

17th Annual Student Scholarship & Creative Achievement Day

Bemidji State University

Presentation Abstracts

Title of the Work: Nationalism Divides America: A Debate

Presenters: Anas AlQaed, Tristan Cofer, Cameron Earnest, Gabriela Lara, Daniela Maltais, Paris Thomas, Quinn Larson

Faculty Sponsor: Patrick Donnay

Abstract: Nationalism is an age-old concept that remains fundamental to the modern world of politics. However, it is not well understood and its role in the world is very controversial. Even in America, some argue it is an important unifying force while others contend that it divides us between competing images of what the United States stand for. We'll debate those perspectives and ask for the audience to contribute their input and evaluate who has won the debate. Audience voting will use the Socrative app available via the IOS App Store or via Google Play for Android devices. Attendees should consider downloading Socrative in advance of the debate.

Title of the Work: Kusyoka Maanzoni: The Struggle for Land Along the DWA Lines

Presenters: Sarah Anderson

Faculty Sponsor: Mark Lawrence

Abstract: In a globalizing world, Western ideologies and practices of boundaries and property ownership are often chosen for government processes. However, in many developing nations, such as Kenya, this leads to a tension between government and the people, because of traditional views of land that are disregarded by legal systems. The Kenyan government rewrote its constitution in 2010, in principle giving people more right to indigenous land. In Kibwezi Division, this has emboldened Akamba people amidst their decades-old struggle with the DWA commercial sisal estate. This presentation explores the reality local groups face in their fight for land, especially affected by political corruption, disregard for traditional land ownership patterns, inadequate surveying, and different perceptions of sense of place.

Title of the Work: Does the Use of Pedal-less Bicycles Improve the Balance and Stability of 6-10-Year-Old Children with Disabilities?

Presenters: Hillary Arechigo

Faculty Sponsor: Shannon Norman

Abstract: A Bertec Balance Plate was used to measure anterior, posterior, and lateral sway of the children. The children rode Strider pedal-less bikes 3 times per week for 20 minutes in duration for

each session. The children were tested at the end of each week for 4 weeks to determine if their balance or stability scores improved.

Title of the Work: What Kind of Constitutional Reform Will Work for the Red Lake Nation?

Presenters: Thomas Barrett

Faculty Sponsor: Patrick Donnay

Abstract: The Red Lake Band of Ojibwe is currently in the process of reforming their constitution and I investigate; "what kind of constitutional reform will work for the Red Lake Nation?" First, I present the constitutional and government history of the sovereign nation. Major political figures and socio-political events over the tribe's history will paint a unique cultural picture. Second, I present a history of constitutional reform throughout many different Native American nations in the United States and Canada. Every tribe is different in terms of landscape resources, traditions and culture, and nation-to-nation relationships with the U.S government. I research what has worked and what has failed when it comes to constitutional reform in Native nations. Third, I present research gathered from the Red Lake Constitution Reform Initiative to help determine what kind of reform we can expect to see. Some of the top priorities with Red Lake constitution reform include; Tribal Enrollment, Government Structure, Tribal Land Protection, and many more. Based on the tribe's government history, constitution reform in Native country, and the current reform initiative; I assess what kind of reform will work for the Red Lake Nation.

Title of the Work: Closing in on the Cultural Gap in Pop-Culture: A Sociological Adherence to Cultural Appropriation

Presenters: Kenneth Bentley

Faculty Sponsor: Carla Norris-Raynbird

Abstract: America is comprised of people from various nationalities and cultures. My research investigates some barriers by which some social groups are separated. I explore the ways in which American culture has become blended and how media affects our socialization process. My inquiry is rooted in the question: Do cultural influences affect perceived race relations between cultural groups? I explore what affect, if any, cultural appropriation has on those who are on the opposite end of the cultural spectrum. My approach seeks to neutralize cultural bias by using a framework of culture developed by Wendy Griswold. I use Hip-Hop culture and associated music as a stimulus and analyze student interpretive responses by applying the Griswold framework. My presentation will discuss preliminary results and the ways hip hop culture shapes reality around us. I will define cultural appropriation and address the notion of original appropriation. Finally, I will discuss ways in which cultural appropriation relates to popular media in the 21st century and the shaping of culture.

Title of the Work: Down the Spine of the Mississippi: Our Experience with Coastal and Community Restoration

Presenters: Christopher Boone, Jordan Morgan, Yunuke Nyanamba

Faculty Sponsor: Carla Norris-Raynbird

Abstract: With the ever changing, globalized, planet we occupy, we find that, increasingly, what occurs in one area of the world has a dramatic effect on another area of the world. In the case of this presentation, the same country. In this presentation we will attempt to explain the various connections between places so far in distance, and in culture, by way of a long, narrow body of water and how this brings the two places, Bemidji and New Orleans, together in ways many would not think to join the two. We will each approach varying issues in the presentation, from the cultural, traditional, historical, economic and political to the natural, medical and developmental traumas and attempt to hit on the same points so in that we display the connectedness of all these components as they relate to not only the cities but the importance to those who are residents of other areas of the Mississippi.

Title of the Work: What Influences, Outside of the Classroom, Determine a Student's Involvement in Student Organizations On-Campus?

Presenters: Christopher Boone

Faculty Sponsor: Carla Norris-Raynbird

Abstract: This research attempts to measure two factors in dealing with student involvement. The first factor, the influences in life (non-academically focused) that contribute to either high, moderate or low student organization participation, on the student's behalf. The second factor, a measure of the level of current student involvement and to what degree as a collective- the amalgamated student body. In this, the presentation will cover the varying priorities of the student. This allows for the exploration of what is important to students and what is not; what components at the university level need more attention, and what components do not. The second factor will focus on what students view as important, so as to provide a sense of "what would work" in terms of student organizational programming and what appeals and attracts the most number of students.

Title of the Work: Examining American Attitudes on the Use of Military Drones

Presenters: Todd Brandon

Faculty Sponsor: Patrick Donnay

Abstract: Recent polls have revealed that Americans of both the political left and right support the use of military drones. This statement stands true among groups who traditionally do not support the use of military force. I hypothesize that people of a more liberal persuasion will be more concerned with whether or not the drone program endangers innocent civilians, while those of a more conservative view will be more concerned with the legality of conducting military drone strikes. I analyze data obtained from the Pew Research Center to examine people's attitudes on military drone strikes via framing theory. My hypothesis has been partially supported by the data in that Democrats in general are more concerned with the risk of civilian casualties than Republicans. However, Democrats tend to show less concern overall with the drone program. This may be, in part, due to their political affiliation with President Obama and a partisan frame to the drone war.

Title of the Work: Humanitarian Intervention: Determining the Effectiveness of Outsourcing Humanitarian Intervention during Humanitarian Crises

Presenters: Clarissa Caola

Faculty Sponsor: Patrick Donnay

Abstract: At the end of the cold war, we witnessed a growing reluctance on the part of many national powers to intervene in international crises. This unwillingness allowed for the development of Private Military and Security Companies (PMSCs). PMSCs have been deployed to provide a wide variety of security-related functions including combat, logistics, training programs, and armed guarding of personnel and infrastructures. Exploring the concept of outsourcing these military functions, others have applied the idea towards addressing humanitarian crises. PMSCs may face fewer geopolitical impediments that can hinder the efforts of many state actors. In certain humanitarian crises PMSCs may better address human suffering. Through detailed case analysis, I have found that the deliverance of aid, even for PMSCs, depends on their compliance with the involved state's government. For example, focusing my research on the humanitarian crisis in Syria, it becomes apparent that President Bashar Al-Assad's leverage over aid deliveries is exacerbating issues within the country. Concluding that the principles PMSCs and NGOs must follow only allow them to work to the advantage of armed forces involved in a humanitarian crisis.

Title of the Work: Social Media and Political Engagement: Environmental Organizations, Social Media and Political Engagement

Presenters: Tyler Cate

Faculty Sponsor: Patrick Donnay

Abstract: Social media is becoming more important in today's digital society, but how effective is the use of social media when it comes to political engagement? How do environmental organizations use social media and is it effective at encouraging their followers to engage in online or offline political activity? I collected Facebook and Twitter data from ten environmental organizations to assess the effectiveness of each posting. I hypothesize that the groups making direct calls for action via social media receive a greater response, beyond clicktivism or slacktivism, than the groups that do not. The data includes the number of likes and shares for each organization's Facebook and Twitter page, as well as the content of each posting and whether or not the organization made a direct call for some sort of action. Tentative results show that, for most organizations, follower interaction increases when the organization makes a direct call to action. However, the social media interaction between a specific environmental organization and its followers seems to vary widely from group to group. These tentative results indicate support for my hypothesis, but also provide other valuable information about the use of social media and its impact on political engagement.

Title of the Work: A Nonintrusive Evaluation of Mammals in Hobson Forest

Presenters: Katy Dahl

Faculty Sponsor: Brian Hiller

Abstract: Two types of nonintrusive methods, scent stations combined with camera trapping, were used to gather data on mammals in Hobson Forest. These eight sites were used to determine visitation rates for five different scents: Wildlife Research Center's Paws and Claws, Wildlife Research Center's Ultimate Bear Attractor, Hawbaker's Beaver Lure, Hawbaker's Marten Lure, and Wildlife Research Center's Raccoon Lure #1. The study took place over a period of 12 weeks in Hobson Forest. The number of visitation per site was recorded for later analysis. I hypothesized visitations to increase for the less predatory scents such as beaver and raccoon. I suspected visitations to decrease for the more predatory scents such as Paws and Claws, bear, and marten. The results of this project will be used as baseline data for future management plans of Hobson Forest.

Title of the Work: Heart Rate Measures of Attention Help Predict Performance in a Mental Rotation Task

Presenters: Emily Ditsch, Maddison Olson, Ashley Toivola

Faculty Sponsor: Keith Gora

Abstract: Students are notoriously bad at predicting their exam performance, the worst performers often being the worst predictors. Sixty participants completed a mental rotation task, predicting performance before, during, and after the task, with heart rate recorded. Heart rate measures of attention to encoding and processing may offer a self-report alternative. Trials were divided into easy, medium, and difficult by varying degree and plane of rotation. Before, during, and after, participants predicted their performance. Three blocks of eight trials were presented, followed by an intervention, followed by two additional blocks of eight with heart rate measures of attention being recorded throughout the tasks. Gora and Myers (2015) found the worst predictors in a mental rotation task were the best performers, A and B-level participants significantly underestimating performance. Furthermore, only B-level students showed significant heart rate acceleration/processing during the task. C and D-level performers were guessing at chance and possibly not engaged in the task, showing little change in heart rate. The findings suggest two things: The more one knows about a task the better they will be able to predict their performance, and heart rate measures of attention could, with work, be used to predict performance in spite self-report.

Title of the Work: Artificial Waterfowl Cavity Nesting Structures and the Rate of Their Use in Beltrami County

Presenters: Ellie Dittes

Faculty Sponsor: Brian Hiller

Abstract: Artificial waterfowl nesting cavities were originally developed when the wood duck (*Aix sponsa*) population rapidly went down due to over hunting and habitat destruction. Widespread use of artificial nest boxes by government agencies and private conservation organizations resulted in recovery of wood ducks from near extinction. These nesting boxes also helped other waterfowl cavity nesting species such as the Golden Eye (*Bucephala clangula*) and the Hooded Merganser (*Lophodytes*

cucullatus). The Minnesota Department of Natural Resources (MN DNR) has placed approximately 500 artificial nest boxes around Beltrami County. In cooperation with the area MN DNR office, I surveyed 50 artificial nest boxes to determine the rate of use, productivity, and species composition of boxes being used. Results have showed that this year's numbers have been down, especially in Blackduck Lake Park, and increased in other areas such as Puposky Island compared to last year. Overall, this study will provide helpful information for the MN DNR to know what boxes are worth the maintenance and annual cleaning.

Title of the Work: Race and Gender and the Perception of Masculinity and Femininity of the American Political Parties

Presenters: Jessica Dulz

Faculty Sponsor: Patrick Donnay

Abstract: How Americans select and identify with a political party can have many different sources. One important source has been found to be the effects of gender and perceptions of masculinity and femininity on party identification. I look deeper into this phenomenon to analyze the effects of race on the perception of masculine and feminine traits within Democrats and Republicans. In order to study this, I analyze 2012 American National Election Study (ANES) data. I hypothesize that among whites the results will be similar to previous studies which found Republicans to be much more favorable of masculine traits and Democrats to favor feminine traits. However, given the strong Democratic leanings of African Americans, I anticipate my results to show that African American individuals do not apply gender aspects of masculinity and femininity nearly as much as white individuals. If this is confirmed, it suggests that gendered interpretations of the political parties are also subject to racial filtering.

Title of the Work: A Study of Consumer Motivations Behind Shopping the Used Merchandise Sector

Presenters: Austyn Eng

Faculty Sponsor: Kelly La Venture

Abstract: The purpose of this study was to learn more about the motivations of consumers who shop the used merchandise sector. To accomplish this end, three university students conducted an extensive literature review, designed and administered a survey using the VALS framework, and analyzed and reported the data to a community client. The VALS framework segments US adults into eight distinct types or mindset using a specific set of psychological traits and key demographics that drive consumer behavior. The framework illustrates eight types and two critical concepts for understanding consumers' primary motivation and resources. The survey was designed to combine motivations and resources in an effort to determine how a person would express himself or herself in the marketplace as a consumer. 100 surveys were distributed at seven local business classified within the used merchandise sector. 100 surveys were completed for a 100% response rate. Using a survey method, students were able to collect data to learn more about the motivations of consumers who shop the used merchandise sector.

Title of the Work: The Effect of Organizational Commitment on Employee Theft

Presenters: Vicky Filer

Faculty Sponsor: Carla Norris-Raynbird

Abstract: My research focuses on the possibility that higher levels of organizational commitment may decrease the amount of employee theft. Employee theft accounts for a fifty billion dollar a year loss for businesses. The majority of research on employee theft has focused on what provokes people to steal. I will use several areas of research on employee theft including history of and several great studies done by Hollinger in the 70s and 80s. Theft will be measured with an organizational deviance scale survey developed by Bennet and Robinson (2000). My examination has covered a variety of research on organizational commitment comparing several other variables such as: turnover, behavior, and production. An organizational commitment questionnaire developed by Lyman W. Porter will be used to measure the level of engagement (a proxy for commitment) an employee has toward the company he works for. By obtaining this information on theft and engagement it will be possible to compare and assess any potential relationship. The research and surveys will assist me with testing my hypothesis: Organizational commitment is inversely associated with workplace theft.

