these collateral consequences take away the rights of citizenship

and leave these individuals without protections of the state, even after they have served their sentence. This then creates a population, overwhelmingly comprised of those of low socioeconomic status and racial minorities, that exist in a state of extreme vulnerability without the ability to participate in the political sphere.

**Nicole Ektnitphong (Phillips Scholars Program)**

**Sponsor: David Newell, Center for Servant Leadership**

Faculty/Staff Lounge, Session B

*"Be the Change: Leadership on Purpose"*

As a recipient of the Jay & Rose Phillips Scholarship, I've spent the last year and a half creating "Be The Change: Leadership on Purpose." This is a summer program for young people in the southwest Minnesota area to explore who they are as individuals and understand the communities they are a part of with intention of setting up a foundation to enable young people to recognize their ability and responsibility as agents of change in their communities. The central points of this program will be about vocation, leadership, service and justice.

I plan to present the stages of my curriculum, which reflect the process of mobilizing young people around issues they are passionate about. In addition, I plan to share tools that I will be using to facilitate this process.

External Presentation: MN Private College Phillips Scholars Spring Luncheon, April 25, 2014, Concordia College, St. Paul, MN

**Lance Erickson (14), Florencia Meana-Prado (University of New Hampshire), Martin Wik (Stockholm University, Sweden), Joel P. Destasio, Madison J. Halloran, Jacob B. Setera, Julia Bryce, Patrick Crill, Joel E. Johnson, Ruth K. Varner**

**Sponsor: Laura Triplett, Geology**

Faculty/Staff Lounge, Session A

*"Mercury Dynamics In Sub-Arctic Lake Sediments Across A Methane Ebullition Gradient"*

Recent studies have suggested that Arctic warming may play a key role in enhancing carbon (C) and mercury (Hg) export from permafrost peatlands, yet the mechanisms by which Hg is mobilized during thaw remain enigmatic. To elucidate the links between these chemical systems, we investigated Hg concentrations in cores taken in organic C rich sediments in lake Villasjön (avg. depth 1.5m) at the Stordalen Mire, Abisko, Sweden. We chose coring sites based on zones with significantly different ebullitive methane (CH<sub>4</sub>) fluxes established in earlier studies and we hypothesized that the microbial community producing CH<sub>4</sub> is also potentially mobilizing Hg. Recovered sediment cores (~44, 41, 40 and 39cm in depth) are characterized by having roughly 30cm of organic-rich silt material on top of a transition to more clastic material in the bottom ~10cm. Cores were sub-sampled every 2cm, and the sediment samples were then freeze-dried and two cores subsequently analyzed for extractable Hg via cold vapor inductively coupled plasma mass spectrometry

and two cores analyzed via thermal decomposition and cold vapor atomic fluorescence. Mercury is most abundant in the upper portions of all sediment cores, after which concentrations decrease with depth. The highest ebullition site had Hg concentrations exceeding 80 ngHg/gsediment at the core top that decreased to a low Hg concentration < 15 ngHg/gsediment at the core base. The lowest ebullition site had overall lower concentrations compared to the highest ebullition site with more intermediate values (< 50 ngHg/gsediment) starting at 2cm depth, dropping to < 15 ngHg/gsediment at ~ 26 cm. We found differences ( $\geq 50\%$ ) in overall Hg contents between the highest and lowest ebullitive cores in the top layers of the core. Mercury content positively correlated with total organic C (TOC,  $R^2=0.74$ ) and sulfur (S,  $R^2=0.92$ ) in the highest ebullition site. Mercury content also negatively correlated with dissolved inorganic carbon (DIC) in the highest ebullition site ( $R^2=0.71$ ). These relationships are only seen in the higher ebullition sites, whereas in the lower ebullition sites, Hg links with other geochemical data (e.g., TOC, C, nitrogen, S, DIC) were more variable. Our findings imply that (1) processes that enhance CH<sub>4</sub> mobilization may also affect Hg dynamics in sediment cores and (2) assessing overall Hg behavior in lakes requires cores in multiple locations.

External Presentation: University of New Hampshire, Durham, NH - August 2013  
American Geophysical Union conference, San Francisco, CA - December 2013

**Chelsea M. Farr (15)**

**Sponsor: Joshua Brown, Philosophy**

Faculty/Staff Lounge, Session B

*"Proving The Empty World"*

This paper attempts to prove the empty world - a world devoid of objects - as one possible world, or more specifically, one of the Wittgensteinian possible worlds. D.M. Armstrong's mode of combinatorialism rejects the notion of an empty world, but this paper will discuss a potential flaw in combinatorialism and its treatment of the ultimate contraction of no objects. Additionally, an infinite truth table and Wittgenstein's own use of language will act as tools in supporting the possibility of the empty world.

External Presentation: April 26th, 2014 - The 2014 meeting of the Minnesota Undergraduate Philosophical Society

**Katie Feterl (15)**

**Sponsor: Anna Versluis, Geography**

Faculty/Staff Lounge, Session A

*"The Role of Urban Agriculture in Community Food Security: A North Minneapolis Case Study"*

Urban agriculture, broadly defined as food crop and livestock production within and around urban areas, has proven to be a successful method of increasing the availability of fresh produce within city limits. The ability to improve local nutritional levels makes urban agriculture a powerful method of increasing community food security, a condition where the

whole community has access to nutritious and culturally appropriate foods produced in a socially just and sustainable manner. Therefore, urban agriculture is particularly beneficial to areas known as food deserts, where it is notably difficult to find affordable, healthy, fresh, and culturally appropriate foods. This issue is compounded by the fact that food deserts often have large minority and low-income populations. North Minneapolis is considered a food desert, home to a large minority population with disproportionate levels of poverty and health issues commonly linked to unhealthy diets. Studies have shown great potential for urban agriculture in solving the area's food desert problem in terms of community support and land availability. Urban agriculture is gaining ground, but there is much room to grow; case studies in other regions have shown that urban agriculture projects can face devastating challenges in sustaining adequate resources and overcoming community alienation. This study will analyze the strengths and weaknesses of existing urban agriculture projects in North Minneapolis based on interviews with community members and those directly involved with the operation of the projects. Identifying the aspects that make projects successful in the community and the aspects that need improvement will benefit community food security development planning.

**Sydney Firmin (14)**

**Sponsor: Julie K. Bartley, Geology**

Faculty/Staff Lounge, Session B

*"An Unusual Mesoproterozoic Carbonate Unit: Relic of a Saline Lake?"*

The Mesoproterozoic Rosspoint Formation of Ontario, Canada is primarily made up of sandstone and shale. The Rosspoint Formation is approximately 1.4 billion years old and is generally interpreted to have been deposited in an intracratonic basin, most likely a rift-related lake. The Middlebrun Bay Member, in the middle of the formation, consists of cherty limestone containing stromatolites. While examining outcrops of the Middlebrun Bay Member on the Channel Islands of Lake Superior, we discovered an unusual limestone bed on Copper Island. This calcite does not contain stromatolites; it has an unusual bright white color and lacks internal structure. Previous work on the Rosspoint Formation suggests that the stromatolites formed when lake levels were low and not much sand was making it to the basin. In this model, stromatolites would have formed in a hypersaline lake environment during intervals of low clastic influx. Based on the evidence collected both in the field and lab, it seems likely that the "white bed" carbonate possesses a unique texture because it was originally precipitated as gypsum. The massive, coarsely crystalline texture indicated pervasive recrystallization, consistent with a primary evaporite mineral, like gypsum, which was secondarily replaced by calcite, resulting in coarse, featureless carbonate and collapse of overlying sandstone layers. Geochemical results are consistent with deposition under hypersaline conditions.

External Presentation: Institute for Lake Superior Geology Conference

**Hana M. Fischer (15), Monica E. Johnson (16), Stefano W. Rosati (15), Claire E. O'Neill (14), Karla E. Marz (Biology)**



**Sponsor: Karla E. Marz, Biology**

Faculty/Staff Lounge, Session B

*"Cryptochrome Interactions With Other Circadian Clock Proteins"*

Mammalian circadian clocks regulate important physiological functions on a 24-hour cycle, and comprise multiple clock proteins, such as Cryptochrome (CRY). Mammals have two CRY isoforms, CRY1 and CRY2, that both bind to multiple other clock proteins. Understanding the activities of these proteins in the circadian clock cycle will require characterizing these binding interactions. Previous work in our laboratory showed that a broad surface of CRY binds the clock protein Period (PER). The immunocytochemistry-based binding assay, however, yielded only large or very small effects of CRY surface mutations, suggesting that this assay may have underreported the effects of some of the CRY mutations. In this project, a mammalian two-hybrid assay was developed to probe with greater sensitivity the interactions of CRY1 and CRY2 with PER1, PER2, and another possible CRY binding partner, protein phosphatase 5 (PP5). Coding sequences for mCRY1/mCRY2 (mouse CRYs) and mPER1/mPER2/rPP5 (rat PP5) were inserted into the plasmids pACT and pBIND, respectively. The resulting genetic constructs coded for two types of hybrid proteins, in which the clock protein was fused to either a transcriptional activation domain (in pACT) or a DNA binding domain (in pBIND). When these genetic constructs and a luciferase reporter construct were taken up by HEK-293 cells, cultured mammalian cells, interaction of CRY with a binding partner would bring the activation and binding domains together, resulting in expression of the firefly enzyme luciferase. Luciferase enzyme activity was measured using a luminometer, allowing us to quantify the binding of CRYs to the other proteins.

**Annie Fittipaldi (16)**

**Sponsor: Beatriz Torres, Communication Studies**

Heritage Room, Session A

*"Cyber Ethnography: A One Direction Fan Website"*

For Ethnography of Communication (COM-247) I conducted a cyber-ethnography of a one direction fan website, OneDirection.net. My research question was how do posts on this website reflect the expectations that fans have of the individual members of one direction as well as the Band as a whole? In order to complete this study I looked at 7 different articles from 7 different days, and analyzed the forum postings. There were several patterns I found; the two main structures were, one: the relationship between members of the website as well as the relationship between website members and One Direction. The second structural pattern is the format of the posts and for both overarching structures, there are several sub-patterns found. For the first structure listed above sub-patterns included connectedness of site members, and support and advice to band members. The second main structure includes sub-patterns pertaining to exaggeration of emotion and grammatical errors. After analyzing all of my data I found that all of the posts could easily relate back to the parasocial relationship theory, which is essentially the personal, yet one sided, relationships people have with TV or fictional characters. Some limitations I had while doing

research were that I was extremely picky in the articles and posts that I chose to analyze and the fact that I was a fan influenced how I perceived the posts.