Title of the Work: Say My Name (or Not): The Significance of Not Naming Grendel's Mother in the Epic Poem Beowulf

Presenters: Casey Fisher

Faculty Sponsor: Larry Swain

Abstract: Within the poetic tradition of the epic poem, a strong emphasis is frequently put upon the choice of names of characters. Within the epic poem Beowulf, this importance can be seen readily. But, there is a reverse to this pattern. This lack (either conscious or unconscious) has just as much weight and importance. Grendel's Mother is the non-named entity in Beowulf. Yet, she is given an impressive amount of time within the epic poem. She is a woman with agency - controlling her life and ruling over her monster horde within her mere-hall. It is possible that the author uses the lack of naming Grendel's Mother as a punishment and a warning. I will argue in this paper that Grendel's Mother (along with all that she rules over) is not named because she is in direct conflict with the norms of the society within the poem (specifically the Danish society) as well as with the society during which this poem would have been written down; and because of such conflict, she is made out to be the antagonist to the title character and his "normal" society.

Title of the Work: Habits, Goals, and Motivation: Gender Differences Pertaining to Exercise

Presenters: Kayla Forcier

Faculty Sponsor: Christina Kippenhan

Abstract: The purpose of this study is to examine the differences between male and female patrons at Bemidji State University's Gillett Recreation Fitness Center regarding exercise habits, goals, and motivation and to see if their exercise habits are consistent with their goals. 42 female and 51 male patrons volunteered to answer a survey using SurveyMonkey on provided tables during a week in November 2015. The survey contained questions about the following information: demographics; goals/reasons, mode, and duration of exercise, as well as the BREQ-3. The data will be analyzed to

answer the following research questions: What are the gender differences pertaining to motivation of exercising? What are goal differences between genders? What types of different exercise habits exist between genders? How do these habits relate with the goals of each individual/gender? Data analysis so far indicates that the majority of respondents (about 60%) were college students between the ages of 18 and 24. The general goal for both genders is to be healthy. Using the weight room was the highest space utilization for men whereas women were close using the weight room and cardio equipment almost the same amount of time.

Title of the Work: Assembly Line Balancing Using Linear Programming

Presenters: Leandro GomesAguiar

Faculty Sponsor: Mahmoud Al-Odeh

Abstract: Improving the output of an assembly line is one of the goals that all factories try to achieve. Many problems and issues restrict factories from achieving this goal, including unbalanced assembly lines. Unbalanced workload among workstations and employees causes performance losses due to excess capacity and hiring more workers than necessary. In order to improve resource utilization assembly line balancing techniques have been used. Achieving balanced lines help organizations to boost productivity by reducing the cycle times, and providing a better environment for the workers, due to the balanced workload. Some companies try to balance their lines using only the expertise of experienced engineers. However, this approach usually leads to non-optimal solutions. The use of linear optimization algorithms, on the other hand, has proven to be a good technique for line balancing. Linear programming has been successfully used to minimize the cycle time or the number of stations/workers in many assembly lines. This research aims to show the process of implementing linear programming techniques to balance mixed-model assembly lines. The results of the implementation will be shared with the attendees.

Title of the Work: The Awareness and The Utilization of the Earned Income Tax Credit (EITC)

Presenters: Theron Granbois

Faculty Sponsor: Sandra Kranz

Abstract: The purpose of this research is to see how the Earned Income Tax Credit (EITC) was and is being used by people who received the refund in the current and previous years. The EITC is a refundable tax credit that was enacted in the 1970's to help encourage low-income people to work or to stay working a job. A huge misconception is that people who receive this credit don't have to work to receive it. Legislation is always being introduced that would decrease the credit or get rid of it altogether. Through my research I tested this misconception with a nine question survey that helps to identify taxpayers who claim the credit and how they spend the refund they receive. I learned through my research that the EITC is primarily being used the way Congress intended for it to be used when it was enacted in the 1970's. This research will help to identify methods to improve the EITC to make it more efficient and effective.

Title of the Work: Lacan and the Artist: Reflecting on Dorian Gray

Presenters: Zachary Hanson

Faculty Sponsor: Jessica Durgan

Abstract: In Oscar Wilde's *The Portrait of Dorian Gray*, the titular character experiences a great deal of dramatic changes in character and personality upon seeing an artistic depiction of himself. This shift seems to be somewhat reflective of Jacques Lacan's Mirror Theory as a function of identity development. However, one key aspect that differentiates the experience presented in Lacan's theory and that of Wilde's protagonists is that the use of art as a mirror, which in Wilde's work seems to present a more accurate depiction of the individual than the mirror. This presentation will focus primarily on how Lacanian theory can be applied to create a new reading of *Dorian Gray*, but will also focus on the differentiation between the portrayed reality which art presents versus the distorted reality in Wilde's novel.

Title of the Work: Walking in Two Worlds: American Indian College Student Transition

Presenters: Deanie Hatch, Janelle Johnson, Michelle Wiuff

Faculty Sponsor: John Gonzalez

Abstract: American Indians are the most underrepresented group in higher education. Therefore, understanding the American Indian college student experience in a higher education settings is important. In this study, we will partially test a developmental theory on American Indian College Student Transition (Schooler, 2014) using the Native American Collective Orientation & Pursuit in Education scale (NACOPE; Thompson, Johnson-Jennings, & Nitzarim). The NACOPE scale measures separation & alienation, community connections, and individual success. Results will be discussed in relation to the University environment at BSU and measures of academic success.

Title of the Work: Controlled Aggregation and Impact on the Photophysics of an Organic Light Harvester

Presenters: Joshua Hatton

Faculty Sponsor: Annie Ricks

Abstract: Phthalocyanines, first discovered in 1907, are commonly used as a dye in many products. Currently, there is ongoing research looking into its use as a thin film for use in solar cells. In solution it has favorable properties for use in a solar cell but it loses them as a solid. Using UV/Vis and transient absorption spectroscopy we see how a phthalocyanine aggregates and how that changes the photophysics of the molecule.

Title of the Work: Silver Compounds and Their Use in Dentistry

Presenters: Jordan Horst

Faculty Sponsor: Mark Fulton

Abstract: The field of dentistry uses several different types of treatments to assist patients in dealing with tooth decay, and one branch of these treatments is the use of silver compounds. Silver has been used in various forms for over 100 years, and as technology has advanced, increasingly effective uses

for this element have been developed. This presentation will provide an analysis of these techniques and an investigation of the positive and negative aspects of each. It will also explain what exactly makes silver a useful component in treating dental issues. The specific situations in which silver is such a useful aspect of treatment will also be included. The information used for this presentation will be found by researching various peer reviewed journal articles with information that is relevant to this topic.

Title of the Work: Pelicans Foraging on the Tamarack River

Presenters: Kristin Huber

Faculty Sponsor: Richard Koch

Abstract: The walleye fishery in Red Lake, Beltrami County, MN, is important to local economy and tribal culture. In recent years, this fishery has been tumultuous and its longevity is the subject of much concern. Most recently there is concern that pelicans feeding in the main tributary (Tamarack River) are having a negative impact on Red Lake walleye populations and spawning behavior. To assess the extent of pelican feeding, several trail cameras were set in 2 locations along the Tamarack River from April 20 to May 16, 2016. Images were recorded in sets of 3, at 5 minute intervals. A total of over 17000 images were analyzed for pelican counts and specific behaviors. Pelicans were found to do all of their foraging at night and in large groups. Expanding current knowledge of nocturnal foraging by pelicans will allow managers to more effectively assess the impact of pelicans on fish stocks, especially those associated with increased activity during low light periods. Furthermore, should pelican predation on the Red Lakes ever reach the point where it is deemed necessary to reduce, knowledge of pelican foraging behavior in the system will help managers implement the most effective and efficient mitigation strategy.

Title of the Work: Quantitative Analysis of HUVEC Cell Transfection by Flow Cytometry

Presenters: Nicholas Hudson

Faculty Sponsor: Michael Hamann

Abstract: HUVEC cells are often used as a model for understanding endothelial cell function in angiogenesis, and it is known that the Rho GTPase TCL regulates some of their functions in this process. To better understand how TCL regulates angiogenesis in HUVEC cells it would be useful to alter TCL gene expression in these cells. Lipofecting reagents are often used to delivery exogenous genes into HUVECs, however, they require optimization particularly for HUVEC cells as they are difficult to transfect. Optimal HUVEC transfection was found by incremental changes to transfection reagents. HUVEC cell transfection was evaluated using a fluorescent protein containing plasmid. Fluorescent cells were quantified using flow cytometry. Results indicated that increased concentrations of transfection reagents had a detrimental effect on HUVECs, while a minimal concentration provided a transfection efficiency of over 40%.

Title of the Work: Merging Lighting Technology with Business Advertisement

Presenters: Brent Humenik

Faculty Sponsor: Mahmoud Al-Odeh

Abstract: Advertising and entertainment technology is a wide market that is integral for creating a market for various products. Marketing success has often been achieved by lights and/or a visual display that draws a customer in, creating a WOW factor. In general, my project would not only provide a product to create WOW factor but also find a lightweight affordable product. The Infinity mirror has always been a great idea to amaze and draw the eyes of potential customers to pitch a product. It is a visual explosion that people not only want to see in advertising but also want to bring into their homes. I have created the basis of a product that could have all the potential to bring them home. Using four plates, a mirror, a two-way mirror and a tri colored led light strip with remote, this simple yet versatile way to produce a lightshow at your home or office would be a hit. In summery you can create your own tailored lightshow that attracts customers, is lightweight and versatile.

Title of the Work: A Study of Workplace Civility

Presenters: Lisa Kittleson

Faculty Sponsor: Kelly La Venture

Abstract: There have been increasing cases of incivility, bullying, social undermining, harassment, emotional abuse, and even workplace violence in higher education institutions. This can lead to increased workers' compensation cases, increased utilization of employee assistance programs, absenteeism, deviant behavior, organizational dishonesty, turnover, reduced product quality, poor customer service, and loss of employee engagement. These are critical concerns for administers of higher education institutions. Three university students were also concerned with the implications for the learning environment, and thus, became interested in exploring this topic. Using a semi-structured flexible interview script, three marketing research students conducted 30-60 minute interviews with 8 mid-level, senior-level, executives, and Cabinet members at one Midwestern university. Specifically, the purpose of the study was to explore how incivility impacts the workplace environment at one Midwestern university. Data indicate incivility had negative implications for the student learning environment, individual and departmental performance, and working relationships. Data also indicate study participants understand the implications of incivility in the workplaces, approach incivility issues seriously, and had ideas for improving on these issues. While a small sample was interviewed for this study, the findings are important. Also, by selecting exploratory research, the groundwork has been set for future studies of workplace incivility.

Title of the Work: Palmitoylation of Na⁺- H⁺ Exchanger Isoform I (NHE1) as a Novel Regulator of Metastasis in Non-Small Cell Lung Cancer

Presenters: Amanda Kooiker

Faculty Sponsor: Mark Wallert

Abstract: Activation of invasion and metastasis has long been recognized as the predominant hallmark of cancer. As malignant tumors develop, they are initially defined as cancer in situ, tumors in place, that have not spread to surrounding tissues. Cell from these tumors then active invasion and

metastasis to spread to surrounding tissue and throughout the body. The Na⁺- H⁺ Exchanger Isoform 1 (NHE1) is a key regulator in cell migration and therefore a key driver of invasion and metastasis. NHE1 moves to the leading edge of migrating cells to coordinate changes in both the intracellular and extracellular environment to regulate cell movement. We have identified for the first time, that NHE1 undergoes reversible palmitoylation, the addition of a palmitic acid residue to the cytoplasmic regulatory domain of NHE1. We hypothesize that this process will help NHE1 be targeted to the leading edge of migrating cells during invasion and metastasis and may provide a potential therapeutic target for cancer treatment. We will present the data demonstrating palmitoylation of NHE1 and the impact that blocking palmitoylation has on cell migration.

Title of the Work: Chinese Housing Registration (Hukou): Bridge or Wall

Presenters: Andrew Kryshak

Faculty Sponsor: Patrick Donnay

Abstract: In 1958 the Chinese government created the hukou housing registration system to control the migration of Chinese citizens from rural to urban areas. A person's hukou has major implications on their lives, it controls food rations, medical benefits, quality of education, as well as movement within the country. I look to answer the question of whether the hukou can be seen as a bridge with which individuals achieve socially, or is it better seen as a wall that prevents social advancement. This has been a question that researchers have been looking into for many years but there has been no concise answer. I analyze data from the Chinese Household Income Project in efforts to answer this question. My results show that social mobilization varies across different regimes of Chinese economic and political leadership. During the Cultural Revolution for example, there was a drastic decrease in the number of citizens obtaining an urban hukou by going to college. In summary, the answer to the bridge or wall question depends upon the regime and the socio-political system that is in place.

Title of the Work: Effects of Three Grassland Management Regimes on Small Mammal Preference of Vegetation Height/Density Using Spatial Analysis on Grand Forks Air Force Base, North Dakota

Presenters: Lynda LaFond

Faculty Sponsor: Jeffrey Ueland

Abstract: Small mammals response to vegetation is associated with density and height of available cover; different cover types provide varying levels from predation protection during foraging. Using vegetation height/density readings obtained with a Robel pole, an analysis of vegetation characteristics and cover available to small mammals will be accomplished using spatial analysis. The three land management areas being compared on Grand Forks Air Force Base are a restored native tallgrass prairie, an old field, and a hay field. Vegetation characteristics and small mammal distribution within each land management area during June, July, and August 2014-15 provide information to answer my thesis questions: how does land management affect vegetation and how does vegetation affect small mammal distribution?

Title of the Work: Hmong Motivations for Political Mobilization

Presenters: Muajkoob Lee

Faculty Sponsor: Patrick Donnay

Abstract: The Hmong migrant group is one of the fastest growing populations within the Mid-West region and they have become a prevalent force within the American electorate. However, little research has been conducted on the uniqueness of the Hmong migrant group, too often they are studied under the pan-ethnic term "Asian." With much research on the general category "Asian" the Hmong have become overshadowed. I investigate what motivates the Hmong to vote in the American elections. I study a variety of characteristics such as socio-economic status, context, identity, or their social network. I study this through interviews with a sampling of Hmong Minnesota residents of varying age and background. These interviews revealed Hmong political mobilization is attributable to a civic identity with the United States that includes a sense of "rights" and duty to vote.

Title of the Work: The Differing Effects of Domain Knowledge on False Memories

Presenters: Cody Lieser, Chase Meidinger

Faculty Sponsor: Travis Ricks

Abstract: These experiments explored when domain knowledge protects or makes individuals vulnerable to false memories. Participants studied five Deese-Roediger-McDermott (DRM) lists, a list of Major League Baseball (MLB) teams, and a list of National Football League (NFL) teams. After presentation of the seven lists a recall test was administered followed by a recognition test. Participants then completed an assessment of their baseball, football, and general knowledge. Independent of general knowledge, sports knowledge negatively and positively predicted false recognition and recall of sports, while having no effect on false recognition and recall of DRM lures. Depending upon characteristics of the memory task, high sports-knowledge participants were more or less prone to false memories for sports-related information compared to low-sports knowledge participants. We provide a possible theory of how domain knowledge can make individuals more or less vulnerable to false memories.

Title of the Work: Demand CS: Why We no Longer Demand this Pesticide

Presenters: Natasha Lukacs

Faculty Sponsor: Erika Bailey-Johnson

Abstract: Demand CS is a pesticide that is used by the University. Pesticides frequently have environmental consequences that need to be reflected upon. Demand CS is highly toxic to aquatic life, and being so close to Lake Bemidji, many people began to question how Demand CS could be affecting the environment around them. In an attempt to make Bemidji State University better environmental stewards, the Environmental Advisory Committee and the Sustainability Office worked extensively on eliminating the use of this pesticide. Personally I learned a lot about pesticides, Demand CS, and spiders. My presentation will inform others about the chemical, and how BSU has become more aware of the ways in which the chemical is being administered around the campus.

Title of the Work: Victorian Noir
Presenters: Cody Madison
Faculty Sponsor: Jessica Durgan

Abstract: When the word "detective" is brought up in literary circles, many critics would probably point to Sir Conan Doyle's Sherlock Holmes as the precedent for modern decisions concerning the mystery genre. However, before the inception of Scotland Yard's wunderkind, Mary Elizabeth Braddon's obscure novel Lady Audley's Secret introduced audiences to many of the tropes we see in detective fiction today. I will discuss Robert Audley, the protagonist of Lady Audley's Secret, in his role as a gentleman detective, analyzing how his character evolves from incompetent playboy into serious crime-solver. Lady Audley's role as an early predecessor to the femme fatale trope of detective fiction bears analysis as well and how her role as a dangerous woman influences the plot. I will also touch upon the subject of other detectives in the era that Braddon was influenced by or influenced with her representation of the gentleman detective.

Title of the Work: Students Without Borders: The Educational Transition Faced by International Students in America.
Presenters: Daniela Maltais
Faculty Sponsor: Marsha Driscoll

Abstract: The goals of many institutions are to bring new social dynamics to their education system, as well as increasing diversity and differentiation within and between institutions. One area through which this goal is reached involves the International Student Programs across the nation. For one moment imagine the willingness and sacrifices made by these students and their families. Leaving behind a way of life, they thrust themselves into a different culture and furthermore, a different mentality. Making the transition process even more complicated is the fact that most educators fail to take into account important facts, such as that 1) English is their second language and 2) the different methods to teach critical thinking skills and most importantly, to express them in writing. The mindset and engrained educational principles of these students cannot be dismissed. Even though they have a fluency in English, they lack the years of foundation building, particularly in the areas of writing. The writing courses they are required to take as International students should shift their focus to not only build the area of comprehension, but also the psychology behind writing with an emphasis on the cultural component.

Title of the Work: Fossil Fuel Free Ice Fishing House
Presenters: Tyler Massey, Randall Riehl
Faculty Sponsor: Timothy Brockman

Abstract: Tyler Massey is pleased to submit this proposal for service learning to support the Sustainability Office at Bemidji State University. Bemidji State University Sustainability Office, has a well-deserved reputation for minimizing the schools environmental impact on future generations. The goal was to provide a solar technology experience to Bemidji State University students by building a fossil fuel ice house. Design the inside of the house to best utilize the space for an ice fishing experience. Practice the sustainable concepts of Reduce, Re-Use, and recycle. Bring educational

business resources together to make this project possible. I had over a hundred hours of my own time as the project manager for the construction of the inside of the ice house. I would like to demonstrate the use of all the resources, off campus and on campus in the Department of Technology, Art and Design that were utilized in the construction phase. We have partnered with several small businesses and other schools to make this vision become a reality in developing a fossil fuel ice fish house.

Title of the Work: Weigh the Waste: Reducing the Amount of Food and Containers That End Up in the Garbage

Presenters: Caitlin McClellan, William Shippen

Faculty Sponsor: Erika Bailey-Johnson

Abstract: This year the BSU Sustainability Office and Aramark partnered to hold a Weigh the Waste campaign on campus. Food, liquid, and container waste was sorted and weighed before and after an educational program to encourage waste reduction efforts in dining halls. A pilot was run during fall semester in Lakeside, and it was noted that the garbage cans would have to be removed from the area to get an accurate measurement. During spring semester, both pre- and post- audits were conducted in Lakeside and Wally's. Come to this session to learn the recommendations and results of these efforts!

Title of the Work: Applying Complexity to Promote Positive Learning Environments and Student Success

Presenters: Ashleigh Meckle

Faculty Sponsor: Marsha Driscoll

Abstract: Although the study of complexity and formulation related theories have been developing at a rapid pace since the late 1900s, the field of education has remained relatively untouched by such studies. Perhaps one of the driving factors which has left the American education system fairly unaffected is the inherent nature of complexity itself. Entirely complex classrooms and learning communities would require great flexibility with nearly infinite acceptable outcomes. No doubt, such a classroom is unrealistic. In today's world of standardized testing and quantitative instruction, the US education system is making changes trending toward breaking subjects into individual pieces and incentivizing mastery of a particular knowledge or skill set. Fundamentally, the structure of the American education system is often at odds with the subjectivity and myriad possibilities that would emerge in a setting focused on complex pedagogies, and resolving this discrepancy is a burden left to educators. However, little information is directly available to discuss how educators can best prepare themselves to create complex learning environments. By implementing the growing science of complexity theory in everyday classroom settings, educators have greater probability in creating classroom success and return to the job year after year.

Title of the Work: The Self-Efficacy of Defensive Pessimism

Presenters: Megan Millmann

Faculty Sponsor: Marsha Driscoll

Abstract: This research is designed to determine whether or not individuals using defensive pessimism have a high self-efficacy for their ability to employ the strategy successfully. Self-efficacy theory states our expectations determine the amount of effort one will expend and the degree to which we will persevere, therefore if we perceive our efficacy as either high or low we can predict whether or not success will be obtained. Defensive pessimists however, do not become derailed in persistence of their goal despite adversities and low self-efficacy. 172 college students completed five different assessments presented in random order measuring defensive pessimism and academic self-efficacy. Results are expected to find individuals scoring high in defensive pessimism and low in academic self-efficacy to score high in strategy self-efficacy, whereas individuals scoring low in defensive pessimism and academic self-efficacy will score low in strategy self-efficacy.

Title of the Work: Take Off the Stigma

Presenters: Zachary Mitchem

Faculty Sponsor: Kate Larson

Abstract: Stigma is a form of negative labeling of people with mental illness and discrimination against them. Every day people from all around the world judge things that people do and say without the understanding the debilitating effects of mental illness. There are many misconceptions about mental illness and the aim of our video is to show that the one thing everyone has in common is being human, and everyone deserves to be treated as such. My group members and I, in order to bring awareness to the real discrimination that takes place every day against those with mental illness, made a video to help raise awareness for those who suffer from mental illness.

Title of the Work: Imagining a Tomorrow with a Fossil Fuel Free Endowment

Presenters: Jordan Morgan

Faculty Sponsor: Anna Carlson

Abstract: Divestment is a growing global movement started by a small group of undergraduate students at Hampshire College in 2011. These students asked their foundation to remove their investments in fossil fuel companies, and reinvest their money into socially responsible companies. Since their humble start, the Divestment movement has rapidly grown. Just five years later, there are currently over 500 institutions who have committed to divesting over \$3.4 trillion. Their message was clear: "fossil fuel investments are a risk for both the investor and the planet." Considering Bemidji State University's core fundamental value of Environmental Stewardship, should Bemidji State University join this swiftly growing movement and invest our endowment into fossil fuel free funds?

Title of the Work: Assessing the Long Term Retention of Environmental Knowledge, Attitudes, and Behavior

Presenters: Jordan Morgan

Faculty Sponsor: Carla Norris-Raynbird

Abstract: Bemidji State University students are required to take the course People and the Environment to satisfy goal area 10 of their liberal education requirements. Yet, how well do BSU students retain the environmental knowledge, attitudes, and behaviors that they learn in this course? My Senior Capstone Research projects aims to determine students' retention level after one, two, three, or more years have passed since a student has completed the course People and the Environment.

Title of the Work: The Bannock Street Project: The Failed Project of the Midterm Election

Presenters: Sean Murphy

Faculty Sponsor: Patrick Donnay

Abstract: The Bannock Street Project was an effort by the Democratic Party during the 2014 congressional elections, to offset the Midterm Dilemma. The Midterm Dilemma is the focus of many theories trying to assess why the president's party tends to do poorly during the midterms. The Bannock Street project failed and as a result the Democrats lost control of the Senate in 2014. I attempt to discover why the Democrat's project failed, and if its failure can be attributed to either The Surge and Decline Theory or The Negative Voting Theory. I use 2014 Pew Center election data to analyze the question. I expect to find that the Negative Voting theory was the major factor in the 2014 midterm shift in power, and furthermore that the Bannock Street Project was not designed to combat this theory. This research can help us better understand American voting habits, especially in midterm elections.

Title of the Work: Contrasting the Sensitivity of Glacial and Bedrock Aquifers in Blue Earth County, Minnesota

Presenters: Rosalyn Nelson

Faculty Sponsor: Melinda Neville

Abstract: Aquifers are a major source of drinking water in Minnesota, however many aquifers are at risk of contamination from chemicals and fertilizers which may leach in from the overlying soil and strata. We examined glacial and bedrock aquifers in Southeastern Minnesota and contrasted contamination resistance in unconsolidated and consolidated aquifers. Contamination resistance may rely on factors such as depth to the aquifer, mineral composition of the geologic layers, and the porosity of the aquifer material. To compare unconsolidated and consolidated aquifers we reviewed information from the Minnesota Department of Natural Resources about the sensitivity of different surficial and bedrock geology formations to nitrogen (N) and phosphorus (P) infiltration. We are focusing on Blue Earth County as our test bed to correlate N and P concentrations in groundwater with the type of aquifers present. Blue Earth County is well suited because aquifer surveys have been mostly completed, and both unconsolidated and consolidated aquifers are present and monitored. Based on previous works, we hypothesize that aquifers with unconsolidated sediments will have

greater concentrations of N and P. We will contrast the spatial distribution of these two analytes in groundwater with the predicted sensitivity of each aquifer.

Title of the Work: Do Personality Factors in Depressed Individuals Deter Self-Harm Behaviors?

Presenters: Hallie Olsen

Faculty Sponsor: Marsha Driscoll

Abstract: This study will look at depressed and non-depressed individuals to see if certain personality factors show up in people who engage in self-harming behaviors and other factors show up in people who do not engage in self-harming behaviors. The data will be collected through several surveys conducted on Bemidji State University students. The data will then be analyzed using t-tests, and a multiple regression through the SPSS system. It is expected that we will find that depressed individuals who engage in self-harm have traits such as openness to experience and neuroticism and depressed people who do not engage in self-harm have traits such as conscientiousness and agreeableness.

Title of the Work: Issue Networks: The Cyber-Industrial Complex

Presenters: Connor O'Malley

Faculty Sponsor: Patrick Donnay

Abstract: When Edward Snowden released a massive trove of classified files from the National Security Agency, the world became aware of numerous global surveillance systems. As Snowden hoped, a global dialogue began concerning surveillance, privacy, and government transparency. While there was a lively discourse surrounding the leak and Snowden, another story was missed. Snowden was not an employee of the NSA, rather he was an employee of Booz Allen Hamilton, a private contractor maintaining computer systems for the NSA. The deeper story here is the emerging relationship between government agencies and technology companies. I discuss the theory of iron triangles and issue networks, specifically the issue networks within the United States intelligence community. The aim of an issue network is to shape policy outcomes; therefore, I examine the connection between Congress, intelligence agencies, and the private companies involved in the cyber-industrial complex. I hypothesize that senators receiving campaign contributions from intelligence contractors are more likely to vote in favor of surveillance activities. I use campaign data from the Center for Responsive Politics from 2009-2014, and Senate votes during the 114th Congress. My findings show there is a complex relationship between lobbying, intelligence spending, and the voting behavior of the Senate.

Title of the Work: Effects of Equine-Assisted Psychotherapy on Individuals with Severe and Persistent Mental Illness

Presenters: Timothy O'Neil

Faculty Sponsor: Angela Fournier

Abstract: This study focused on improving optimism and self-efficacy in individuals with Severe and Persistent Mental illness (SPMI), through the use of equine-assisted psychotherapy (EAP). Individuals (N=12) were given both the Life Orientation Test and the General Self-Efficacy Scale in a pretest/posttest format, and interaction between the humans and horses was recorded using the human-animal interaction scale for each session (N=6). We predicted that both optimism and self-

efficacy would be higher at posttest, and that human-animal interaction would increase throughout the sessions. Although later sessions did include more human-animal interaction than earlier sessions, it cannot be determined whether this was due to changes within the individual, or the unique nature of the sessions themselves. Self-efficacy was unaffected by the EAP group treatment; while optimism levels were slightly higher, the results were not significant. The findings could be attributed to low sample size, a ceiling effect, or inconsistent attendance. Future research should incorporate additional dependent measures and incentives to encourage attendance.

Title of the Work: Survival of Walleye Eggs in Upper Red Lake and the Tamarac River

Presenters: Phillip Oswald

Faculty Sponsor: Andrew Hafs

Abstract: Data about walleye egg survival in the lake and river is lacking. Mesh cages were placed in both the Tamarac River and Upper Red Lake to compare survival rates. Twenty cages were set, ten in the river and ten in the lake. Each cage contained one hundred fertilized eggs which were checked every third day to measure survival. Temperature ($\sim\frac{1}{2}^{\circ}\text{C}$), dissolved oxygen (mg/L), and pH were measured at each location. The river had an average survival rate of 22% and the lake 8%. There was a significant difference in survival rates between the lake and river ($p = 0.007$), meaning that the river in the spring of 2015 was more suitable for walleye egg survival. Temperature did not differ significantly between the lake and river ($p = 0.12$) and therefore was not a likely cause of differences in egg survival. Dissolved oxygen significantly differed between the lake and river, ($p = 0.004$) however, it likely had little influence on survival because dissolved oxygen levels were in the optimal range for egg survival throughout the study in both systems. The lake had a lower survival rate than the river likely resulting from a higher average pH ($p < 0.001$).

Title of the Work: Transcendence of e

Presenters: Carah Pearson

Faculty Sponsor: Eric Lund

Abstract: While everyone knows about rational and irrational numbers, prime numbers and so forth, mathematicians make a further distinction between the so-called algebraic numbers and the transcendental numbers. Although it is straightforward to define and find many examples of algebraic numbers, it is much more challenging to prove that transcendental numbers actually exist! In this talk we will review all of these types of numbers, look at some examples, and prove that the important mathematical constant e is transcendental.