**Evan Flolid (14)**

**Sponsor: Anna Versluis, Geography**

Faculty/Staff Lounge, Session A

*“Primary factors that influence societal perceptions of water quality issues on the Minnesota River”*

Personal perceptions of environmental issues play a key role in how we identify and address many environmental problems. Perceptions of environmental issues are influenced by a variety of factors such as socioeconomic status, demographics, and proximity to an environmental resource. Previous studies show the importance of “place effect,” the idea that your physical and social surroundings are key factors in determining your environmental views. Other studies show a positive relationship between education level and the perceived need to take action when it is determined there is a water pollution problem. Through qualitative interviews with those living within five miles of the Minnesota River, this research will look at factors affecting public perception of river water quality. The sources of influence that will be addressed in this research include occupation, proximity to the body of water, level of education, and personal experiences with the River.

**Brianna J. Furey (15)**

**Sponsor: Anna Versluis, Geography**

St. Peter Room, Session B

*“Wind Power Development: A Community-Level Analysis of Wind Turbine Acceptance in Minnesota”*

In the past few decades, the world has become increasingly aware of the negative impacts that burning fossil fuels have on the climate, such as CO<sub>2</sub> emissions which cause warming of the Earth because of the greenhouse effect. Because of global warming and other problems associated with fossil fuel consumption, producing more energy with renewable sources is important. Wind and solar power are at the forefront of renewable energy production, and, while the United States has consistently increased the amount of energy it produces from renewable sources, it is still far behind other countries such as Germany and Sweden. Reasons for slow growth in U.S. renewable energy can be attributed to existing energy policies, market acceptance, and community-level acceptance. In the case of wind power development, many people often support the idea of renewable energy, but tend to oppose specific wind turbine projects in their own town or near their neighborhood, known as the “not in my backyard” attitude. This phenomenon can be a significant obstacle to wind power development at the local level. In an effort to aid future planning for the purpose of increased wind development, this research will identify factors that lead to increased wind turbine project acceptance at the community level by conducting and analyzing interviews with community members from southern Minnesota towns that have had failed wind projects, towns with completed wind projects, and towns that have a wind project currently

in the planning process.

**Ana Gleason (14)**

**Sponsor: Heidi Meyer, Nursing**

St. Peter Room, Session A

*"Perceptions of Complementary Therapies and the Role They Play in Healthcare: An Exploratory Study of Nursing Students."*

According to the American Nursing Association (ANA), nurse educators consider the inclusion of complementary and alternative therapies in nursing curricula with increasing frequency, motivated at least in part by the ever-increasing public enthusiasm for these therapies (American Nurses Association, 2013). Since the use of complementary and alternative therapies are increasing it is important for students in the health care field to understand and safely implement complementary therapies with patients. The purpose of this study is to explore the perceptions and knowledge of Complementary Therapies in a population of junior year baccalaureate nursing students.

This exploratory research study, currently in progress, includes participants who are junior nursing students, both male and female. The participants have been recruited from a rural 4-year baccalaureate college in the Midwest United States. This study is a 11-question paper pre and post survey that uses different types of questions including: demographic questions, Likert scales, and open-ended questions to gather both quantitative and qualitative data. IRB approval was obtained and data collection runs from November 2013 through December 2013. Descriptive and correlational statistics, as well as content analysis, will be used to analyze the data. Participants were surveyed prior to a dedicated class day on complementary therapies and at the beginning of their clinical experiences. The post-survey will be completed at the end of the semester upon the completion of their classroom and clinical experiences. Preliminary analysis of the pre-survey indicates that 78.6% of the participants have had experience with complementary therapies coming into the nursing program. There was no statistical significance found between having a background of certified nursing assistant (CNA) training and the perception of the importance of Complementary Therapies. The results of this study may be used to guide nurse educators on integrating and perfecting their approach of complementary therapies into their curriculum.

External Presentation: National Conference on Undergraduate Research (NCUR),  
University of Kentucky, Lexington, KY, April 3-5, 2014

**Karl Grant (14), Laurel Boman (14), Susan Crane (14), Peter Westby (15), James Skoog (17)**

**Sponsor: Eric Dugdale, Classics**

St. Peter Room, Session B

*"The Homer Multitext Project: Understanding Composition in Performance"*

The authorship of the Iliad and the Odyssey has been the subject of a centuries-long debate

on what is known as the "Homeric Question." Though traditionally ascribed to Homer, recent scholarship suggests that these two epics were originally part of an unwritten, oral-poetic tradition marked by variation from one telling to the next. At some point in time, these works were recorded in writing, beginning a long manuscript tradition that has produced our current, more fixed versions of the texts. It is within this historical context that the Homer Multitext project, spearheaded by scholars Casey Dué, Mary Ebbott, Christopher Blackwell, and Neel Smith, reframes the modern understanding of these epics and their origin. The goal of the project is to publish digital editions of the Iliad and the Odyssey that reflect their native, oral environment. Laurel Boman and Karl Grant attended the Homer Multitext seminar in Washington D.C. during summer 2013, where they were trained to bring the project back to Gustavus, where work continues this semester: Laurel Boman, Susan Crane, James Skoog and Peter Westby are now working on Book 12 of the Iliad.

External Presentation: Minnesota Private College Scholars at the Capitol, 8 April 2014

### **Daria Grishina (14)**

**Sponsor: Thomas Gardner, Chemistry**

St. Peter Room, Session A

*"Towards Synthesis of a Novel Switchable Aromatic 8,10,21,23-tetrahydroxyhemiporphyrzine Ligand"*

Hemiporphyrzines are a well-known class of non-aromatic [20]  $\pi$  e-tetraaza rings. The recent report of a novel dicarbahemiporphyrzine ring system that is [18]/[20] $\pi$  e-switchable to aromaticity (J. Am. Chem. Soc. 2012 , 134, 190-193) has inspired us to pursue the synthesis of an analogous hemiporphyrzine ring that can serve as a novel switchable aromatic ligand for metal complexes. This presentation reports on the synthesis of this hemiporphyrzine, and its use as a switchable ligand.

External Presentation: ACS National Meeting, Spring of 2013 in New Orleans, LA.  
Celebration of Creative Inquiry, Spring of 2013 in Gustavus Adolphus College, St. Peter, MN.

Physical Science, Math, and Computer Science Undergraduate Research Symposium (URS) at The University of Chicago, October 25-26, 2013 in Chicago, IL.

### **Daniel Gronau (14)**

**Sponsor: Baili Chen, Mathematics and Computer Science**

St. Peter Room, Session B

*"An Epidemic model Using SIR Differential Equations"*

Using SIR equations is a great way to model spread of disease in the population of a society. Individuals in the population are assigned to three different subgroups or compartments, each representing a specific stage of the epidemic: susceptible, infected, and recovered. We use a system of differential equations to model the impact of travel on the spread of disease between two cities. We use the techniques of nonlinear analysis to

study the conditions of parameters which drive the system to the disease-free equilibrium.

**Kayla E. Hanson (14), Gordon Mansergh (84, Centers for Disease Control and Prevention, Division of HIV/AIDS Prevention), Beryl A. Koblin (New York Blood Center), David McKirnan (University of Illinois-Chicago), Stephen A. Flores (CDC Division of HIV/AIDS Prevention), Sharon M. Hudson (Health Research Association, LA), Lynnea Myers (Nursing 05), Grant N. Colfax, (San Francisco Department of Public Health)**  
**Sponsor: Lynnea Myers, Nursing**

St. Peter Room, Session A

*“Depressive Symptoms are Differentially Associated with Unprotected Receptive and Insertive Anal Sex Among MSM”*

This is the abstract I wrote while interning at the CDC this past January:

**Background:** Men who have sex with men (MSM) are still disproportionately affected by HIV. Previous findings are mixed regarding the association of depression and sexual risk behavior. More analyses are needed that stratify by HIV serostatus for specific anal sex risk behaviors (unprotected receptive, insertive), especially among high-risk groups such as substance-using MSM.

**Methods:** Data are from a convenience sample of MSM (n=1203) reporting recent unprotected anal sex and substance use (Project MIX) conducted in Chicago, Los Angeles, New York City, and San Francisco. The 2005-06 baseline survey assessed self-reported depressive symptoms (past week) using a CES-D short version; an average score per respondent was dichotomized to symptoms “rarely or sometimes” (0) vs. more than “sometimes” (1).

**Results:** HIV-positive (vs. -negative) MSM were more likely to report depressive symptoms (45% [n=271/604] vs. 39% [n=232/599] respectively,  $p<.05$ ). In multivariate analyses for HIV-negative MSM, depressive symptoms were associated with unprotected receptive anal (URA) sex (adjusted Odds Ratio [OR]=1.58, 95% Confidence Interval [CI]=1.07-2.33). Similarly, among HIV-positive MSM, depressive symptoms were associated with URA (OR=1.61, CI=1.13-2.29). Alternatively, depressive symptoms were inversely associated with unprotected insertive anal (UIA) sex among HIV-positive MSM (OR=0.61, CI=0.47-0.97) but not among HIV-negative MSM ( $p>.05$ ).

**Conclusions:** Depressive symptoms are associated with URA for both HIV-negative and -positive MSM, but inversely associated with UIA for HIV-positive MSM, among substance-using men. Future research and programs should address this differential link to better understand and intervene on the comorbid associations of negative affect and risk behavior.

**External Presentation:** I presented this data to colleagues at the Centers for Disease Control on January 31, 2014. The abstract has been submitted to the American Public Health Association (APHA) and I may get the chance to present at their annual convention

this coming November.

**Madison Heckel (14)**

**Sponsor: Anna Jacobsen, Sociology & Anthropology**

St. Peter Room, Session A

*"The Importance of Multilingualism in Preserving and Extending Diversity of Cultures"*

Language extinction rates have risen drastically in recent centuries. With the growth of the global economy comes an increase in the need to communicate with people of all cultures and languages from all ends of the world. This makes bilingualism essential for those who do not speak a widely spoken language, but reduces the need of bilingualism for those who do. Globalization is helping certain languages, such as English and Mandarin, to grow in importance, while forcing out lesser-spoken languages across the world, removing the diversity that comes with having a multilingual culture. This paper includes research that shows that bi- and multilingualism are not only essential to creating and maintaining diversity of cultures in the world, but are also beneficial to the individual speakers. In this paper I will argue the importance of maintaining culture through the diversity of language, and the need to promote the learning of multiple languages rather than conforming to power languages. Globalization gives language a power that it did not have before, and this only accelerates the extinction of lesser-spoken languages across the world. In order to promote language diversity, second language learning needs to be pushed in such a way that the culture's original language is preserved rather than replaced. Culture is best preserved when its original language is kept alive; bi- and multilingualism can maintain this diversity in a way that language recovery and revitalization cannot.