Title of the Work: Tree Trunk Lichens of Hobson Forest: Inventory and Habitat Preferences

Presenters: Mindy Phillips

Faculty Sponsor: Mark Fulton

Abstract: Lichens are symbiotic organisms composed of a fungal holdfast and an algal photosynthetic partner. These unique organisms can occupy a multitude of environments and are often important indicators of succession, forest health, and air quality. In this study, I will survey Hobson Memorial Forest lichen species found on tree trunks. The survey will be completed by a randomized plot distribution constituting a representative sample of forested areas within Hobson Memorial Forest. At each plot, trees with diameters greater than 5 cm will be surveyed at a height of 150 cm from tree base using a ladder quadrat at four cardinal points on the trunk. During surveying, reference samples will be

collected for an herbarium repository. Data will be analyzed to determine if patterns in data indicate habitat preferences exist.

Title of the Work: The Intermediate Value Theorem - An Extension to Functions of Two Variables

Presenters: Victoria Riebe

Faculty Sponsor: Eric Lund

Abstract: The Intermediate Value Theorem is one of the central results from the first semester of calculus. Students are typically introduced to the IVT and various simple applications of it in terms of real-valued, continuous functions of a single real variable. In this talk we present an extension of the IVT to functions of two real variables. The extension is carried out using topological techniques; counter-intuitive applications to such areas as meteorology are presented.

Title of the Work: Reducing Math Anxiety in the Secondary Classroom

Presenters: Haley Scheldorf

Faculty Sponsor: Todd Frauenholtz

Abstract: Research and information on reducing math anxiety in secondary classrooms will be presented in this session. The presenter is completing her Honors Thesis on the topic of math anxiety and will share her findings. This presentation will define math anxiety. Then give an overview of the research on math anxiety in middle and high school students in the United States. Including causes of math anxiety along with methods and strategies to help reduce math anxiety in middle and high school students.

Title of the Work: Teaching Deviance

Presenters: Justine Scheller

Faculty Sponsor: Carla Norris-Raynbird

Abstract: During my research on deviance, I have created a survey for people between the ages of 18-23. This survey seeks to understand how the concept and actions associated with deviance are created. I explore the research behind parenting styles and peer association, and which one holds a greater influence on the individual. The survey asks a series of questions on the individual, family and friend history and current life style. It is designed to filter out the common theories of what causes deviance and break down the life style choices of each individual. During the survey I also ask each participant to define and give explanations of what they believe deviance is, allowing myself to better understand the wide variety of the deviance definitions.

Title of the Work: Quality Improvement Using Scrum Techniques

Presenters: Gary Skoog

Faculty Sponsor: Mahmoud Al-Odeh

Abstract: Organizations are using different techniques to save time, remove waste, and cut cost to be able to compete in the competitive market. This presentation aims to explain the process of improving quality using scrum techniques. The methodology of scrum comes from the rugby term for a

scrimmage and is said to be the art of doing twice as much work in half as much time. Scrum works on the principle of dividing a complicated workplace project into small, workable packages that can get done in a short amount of time. In this presentation, I will be sharing my experience using scrum in manufacturing settings. I was introduced to scrum at MaxBotix Inc. where I worked the past two summers. Last summer, I was part of the manufacturing scrum team. While scrum is most commonly used in the field of software development, we adapted the techniques used for collecting and updating all of the manufacturing department's internal documentation, from procedural documents to quality control travelers. The audience will learn about the process of implementing scrum technique to improve quality, save time, eliminate waste, and cut costs in the manufacturing environment.

Title of the Work: #StompTheStigma

Presenters: Raquel Thelen

Faculty Sponsor: Kate Larson

Abstract: "An estimated 26.2 percent of Americans ages 18 and older or about one in four adults suffer from a mental disorder in a given year" (National Institute for Mental Health, 1). We want those suffering to know that they are not alone and there is nothing "wrong" with having a mental illness. Five students were given the task to create a public service announcement (campaign for change) to make people aware of the stigma those with mental illness face. They were asked to address the question: why is it important to fight the stigma of mental illness? This presentation addresses that question and a brief background on stigma along with a short video. The goal is to have people leave with more knowledge about stigma and a better awareness to combat it. Works Cited National Institute of Mental Health. U.S. Department of Health and Human Services. 8 June 2014. Web. 24 February 2016.

Title of the Work: Bemidji State University Student Health Survey

Presenters: Alicia Thell

Faculty Sponsor: Carla Norris-Raynbird

Abstract: For most college students, college can be an exciting time; one filled with new experiences, new friends, new social pressures, and, most of all, complete freedom. Freedom can also be a catalyst for dangerous behavior and comes with difficult decisions. In particular, decisions regarding health during this critical time can impact college students long after they graduate. My study aims to analyze the health choices of Bemidji State students when compared to the health choices of college students in the whole of Minnesota. This study, achieved through survey form, will explore potential associations between being a healthy college student and variables such as having health insurance and sexual history. The study also explores the assumption that a healthy college student strives for academic achievement with excellence. Findings from the BSU survey will be compared to those of the Minnesota Post-Secondary Health Survey conducted by the University of Minnesota Twin Cities and Bryon Health.

Title of the Work: Space for Play: Video Game Rhetoric and Procedural Space

Presenters: Bradley Tramel

Faculty Sponsor: Michael Morgan

Abstract: Video games are rhetorical. They make arguments. For better or worse, they have the power to express ideas, persuade, and provoke thought. They differ from other art in that they are intrinsically interactive: they provide a virtual space and the agency to explore that space. I believe the effectiveness of video game rhetoric - how well they communicate, resonate, persuade - has much to do with how well a game's structure lends itself to its rhetoric. In this presentation, I will show how two games exemplify this sort of interplay: *Fallout: New Vegas*, an open-world game that champions player choice, and *BioShock*: a linear adventure game with few choices. Specifically, I will explain why one falls short as a commentary on the nature of war while the other succeeded in delivering a pointed critique of Randian Objectivism, as well how their game worlds affected that outcome. This oral presentation will also demonstrate how critical rhetorical analysis of games can benefit educators, game designers, and the players themselves.

Title of the Work: Weird Dice

Presenters: Joseph Washenberger

Faculty Sponsor: Eric Lund

Abstract: One might think to ask: Are there any alternative ways of assigning face-values to a pair of six-sided dice so that the outcomes and probabilities with this non-standard pair are the same as the outcomes and probabilities with a standard pair? In this talk we will look at "Weird Dice," which is a pair of dice with just this property! Using techniques from the realm of Abstract Algebra (namely, Ring Theory and the Unique Factorization Theorem for polynomials with integral coefficients), we will see that there is only one such non-standard pair of dice possible, the so-called "Weird Dice," also known as Sicherman Dice.

Title of the Work: Spotted Knapweed Control in the Greater Yellowstone Ecosystem

Presenters: Adam Weishair

Faculty Sponsor: Mark Fulton

Abstract: This summer I worked for the National Park Service at Grand Teton National Park on the invasive species vegetation crew. Invasive plants are harmful to ecosystems because many times if they are left untreated they will form a monoculture. This lowers the quality of the environment by decreasing plant species that could be sources of food for a variety of animal species. Most of these invasive plants do not face natural competition or serious predation, and the native species are not adapted to compete with the invasives. The species that we found most prevalent was Spotted Knapweed (*Centaurea stoebe*). I will describe some of the problems Spotted Knapweed causes, and some of the management techniques being used. I will also talk about how the National Park Service has been treating it.

Title of the Work: Physical Geographic Phenomena and Population Decline in Illinois

Presenters: Jane White

Faculty Sponsor: Jeffrey Ueland

Abstract: Data from the US Census shows that Illinois is leading the nation in population decline, and a 2014 Gallup poll revealed that 50% of IL residents would leave if they could. According to that Gallup Poll, 17% of those planning to leave the state recorded a reason having to do with "weather/location". This is 6 points higher than the national average for those intending to leave their state of residence, and the largest percentage of "weather/location" respondents of the 12 states with the highest percentage of the population planning to leave. Illinois has a higher than average population per-square mile and is a geologically depressed area; the Illinois Basin is a structural depression composed of sedimentary rock (and is therefore resource-rich). There are also several major river valleys that contribute to low elevation of Illinois compared to its neighboring states. This project is intended to determine if there is a relationship at the city and county levels for population loss since 2010 with low elevation, floodplains, flash-flooding, and the severe thunderstorms, tornadoes, hailstorms, and damaging winds that are common in the area with the use of data from NOAA, NASA, USDA, NWS and the US Census.

Title of the Work: Illinois Population Decline: Is Quality of Life and Employment Impacted by Ecological Stress?

Presenters: Jane White

Faculty Sponsor: Samantha Jones

Abstract: Data from the US Census shows that Illinois is leading the nation in population decline, and a 2014 Gallup poll revealed that 50% of IL residents would leave if they could. According to that Gallup Poll, 26% of those planning to leave the state recorded a reason such as "work/business related", 17% recorded "weather/location", and 15% recorded "quality of life/change". The purpose of this project is to use quantitative data from the US Census, USDA, NASA, NWS, and FBI to determine if there are relationships with population decline within the parameters of population density, agricultural stress on the environment, environmental stress on agriculture, energy extraction, investment in infrastructure, and opportunistic crimes during natural disaster events. Population decline will be explored at the city and county level in IL. That is, besides the obvious "weather/location response", is it possible that the other two most frequent response categories are related to physical geographic phenomenon and management?

Title of the Work: Shevlin Area Wild Turkey Trail Camera Research

Presenters: Alexander Zachman

Faculty Sponsor: Mark Fulton

Abstract: Wild turkeys (*Meleagris gallopavo*) are not a native species to northern Minnesota, but recently they have been observed in high numbers around Bemidji. This is the first time the DNR is allowing a wild turkey hunt in northern Minnesota. I studied habitat use by wild turkeys around the Shevlin Minnesota area from January 28 to November 29 2015. I set out five motion detecting cameras in twenty-four different locations over the course of the study. Except for two cameras near roost

sites, cameras were relocated on a regular basis to various different types of canopy cover and landscape. The cameras captured 327 photos of wild turkeys. It was found that the turkeys were more commonly active in open areas or edges, by agricultural fields, pastures and near homes. The turkeys were most commonly observed late morning and early afternoon. The study showed that there is a healthy population of wild turkeys in the area, and that the landscape around Shevlin has a range of habitats they can use.

Poster Abstracts

Title of the Work: Water Current Turbines

Presenters: Isaac Aanerud, Daniel Tuckett, Matthew Wang

Faculty Sponsor: Dragoljub Bilanovic

Abstract: Our planet Earth is something that we should all be working to sustain. Although environmental sustainability appears to be the most important aspect for survival of human population a large number people disagree and in fact act against environmental sustainability. Our project focuses on renewable energy sources because we think it is about time to terminate our reliance on fossil fuels. Underwater turbines are safe and efficient way to produce energy. To generate energy, the turbines are positioned in underwater currents, such as Gulf Stream, so the portion of a current flows through the turbine generating electricity. We plan to conduct an anonymous, voluntary survey of our peers here at Bemidji State University to find what they know about this source of alternative energy. Preliminary results indicate majority of people are not aware of this energy source. The goal of the project is to inform general public about this energy source. Large investment is needed to develop this source of energy but if developed it would dramatically improve environmental sustainability.

Title of the Work: Determination of the Percent Vitamin C Content in Cooked and Uncooked Fruits and Vegetables

Presenters: Maria Andersen, Nikki Galatowitsch

Faculty Sponsor: Katie Peterson

Abstract: Vitamin C (ascorbic acid) is a water soluble vitamin that is vital for the growth and repair of tissues in all parts of the body. It is obtained through consuming various tablets and or foods such as broccoli and citrus fruits. The daily requirement of the amount of Vitamin C that should be consumed is very small; with the Food and Drug Administration recommending around 50 milligrams per day per person. Although, since it is a water soluble vitamin, many individuals may not be meeting these daily requirements due its extraction during cooking. Therefore, the approach we decided to take in this experiment was to analyze and compare the vitamin C content in cooked and non-cooked foods through the method of titration; more specifically, redox titrations using iodine.

Title of the Work: Effect of Phosphorylation of Amino Acids S602/S605 of NHE1 on Non-Small Cell Lung Cancer Development and Progression

Presenters: Maria Andersen, Erin Johnson, Oyunbileg Narantsogt, Latoya Rose

Faculty Sponsor: Mark Wallert

Abstract: Non-small cell lung cancer (NSCLC) accounts for 85% of all lung cancer cases. Lung cancer is the leading cause of cancer deaths for both men and women, with an estimate 158,000 Americans dying from lung cancer in 2015. Cancer is a multifaceted disease that has several main characteristics including increased proliferation, invasion, and migration. Our project focused on the effect of the sodium-hydrogen exchanger isoform 1 (NHE1) and its role in regulation of intracellular pH which allows it to regulate growth and migration in cells. NHE1 function is regulated by phosphorylation at seven distinct sites, catalyzed by five different kinases. We specifically focused on the protein kinase PYK2 which phosphorylates NHE1 at serine 602 and serine 605. This was accomplished by creating two distinct mutant cell lines with altered phosphorylation sites of NHE1. Serine 602 and serine 605 were altered to alanine in one cell line (S602A/S605A), which removed the PYK2 phosphorylation site from NHE1. Serine 602 and serine 605 were altered to Aspartate (S602D/S605D) in another set of cells to mimic permanent phosphorylation. We will present data that demonstrates the cell line production and the impact of these mutations on proliferation and migration.

Title of the Work: Overpopulation

Presenters: Donald Anderson, Jay Dickman, Irvin Womack

Faculty Sponsor: Dragoljub Bilanovic

Abstract: Overpopulation is among most important social and environmental problems. Human population is growing; we are now adding one billion people to the Earth every 12 years or roughly 230,000 people per day. The list of problems the growth of human population is causing is a long one. The list includes shortages and increasing use of natural resources, war and social conflicts, limits on personal freedom, health issues, survival of other species and numerous additional problems. One in seven people go to bed hungry every day; 25,000 people, or two populations of Bemidji, die daily of malnutrition and hunger-related diseases. Roughly two billion people lack access to fresh water while 3.5 billion people do not have any kind of wastewater treatment. The demographic explosion also results in low wages and high unemployment rates, deterioration of educational and health systems. The goal of this work is it discuss problems caused by population growth and to highlight potential solutions.