**Madison Heckel (14)**

**Sponsor: Kyle Chambers, Psychological Science**

St. Peter Room, Session B

*"Second Language Learning and Its Influence on Executive Control"*

Several studies have shown a connection between bilingualism and better performance in cognitive tasks. Not only does bilingualism increase one's abilities at verbal tasks, which are clearly connected to language learning, but nonverbal tasks, such as executive control including attention, working memory, and task switching. Though some people are born in bilingual settings, much of second-language learning does not result in a proficient or fluent understanding of a second-language. Little research has been done during the learning phase of language, though this phase is a necessary part of the process into becoming bilingual. This study examined how students of different levels of second language experience differed in executive functioning tasks relating to short-term memory, attention, and task switching in order to fully understand how second-language learning influences cognitive functioning. Participants completed three non-verbal executive function tasks before responding to a questionnaire regarding their previous language learning experiences. This study tries to identify what amount of language learning is necessary in order for second-language learners to achieve similar cognitive benefits as bilinguals.



**Carlie Hedlund (15)****Sponsor: Anna Versluis, Geography**

St. Peter Room, Session B

*"From Sisu to Sauna: Influence of Finnish Immigration on Cokato, Minnesota"*

In the nineteenth century, Finnish settlers made Cokato, Minnesota their pesäpaikka.. They migrated to Cokato in search of farmland and the American Dream. Through their agricultural exploits and the preservation of religion, language and other traditions, the Finns have shaped the cultural landscape of Cokato in ways that stand out among other European settlements in Minnesota. Cultural assimilation of immigrants to the host country is complete when the immigrant fully accepts the culture of the new country, including its external features, norms and values. The Finns of Cokato never fully assimilated to the culture of the receiving country. Instead, they used their heritage as a tool to transform and make a brand of made-in-American Finns. With their strict cliques and radical religious views, the Finns of Cokato have replaced other ethnic identities with their own. For example, despite the fact that Swedes once outnumbered them, Finnish culture now dominates the area. This proposed research will study how non-Finns in Cokato are influenced by the local Finnish culture through interviews and the interpretation of the cultural landscape.

**Kara R. Helgeson (16)****Sponsor: Hilary Christensen, Geology**

Three Crowns Room, Session B

*"Bison Remains: Migration, Diet And Climate"*

My project is the examination of a set of fossil bison bones that were gathered from the Des Moines River to learn about the biological characteristics of the bison. I will investigate how these bison lived, including their diet, whether they are a migratory or sedentary species, and the climate of their habitat. To learn these things I will be analyzing the chemistry of the bison's teeth and bones using stable isotopes. I will be looking specifically at isotopes of oxygen and carbon gathered from the fossilized bison bones and teeth.

Carbon isotopes represent variations among land vegetation. Oxygen isotopic values are related to precipitation, which varies according to local temperatures. As mammals maintain a constant body temperature oxygen isotopes from their teeth have been used as a reliable indicator of temperature (Koch 1998). Because climate has changed a great deal in Minnesota over the time period under investigation knowing the age of the fossil material is critical to interpretation of these isotope results.

**Jason Helland (14)****Sponsor: Jill Locke, Political Science**

Three Crowns Room, Session A

*"Presidential Lying in Politics"*

Presidents use lying to justify their actions in foreign affairs because it's easier to get public opinion on your side and convince people that what you're doing is right if you stretch the truth. My question then is: How can deception in politics today be explained by Hannah Arendt's theory of truth and politics? It is no secret that our Presidents aren't always honest with the American people, but is this harmful? If it is harmful to citizens or to the country, why do they continue to lie? I will look at three examples from history to answer these questions. These examples are: FDR and the Yalta Conference, Richard Nixon and the Pentagon Papers, and Ronald Reagan and Iran-Contra Affair.

### **R. Eiler Henrickson (14)**

**Sponsor: Jillian Locke, Political Science**

Three Crowns Room, Session B

*"Tricolor Over Africa: Françafrique Through The Arendtian Lens, 1960-Present"*

Since the early 1960s French relinquishment of sovereignty over its African colonies, the term Françafrique has emerged as the definition of Paris' continued involvement – politically, culturally, and militarily – on the African continent. Between the years 1960 and 2010, the French Armed Forces conducted some 40 military operations on the African continent – from bolstering threatened French mining interests in Kolwezi, Zaire, in 1978, to toppling the Central African Republic's autocratic military dictator Jean-Bédel Bokassa in 1979 – and operations such as these have left an indelible socio-political imprint on the African soil. The term neo-colonialism is increasingly used to describe the continued French political and military presence in its former colonies, and were she alive today, mid-20th century German-born political theorist Hannah Arendt would likely not have hesitated to use such a term in her writings. In this paper, the author posits that Arendt's critique of imperialism – a system she found to be racist, exploitative, and lacking in the fundamental philosophical good – would equivocally translate into today's observations of the neo-colonial conduct undertaken by the French Fifth Republic in Africa.

### **Mariecus Jarvis (14), Lauren Johnson (15), Josie Steinmetz (14)**

**Sponsor: Heather Haemig, Chemistry**

Three Crowns Room, Session A

*"Cloning PrgX Single Mutants I251A And T290A Into Tagged Overexpression Vectors pGEX And pET28b(+)"*

PrgX is a peptide-dependent transcription factor that negatively regulates transcription of an operon containing gene products for conjugation. It is hoped that by further understanding the mechanism by which PrgX is regulated, the lateral gene transfer of bacterial resistance can be minimized. PrgX, in its tetrameric form, is known to repress lateral gene transfer. Two mutants, I251A and T290A, are thought to be important to the formation of the tetrameric complex that represses transcription of PQ. This research aims to clone mutated residues in PrgX into different expression vectors and purify the mutated protein. These products can be used in future structural studies and in vitro transcription assays to determine if the amino acid mutations, I251A and T290A, hinder PrgX's ability to

tetramerize and repress transcription. In order to accomplish this task, our objective is to clone the prgX gene containing single mutants I251A and T290A from plasmids pBK2m251 and pBK2m290 into pET28b(+) and pGEX vectors. These vectors are ideal for our analysis as they include a Multi-Cloning Site (MCS) with many restriction enzyme sites as well as expression tags. The pET28b(+) contains a histidine tag and the pGEX contains a GST tag. While the histidine tag will be very helpful for purification, it may affect the oligomerization of PrgX. The GST tag on the other hand can be removed after the purification process. These newly created plasmids will offer two means to purify the mutant PrgX proteins for further analysis.

**Monica Johnson (16), Mariecus C.M. Jarvis (14), Audrey L. Messelt (12), Karla E. Marz**  
**Sponsor: Karla Marz, Biology**

Three Crowns Room, Session B

*"Using CRY and PER Co-Localization to Map CRY's PER Binding Surface"*

Cryptochrome and Period, or CRY and PER, are two proteins that have essential roles in circadian rhythms, repeating 24-hour biological cycles that are entrained by environmental cues. Learning what surface of CRY binds to PER improves understanding of the molecular level of the circadian rhythm. This knowledge gives clues about these proteins' functions, as well as what surfaces are available to bind with other proteins involved. In HEK293 cells, our experimental system, CRY is found in the nucleus, and a PER protein missing a portion at its N terminus is located in the nucleus and cytoplasm. When both are present in a cell, both are in the nucleus together, indicating that CRY binding to PER shifts PER's location to the nucleus. We expressed wild-type and mutant CRYs (which had amino acids on their surface changed) with PER in cells, and then determined their locations using antibodies, two of them tagged with fluorophores, and fluorescence microscopy. Most of the mutations tested had no effect on the location of PER, some had small effects, and one had a large effect. Based on which mutations on the surface of CRY affected co-localization with PER, it can be interpreted a large area on the surface of CRY binds PER.

External Presentation: Midstates Consortium for Math and Science (MCMS) at Washington University in St. Louis, Missouri on November 2nd, 2013.

Winchell Undergraduate Research Symposium at St. Mary's University of Minnesota in Winona, Minnesota on April 26th, 2014.

**Matthew Keller (15)**

**Sponsor: Anna Versluis, Geography**

Three Crowns Room, Session A

*"Decreasing Walleye and Increasing Hostility: Resource Conflict among Chippewa and Non-natives on Minnesota's Lake Mille Lacs"*

In 1998, the Minnesota v. Mille Lacs Band of Chippewa case granted the Chippewa Nation usufructuary lake rights that had been taken from them in a 1837 treaty. The verdict

designated the Minnesota Department of Natural Resource (MN DNR) to set quotas and allowable harvesting techniques for fish taken from Mille Lacs Lake. By 2013, the walleye population in Lake Mille Lacs was nearing its lowest number in the last forty years. The fishery decline, along with the designation of quotas and the techniques used to harvest fish, has led non-native Mille Lacs stakeholders to question the Chippewa's right to harvest fish. As a result of this conflict, hostility has increased between the Chippewa and non-Native communities. Through the use of telephone surveys with Mille Lacs stakeholders in both Chippewa and non-native communities, the proposed study will study the current social relationship between the Chippewa and the non natives to asses whether or not their relationship has deteriorated. The goal of this study is to asses the current social relationship between the two parties and highlight which social areas need improvement.

**Edward Kluender (14), Peter Crady (14)**

**Sponsor: Thomas Huber, Physics**

Three Crowns Room, Session A

*"Visualization of Vibrating Systems Using a Scanning Laser Doppler Vibrometer"*

A scanning laser vibrometer uses the Doppler shift of reflected light from an object to obtain incredibly precise visualizations of the deflection shape of vibrating objects. This system has been utilized to obtain insights about a wide variety of physical systems. We will describe measurements where the non-contact ultrasound radiation force excited vibrations of systems ranging from a microcantilever to the face of an acoustic guitar. Other measurements demonstrated that the reed in a reed organ pipe experiences accelerations in excess of  $4000g$ . Visualization of the vibration of beakers excited by a speaker allowed better understanding of how they break. The vibrometer even enabled measurement of the sound waves traveling in tubes or emitted from ultrasonic ranger. Videos and curriculum guides have been produced to allow these visualizations to be utilized in classes. This project has been supported by NSF Grants: 0959858, 0900197, and 1300591.

External Presentation: American Association of Physics Teachers National Meeting, University of Minnesota, July 26-30, 2014

**Samuel Knutson (14)**

**Sponsor: Sheng-Ping Yang, Economics & Management**

Three Crowns Room, Session B

*"Implications Of The Efficient Market Hypothesis And The Drift Effect in Growth And Value Stocks"*

This study examines how the predictions of the efficient market hypothesis regarding the returns of stocks compare to empirical data regarding returns. Specifically, the objective is to address whether the phenomena of momentum, the changes security prices following an informative event for periods following the event, is similar between growth and value stocks. The historical daily returns of a sample of S&P 500 stocks will comprise the principal data for this study. The significance of serial correlation of returns following changes in

analyst recommendations will then be tested. The presence of lag effects in returns would imply that investors are giving undue weight to returns after this information is reflected in stock prices. If this lagged effect differs between growth and value stocks, then evidence for market inefficiencies between stocks of different characteristics exists. This is an opportunity to examine investor behavior and to determine whether any mainstream framework can adequately explain it in light of the evidence presented herein.