Title of the Work: Trying Something New: Calculating Impervious Surface Coverage in Cass County

Presenters: Sarah Anderson

Faculty Sponsor: Samantha Jones

Abstract: As an intern for the Cass County Environmental Services Department, Sarah was challenged by a coworker to utilize ArcGIS to calculate and map out impervious surface around lakes in the county for an addition to the new water plan being drafted. By digitizing impervious surface features and designing a model, she created a reproducible process that can be utilized whenever the county needs.

This poster presents the model used as well as the results that were found for impervious surface within 250 feet of 11 targeted lakes in Cass County.

Title of the Work: Is Connectedness More Applicable than Educational Based Programs in Decreasing Suicide Rates in Adolescents 12-18?

Presenters: Bridget Bergeson, Kayce Gavel, Rachel Pollock

Faculty Sponsor: Nancy Hall

Abstract: Purpose: To determine if connectedness is more pertinent in decreasing suicide rates than education programs. Method: Literature Review Suicide is the leading cause of death in the adolescent population in the U.S. (Whitlock, Wyman, & Moore, 2014). This is a concern related to emotional, psychosocial morbidity in addition to increased medical costs and distress among family members (Whitlock et. al., 2014). Connectedness and educational programs have been implemented to improve the rates of adolescent suicide. Connectedness is often used interchangeably with attachment, bonding, social integration and social support (Whitlock et al., 2014). Reducing factors of suicide related to connectedness are significant when an adolescent has someone that they can trust. This literature review sought to determine whether connectedness is more significant in preventing suicide than educational programs. Logan (2009) found that 30.3% of adolescents who felt they were connected to school were less likely to have suicidal ideation in comparison to 20.9% who did not feel that they were connected with school.

Title of the Work: California Pollution

Presenters: Ryan Best, Megan Crandall, Tyler Roed, Sophia Yousey

Faculty Sponsor: Dragoljub Bilanovic

Abstract: The last two decades California has had the highest levels of air-pollution in the United States of America. Ozone concentration, concentration of dust particles (i.e. referred to as "particulate matter"), and a few other factors are used to measure air pollution. With respect to ozone pollution, five California cities top the list of the 25 most polluted cities in the USA. With respect to dust pollution, seven California cities top the list of the 25 most polluted cities in the USA. Both ozone and dust pollution could worsen since California is currently going through a record drought. Atmospheric concentrations of ozone, dust, and other air pollutants has been decreasing in California since the mid-seventies but concentrations of the pollutants in California's air still remain significantly higher than in the rest of the USA. This project will address methods that either are, or should be, employed to minimize air pollution in California. The project will focus on elimination of ozone and dust pollution.

Title of the Work: Society's Changing Views on Food Safety

Presenters: Robert Bohland, Justine Kapitzke, Nicholas Lossow, Emily Rapp

Faculty Sponsor: Carla Norris-Raynbird

Abstract: Trust in food safety and manufactured food products is a common concern in today's society. We will investigate the recent history of social food concerns in America as it relates to food preservatives and food safety standards. We will also demonstrate and discuss the evolution of food safety as dictated by societal concerns. We hope to alleviate these concerns by showcasing the

standards set in place by the FDA, the USDA, and other non-governmental organizations. We will also present international regulations set in place to help control the safety of the global food economy.

Title of the Work: The Sociology of Environmental Impact on Isle Royale

Presenters: Brandon Boomgard, Scott Kelley, Scott Kliszc, Samuel Rausch

Faculty Sponsor: Carla Norris-Raynbird

Abstract: In this poster presentation we will be looking at the (mostly) enclosed environment of Isle Royal through the lens of human interaction. We are going to be focusing on aspects of zoology and ecology of the island as these intersect with and are affected by the micro context of individual human activity on the island. We also examine from a macro perspective, the possible ramifications to the island's environment of the broader context of global human activity.

Title of the Work: 2016 Annual Bemichiigamaag Treaty Day

Presenters: Nicole Buckanaga

Faculty Sponsor: Vivian Delgado

Abstract: This Establishment/Institution proudly acknowledges Annual Bemichiigamaag Treaty Day in place of Columbus Day. We would also like to acknowledge the great contributions of the Indigenous People to this Country. Please help us in honoring the listed Treaties between the U.S Government and the Dakota and Ojibwe People of Minnesota.

Title of the Work: Nutrition Education Effects on Low-Income Families

Presenters: Christine George, Rosalba Gomez, Ashley Midas

Faculty Sponsor: Nancy Hall

Abstract: To feed a family of four in the United States can cost over \$1000 per month, according to the United States Department of Agriculture (USDA) (Hellmich, 2013). To adjust to this rise in costs, many families choose cheaper, less healthy options even when on government assistance. Low-income families in the United States are faced with making choices between nutrition and cost-effectiveness. This raises an important question: For families receiving government food assistance in the United States, what is the effect of nutritional education on food choices at the grocery store versus those who do not receive nutritional education? A literature review was conducted to synthesize the results of research surrounding nutritional education. Evidence supports nutritional education giving families insight into how to make healthy choices to fully utilize their government assistance. In our plan, before families can receive government assistance, they must undergo a nutritional education class and demonstrate understanding of the material covered. After six months on the government assistance program, the families must turn in receipts from shopping trips to be analyzed by the program. By making healthier choices, these families will be living healthier lives and will likely see a decrease in chronic diseases.

Title of the Work: Hg in H₂O

Presenters: Andrea Bunich, Eva Froehle, Valerie Westlund

Faculty Sponsor: Dragoljub Bilanovic

Abstract: Mercury is an extremely toxic metal which damages our nervous system. We decided to prepare a poster on mercury pollution because we care about people and environment and because we would like to increase general awareness about mercury pollution. Fish and other aquatic organisms accumulate mercury in their fat tissue. Eating fish containing mercury brings mercury into our body. To prepare the poster we will analyze scientific papers and information presented in our book. Mercury in fish is quite dangerous to pregnant and nursing mothers, children but also to all other members of population. Minnesota Department of Natural Resources (MN-DNR) maintains database which provides up to date information about concentration of mercury in fish in most of Minnesota's lakes. MN-DNR database also provides recommendations about consumption of the fish from those lakes. We will use MN-DNR database to compare mercury levels in different lakes in Minnesota.

Title of the Work: The Effectiveness of STI Prevention in the Adolescent Population

Presenters: Emilie Carpentier, Kia Johnson, Elle Namur, Jaime Vansickle

Faculty Sponsor: Nancy Hall

Abstract: Sexually transmitted infections (STIs) are a significant health problem in the United States. The prevalence is especially concerning in teens. According to the Center for Disease Control and Prevention (2015), "nearly 20 million new sexually transmitted infections occur every year in this country, half among young people ages 15-24"(CDC, p.1). Minnesota has also seen increased rates of STIs. According to the Minnesota Department of Health (2013), "Over the past decade (2003-2013), Minnesota's chlamydia rates showed an overall increase of 65 %"(MDH, p.4). Consequences to short and long-term well-being make STI prevention education pertinent for adolescents. Evidence indicates that intervention and education of healthy sexual behavior and risky behavior catered to specific adolescents' needs is effective in reducing the incidence rates of STIs. We sought to identify effective means to provide preventative education to adolescents ages 13-18 to reduce the prevalence of STIs, asking the question how are STI prevalence rates in 13-18-year-old adolescents affected by education as a preventative intervention strategy? The proposed intervention is to provide STI education designed to meet individual needs in classroom or clinic carried out by the Minnesota Department of Health.

Title of the Work: Food Sustainability

Presenters: Carling Carr, Alexander Furey, Matthew Wixon

Faculty Sponsor: Dragoljub Bilanovic

Abstract: Food sustainability, an integral part of which is the food security, is a major problem across the globe. Without global food sustainability our environment, economy and personal well-being will suffer. Oil supply strongly affects production, distribution, and availability of food both at home and abroad. Current food production technologies pollute waters, soil and air. Food processing plants sometimes trigger diseases outbreaks. Current food production and processing practices and technologies could rob our children's future by depleting their food sustainability. We will analyze

papers on food sustainability in environmental, and other scientific journals. The analysis will focus on: problems pertinent to current agricultural and food systems, and on potential solutions to the problems. For example, a tremendous amount of food is wasted because of inadequacies of the current production-distribution systems. Instead of wasting it this food could be redistributed to the less fortunate thus contributing to food sustainability. Overall, the food sustainability could be achieved provided people become aware of the food sustainability issues which requires both education and time.

Title of the Work: Evaluating the Impact of Mutations of NHE1 at S770/S771 and Effects on Growth and Migration

Presenters: Michaela Casavan, Katelyn Ditmanson, Emily Paquin

Faculty Sponsor: Mark Wallert

Abstract: Non-small cell lung cancer accounts for 85% of all lung cancer cases in the United States. Smoking causes an estimate of 200,000 cases per year. There are six defining hallmarks of cancer; our research specifically relates to two of these: sustaining proliferative growth and activation of invasion and metastasis. The sodium hydrogen exchanger isoform 1 (NHE1) is a trans-membrane protein found in all cells throughout the body and is a major contributor to cancer development and progression. NHE1 functions to maintain intracellular pH and has been shown to affect cell growth and migration. The activity of NHE1 is regulated by phosphorylation at seven distinct sites catalyzed by five different protein kinases. Extracellular signal regulated kinase (Erk) is one of the kinases that phosphorylate NHE1 specifically at sites serine 770 and serine 771. In our experiments, serine was either mutated with an alanine (A) residue to interrupt phosphorylation (S770A/S771A) or an aspartic acid (D) residue to mimic constitutive phosphorylation (S770D/S771D). Our presentation will demonstrate the development of cell lines expressing the mutant forms of NHE1 and evaluate the impact of these mutations on cell proliferation and migration.

Title of the Work: Microbial Fuel Cell – Effect of Microalgae

Presenters: Andreas Christodoulou, Nicholas Halverson, Adam Lorentz, Joseph Otto

Faculty Sponsor: Dragoljub Bilanovic

Abstract: Winogradsky column is a device for enrichment of bacteria present in low concentrations in the environment. The upper part of the column is aerobic; its redox potential (Eh) generally exceeds 50mV. The bottom part of the column is anaerobic with the Eh often below -200mV. Microbial fuel cell (MFC) also contains anaerobic and aerobic part which are separated by a membrane. A locally constructed Winogradsky column will be tested as membrane-less MFC. Sediments from Bemidji Lake will be used in anaerobic part of the MFC. Freshwater microalgae *Chlorella vulgaris* will be used in aerobic part of our MFC. Graphite cathode and anode will be used to measure the electrical current between aerobic and anaerobic regions of the columns. The effect of microalgae addition on development and performance of the membrane-less MFC will be observed, with focus on *Chlorella vulgaris*. This project was made possible through support of The Minnesota Space Grant Consortium.

Title of the Work: Life Downwind: The Environmental Costs of Wind Generators

Presenters: Karmen Clark, Marilyn Hurd, Jolie Richter

Faculty Sponsor: Dragoljub Bilanovic

Abstract: Wind energy turbines seem to be a logical and renewable source of electricity in some places. This poster focuses on potential issues and environmental costs of building, shipping, and maintaining wind turbines in different environments. To address the potential issues and the environmental costs associated with wind energy production, we will analyze current scientific literature. Preliminary analysis indicates that both marine and terrestrial wind farms could affect wildlife. In addition, maintenance costs could be up to 25% of electricity production costs over the lifespan of the turbine. We will discuss current limitations of wind turbine technology and report on potential solutions. Wind energy could be generated at a competitive cost in windy locations while other alternative energy sources should be used in places where there is not enough wind.

Title of the Work: Pain Management in Pediatric Oncology Patients

Presenters: Breanna Columbus, Leah Gnitka, Laura Heisler, Hidayo Mohamed, Whitney Wivoda

Faculty Sponsor: Nancy Hall

Abstract: According to National Center Biotechnology Information in an article by Siegel, King, Tai, Buchanan, Ajani, and Li, there were 120,137 childhood and adolescent cancer cases during 2001-2009 with an age-adjusted incidence rate of 171.01 per million (2014). Disadvantages of only using medications to treat pain include dependency and tolerance to medications, availability of the medication, side effects of the medications, and costs. Pediatric oncology patients often suffer from not only physical pain, but also psychological pain, which cannot be fully treated by solely pharmacological interventions. Implementation of pharmacological interventions accompanied by non-pharmacological interventions will help reduce pain of patients in a more holistic manner. Our purpose is finding the advantages of implementing non-pharmacological interventions along with pharmacological interventions versus only using pharmacological interventions in order to help treat pain from cancer in children 5-15 years old. The expected outcome is that using the implementation of non-pharmacological interventions will decrease the patient's pain. Our research question is "What are the advantages of implementing non-pharmacological interventions versus only pharmacological interventions to help treat cancer pain in children 5-15 years old?" Our methods and sampling plan included a literature review. We excluded articles related to adult cancer patients and adult pain management.

Title of the Work: Children with ADHD

Presenters: Mary Cosgrove, Brittany Hull, Andrew Solseth

Faculty Sponsor: Nancy Hall

Abstract: Purpose: We conducted a literature search review to determine if Attention-Deficit/Hyperactivity Disorder (ADHD) had an increase in diagnosis and an increase in use of medications. Synthesis of Evidence: Evidence from the Center for Disease Control and Prevention (CDC) in 2014 has shown there is a significant increase in use of medication and higher rates of diagnosis in the last 20 years. Proposed Practice Change: A better method of screening for the use of medication and a push

towards non-pharmaceutical forms of treatment. Findings: The diagnosis of ADHD is becoming more common; the new social norm revolves around an increase of individuals being diagnosed with ADHD and prescribed medication. As stated by the Center for Disease Control and Prevention (CDC) in 2014, research shows attention deficit hyperactivity disorder (ADHD) diagnosis has increased 42% and medication usage has increased 28% from the years 2007-2011, Prescribed medication is the first step in treatment, rather than alternative methods such as education, behavior therapy, support at home and school, proper nutrition, and exercise. Children diagnosed with ADHD should be offered alternative methods of treatment before being prescribed medication.

Title of the Work: Olympus Mons and Tharsis Montes Geomorphology: A Martian Geospatial Analysis

Presenters: Alexander Danielson

Faculty Sponsor: Jeffrey Ueland

Abstract: The focus of this project is to investigate the Olympus Mons and Tharsis Montes physiographic regions and analyze the geothermal and geohydrologic features for spatial significance. These regions have been studied for many years since the Viking and Mars Orbiter Laser Alter satellites were first launched to remotely sense the enigmatic landscape and what similarities and differences it holds to Earth. The Olympus Mons and Tharsis Montes regions are unique in terms of surface temperature, stratospheric atmosphere, albedo, volcanism, geology and geographical anomalies. The landscape subdivides smooth typography and rough networks formed by hydrology and geological formations and phenomena. The question lies on how these networks and topographic features are all correlated together and spatially related. Using remote sensing and GIS techniques with the data obtained from numerous satellite missions, geological and topographical features of Olympus Mons and Tharsis Montes will be analyzed and their significance in analytical temperature, surface features and stratigraphic elements will be induced. To this end, a three dimensional model will represent the variations of these elements that are disturbed between Olympus Mons and Tharsis Montes, while overlaying different elevations, reflectance levels, and atmospheric concentrations to see where geographically anomalies coalesce in space.

Title of the Work: Determination of Sulfite Concentration in Wine

Presenters: Marisa Davern, Bethaney Giles

Faculty Sponsor: Katie Peterson

Abstract: Wine contains sulfur dioxide, which is said to cause asthma and other allergies. Food products like wine also contain sulfites to help eliminate bacteria and aid in preservation. This experiment aims to determine the amount of sulfites in different types of wine. Three different flavors of red and white wines are measured via Ion Chromatography (IC) and Inductively Coupled Plasma (ICP) to detect the amounts of each sulfur dioxide in the wine samples. In the Ion Chromatography portion of the experiment, standards of sodium sulfate and potassium bisulfite are used to form a calibration curve to determine the amount sulfite in the samples. An Inductively Couple Plasma Atomic Emission Spectrometer is also used to measure the total sulfur content. Using known standards, a calibration curve is made to determine the amount of sulfur in each wine sample. Most wine

companies label the sulfite content of their wines; this experiment will prove if sulfite concentrations are misleading, and if there is actually such thing as sulfite free wines.

Title of the Work: Compounding in the Pharmacy

Presenters: Marisa Davern

Faculty Sponsor: Julie Larson

Abstract: Pharmacy compounding is the science of preparing medications to meet a patient's needs. These medications are made based on a practitioner's prescription in which individual ingredients are mixed together in an exact dosage based on the patient's condition. Compounds can come in different forms like ointments, creams, liquids, suspensions or capsules. Once a pharmacist receives the prescription for the compound, there is a specific method they employ to ensure the medication is made properly. First, they print the list of needed ingredients. Second they compile these ingredients in the area in which the compounding is to occur. Third, they utilize the proper documented technique for the preparation of the specific medication. The final medication is then stored in the appropriate container. In the past six months I have been shadowing three pharmacists from Walgreens, and watching the process of compounding.

Title of the Work: Animal-Assisted Therapy for Individuals with Chronic Mental Illness

Presenters: Bobbie Davis

Faculty Sponsor: Cheryl Byers

Abstract: This poster presentation will review the literature related to animal-assisted therapy and its use for individuals with chronic mental illness. Animal-assisted therapy is an emerging technique with limited research. The presentation will include: The difference between animal-assisted therapy (AAT) and animal-assisted activity (AAA). Animal-assisted therapy is goal directed and the animal is used to elicit responses. Animal-assisted activities are utilized to promote socialization and improve mood. An examination of the areas of improvement for individuals with mental illness, including socialization, self-efficacy, and living skills. In studies utilizing canine-assisted therapy clients were able to quickly build rapport with the human therapist. In equine-assisted therapy self-efficacy improved as clients completed assigned tasks within groups with a trained equine therapist. Through animal-assisted therapy and activities, participants showed improvement of living skills such self-grooming and feeding, through activities such as grooming, feeding, and exercising the therapy animal. Various species have been utilized such as dogs, horses, and sheep, and the therapeutic goals or mental illness symptoms that each species may work better to address will be discussed. Dogs were used with participants with trust issues to assist in rapport building with the therapist, whereas horses were used with individuals with histories of violent behavior.

Title of the Work: Self-Assembled Fluorescent Sensors for Molecular Oxygen

Presenters: Zackary DeAdder, Joseph Simonson, Caitlin Zeller

Faculty Sponsor: Katie Peterson

Abstract: The purpose of this research project, is to design and create a heme-based, molecular oxygen detection system. It has been seen that molecular oxygen, O₂, can be bound to an iron porphyrin. For

this project 4,4',4'',4'''-Porphine-5,10,15,20-tetra(yl)tetrakis(benzoic acid) (TCPP) is the porphyrin being metalated to create the iron porphyrin (Fe(III)-TCPP). The metalation process is monitored with UV-VIS spectroscopy. After the porphyrin is successfully metallated, it will be reduced to iron(II), and beta-cyclodextrin (beta-CD) will be added to stabilize the Fe-TCPP complex. The primary end goal of this research is to create a self-assembled system that will detect molecular oxygen via fluorescence through the incorporation of a quantum dot. The probe being assembled will be able to identify the levels of oxygen in a biological system. This is important because if there is surplus or deficiency of oxygen, there can be detrimental effects on health.

Title of the Work: Quantitative Analysis of Nutrients in Baby Formula

Presenters: Zackary DeAdder, Nicholas Hudson

Faculty Sponsor: Katie Peterson

Abstract: The supply of essential nutrients during infancy is critical for proper cognitive and neurological development. Many parents have turned to supplemental formula as a means of providing these nutrients to their child. This study uses ICP-OES, FTIR-ATR, and titration methods to measure and compare the concentration of iron and omega-3 fatty acids in an organic and bestselling supplemental formula. Metal content was detected and quantified using ICP-OES and titration methods, while fatty acids were investigated with FTIR-ATR. Solutions containing known concentrations of analytes were used to construct a calibration curve. This enabled adequate determination of analyte concentration within the infant formulas. Analysis methods were used to verify product ingredient claims as well as determine which formulas contained adequate levels of essential nutrients.

Title of the Work: Is Light or Temperature the Limiting Factor for Phytoplankton Under the Ice

Presenters: John Delaske, Daniel Tuckett, Daniel Vosberg

Faculty Sponsor: Debbie Guelda

Abstract: In order to assess if light or temperature is the limiting factor for phytoplankton growth, we cultured both natural and commercially purchased phytoplankton (stock) under different environmental conditions. Samples from Lake Irving and stock phytoplankton were placed in separate 250 ml clear containers. The containers containing phytoplankton were placed in four separate conditions of high light and low light in cold temperature (1C) and high and low light at (22C). We attempted to recreate natural conditions of low light and cold water temperatures (1C) as would be found below ice cover in Lake Irvine. Light regimes were 10-hour light/14-hour dark cycle. Phytoplankton samples were collected on days 4 and 7, preserved and stained with Lugol's solution, and were later enumerated. Population growth rates were calculated for all samples and we suggest that the highest growth will occur within the high light/high temperature environments, but we are unsure of how community composition will differ among treatments.

Title of the Work: The Sensitization of Fathead Minnows to a Perceived Predator
Presenters: Zane DenOuden, Jeremiah Randall, Tanin Richards, Andrew Schmieg
Faculty Sponsor: Debbie Guelda

Abstract: In order to assess the sensitization of fathead minnows (*Pimephales promelas*) to potential predators, we exposed the fish to lures of various colors and sizes. Minnows were placed in tanks as individuals and in groups and were exposed to lures of increasing size. We used three sizes of lures (1, 3, and 5 inches) as well as three color patterns (indicative of yellow perch, largemouth bass, and shad). Responses were measured as either a reaction to the lure or no reaction. The results of this experiment suggested that fish in groups were less responsive to the representative predator than individual fish (p value=0.049). The experiment also indicated that the lure pattern most resembling largemouth bass produced the largest and most frequent reactions (p value=0.043). This experiment suggests that that individual fish are more responsive to a perceived threat than fish in groups.

Title of the Work: Drip Line vs. Sprinkler Systems
Presenters: Brady Dorn, Mitchell Gindele, Dane Lynch, Todd Sonnek
Faculty Sponsor: Dragoljub Bilanovic

Abstract: Today, agricultural irrigation in most of the world relies on "Center Pivot Sprinkler (CPS)" technology. The CPS technology is often employed to grow corn, soybean, and other agricultural products. Technological developments and environmental awareness led to use of "Drip Line Irrigation (DLI)" systems. The DLI system delivers water to individual crops. CPS technology is rather simple in comparison to DLI system, unfortunately CPS uses much more water than DLI system. Amount of water used by CPS and DLI systems changes with water management practices, type of climate, soil quality and extent of the root zone; even so, DLI application still saves very large amounts of water in comparison to CPS. We will compare water usage in CPS and DLI to determine a size of an agricultural field which is no longer suitable for application of DLI due to either technological or other limitations. We will also identify crop types which are best suited for DLI.

Title of the Work: What Do You Know About GMOs?
Presenters: Luke Edlund, Zachariah Edminster, Blake Holder, Aili Kultala, Yu Xiaoqing
Faculty Sponsor: Carla Norris-Raynbird

Abstract: Our poster presentation examines the pros and cons of genetically modified organisms. As a group of students, we are interested in where our food comes from and how technology and engineering are being used to change the simpler farm to table grow processes of the past. We explore the far more complicated process of GMO enhanced food that raises many concerns about human health and impacts of GMOs on the environment. We address issues such as labeling practices, transparency and public awareness of GMO agriculture.

Title of the Work: Zooplankton Population Composition

Presenters: Kristina Erickson, Ryan Henry, Victoria Meyer, William Varela

Faculty Sponsor: Debbie Guelda

Abstract: In order to determine if there is a significant change in zooplankton populations in correlation to seasonal temperatures, zooplankton densities in Lake Bemidji were determined before fall turnover and after ice cover. Using a 63-micrometer plankton net, three zooplankton samples were collected from each of two sites weekly from the dates of August 27 to September 24 2015, and February 4 to March 3, 2016. Additionally, physical and chemical parameters of depth, dissolved oxygen, and temperature were measured using depth finders and a YSI multimeter. Zooplankton population composition was determined by counting three 0.5ml droplet samples from each site. We anticipate that with colder water temperature, density of zooplankton will decrease. We also anticipate that the zooplankton population composition will contain more Copepoda (omnivores) than Cladocera (herbivores) due to lower autotrophic food availability.

Title of the Work: Microbial Fuel Cell – Effect of Nitrifying Bacteria

Presenters: Bethany Erickson, Dustin Gabrelcik, Sadie Libal, Rosalyn Nelson, Randall Riehl

Faculty Sponsor: Dragoljub Bilanovic

Abstract: Nitrifying bacteria are of great significance in the removal of nitrogen from waters. They convert ammonia (NH_4^+) to nitrite (NO_2^-) and then to nitrate (NO_3^-) in an aerobic environment. Denitrifying bacteria then convert nitrate to molecular nitrogen (N_2) in anaerobic and facultative environments where it is released as a gas. A Winogradsky column is made up of aerobic, facultative and anaerobic regions. We have constructed a Winogradsky column to test its performance as a microbial fuel cell for these bacteria and how it eliminates N-pollution. On daily basis we are measuring: N-concentration, pH, CO_2 , electrical potential, and absorbance of light. To construct the column, we used bacteria rich sediments from Lake Bemidji. We also used a synthetic wastewater containing known amount of ammonium chloride (NH_4Cl). On weekly basis we add ammonium sulfate to reactors to provide enough nitrogen and sulfate to bacteria. This project was made possible through support of The Minnesota Space Grant Consortium.

Title of the Work: Microaggressions and Persistence for American Indian College Students

Presenters: Melissa Felt, Chastity Francisco, Megan Reeves, Mai Vang

Faculty Sponsor: John Gonzalez

Abstract: The purpose of the study is to investigate the relationship of microaggressions and persistence for American Indian college students. BSU currently only experiences a 35% retention rate of American Indian students within the duration of the academic year. The six-year graduation rate is 13% for American Indian students. We recruited American Indian students registered for the 2016 spring semester at BSU via email. Students were asked to answer an online survey pertaining to their experiences as a BSU student. Relationships between these experiences and persistence are explored using Pearson R correlation coefficients within the SPSS system.

Title of the Work: Recycling

Presenters: Toni Ferdig, Aryn Jacobson, Shannon McGowan

Faculty Sponsor: Dragoljub Bilanovic

Abstract: Our planet is being more and more polluted and humans are not doing enough to eliminate various kinds of pollution. We care about this issue because we want to live in a clean environment thus have a healthy and an enjoyable life. The more pollution we eliminate the higher we will be environmental sustainable and increase the quality of our life. We will conduct voluntary discussions with our families and friends to learn how and if people care about pollution of the Earth. We will also estimate how and if our friends and families practice recycling towards eliminating different kinds of pollution. Initial observations indicate people do not recycle as much as they could. Some individuals do not care, other are not aware of environmental benefits of recycling. The goal of this work is to increase awareness about environmental and financial benefits of recycling.

Title of the Work: Accessibility to Integrated Care for Low Income and Minority Populations

Presenters: Patrick Flaherty

Faculty Sponsor: Jeffrey Ueland

Abstract: Because of the rising rate of mental health issues among clients who visit Substance Abuse Treatment facilities, there is pressure for these facilities to integrate substance abuse and mental health care. For years, health care reform has been a serious topic of debate with one of the main points being to provide affordable health insurance to low income families in order to improve access to care and reduce health care disparities among minorities. My research hypothesis states that there will be a difference in accessibility to substance abuse treatment facilities that offer integrated care in communities that are low income and minority dominated compared to others. In order to quantify the results of this study, data will be used from the U.S. Census and National Survey of Substance Abuse Treatment Services in order to find block groups in the Twin Cities area where there is relatively little income and high populations of racial/ethnic minorities to compare the distance between them and Integrated Care Facilities. The results will be presented through a GIS analysis as well as a regression analysis which shows the likelihood that facilities that overlap with specific groups relevant to this study offer integrated care.

Title of the Work: Analysis of Coffee

Presenters: Avery Franzen, Caitlin Zeller

Faculty Sponsor: Katie Peterson

Abstract: Coffee is made from the tropical coffee plant. The seeds of the coffee plant are roasted, ground, then brewed to make coffee. During the brewing process, many compounds bound in the bean are released. This project will quantitatively compare the caffeine and potassium levels in either different roasts of coffee or investigate how the levels of these analytes change with different coffee brewing or preparation methods. The concentration of caffeine will be analyzed by infrared spectroscopy. Lighter roast coffees are expected to contain more caffeine. Potassium will be detected by inductively coupled plasma-atomic emission spectra. Coffee is consumed in part because people

enjoy the way that it tastes. Coffee is also consumed because it contains caffeine. This analysis will compare the caffeine concentrations with respect to the type of coffee.

Title of the Work: Isolation and Quantification of Lycopene from Tomato Paste

Presenters: Nikki Galatowitsch

Faculty Sponsor: Katie Peterson

Abstract: Lycopene is the deep-red pigment found in natural fruit and vegetable products. It acts as a free radical-fighting antioxidant, which helps battle and prevent certain cancers such as prostate, lung, and stomach cancers. In this study, Lycopene was extracted in various amounts from warm tomato paste by a simple extraction method using Toluene. The solvents that were decanted were then evaporated using a rotary evaporator; leaving behind residues containing lycopene. The residues were purified using a column chromatography method with alumina as the adsorbent. Characterization of the chemical structure of the pure Lycopene samples were done using UV-Vis, FT-IR, and NMR spectroscopy. The quantity of extracted pure Lycopene samples was also obtained.