**Adeline Konnad (16), Kendrick Hall (14), Garrison Meyer (16), Ben Elvestrom (15), Erika Clifton (15), Molly Butler (16), Wilson Fields (16), Kelsey Hering (14), Video Artists: Cameron Blair, Leah Creger, Olivia DeViscio, Patrick Dolan, Alex Gunderson, Mara Johnson-Groh, Abby Lyle, Mackenzie McCann, Spencer Passmore, Oliver Sukhum, Kong Xiong**

**Sponsor: Phil Bryant (English), Priscilla Briggs (Art), English**

Three Crowns Room, Session B

*"Writing Poetry: Student Chapbooks"*

These chapbooks are the result of a semester long program dedicated to writing poetry. Throughout the semester, we analyzed different styles of poetry and applied them to our individual work. A chapbook is a compilation of ten to fifteen poems that often follow a similar theme to convey a greater message. We will present these chapbooks along with videos that were made as a visual representation of the poems made by Professor Priscilla Briggs' Video Art class.

**Emily Bo LaFontaine (15), Kaitlin Lang (15)**

**Sponsor: Stephanie M. Otto, Health & Exercise Science**

Three Crowns Room, Session A

*"Comparison of Hand-eye Coordination between Gymnasts, Soccer and Tennis Athletes "*

Hand-eye coordination is essential to success in a variety of sports. The body sees the object and responds to it, whether catching or throwing a ball, or hitting an object. Filipcic, Pisk, and Filipcic (2010) were able to predict success rates of young tennis players based on the results of hand-eye coordination tests. In contrast, Davlin, Sands, and Shultz (2002) reported gymnasts rely on kinesthetic awareness rather than visual cues associated with hand-eye coordination while flipping in the air. Bankosz and Skarul (2010) recognized that kinesthetic differentiation ability is one of the most important coordination motor skills as it allows one to act and perceive force, time, and space in their surroundings. Currently, it is unclear how hand-eye coordination would compare between gymnasts and other groups of athletes. The purpose of this study was to explore whether differences in hand-eye coordination exist between gymnasts, tennis athletes and soccer athletes. This study included eight Division III female athletes selected randomly from each sport. A parallel group design was used. Participants performed three hand-eye coordination tests; tennis ball throw and catch, tic-tac-toe number/shape hit, and the cup stack. One trial of each test was performed each day until the participant had completed three trials. The sequence of tests was randomized and delivered in a controlled environment. The independent variables

entailed gymnasts, tennis, and soccer athletes. The dependent variables were average scores on each of the hand-eye coordination tests. A MANOVA ( $p < .05$ ) statistical method was used to compare the differences in hand-eye coordination between groups on each of the three tests. Results revealed a significant difference on the tennis ball throw and catch test between tennis athletes compared to both gymnasts and soccer athletes,  $F(8,36) = 4.49$ ,  $p = .001$ , Wilk's lambda = .25, partial  $\eta^2 = .5$ . Tennis athletes demonstrated the best accuracy on the tennis ball throw and catch test. No other significant differences were found between groups. Results of this investigation helped strengthen our assumption that gymnasts, by nature of their sport, are not as successful when performing hand-eye coordination tests compared to other athletes who use this type of skill in their sport. Future research may look at whether a kinesthetic awareness evaluation might be useful in predicting future gymnastic success.

IRB #1314-0135.

External Presentation: National Conference on Undergraduate Research (NCUR),  
University of Kentucky, Lexington, KY, April 3-5, 2014

**Samara L. Lenort (14), Ashley Greeder (14)**

**Sponsor: Barbara Zust, Nursing**

Three Crowns Room, Session B

*"College Students' Knowledge of Sexually Transmitted Diseases"*

One in two Americans will contract an STD at some point in their lifetime. The purpose of this research is to evaluate the knowledge of college students in the Midwest on the topic of sexually transmitted diseases (STD). An exploratory study was designed to investigate the knowledge college students have regarding STDs. Following IRB approval, students were randomly asked to participate in the study. Eighty five participants completed a survey that included demographics and questions that asked the participant to rate their personal perception of their knowledge of STDs on a 1-10 Likert scale. A ten-item quiz was used to check the participant's general knowledge of STDs. The questions specifically incorporated information regarding chlamydia, HIV, and common myths associated with STDs. Data were analyzed using simple frequencies, descriptive statistics, and Pearson R. Preliminary findings indicated that the participants perceived knowledge was positively associated with their score on the quiz included in the survey. Findings also showed that although, the average student is aware of sexually transmitted diseases, this did not translate to their frequency of condom use.

**Serenity Mahoney (15), Dominic Delmont (15), Kara Helgeson (16)**

**Sponsor: Hilary Christensen, Geology**

Three Crowns Room, Session A

*"Radiocarbon dating and rare earth element tracing leads to origins of bison remains found along the Des Moines River"*

Fossilized remains of American bison collected from over 40 miles of the Des Moines River



suggested that some catastrophic event occurred, resulting in a mass execution. The large number of remains found convoluted the theories of where the bones were washing downstream from and whether one execution site yielded all of the fossils, or multiple sites. Using radiocarbon dating the age of the bison remains was ascertained and using ICP-MS the rare earth elements contained in the stream-worn were traced back to the point of origin.

**Brianna Malecha (17)**

**Sponsor: Angelique Dwyer, Modern Languages, Literatures, and Cultures**

Three Crowns Room, Session B

*"A Victim of His Work"*

At the end of the 1970's, President Perón of Argentina died, leaving a power-hungry government in control. The fear instilled on the people by the new and controlling government along with the desire for the citizens to escape to a safer place inspired Luisa Valenzuela to write the short story, "Los Censores." Through the protagonist, Juan, Valenzuela is able to capture the fear exhibited by not only Juan himself, but the entirety of the population of Argentina. Likewise, she reveals through subtleties that everyone, even the bravest, is incapable of escaping the power of the government. This paper uncovers how the author was able to construct Juan as a representation of the entire Argentinian population and, furthermore, the inevitable power of the government.

**Andrew Malo (17)**

**Sponsor: Angelique Dwyer, Modern Languages, Literatures, and Cultures**

Three Crowns Room, Session B

*"Encontrar el camino destinado: An Indirectly Relevant Message for College Students in a Mexican Short Film"*

When presented with the task of analyzing a character from any of the works we had studied throughout the course, I chose to evaluate Carmelita from Carlos Cuarón's comedic short film, *Sístole Diástole*. In the context of the class, this short film teaches a student a great deal about Mexican culture, featuring a traditional Mexican family and the chaos that surrounds their attempt at enjoying an anniversary celebration. Carmelita, the evident black sheep of the family, desperately awaits a signal from God that she is on the correct path to self-fulfillment in her choice of career as a nun. Among college students, it is also often difficult to feel confident about the paths on which we are headed. We have a tendency to second-guess, fear, and forget to seek help in achieving auto-realization. The importance of maintaining a strong sense of self becomes evident through the development the character, Carmelita. In my presentation, I will attempt to explain the way Cuarón unintentionally created a character in his film whose mission can serve as an inspiring example to any student looking to find their appropriate path in life.

**Ciara Marshall (14), Josef Haas (14)**

**Sponsor: Kristian Braekkan, Economics & Management**

Three Crowns Room, Session A

*“Psychological Contract Violations and Organizational Citizenship Behaviors: A Study of Exploitation by Economic Necessity”*

Neoclassical models of the employment exchange assume that exploitation is an improbability in competitive markets as these will regulate behaviors and provide checks and balances against abuse. Marx, however, argued that a person is exploited if he or she performs more work than is required to produce his or her own consumption and that, consistent with the political economy conception of conflict, employers and workers are experiencing a class-based conflict. The term psychological contract violation (PCV) refers to a situation in which the individual employee experiences negative affective reactions or feeling of injury that results from the employer's failure to comply with what the employee perceives to be a mutually agreed upon contract. Previous research suggests that organizational failures to fulfill obligations are sources of emotional exhaustion, job dissatisfaction and reduced organizational citizenship behaviors (OCB), increased intentions to quit, and reduced organizational commitment. This study tests a model, which suggests that “exploitation by economic necessity” moderates the relationship between perceived violations and OCBs. The results indicate that individuals that are forced to sell their labor power and obtain what they need through the market will not exhibit lower OCBs and that they will be more likely to continue to be exploited by the employer. Specifically, the results indicated that the negative relationship between PCV and OCBs weakened in the presence of high economic necessity. These results appear to be consistent with Marxist arguments, as these workers have no other options than to continue their relationship with the employer.

**Zoë May (14)**

**Sponsor: Jill Locke, Political Science**

Three Crowns Room, Session B

*“Forgiving For The Future? An Exploration Of Arendt And Tutu's Theories Of Forgiveness”*

Catastrophic events challenge human nature, our faith in one another, and our ability to forgive. Acts of war, genocide, and unspeakable violence mar the canvas of history, and impair still today our actions moving forward. Is there the potential for forgiveness in these instances of injustice? Does there exist a capacity for reconciliation in the midst of the pain and conflict caused by humans? More importantly, is there a necessity for forgiveness in order to move forward through such circumstances? With these questions, this paper seeks to explore Hannah Arendt and Desmond Tutu's understandings of forgiveness and what insights can come of reading these two perspectives in conjunction with one another. Through their theories, I seek to consider what place Arendt and Tutu's notions of forgiveness hold in history, and in the future of modern politics.

**Will Metcalf (15)**

**Sponsor: Anna Versluis, Geography**

Three Crowns Room, Session A

*“Impact of Hydrologic Modeling on the Results of GRACE-derived Ice Sheet Mass Balance Calculations”*

This paper examines the application of hydrologic models in monthly ice-sheet mass balance calculations based on Gravity Recovery and Climate Experiment (GRACE) observational data. GRACE data are satellite-based observations of variations in Earth’s gravity field that can be used to calculate mass changes on Earth’s surface, such as ice mass loss at the poles. In order to better capture total ice mass changes in Greenland and Antarctica, previous studies have mathematically “shifted” the weight of continental regions toward the coasts, thereby reducing the external signal leakage effect, which is a significant source of error in calculating global mass changes. A better understanding of the discrepancy between modeled hydrologic processes and actual geophysical variation caused by them is required to evaluate these model assumptions. This necessitates an exploration of how Earth’s hydrosphere—an important subsystem of global surface mass variation—is parameterized in such models. This study assesses the significance of hydrologic modeling choices on the results of GRACE-derived ice-sheet mass balance studies in an effort to isolate the impact of such choices on mass balance change uncertainty. For example, the inclusion of ice shelves in the measurement region and aliasing of residual ocean tides impacts the variability of time-series data. In studies where hydrologic contributions to perceived signal leakage are calculated separately, it will be possible to either add the coastal weight from calculations where they do not exist (bringing them in from other studies with similar methodology) or remove them (for comparative purposes) where they do.