Title of the Work: The Effects of Stress on College Students Alcohol Consumption

Presenters: Mary Gehrman, Amber Larson, Jenna Sanoski, DeAnna Schramel, Malia Tolkinen

Faculty Sponsor: Nancy Hall

Abstract: In college students who are 18-24 years old, what is the effect of stress relieving strategies on alcohol consumption compared with no stress relieving strategies? Binge drinking is very common with college age students. This is shown to lead to wide range of poor outcomes, specifically psychological problems. There is a correlation between college binge drinking and stress and a large gap in information regarding stress-relieving options for college-aged students. There was very little information on the interventions used to fix this problem of increased alcohol consumption with increased stress in traditional college students ages 18-24. Through literature synthesis, our findings identified students are more likely to consume larger amounts of alcohol when experiencing higher stress levels. Our findings could be used to predict stress and alcohol consumption in other age populations. Communities can use these findings to identify populations at risk and create primary prevention programs that focus on decreasing stress and stress-related binge drinking. This information shows significance to colleges within the United States, and is valuable information to better the lives and safety of their students and community members.

Title of the Work: The Effect of Pond Snails on Benthic Carbon Content of Aquatic Environments

Presenters: Jason Gildart, Eric Gruber, Clayton Marcott, Heather Marjamaa

Faculty Sponsor: Debbie Guelda

Abstract: In order to determine the effect of grazing on benthic carbon content in aquatic systems, we introduced pond snails into algal colonized environments. We placed a total of 32, two-inch square ceramic tiles in the bottom of 3 ten gallon aquaria allowing 21 days for phytoplankton growth. Twenty-five snails were placed in each of two aquaria and an additional aquarium served as a control without grazers. 5 benthic tiles were removed a once a week for five weeks and carbon content was measured using the ash free dry mass (AFDM) method. We expect a reduction in overall carbon content within

tanks containing snails, although we are uncertain if the snails will ultimately increase carbon content through their introduction of metabolic waste products.

Title of the Work: Forecasting Amazon's Revenue for 2016

Presenters: Alyssa Goehring

Faculty Sponsor: Randy Robinson

Abstract: Amazon is an e-commerce company offering online retail, computing services, consumer electronics, and digital content. It started as an online bookstore in 1994 and later diversified, selling everything from DVDs and music to apparel, toys and jewelry. According to recent figures, Amazon is now the leading e-retailer in the US with more than 107 billion dollars in 2015 net sales. In my predictive analytic project, I will look for trends in the data and seasonal effects. I will use time series and historical data from previous years to forecast the revenue for 2016.

Title of the Work: The Relationship Between Age Demographics and National Forest Visitation

Presenters: John Greiner

Faculty Sponsor: Jeffrey Ueland

Abstract: Research indicates that the amount of visitors to designated wilderness areas has increased since the passage of the Wilderness Act in 1964. Trends indicate an increasing proportion of older visitors and a decreasing proportion of young adult visitors. Research suggests that age is an important component influencing "recreation behavior choices"; by comparing the different age groups among wilderness visitors over time with their choices in types of recreation, "managers may gain a better understanding of existing and future recreation demand." This project aims to examine the spatial aspects of age demographics as they relate to national forest visitation. I will use data from articles in the International Journal of Wilderness and data from a research paper (RMRS-RP-91) published by the Rocky Mountain Research Center in 2012, analyzing three studies done in the BWCAW in 1969, 1991 and 2007. Finally, the USDA National Visitor Use Monitoring program (nvum) collected surveys across all of its national forests over two time periods: from 2005-2009 and from 2010-2014.

Title of the Work: Analysis of Lead in Chili-Flavored Candy from Mexico by IPC

Presenters: Jeremy Hoffman, Sebastiano Mangiamele

Faculty Sponsor: Katie Peterson

Abstract: Maintaining consistent regulatory testing of all candy produced worldwide has become increasingly more challenging. These regulatory measures insure that contaminate restrictions are met and food is safe for consumption. Mexican candy has been known to contain harmful amounts of lead (Pb) defined by the FDA as candy containing above 0.1 ppm of this toxic metal. High consumption of Pb, especially in youth, can lead to physical and mental stress on the body, which in turn, creates long lasting harmful effects. These problems may include kidney failure, brain damage, coma, and death. For this experiment, the Pb levels of five different brands of chili-based Mexican candy were analyzed using inductively coupled plasma optical emission spectroscopy (ICP-OES). These results were then compared to the calibration curve to predict the concentration of Pb. Candy having a higher Pb concentration than the FDA limits were considered unsafe for consumption. In addition, the wrappers

were also analyzed with the same method, since it is possible Pb used in the production of the wrapper can leach into the candy.

Title of the Work: Toddler Eating Habits and Obesity

Presenters: Christina Hopson, Davis Mills, Eric Stefanich

Faculty Sponsor: Nancy Hall

Abstract: Background: High fats, high sugar, and high sodium diets have become a normal part of our society leading to cardiovascular disease and obesity. Toddlers only know what they see and the choices made by caregivers are causing obesity to become a problem in young children. Statement of Problem: Toddlers establish food patterns and preferences. The food provided to toddlers by parents or other guardians is not given with much of a choice. This suggests a correlation between the parents eating habits and how the child eats. Purpose: The purpose of the study is to synthesize the evidence to discover if there is a correlation between toddler eating habits and developing obesity. This will allow nurses to educate parents and reduce the risk of developing childhood obesity. Findings: Evidence has shown that caregivers have a direct relationship on the food consumption and eating habits developed by toddlers. Education needs to be provided caregivers on incorporating a well-balanced diet. Caregivers must be mindful that children mimic, learn and behave based on what they observe. We believe incorporating placemats or trays with the USDA MyPlate portions appropriately designated into mealtime routine would encourage toddlers to learn adequate eating habits at an early age.

Title of the Work: Using Historic PLS Notes to Estimate Wetland Loss and Conversion

Presenters: Michael Hudec

Faculty Sponsor: Jeffrey Ueland

Abstract: This project will explore how land cover conversion has resulted in the loss of wetlands in the prairie regions of Minnesota. This would be an important step in recognizing the problems with how Minnesota has handled wetland management. The hypothesis examines the possibility of a correlation between prairie conversion (most likely to agriculture) and the decline of prairie potholes. Using a combination of PLS note data and LiDAR-produced contours, I will estimate approximations of the historic marsh basins and, comparing this data to that of the current National Wetlands Inventory, I can explore the overall change in wetland coverage. There is value in studying how Minnesota has managed the conversion of our natural prairies. Exploring how we may have sacrificed some of the natural world to benefit our own personal agendas can aid us in preserving what resources remain. Nearly all of this data is currently available through the Department of Natural Resources. The findings will compare Minnesota's past and present land use/land cover. It is expected that the research will reveal a certain disregard for waterfowl habitat preservation in favor of agricultural expansion.

Title of the Work: Food Deserts Near You

Presenters: Patricia Jennings, Caitlin McClellan, Alicia Thell, Kristy Whitson

Faculty Sponsor: Carla Norris-Raynbird

Abstract: Food deserts are geographical areas with limited access to affordable, nutritious, accessible food. Some research links food deserts to residents of inner cities or rural areas suffering diet-related health problems and health disparities within the affected population as a result. Food deserts are a result of an uneven distribution of resources prompted by racially and socioeconomically discriminatory policies and patterns of development such as Redlining. Distance from or concentration of nutritional food retailers such as grocery stores, supermarkets, farmer's markets, and other healthy food providers is the main criteria used to classify communities as food deserts. We will be using Red Lake as an example of a local area impacted by various conditions associated with this disparity. We will also explore what actions have been taken to decrease the food insecurity and disparity within this community and what challenges this community and other areas in terms of progress towards solving these issues.

Title of the Work: Synthesis of a Hydrogen Sulfide Detecting Fluorescent Probe

Presenters: Erin Johnson

Faculty Sponsor: Katie Peterson

Abstract: The purpose of this experiment is to synthesize a fluorescent probe which could be used to detect hydrogen sulfide (H₂S) in cells. H₂S has been found to be biologically relevant in physiological processes such as neurological function, antioxidation, and anti-inflammation. The probe was synthesized by reacting 7-Hydroxychromen-2-one with 1-fluoro-2, 4-Dinitrobenzene to produce 7-(2,4-Dinitro-phenoxy)-chromen-2-one. This process successfully produced 7-(2,4-Dinitro-phenoxy)-chromen-2-one, which has different excitation and emission wavelengths. This allows a reaction with H₂S that removes the dinitrobenzene group and regenerates the original 7-Hydroxychromen-2-one, enabling detection of H₂S. Additional studies include examining the response kinetics of the probe to H₂S overtime and measuring its selectivity for H₂S over other biologically active thiols.

Title of the Work: An Examination of the Relationship Between Diabetes and Poverty

Presenters: Justine Kapitzke

Faculty Sponsor: Jeffrey Ueland

Abstract: Being restricted from a healthy diet can lead to an increased risk of Diabetes. Through a lack of both resources and mobility, people living in poverty often cannot maintain a healthy diet. This project examines how access and location factor into Diabetes rates, and whether any patterns can be observed at the county level. I hypothesize that there is a statistically significant difference in rates of Diabetes between counties with high income levels and counties with low income levels within Minnesota. All data will come from the Census and the Minnesota Department of Health. Both correlation and regression analyses will be used to compare diabetes rates by counties and throughout time.

Title of the Work: Research into Aquatic Invasive Species Spread and Species within Minnesota

Presenters: Dalton Lammers

Faculty Sponsor: Jeffrey Ueland

Abstract: My Research into the spread and competing species of invasive plants and animals (AIS) will be the aim of this project. I will be looking in multiple spans of years to see how many AIS have spread in the state of Minnesota, and see exactly which are spreading the fastest and where. It is important to know where these species are spreading, because if they move in a particular direction, we can identify what factors could be causing movement to slow or stop it altogether. I will examine the factors by which these animals and plants move and to see which are more important. I will be using the MNDNR data deli and Minnesota Geospatial Commons for my data, as both have detailed data into the aquatic invasive species spread. I will present my results through maps and any relevant graphs displaying the more threatening species that have been identified, and how I believe we should go about the control based on my findings and data.

Title of the Work: Who Affects Me - Political Website

Presenters: Matthew Larson

Faculty Sponsor: Francois Neville

Abstract: I will present a poster for a web app that I am creating as part of a work-study project. The website will be called Who Affects Me, and it will provide users from the United States with information about the individuals who currently hold political office, as well as personal information about these officials and basic information about the duties that they are required to perform. I intend to eventually cover both the state and federal government, although this presentation will only cover the federal government and the state government of Minnesota. For my poster I will show screenshots of the pages of this website to illustrate both its design and its functionality. I will also attach easy to understand descriptions of what can be done on each page, and what might be added in the future. I will provide a demo of the website.

Title of the Work: Are Pan Fish Dying Due to Boat Access Points?

Presenters: Amber Lepisto

Faculty Sponsor: Jeffrey Ueland

Abstract: This study analyzes the correlation between pan fish abundance in Minnesota lakes and lake access density. There are 11,842 lakes in Minnesota with 87 counties. Not all lakes have a public access to them. The fish that I will be conducting the study on are Black Crappie (*Pomoxis nigromaculatus*), White crappie (*Pomoxis annularis*), Bluegill (*Lepomis macrochirus*) and Pumpkinseed (*Lepomis gibbosus*). Not every lake has each of these pan fish in them so they will be totaled all together into one number as the population for that lake. For a body of water in Minnesota to be considered a lake it must be ten acres in size. Five lakes from each county will be sampled and a correlation analysis will be conducted. Fish abundance will be calculated from the most recent DNR gill net sample. My research hypothesis will test if there is a relationship between public access and pan fish populations.

Title of the Work: Iron Content in Coniferous Trees: Mesabi Iron Range vs. Bemidji

Presenters: Nicole Limberis, Joseph Simonson

Faculty Sponsor: Katie Peterson

Abstract: Iron has an important role in the production of chlorophyll in plants. In trees, iron is absorbed through the roots and distributed throughout the plant. Therefore, the iron content in the ground can possibly determine how much is absorbed by the tree. If there is insufficient iron in the tree, it can lead to a disease called chlorosis. The purpose of this experiment is to explore whether or not trees can absorb excess amounts of iron. The Mesabi iron range in northern Minnesota is rich with iron ore deposits. Pine needles from two species of coniferous trees from the iron range are tested for iron content and compared to the same species growing in Bemidji, MN which has less iron in the soil. Soil samples surrounding the trees are also tested for iron content. Inductively coupled plasma optical emission spectroscopy (ICP-OES) is used to analyze the iron content of pine needles and soil samples. It is assumed that due to the abundance of iron in the soils on the iron range, trees should contain higher-than-normal concentrations of iron, compared to an area with less iron in the soil.

Title of the Work: Minnesota Obesity Rates and Poverty Rates

Presenters: Aaron Luehrs

Faculty Sponsor: Jeffrey Ueland

Abstract: For this spatial analysis project I will be looking at and comparing poverty rates and obesity rates in Minnesota at the county level in the state of Minnesota over several years. The main goal of this project is to see if there is a correlation between poverty rates and obesity in Minnesota and if it has change in space and time. This project is important because little information exists on the spatial dimensions relationship between poverty rates and obesity rates. Also, worldwide, not just in Minnesota, there has been noted decreases in activity along with increases in obesity rates. My hypothesis seeks to assess if there is a correlation between poverty and obesity rates. This project will utilize data from the Minnesota Department of Health and the US Census. This analysis will further the discussion surrounding obesity and income and open the discussion on the spatial dimension of this very important issue.

Title of the Work: Development Surrounding the Metropolitan Area

Presenters: Natasha Lukacs

Faculty Sponsor: Jeffrey Ueland

Abstract: This project will analyze the relationship between population and development for the 13 county Minneapolis, St. Paul metropolitan area. Increased development and population growth generally occur simultaneously, but it is important to look at the strength of that relationship. Utilizing block census data, I will compare population numbers with increases in housing unit densities between the years of 1990 and 2010. I will also conduct a spatial analysis using GIS mapping technologies. Planning for increased development is extremely important because it can help us better manage our resources. We must better understand the relationship between development and population in order to plan for future growth.