**Brooke Meyer (14)**

**Sponsor: Kyle Chambers, Psychological Science**

Three Crowns Room, Session B

*“Influence of Conformity on Preschoolers’ Selective Trust”*

A number of recent studies have found that children do not trust everyone equally, and use a number of cues when determining whom to trust as sources of information (e.g. Scofield et al., 2013; Koenig & Woodward, 2010). These results have proven to be robust for semantic knowledge (e.g. object names); however, conflicting results have been found for episodic knowledge (e.g. object locations). A likely source of this discrepancy may be the fact that semantic knowledge can be conventional, whereas there is no conventional hiding place for an object. The present study sought to separate accuracy from conventionality by having children observe three actors conform in the way they used novel toys, while one actor used the toy in an equally accurate but nonconforming way. We then assessed whether children preferred to seek and endorse information from the conforming actor for semantic knowledge (object functions and object names) and episodic knowledge (object locations).

External Presentation: Minnesota Undergraduate Psychology Conference - April 26th, 2014

**Lacie Micek (14)**

**Sponsor: David Obermiller, History**

Three Crowns Room, Session A

*“Judicial and Historical Denial: Judge Jack Weinstein’s Exoneration of Agent Orange”*

Although the Vietnam War ended in the 1970s, the effects of Agent Orange are still felt today. I have compared two lawsuits with American Veterans and Vietnamese victims suing chemical companies for health and environmental damages from Agent Orange, and explored how the outcomes of these court cases were influenced and transformed the historical memory of the Vietnam War. Agent Orange use can be described as an ecocide, and an atrocity that continues to cause damages throughout generations. Judge Jack Weinstein failed to identify a culpable party for the long-lasting effects of herbicide use, illustrating the historical amnesia surrounding this and other war crimes committed by the United States. This study also demonstrates how our U.S. court system, made to bring justice to those deserving, actually functions to maintain the status quo. Although the Vietnam War is a widely discussed aspect of American history, legal studies of Agent Orange are rarely conducted. By examining this tragedy through historical, legal, sociological, political, and environmental aspects, this research demonstrates the interdisciplinary nature of the issue to challenge the master narrative of the Vietnam War and illustrate the importance of studying historical amnesia to discover insight into American exceptionalist culture.

**Paige Miller (15), Andrew Park (University of Georgia)**

**Sponsor: Tom LoFaro, Mathematics and Computer Science**

Three Crowns Room, Session B

*“Factors Leading To Increased Transmission and Drug Resistance Emergence Of Heartworm In The United States”*

Heartworm disease has been observed all over the world but is distributed heterogeneously where hotspots are thought to be promoted by factors such as climate, pet and owner demographics, and percent of canid population given medication. Recent concerning evidence has suggested the establishment of drug resistant worms in some areas of the United States. Because only one class of drugs exists to treat heartworm, resistance presents a large problem. Two of the first models for heartworm disease dynamics and drug resistance emergence, one deterministic and one stochastic, were developed in order to identify factors that could lead to higher rates of transmission or faster rates of resistant allele increases. Factors analyzed included vector abundance, treatment coverage, and fitness benefit of mutation. It was found that areas with high mosquito abundance and low treatment coverage are more likely to suffer from higher worm burdens in general. Speed of resistance emergence and probability of resistant worm invasion depend on the fitness cost of mutation in heartworms and founding size of resistant worm population. Collectively, these models help to identify key factors and regions that are associated with successful and rapid establishment of drug resistant heartworm populations.

External Presentation: NimBIOs Undergraduate Research Conference on the Interface of Mathematics and Biology; November 2013; University of Tennessee

**Larissa Milne (14), Angel MacDonald (14), Alexandra Buelow (14)**

**Sponsor: Barb Zust, Nursing**

Three Crowns Room, Session A

*“Correlating Menstruation & Alcohol”*

In previous research studies, it has been found that there is a correlation between menstruation and emotions, as well as a correlation between emotions and alcohol intake. There are no known studies that link alcohol consumption with emotions during menstruation. Therefore, the purpose of this study is to explore the association between alcohol consumption and emotions during menstruation. Following IRB approval, a 10-item questionnaire was sent via Survey Monkey to various collegiate women’s organizations at a traditional liberal arts college. Data was analyzed using simple frequencies, descriptive statistics, and correlations. Narrative data was analyzed using content analysis. Preliminary findings indicate that 70 of the 100 participants stated that emotions are related to alcohol intake. Of the 100 participants, 86 believed that emotions are influenced by menstrual cycle. There were 8 different emotions included in the research survey. Of these emotions, 43 of the 70 participants who believed that alcohol consumption is related to emotions also identified stress as a reason for consuming alcohol. Of the 86 participants who indicated that emotions are influenced by their menstrual cycle, 66 also believed that stress is related to their menstrual cycle. Of the 70 participants who believed that consuming alcohol is related to emotions, 20 also identified sadness as a reason for consuming alcohol. Of the 86 participants who believed that emotions are influenced by their menstrual cycle, 56 also stated that sadness is related to their menstrual cycle. Frustration and anxiety also displayed a notable correlation as being associated with both menstrual cycle and alcohol consumption. The study also investigated differences between involvement in collegiate organization and survey results. Data analysis is still underway. The findings from this study will help guide practice in raising awareness regarding alcohol consumption, especially in relation to emotions and menstruation.

External Presentation: National Conference on Undergraduate Research (NCUR), University of Kentucky, Lexington, KY, April 3-5, 2014

**Steve Moertel (15), Matt Gantz (Concordia-Moorhead College)**

**Sponsor: Kathy Lund Dean, Economics & Management**

Three Crowns Room, Session B

*“Draw: A Social Entrepreneurship Project From India”*

Draw, is inspired by my father, who always wanted to create a children's book but never had the chance to do so. Draw, is an ever-changing children's book designed to promote creativity and imagination in anyone of any age. The user is given a book of blank sheets of paper that only have a prompt of what to draw written at the top. Along with some coloring

utensils (crayons became a favorite) the user decides to draw whatever they desire. There is no right or wrong, and every person's book is unique; some people have chosen to write stories with their pictures too.

I started this project while abroad in India first semester, and along with Matt Gantz of Concordia-Moorhead, we brought Draw to three schools, IBM, Thomson-Reuters, coffee shops, and 3 other countries besides the US and India. Wherever we brought the book, the idea was received very well. One international school even temporarily incorporated the book into their curriculum. By the end of our trip we had collected over 115 drawings, gave out 20 books, created a website, and had great plans for our return to the U.S. Through the readjustment period of being home, many of our aspirations have been put on hold temporarily, but I saw this has a great opportunity to share my idea with the Gustavus community and great way to regain momentum for this book. Thank you.

<http://drawbyyou.com/>

External Presentation: Visthar, Bangalore, India, and other venues around Bangalore

### **Talia Moorman (16)**

**Sponsor: Anna Versluis, Geography**

Three Crowns Room, Session A

*"Lasting Impacts of 20th Century Transportation Infrastructure on Racial Segregation in the Twin Cities"*

The 20th century's transportation infrastructure helped produced many of the cities we live in today. Streetcars had a significant impact on city design and development, while the introduction of the vehicle led to the construction of roads and highways we continue to use today. Evolution of transportation infrastructure affected the growth of cities and the people who settled within them. One such pattern of human settlement is the racial segregation in U.S. cities, including the Twin Cities, Minnesota. This research will look at the contribution of streetcars, roads, and highways to racial segregation in the Twin Cities through an assessment of historical infrastructure construction and U.S. Census block data.

Understanding transportation infrastructure's impact on urban race patterns will help confront the level of racial segregation in the Twin Cities, raise awareness of this issue, and allow for future transportation infrastructure that will ultimately improve racial equality.

### **Neo Mpunga (15)**

**Sponsor: Anna Jacobsen, Sociology & Anthropology**

Three Crowns Room, Session B

*"I Wish I Never Crossed the Border: Xenophobic Violence against Foreign Nationals and 'Outsiders' in South Africa "*

Over the past few years numerous academic studies have brought further understanding to xenophobia around the world. South African communities remain uniquely burdened by the legacy of Apartheid, racism and inequality and have been, therefore, well-documented. The xenophobic violence of May 2008, which arguably kick-started much of the ongoing



violence among immigrant communities and South African citizens around the country, provides a particularly salient locus for further exploration. What is somewhat understudied thus far, however, are the community and nation-wide efforts currently undertaken to stop such violence and inequality in South Africa.

This paper is based on research conducted in Cape Town, South Africa, about how the xenophobic attacks in 2008 affected the lives of “non South Africans.” In this paper I explore issues pertaining to xenophobia and racism with particular attention to the role of the government and on relationships among the following ethnic groups: Xhosas, Somali immigrants/refugees, and white Afrikaners. In my research, I have observed that there isn’t a difference between university educated and not as well-educated members. I noticed that the most common expressions of xenophobia were articulated as rejection, fear and hatred of an ethnic group by a range of individuals in Cape Town. In this paper I will argue that although many young men and women exacerbate the hatred of immigrants, the government-funded programs are changing and ameliorating how local people view outsiders. To illustrate this, I draw on data collected through various ethnographic methods, including participant observation, semi-structured and open-ended interviews, and videography.

External Presentation: Central States Anthropological Society conference

**Mikie Phan (14), Joseph Thayer (15), Christian Medrano (14)**

**Sponsor: Margaret Bloch Qazi, Biology**

Three Crowns Room, Session A

*“Transgenerational Effects Of Female Age On Offspring Viability In Drosophila Melanogaster”*

Maternal age and larval density have been shown to influence offspring viability from numerous studies on *Drosophila melanogaster*. However, little is known about how these factors interact and contribute to variation in offspring viability, and whether the effects of female age are transgenerational. Our data are consistent with other findings, such that both older maternal age and high larval density significantly lowered offspring viability. Old grandmaternal age also showed negative influence on egg-to-adult viability in offspring, suggesting that the female age effects are transgenerational. Overall, offspring from old mothers and old grandmothers had the lowest viability regardless of larval density, indicating that the age effects are cumulative.

**Sanjive Qazi (Biology), Shelby Roles (15), Sara Kullberg (15)**

**Sponsor: Sanjive Qazi, Biology**

Three Crowns Room, Session A

*“Transgenic Mouse Model System For Childhood Leukemias Driven By Genetic Lesions In B-cell CD22 Receptor.”*

Therapeutic advances in oncology is severely hampered by the high rate of clinical stage failures demonstrated by 95% of drugs failing human clinical trials and success rate for

translation of therapies from animal models to human trials is less than 10%. One major area of focus is to develop preclinical mouse models that better represent the disease in human subpopulations by directly incorporating the human oncogene in a transgenic mouse and characterize the progression of the disease in the mouse and comparing the genetic mechanisms known to occur in the human cancers. Presently there is an unmet need for highly targeted therapies for infant leukemias to reduce toxicity of chemo/radiation therapy and treat the rapid development of resistant clones of cancer cells. Collaboration with the research team at Children's Hospital Los Angeles has led to the discovery of a genetic lesion in the CD22 receptor of B-cell leukemias. The human gene has been cloned into transgenic mice, which develop very aggressive leukemias. Additionally, gene expression profiling of these leukemia cells show marked similarity to pathways activated in high risk human leukemias through the interrogation of public databases for the human disease (over 100 pathways were found in common). Comparing the mouse and human transcriptome revealed upregulation of the proliferative MAP Kinase pathway and some members of the pathway are alternatively spliced in these leukemias. This approach demonstrates the utility of both the transgenic mouse cancer model and the comparison with large gene expression databases to better understand leukemia progression.

**Madeline Randall (14)**

**Sponsor: Lynnea Myers, Nursing**

Three Crowns Room, Session B

*"An Exploration of the Perceptions of High School Students Related to the Profession of Nursing"*

The United States is facing a shortage of nurses and is predicted to get worse. The purpose of this study was to evaluate the perceptions of nursing of high school students before and after participating in a 5-day, 4-night residential summer institute on nursing. The summer institute provided a dynamic and engaging environment that allowed students to learn more about the nursing profession through skills sessions, observation experiences, and other classroom activities. The study was conducted utilizing a pre- and post-survey design to measure perceptions of high school students related to nursing. The sample included 25 high school students, 24 female and 1 male, ranging from 14-18 years. Data were analyzed using descriptive statistics, simple frequency, correlations and content analysis. Results show that as age and gender increased so did the likelihood of the participants to pursue a career in nursing. The surveys included a list of qualities that students were asked to rate how strongly they felt nurses exemplify each once using a 1-5 Likert scale. The three qualities students rated most highly post-institute were empathy, power, and leadership. Post-Survey the qualities had higher averages than pre-survey. Students were also asked qualitative questions asking if their perceptions changed and how they felt performing nursing duties. Responses consisted of students feeling more appreciation for nurses and learned how important their role is in healthcare. Overall, results indicate that exposing students early to the profession of nursing, as part of a summer institute can greatly improve perceptions of nursing.

External Presentation: Presented at The Sigma Theta Tau International Society of Nursing Research Conference in Mankato, MN (September 2013) and The Midwest Nursing Research Society Conference, in St. Louis, MO (March 2014).

**Olivia Reininger (14), Carl Skrukrud (14)**

**Sponsor: Jessica Stadick, Nursing**

Heritage Room, Session B

*"The Effects of Classical Music on Perceived Stress and Physiologic Measures"*

Music is a strategy many use to cope with stress. Music has the ability to make an individual feel good, it has the ability to emotionally change how you feel, and it may also have the ability to decrease rated stress and vital signs. Stress is an experience that affects an individual cognitively and physically. The purpose of this study is to determine if classical music has an impact on vital signs (blood pressure, respiratory rate, and pulse) and self reported stress level (self inventory).

Following IRB approval this exploratory research study included participants who attended a wellness fair that took place in a small rural community. Participation in the study was voluntary. The questionnaire for the study consisted of eleven questions. The participants had their vital signs taken before and after listening to Chopin's Nocturne in Eb Major. The effects of classical music on perceived stress and physiologic measures were evaluated. Twenty-two individuals voluntarily participated in the study. The participants rated their current stress level on a likert scale from 1-10 and had their blood pressure, pulse, and respiratory rate obtained prior to listening to approximately three and a half minutes of Chopin's Nocturne in Eb Major via headphones. Following the music the participants rated their stress level on the same likert scale and their blood pressure, pulse and respiratory rate were obtained. Additionally, participants were asked to describe their current mood post music and how they perceived the classical music.

Preliminary results suggest that music may have an effect on one's perceived stress level and physiologic measures. Of the twenty-two participants 9 had a decrease in their blood pressure, 19 had a decrease in their pulse rate, and (n=21) had a decrease in their respiratory rate post exposure to the music. In addition 15 participants reported a decrease in their stress level post music. Descriptive and correlational statistics will be used to further analyze the data. Narrative data will also be further analyzed for content. Additional results from this study will have further implications for future research on the benefits music has on an individual's mental and physical health.

**Joseph Renier (14), Oghenemine Obrik-Uloho (15)**

**Sponsor: Margaret Bloch Qazi, Biology**

Heritage Room, Session B

*"Oviposition Rate Fertilization Success, Embryo Size, and Offspring Viability Decline with Increasing Female Age in Drosophila Melanogaster"*

Aging is the irreversible, inherent decline in an individual's reproductive function (Partridge and Barton 1996). In this experiment, we used *Drosophila melanogaster*, also known as the pomace fly, to identify the effects of female age on oviposition rate, fertilization success, embryo size, and offspring viability. We found that as females aged, there was a decline in oviposition rate, fertilization success, embryo size, and offspring viability. This shows that older females partition resources towards somatic maintenance, rather than reproduction. Further, embryo size could vary as a result of the quality of resources that are provided during embryogenesis, which could reflect the declines in oviposition rate, fertilization success, and offspring viability in older female flies. This could mean that oviposition rate, fertilization success, embryo size, and offspring viability all are interconnected mechanisms that are affected in the same manner due to increasing female age.

**Matt Saemrow (14)**

**Sponsor: Mary Joos, Health & Exercise Science**

Heritage Room, Session A

*"Adolescent ACL Injury: A Case Study"*

The purpose of this case study is to aid other athletic trainers in further understanding the accurate diagnosis and treatment of the anterior cruciate ligament tear in the adolescent athlete. A 17 year-old high school football player sustained an anterior cruciate ligament (ACL) tear during a varsity football game. His chief complaint was catching in the knee and anterior joint knee pain. Initial treatment was for a meniscal tear but after imaging it was revealed to be an ACL tear, with abnormal findings due to a previous injury. Differential diagnosis included meniscal tear and ACL tear. Treatment included surgery to repair the damaged ligament. A patellar bone graft was used. This case stands unique in that imaging of the knee revealed the ligament had been reattached in an inferior direction, leading to the conclusion that the ligament was torn earlier in life. This may have caused biomechanical changes that lead to less dependence on the ligament and more on the surrounding muscle. This biomechanical change may have led him to be more susceptible to tearing his ACL, which could have been prevented if caught during initial injury. In conclusion, when a knee injury occurs, especially in adolescents, recognition of the correct injury is crucial as an incorrect diagnosis can lead to delayed recovery and a potential risk for more injury. Therefore, it is important for the athletic trainer to be familiar with the anatomy, special tests, and mechanism of injury of the knee, as well as a patient history.

External Presentation: This poster will be presented on April 12th at the Minnesota Athletic Training Association symposium in Rochester, MN

**Ray Sajulga (17), Dwight Stoll (Chemistry)**

**Sponsor: Dwight Stoll, Chemistry**

Heritage Room, Session A

*"Simulation Of Sample Matrix Effects In Liquid Chromatography With Large Injection Volumes"*

High Performance Liquid Chromatography is an analytical chemistry technique that allows

for the qualification and quantification of chemical compounds of unknown identity or amount. With the right equipment and knowledge, multiple experiments can be run over a time frame. However, these experiments may have durations longer than necessary—therefore wasting material—with all the trial and error that comes with experimenting. With this simulation, it can be easier to predict when an analyte will elute given certain conditions. As a result, experiments can be fine-tuned to minimize the use of resources without sacrificing results.

The way it does this is through a combination of disciplines like calculus, computer science, and chemometrics. By dividing time and distance into small slices, chemical concentrations at given times and distances throughout the column can be calculated given an initial injection volume using Matlab.

This concept of simulated chromatography isn't entirely new. A lot of the chemophysics and concepts needed to program this simulation was explained thoroughly in a paper by the chemists Martin Czok and Georges Guiochon interpreted by Dr. Stoll. However, to take a step forward, with the help of Dr. Stoll, this simulation was modified to handle gradient elution situations, which is a unique aspect.

Another step taken was the creation of a supplemental program that animates the analyte in a real-time video clip as it travels through the column. In the future, there is hope for a website and a java program to assist chromatographers and to educate the curious through manipulable visuals.

**Carl Schiltz (14), Grant Walters (14), Ryan Ragan (15)**

**Sponsor: Heather Haemig, Chemistry**

Heritage Room, Session B

*“Expression and Purification of DnaK Within Escherichia Coli”*

*Enterococcus faecalis* is a bacterium responsible for many antibiotic resistant hospital-acquired infections. Some preliminary work suggests that impaired function of a chaperone protein, DnaK, reduces the ability of *E. faecalis* to transmit DNA via conjugation, which makes DnaK a potential target for combating infections caused by *E. faecalis*. In order to more fully understand the role and function of DnaK in gene transfer, we are attempting to produce the purified protein, which can be used in subsequent biochemical assays. Our strategy for achieving this goal is to generate a DnaK-GST fusion protein via standard cloning methods, which can be expressed in *E. coli* for ease of protein expression and purification. A GST tag is especially useful for this application because it will allow for the isolation of DnaK through affinity purification. Additionally, GST tags can be enzymatically cleaved from the protein of interest, resulting in purified native protein. Thus far we have successfully amplified the *dnaK* gene from *E. faecalis* using PCR and have attempted to insert the *dnaK* DNA into the plasmid containing the GST tag. Once we have successfully generated a *dnaK*-GST fusion, we will attempt to express the fusion protein in *E. coli* and purify it.

**Madeline Schmitz (14), Anna Torborg (14)**

**Sponsor: Barbara Zust, Nursing**

Heritage Room, Session B

*"Exploring First Year Students' Experience With Digital Abuse"*

In the substantially digital world of today, cell phone use and participation in social media websites (Facebook®, Twitter®, Instagram®) is all the rage among adolescents and young adults. While many healthy relationships can be fostered through the use of this digital technology, harm may be caused as well, challenging the health and wellbeing of young people. There is very limited research on digital abuse and its impact on young adults. The purpose of this study is to explore the perceptions of and experience with digital abuse in male and female first year college students.

Following IRB approval a 12-item survey was distributed to First Term Seminar classes at a Midwestern Private College. The survey collected demographic data concerning age, gender, sexual preference, race and identification with rural or urban upbringing. The 12 items in the survey collect data on the participant's use of social media; familiarity with the concept of digital abuse; perception and experience of the problem for self or others; and whether the participant has been the victim, the perpetrator or both of digital abuse. Using a Likert scale, participants were asked to rate the impact of digital abuse on sleep, eating habits, relationships with others, and on mood. Participants are asked to provide narrative data to further describe their perceptions.

Upon completion of data collection, the data will be analyzed using correlations, descriptive statistics and simple frequencies. Narrative data will be analyzed using content analysis. Information from this study will add to the body of knowledge concerning digital abuse in order to guide health promotion efforts on this issue.

**Dempsey Schroeder (14)**

**Sponsor: Lisa Heldke, Philosophy**

Heritage Room, Session A

*"The Bi-Fortnightly Anodyne"*

The Bi-Fortnightly Anodyne was founded in response to what I perceived to be shortcomings in the Gustavian Weekly's opinion and letter to the editor sections. I had, in the past, submitted letters to the editor of the weekly, but they were always rejected because of my views' uncommon natures. Through the Anodyne, I sought to give voice to opinions that seemed to have no place at the weekly.

The paper's maiden issue was in the fall of 2013, and was subscribed to by only 35 people. Over the course of the year the paper has published opinion articles on every thing from necrophilia to cannibalism, and currently has roughly 200 subscribers.

The Anodyne has, and continues to provide an outlet for people to express unusual opinions that would otherwise be left unheard, it also exposes them to others' opinions that they otherwise wouldn't hear.



**Anna Schulte (14), Laura Dack (14)**

**Sponsor: Lynnea Myers, Nursing**

Heritage Room, Session B

*“Survey of High School Students’ Anxiety During High-Fidelity Simulation”*

Simulation is used to prepare nursing students for clinical experiences and to provide a safe learning environment. This study investigates the effect anxiety has on students’ performance and experience during simulation, hypothesized to be debilitating. Previous studies have evaluated the use of simulation and its effect on anxiety with baccalaureate nursing students, but lack evidence about younger populations. According to the Neuman Systems Model (1970), anxiety is a stressor that can break down the body’s normal line of defense. Neuman explains learning best occurs when the body is in a complete, unbroken state of wellness. Therefore, decreasing anxiety during simulation should facilitate a stronger and more valuable learning environment (Moscaritolo 2009). This study uses a mixed methods design to survey anxiety during two simulations over a weeklong summer nursing camp. Analysis of the survey results indicates that overall anxiety during simulation was low. Of the sample, 60% stated low to nonexistent levels of anxiety and 36% stated their anxiety was mild to moderate. Other significant findings illustrate the value of simulation as a learning experience – the rated value of simulation increases as anxiety decreases and as the reality or life-like quality of the simulated patient increases. These results imply that simulation should be made as realistic as possible in order to promote a better learning experience. Simulation can be a useful nursing tool to prepare a younger for lifelike situations and to challenge their critical thinking skills.

External Presentation: Presented at "Midwest Nursing Research Society Annual Conference" in St. Louis, Missouri - March 27-30, 2014

**Lyndsi M. Schwichtenberg (14)**

**Sponsor: Heidi Meyer, Nursing**

Heritage Room, Session B

*“Exploring Sleep Quality of First-Year Students Related to Sleep Habits and Lifestyle”*

This exploratory research study includes participants who are first-year college-aged male and female students. The participants were recruited from a rural 4-year baccalaureate college in the Midwest United States. The study is a combination of an 11-question paper survey that addresses questions related to the lifestyles of the participants and the Pittsburgh Sleep Quality Index (PSQI), an instrument that assesses overall sleep quality. IRB approval was obtained and data collection ran from November 2013 through December 2013. Descriptive and correlational statistics were used to analyze the completed data. Findings indicate that over half (53%) of first-year students have poor sleep quality. Lifestyle factors that were assessed included extra-curricular activities (sports, music, theater, clubs, etc.), class hours, work study, caffeine use, and the use of social media. Between the hours of 10pm and 6am, 95.3% of first-year students reported using some form of social media with the average amount of time being two hours. The relationship between the number of

hours spent on social media and sleep quality was found to be significant (t-test sig. = 0.006). The relationship between caffeine use and sleep quality was also significant (Phi co-efficient sig. = 0.008). There was no significance found between sleep quality and the remainder of the lifestyle factors assessed. Results from this study may be used to assist college campuses in acknowledging lifestyle and sleep pattern habits as a means to integrate health and wellness promotion activities.

External Presentation: National Conference on Undergraduate Research (NCUR),  
University of Kentucky, Lexington, KY, April 3-5, 2014

### **Emilie Scott (14)**

**Sponsor: Valerie Walker, Elementary & Secondary Education**

Heritage Room, Session A

*"The Price of Privilege"*

When looking at underrepresented groups in the United States, privileged teens do not appear often nor are they studied often in terms of behavioral patterns and interests. If they did have any problems, most would assume that because they are privileged, they can afford the help they need for therapy, medication, or treatment. In my research and project, I use the book "The Price of Privilege" by Dr. Madeline Levine as the premise of my arguments and connections with characters from the Disney movie "High School Musical." I focus on the issues of privileged teens that are overlooked in society and how parents neglect or are hesitant to reach out for help for their children. The drug, alcohol, behavioral, and mental problems that arise within the group of privilege is one that should not be downplayed or pushed aside because the privileged teens are the ones who will go into the positions of power due to their background and privileged opportunities. If we want to have future people in power who do not have mental disorders or drug and alcohol problems, we must face the "Price of Privilege" as a serious concept alongside those of poverty and inequality.

### **Travis Sigafoos (16)**

**Sponsor: Janine Wotton, Psychological Science and Neuroscience**

Heritage Room, Session B

*"Investigating The Relationship between Salicylate-Induced Tinnitus And Circadian Rhythmicity"*

This investigation analyzed the effect of circadian rhythmicity on the acoustic startle reflex (ASR) based gap-startle (gap) and pre-pulse inhibition (PPI) paradigms using a rodent model. In order to study whether the startle response varied over the course of a day, each rat (n = 10) was tested at 0800, 1200, 1600, and 2000 hours on a 12:12 hr LD cycle (0400 lights-on; 1600 off) with either a gap in noise or a noise pulse as a warning signal preceding the startle pulse. Analysis of variance (ANOVA) revealed that there were significant measured differences in the force observed, between both paradigms ( $p < .001$ ) and trial types ( $p < .001$ ), whereas the main effect of time was not significant. However, there was a

marginally significant interaction between time and trial type ( $p = .052$ , power = .53). There was also a significant difference between the two paradigms and their constituent trials. And while the data do not definitively support the relationship between circadian rhythmicity and the acoustic startle reflex, further research is hypothesized to support the validity of our predictions.

External Presentation: Mid-States Consortium for biological and psychological sciences at Washington University in St. Louis; Midbrains Conference at Carleton College

### **Caitlin Skvorc (14)**

**Sponsor: Lisa Heldke, Philosophy**

Heritage Room, Session B

*“Wabi-Sabi World: An Artist's Search”*

In the discussion of symmetry and beauty and their relation to each other, there arises a disconnect between science and culture; where science looks to explain the universe in as concrete terms as possible, art and culture explain the surrounding world through less precise means based on relationships and emotion. The Japanese term wabi-sabi describes an aesthetic of the imperfect, asymmetrical, and impermanent in all things and is considered by some scholars to be the core of Japanese culture. As West and East are often pitted against each other, so are symmetry and asymmetry, but the pairs do not have to be mutually exclusive to increase an overall knowledge of the universe.

This project uses research in chemistry, philosophy, and art to explore the appeal of asymmetry versus symmetry, as the foundation of a creative effort to portray wabi-sabi through personally composed digital photographs and the haiku form of poetry.

Accompanying the visual presentation will be a short paper detailing the scholastic research conducted and proposing the idea that although the concept is Japanese, the core values of wabi-sabi can be embraced by all people, and that asymmetry, in turn, also has value in every culture.

### **Victoria Sowa (16)**

**Sponsor: Kristian Braekkan, Economics & Management**

Heritage Room, Session A

*“The Exercise of Creative Potentials: An Examination of Labor Rights, Gender Equality, and Innovation”*

With increasing economic uncertainty, ongoing recessionary trends, and economic inequality during the neoliberal phase of capitalism, Marx's Aristotelian conception of “the good life” has begun to regain interest in recent years. Marx's contention was that such a reality could only be made possible in a society in which market powers yield to species powers, or the exercise of creative potentials. Although Marx recognized that advancements were made under capitalism, he also argued that these were accomplished to the detriment of the vast majority of people's ability to achieve self-realization. Interestingly, innovation and entrepreneurship have become synonymous with market capitalism and it is often

assumed that the main antecedents of innovation in a society are unregulated and “free markets.” This study proposes a model which suggests that the species powers, or the creative potential of mankind, is best protected and developed in societies in which the individual is not coerced into performing social and market valuable tasks, but is allowed to develop their own skills through meaningful work where they are protected from workplace exploitation. Specifically, we propose and test a model with global data in which we hypothesize that innovation will be higher in societies with high labor standards, strictly enforced labor rights, and low gender inequality. The model rests on the assumption that individuals who are free to choose the skills they desire to develop without being exploited by employers and who face fewer structural constraints, based on gender and class, are more likely to exercise their creative potentials.

**Ashley Steinberg (14)**

**Sponsor: Lisa Heldke, Gender, Women, and Sexuality Studies**

Heritage Room, Session B

*“Redefining Marriage: Choosing Dependency”*

Many legally married individuals do not fit the traditional idea of marriage. Marriage is not only about the physical interactions between partners resulting in biological offspring or emotional romantic attraction between partners. Marriage is a term to define something deeper than that; it recognizes dependency and choice. Marriage needs to be redefined as a term that recognizes human dependency on one another, no matter one’s sexual identity, and the conscious choice of each individual to be committed physically, emotionally, and in other ways to their relationship.

The legal status of marriage should be thought of as choosing and recognizing the physically, emotionally, and often financially dependent relationships between individuals. Each independent individual must consciously choose to legally recognize their relationship and every party involved must make this personal, conscious and individual choice. Through limiting and denying marriage status to relationships, we as a society would be embracing something primitive and un-evolved, not going beyond a basic physical function while consciously excluding relationships that should qualify for legal benefits.

This research will address how historically important the social institution of marriage is in the United States and why other theories such as contracts in lieu of marriage and marriage reform alone cannot combat the unjust oppressive nature and the prevalence of the legitimate or illegitimate dichotomy that exists in current marriage law. Through understanding legal marriage as choosing dependency, the binary of single or married is made irrelevant because of the plethora of relationships that are legally recognized and legitimate.

**Janelle Thienes (16)**

**Sponsor: Beatriz Torres, Communication Studies**

Heritage Room, Session B

*“The Power of Certainty in International Adoption”*

This essay details an ethnographic study of an online adoption forum and the communication methods used within the group to effectively communicate. The ethnography strived to answer how members are able to effectively connect with other members in the forum and to identify if there is a correlation between seeking advice and communicating about the child's culture online by analyzing previous research as well as an observation of the online international adoption forum, <https://forums.adoption.com/international-adoption-support/>. Many themes and patterns emerged in the coding process, including self-identification and the ability to relate, positive help-seeking, the sharing of knowledge and personal experiences, as well as the theme of continuing personal connections. The findings of my research suggest that the theory of uncertainty reduction is used by the individuals of the site to reduce the unpleasantness that is associated with the unknown. This essay further details these findings through specific examples and research found within the forum.

**Rebecca Thompson (14), Jessica Skaare (14), Megan Hennen (St. Scholastica '14), Jaira Wilsey, (Colorado College '14)**

**Sponsor: Thia Cooper, Religion**

Heritage Room, Session B

*"Peace Lines, Interfaces, and a Divided Mindset in Northern Ireland"*

Northern Ireland's history of violence and sectarianism has led to a deeply divided society. This division is both physical, as seen in the presence of numerous peace walls and interfaces that separate Catholics and Protestants in the cities, and perceived, as conflicting national and political identities create a divided mentality among many Northern Irish residents. This research seeks to determine the relationship between physical barriers and this divided mindset. Barriers have long been a part of Northern Ireland's history, going back to the construction of the city walls of Derry/Londonderry in 1613, and more recently, including the peace lines and interfaces that separate Catholic and Protestant neighborhoods to prevent sectarian violence in Belfast and Derry/Londonderry. A number of barriers physically divide Catholics and Protestants resulting in segregated neighborhoods and schools. Although the rate of violence has sharply decreased following the 1994 ceasefire and the 1998 Good Friday Agreement, many of the peace lines and interfaces remain intact because residents of divided neighborhoods want the walls to remain due to concerns of increased violence if they were taken down. Not only are neighborhoods and schools divided along sectarian lines, many people hold a divided mindset that separates them from what they consider to be the opposing group. In order to move toward a shared future, Northern Ireland needs to work to overcome divisions within its society, both physical and mental.

**Liz Underwood (14)**

**Sponsor: Anna Versluis, Geography**

Heritage Room, Session A

*"A Comparison of the Environmental Footprints of Locals and Second homeowners in Ottertail County, Minnesota"*

Seasonal occupants, second homeowners, and tourists have important impacts on many rural areas of America. They impacting the local environment, development, and culture of rural places. One such place is the Ottertail Lakes County in Northern Minnesota, a popular destination for vacationers and cabin owners and the second most popular site for seasonal occupants in North- Central Minnesota. This study investigates how seasonal occupants affect the landscape and environment of Ottertail Lakes County by examining the differences in environmental footprints among second-homeowners and locals. I speculate that the differences in environmental footprints will be due to cultural and economic differences between the two groups of people. I am expecting to find this because, on average, people who live in urban areas earn more money, than those who live in rural places.

**Ka Bao Vang (14), Katie Hopfner (14)**

**Sponsor: Bruce VanDuser, Health & Exercise Science**

Heritage Room, Session A

*"The Effects of Exercise on Memorization "*

Previous studies have examined the effects of exercise on memory. Labban et al. 2011 researched the effects of acute exercise on long-term memory. Sibley et al. 2007 examined the effects of exercise on working memory. Coles et al. 2008 studied the effects of acute exercise on executive processing, short-term memory, and long-term memory. Many students study while exercising. This raised the question whether exercising while studying decreased memorization. Twenty subjects from Gustavus Adolphus College will volunteer for this study. Subjects will memorize a list of twenty simple, random words for four minutes, once while using a reclining bike at 50 RPM speed for five minutes and once without biking. Each participant will undergo both conditions on two separate testing days. Participants will then write down as many words as they can remember during a one-minute recall period. A one-sample design will be used for this study. The independent variables are exercise and no exercise. The dependent variable is the number of words recalled. A paired-sample t-test will be used to evaluate the data. Results are predicted in favor of an increase in word recall after exercise as oppose to words memorized while at rest. Exercise will have a positive effect on memorization.

External Presentation: National Conference on Undergraduate Research (NCUR),  
University of Kentucky, Lexington, KY, April 3-5, 2014

**Avery Wallace (14)**

**Sponsor: Kate Wittenstein, History**

Heritage Room, Session B

*"Pirates of the Caribbean: The Roots of Piracy's Popular Culture Representation in the English and Spanish Empire"*

On February 14th, 2014, Julia from Somerville, MA called in to On Point, a radio show



featuring the theme of piracy in the Caribbean, to ask about the methods of communications between pirates. More important than her questions, however, was her reason for calling. She confessed her interest in piracy was peaked after playing the video game Assassin's Creed IV: Black Flag set in the Caribbean in 1715 during the "Golden Age of Pirates." While piracy has become a pervasive theme in American popular culture, in Spain and Spanish America it has not flourished to the same extent. In order to account for this difference, this project traces the historical roots of piracy's representation through three hundred years of literature and examines the effects of the variances in historical context of the Spanish and English sources.

**Kayla C. Warner (14), Alecia K. Woods (14)**

**Sponsor: Lynnea Myers, Nursing**

Heritage Room, Session A

*"Students' Perceptions of Teaching and Education In The Role of A Registered Nurse"*

Service-learning is a practical, hands-on teaching and learning strategy which incorporates meaningful community service and reflection to promote personal growth, strengthen leadership skills, and enhance professionalism. Many studies reveal that service-learning enriches the learning of the student while benefiting the ones served, through community partnership and interaction. Service-learning aids nurses in developing and strengthening skills, providing the stepping stones to competent and high quality nursing care. The poster will highlight best practices in service-learning as they relate to future professional roles. One major component of service-learning is providing education to a population in need. Although a primary role of a Registered Nurse is to provide direct patient care, another critical role is patient education. Unfortunately, many RNs lack any type of training or experience in patient education. This poster will highlight results of teaching strategies in a community health course to expose students to the role of the nurse as an educator through service-learning experiences. The presentation will also highlight results of an innovative research project investigating the perceptions of students through reflections related to what it is like to teach and why it is important for a nurse to teach.

External Presentation: This research was included in a podium presentation with Lynnea Myers entitled "Engaging Students in Pediatric Nursing" at the 2014 National Conference for the National Association of Pediatric Nurse Practitioners in Boston, Massachusetts on March 14, 2014.

**Mikaela Warner (16)**

**Sponsor: Gaywyn Moore, English**

Heritage Room, Session B

*"How to Reject a Knight: Contortions of Unrequited Love"*

Though no longer formally practiced, chivalry and courtly love permeate our society. When dealing with unrequited love, a traditional chivalrous knight must channel his passions and contribute to society. British and American comedies reveal chivalry as a broken system

that does not value women or consent. The comedies that expose this Western trend include early modern English texts and modern American film, including Geoffrey Chaucer's *The Miller's Tale*, Ben Jonson's *Volpone*, *The Princess Diaries* film and the Nickelodeon T.V. series *iCarly*. Through deconstruction of these works we can see the darker side of comedy pointing out that rejection in the courtly context is easier said than done. When chivalry is misconstrued, sexual violence becomes the new custom in unrequited love.

**Helen Wauck (14)**

**Sponsor: Michael Hvidsten, Mathematics and Computer Science**

Heritage Room, Session A

*"Algorithms for Real-time Hand Recognition on the Raspberry Pi"*

The problem of recognizing hand gestures in real-time from a video feed has been thoroughly studied in the field of computer vision, but methods for real-time hand gesture recognition on low performance machines are scarce. In this work, we investigate several different algorithms for hand gesture recognition on a Raspberry Pi, a cheap computer with a low performance CPU and a relatively high performance GPU. We develop two different methods for hand gesture recognition on the Pi: image histogram comparison and contour comparison based on sample gesture images. For each of these two main approaches, we first implement a simple algorithm and a more sophisticated version. We then compare the speed and accuracy of all our algorithms to pick the approach that yields the best accuracy while still achieving real-time analysis.

**Brian White (14)**

**Sponsor: Anna Versluis, Geography**

Heritage Room, Session B

*"Assessing the Socioeconomic Impact of Sports Stadium Development for Thunder Bay, Ontario"*

Sports stadiums are built every year, and to many city officials, they are the answer to economic growth. If the metropolitan area is large enough to sustain such a large project, stadium development can increase aggregate demand, generate jobs, and have a positive affect on economy. In other cases, such major projects leaves an area blighted by an underused stadium, which takes up a lot of space and costs the city more money. With reports of stadium development for Thunder Bay, an assessment on if the metropolitan area will benefit economically from a new stadium is necessary. This study will compare and contrast recent sports stadium development in cities similar to Thunder Bay in terms of socioeconomic, demographics, transportation, and other characteristics. This study will assess if a new stadium development is economically suitable for the city of Thunder Bay.

**Kelsey Wiebusch (15)**

**Sponsor: Bruce Van Duser, Health & Exercise Science**

Heritage Room, Session A

*"Core Strength Training Does Not Influence Distance Running Performance in Collegiate Cross-*

## *Country Runners”*

Sato et al. (2009) reported that core training affected running kinetics, lower extremity stability, and 5000-meter run performance. The purpose of this study is to examine the effects of core strength training on distance running. Thirty Division III men’s college cross-country athletes were randomly assigned to a control group or a core strength training (CST) group. A parallel group design compared the differences in the dependent variables of run times and survey scores between the independent variables of core strength training and control groups. The CST group engaged in an eight-week core strength training program. The control group did no additional training beyond their normal cross-country workout regimens. The average of the first two and the average of the last two eight kilometer season race times were used as pre-test and post-test data. Surveys evaluating individual perceptions on running technique were administered after each of the four races. An independent t-test indicates no significant difference ( $p > 0.05$ ) in race time between the control ( $-0.30 \text{ minutes} \pm 0.32$ ) and the CST ( $-0.11 \text{ minutes} \pm 0.77$ ) groups. Results also indicate no significant difference ( $p > 0.05$ ) in survey scores between control ( $-3.60 \text{ points} \pm 6.27$ ) and the CST ( $-2.39 \text{ points} \pm 1.19$ ) groups. Based on the results of this study, core strengthening may not improve running performance and perceptions of running form, and coaches may not consider this type of training as beneficial. The ceiling effect for core strength in athletes may decrease the chance of observing differences in run performance.

External Presentation: National Conference on Undergraduate Research (NCUR),  
University of Kentucky, Lexington, KY, April 3-5, 2014

## **Miles Wilson (14)**

### **Sponsor: Anna Versluis, Geography**

Heritage Room, Session B

*“Effects of Aquatic Invasive Species on Minnesota Lakes and Economic Valuation of Species Removal.”*

An invasive species is defined as an organism or plant that is introduced into a new environment and upsets the food chain of the native flora and fauna. The arrival of such a species disrupts the native habitat in environmental, ecological, and economic ways. They can be introduced by natural range extensions or from human activity. These invasive aquatic species can have major impacts on the native ecosystem, which include loss in biodiversity, changes in ecosystems, and impacts to economic enterprises that are influenced by agriculture, forestry, fisheries, power production and international trade. Aquatic invasive species have become a major threat to Lake Minnetonka. It is the aim of this paper to investigate how much and what people are willing to do to treat or remove aquatic invasive species in the lakes they use. In pursuit of this goal the focus will be on the zebra mussel and their affect on Lake Minnetonka. By compiling a summary of the current data surrounding the issue, the question of what people are willing to do to control the problem can be addressed. Controlling invasive species to prevent these aforementioned detrimental impacts can be costly in terms of money and time with costs conservatively

estimated into the millions to billions of dollars per year, not to mention the countless hours.