Title of the Work: Distribution of Custom Automotive Shops in Minnesota

Presenters: Max Madoll

Faculty Sponsor: Jeffrey Ueland

Abstract: Car ownership is ubiquitous in the United States and with high levels of ownership comes the need for automotive services. Specifically, understanding what affects the distribution of custom automotive shops in the Minneapolis/St. Paul metro area, Minnesota's most populous place, has a strong connection to urban development and the state's economy. This project examines the distribution of mechanic shops and their relationship to population and income levels at the census block group level. This project hypothesizes that there is a relationship between shop location and income. Utilizing data from the US Census and business listings database, this project will examine this the spatial dimensions of this question. Specifically, this project will use clustering and a modeling methods to perform this project. With these new findings someone that is building a shops could easily find a location that would give then a competitive edge.

Title of the Work: The Role of Na⁺- H⁺ Exchanger Isoform I (NHE1) Phosphorylation in Cancer Development and Progression in Non-Small Cell Lung Cancer

Presenters: Taylor Manzella, Tayler Smith

Faculty Sponsor: Mark Wallert

Abstract: The hallmarks of cancer are a collection of phenotypic changes that define cancer development and progression. One of these hallmarks, sustaining proliferative growth, is regulated in part through the phosphorylation of the Na⁺- H⁺ Exchanger Isoform 1 (NHE1). NHE1 is a transmembrane protein that can be phosphorylated by five distinct protein kinases that phosphorylate NHE1 in seven different locations. These kinases and the locations they phosphorylate are: 1) Pyk2 which phosphorylates NHE1 at S602 and S605, 2) AKT/Protein Kinase B which phosphorylates NHE1 at S648, 3) ROCK which phosphorylates NHE1 at T653, 4) RSK which phosphorylates NHE1 at S703, and 5) ERK which phosphorylates NHE1 at both S770 and S771. To evaluate the role of these phosphorylation sites in the regulation of cell proliferation, we have created a cell line each expressing human NHE1 with all seven of phosphorylation sites mutated to an alanine, thus removing that ability for NHE1 to be phosphorylated at these locations. We will present data on the production of this cell line and the impact of removal of these sites on cell proliferation.

Title of the Work: Occurrence of Lyme Disease in Metro, Suburban, and Rural Counties of Minnesota

Presenters: Erin Mapes²

Faculty Sponsor: Jeffrey Ueland

Abstract: The topic I will present is the occurrence of Lyme Disease in Minnesota. I will be using past data, to look at occurrence of Lyme Disease in Minnesota counties. This is a very important topic because the occurrence of Lyme Disease is very common. It can cause serious and long lasting effects on people who do not treat it soon enough. The resource hypothesis is that there is a difference in Lyme Disease occurrence in the Urban Counties, the Suburban Counties and in the Rural Counties in Minnesota. The null hypothesis is that there is no difference between the Urban Counties, the Suburban Counties, and the Rural Counties in Minnesota. My datasets will come from The Centers for

Disease Control and Prevention and Minnesota Department of Health. These two are very relevant datasets because they are two trusted websites. Both are government websites, where one does disease testing and research and the other provides state disease information. I will present my results in a poster form at Student Achievement Day. Some expected issues my findings will address are the occurrence of Lyme Disease, the highest counties in Minnesota where it is found, and the lowest counties in Minnesota.

Title of the Work: Walleye Stocking

Presenters: Adam Marlow

Faculty Sponsor: Jeffrey Ueland

Abstract: Walleye stocking is a method used by the MN DNR to improve lakes as fisheries. This is an important because fishing, especially walleye fishing, is an important economic factor for Minnesota. There are currently twenty-two lakes in Beltrami County that are stocked with Walleyes. This study aims to find out if walleye stocking has a relationship to walleye size and population. The data that will be used will be from the MN DNR stocking reports for Beltrami County and the netting data from lake surveys of the selected lakes.

Title of the Work: Detection of Metals and Anions in Commercial Glycol Samples

Presenters: Reid Mimmack, Sarah Stram

Faculty Sponsor: Katie Peterson

Abstract: The composition of a glycol sample provided by a local company was analyzed in order for it to be adequately reproduced in-house to save money on transportation costs. Ethylene or propylene glycol are chemicals that get added to heating and cooling systems to lower the freezing point of water. Glycol is especially prevalent in homes in the northern hemisphere to prevent pipes from freezing and bursting in cold northern winters. Metals, magnesium and calcium, were examined in the samples by using Inductively Coupled Plasma elemental analysis and dilution techniques. These two metals in high concentrations are indicative of "hard water." Anions, such as sulfate, nitrate, nitrite, phosphate and chloride, were also analyzed in the glycol samples using Ion Chromatography with a positively charged column. Quantitative measurements were taken of the analytes, which determined their concentrations in the glycol sample.

Title of the Work: Drinking Education for Minors

Presenters: Dannielle Mittag, Corissa Schmidt, Carli Schwint, Chelsey Wik

Faculty Sponsor: Nancy Hall

Abstract: Background: Students aged 18-24 are considered traditional college age. In this literature review, we will be looking at students who are 18-20 years of age. With a national drinking age of 21, anyone 20 years and younger is considered underage to drink alcohol. For our purposes, we are looking at just college students in the United States that meet the 18-20 criteria. Statement of Problem: Everywhere we go; there is a large number of people under the age of 21 consuming alcohol. This can lead to multiple risk taking behaviors and problems with the law. Purpose: The purpose of this literature review is to determine if education about alcohol and its consequences would be beneficial

in reducing the number of underage drinkers. Sample: Scholarly articles were researched regarding education given to college students who were caught drinking while underage. Nursing Implications: We feel this information is important because alcohol affects people in many ways including increased risk taking behaviors, altered judgement and overall mental health. These behaviors could lead to an increase in sexually transmitted infections (STI), unplanned pregnancies, and alcohol related motor vehicle accidents, which affect overall health.

Title of the Work: Wildlife Corridors in the Cascade Mountains

Presenters: Jordan Morgan

Faculty Sponsor: Miriam Rios-Sanchez

Abstract: The development of roads and highways through wild spaces has disturbed, fragmented, and destroyed millions of acres of wildlife habitat globally. Wildlife corridors consist of passes over and under these roads and highways. They have been determined as one way in which the flow of motorized vehicles can be enabled to coexist with the flow of wildlife. I-90 cuts through and fragments the expansive wilderness area that is the Cascade Mountains in Washington State. Collaborative efforts between numerous Governmental Entities, Non-Governmental Entities, Universities, and Tribal Nations have sprung up in this area to better incorporate ecological thinking into how we plan road infrastructure. Three scholars from across the nation explored if these new wildlife corridors will successfully reduce fragmentation of habitat, increase wildlife resiliency to climate change, and promotes stabilizing endangered species populations. Are the benefits of wildlife corridors worth their costs?

Title of the Work: Harnessing the Roles of Human-Animal Interaction & Metaphor: An Examination of Equine-Assisted Intervention

Presenters: EmmaLeigh Pasiuk

Faculty Sponsor: Angela Fournier

Abstract: The present study investigated human-animal interaction (HAI) as it occurs in equine-assisted learning or psychotherapy (EAP). A total of 46 men and women participated in the study by attending an EAP session and completing self-report measures. This field study was designed to describe the range and frequency of behaviors reported during an equine session. In addition, participant comments were analyzed, drawing metaphor themes from participant perceptions in an effort to better understand the EAP process. Finally, analyses were conducted to determine whether reported HAI was related to the themes that emerged. Participants reported a range of behaviors were emitted by them and by the horses involved. Qualitative data indicate the horse can serve as a metaphor for various aspects of one's life, including family and friends, positive or negative feelings or states, and personal challenges. Preliminary analyses indicate HAI was not dependent on the type of metaphor reported by client. Further research is needed to clearly describe and explain the mechanisms underlying EAP.

Title of the Work: Biodiversity and Land Use in the Metro Area of Minneapolis St. Paul

Presenters: Reba Peterson

Faculty Sponsor: Jeffrey Ueland

Abstract: Areas that have been impacted by human development and are no longer in the natural state tend to be lower in species diversity. It is important to see how human-centric changes, particularly in terms of population growth, influence the landscape and biodiversity of a given area. A visual representation of how the expansion of development has changed biodiversity within a certain area will illustrate this issue. This project aims to examine the relationship between biodiversity and population density in the thirteen county metro area of Minneapolis St. Paul over the last couple of decades. To this end, biodiversity will be calculated using data from the National Land Cover Dataset from the USGS. Population density will be derived from the US Census Bureau at the block group level which will be the unit of analysis for this project. A spatial statistical analysis will be conducted to evaluate the relationship of these two variables across time and space.

Title of the Work: Winter Effects on Phytoplankton Chlorophyll a Concentrations

Presenters: Samuel Peterson

Faculty Sponsor: Debbie Guelda

Abstract: To determine whether light or temperature is limiting for chlorophyll a concentrations in lakes during winter, we cultured phytoplankton in differing environmental conditions. Each treatment varied between high to low light and temperature. 1000ml beakers containing phytoplankton were placed in four separate conditions of high light and low light in cold temperature (1C) and high and low light at (22C). We attempted to recreate natural conditions of low light and cold-water temperatures (1C) as would be found below ice cover. Two phytoplankton samples from each treatment were collected on days 0, 4, and 7, and chlorophyll a concentrations were measured via standard spectrophotometry. We anticipate the highest chlorophyll a concentrations in the treatments of high light and temperature.

Title of the Work: Identification and Characterization of Bacteriophage KleverKiS

Presenters: Krysta Sanders

Faculty Sponsor: Holly LaFerriere

Abstract: Bacteriophages are viruses that infect bacteria. In recent years, renewed interest in the use of bacteriophages as an alternative to antibiotic treatment has emerged with the growing prevalence of antibiotic resistant strains of bacteria. Phage therapy studies rely upon a large number of characterized bacteriophages. In the current study KleverKiS, a novel mycobacteriophage, was identified and analyzed. KleverKiS was isolated from a soil sample obtained from a 3-year-old compost pile in Bemidji, Minnesota. Direct plating was used to isolate bacteriophages that infect *Mycobacterium smegmatis* from the soil sample. Four rounds of purification were performed to isolate a single type of bacteriophage. Purification rounds allowed for closer examination of plaque morphology revealing plaques ranging in size from 2 mm to 0.5 mm. The plaques were clear indicating the phage is lytic. Phage lysate was harvested from web pattern plates and the titer was calculated. The bacteriophage was analyzed via electron microscopy to determine the size and shape of a single

phage particle. DNA analysis using restriction enzymes was performed to determine whether or not the bacteriophage isolated was newly identified. The ability of the bacteriophage to infect a second species within the genus *Mycobacterium* was also examined.

Title of the Work: Assessing Relationships Between Rainfall and Vegetation in India

Presenters: Priya Setlur

Faculty Sponsor: Bill Sea

Abstract: Chronic water shortages in many areas of the world pose significant problems for agricultural production. This problem is especially acute in India where frequent droughts significantly reduce agricultural yields. Remote sensing provides a low cost approach to study environmental problems at large spatial scales and over long periods. Here, we make use of two readily available free remote sensing datasets to assess vegetation condition in response to changes in rainfall. Moderate-resolution imaging spectroradiometer (MODIS) Normalized Difference Vegetation Index (NDVI) data are used to monitor vegetation stress and Tropical Rainfall Measuring Mission (TRMM) data are used to compute daily rainfall estimates at selected 5 x 5 km areas of Rajasthan and Telangana for 2000-2015. Comparisons of time-series of NDVI and TRMM rainfall are used to examine how fluctuations in precipitation affect vegetation health, and hence agricultural production. Preliminary results suggest that in Telangana the timing of the monsoon and the duration of rain-free periods during the monsoon are more important for crop production than the total rainfall during the monsoon. In more irrigated Rajasthan, however, a more complex relationship is needed to explain the relationship between rainfall and crop yields.

Title of the Work: The Annotation of the Genome of Mycobacteriophage SamScheppers and Isolation of a Bacteriophage that Infects *Mycobacterium smegmatis*

Presenters: Eric Sikorski

Faculty Sponsor: Holly LaFerriere

Abstract: The goal of this experiment was to discover and characterize previously unidentified bacteriophages infecting the bacterium *Mycobacterium smegmatis*. In the first set of six experiments soil samples were taken from 6 locations in Minnesota and used to isolate phage. It was hypothesized that soil samples were likely to contain phage with the ability to infect *M. smegmatis*, since this bacterium is readily isolated from the soil. To test this hypothesis direct plating from environmental samples was conducted once as well as six enrichment procedures to increase chances of isolating a single bacteriophage. These first sets of experiments were unsuccessful. In the second set of experiments, the annotation of the genome of the phage SamScheppers was performed. The programs DNAMaster, Phamerator, HHPred, BLASTP, and Starterator were used to highlight areas of the bacteriophage's genetic code that likely contain open reading frames (ORFs) and determine possible protein functions that these ORFs encode. These areas were reviewed using multiple methods to ensure they met the requirements necessary to be considered ORFs and these ORFs were compared to other phage genomes that had been previously annotated. There were 95 putative ORFs identified within the 58351 bp genome. This bacteriophage is in cluster K4.

Title of the Work: Differences in Tornado Activity in America

Presenters: Anthony Smith

Faculty Sponsor: Jeffrey Ueland

Abstract: This project will be analyzing the spatial dimensions of tornadoes activity over time in the United States. Tornadoes are very mysterious, dangerous and interesting occurrences on Earth. Little is known about how to predict or tract tornadoes which leads to many to be unaware of their power. A few questions come to mind on the topic; how much does elevation influence tornadoes? Do they happen more often in densely built up areas? Do they happen more often in populated areas? These are the areas I'll be focusing on along with some of the myths about tornadoes. This work is important because it could help people be more aware of the danger of tornadoes. It can also help identify areas of higher tornado density. The data sources will be the "National Oceanic and Atmospheric Administration" (NOAA) and the U.S. Census Bureau. This analysis will be conducted at the county level.

Title of the Work: A Comparison of Isis Activity and Population in Syria

Presenters: Trey Steele

Faculty Sponsor: Jeffrey Ueland

Abstract: The focus of this project is to investigate the terrorist group Isis and whether or not there is a spatial pattern to the location of their attacks in Syria. An additional analysis will be conducted to look at this pattern and its relationship to demographic characteristics of the Syrian population. The region has been the focus of a great deal of turmoil in recent years. The project will deal with the most recent list of killings in Syria, which is from 2011. The data for this comes from the Guardian and the population data from UNICEF.

Title of the Work: Historic Relationship of Population Density Developed Landcover Change in the MN Metro

Presenters: Aaron Thompson

Faculty Sponsor: Jeffrey Ueland

Abstract: Undoubtedly, major cities across the United States have been suburbanizing for decades, and the sprawl of many urban communities has reached far beyond what the initial residents could have ever imagined. This project aims to examine how suburbanization change in land use relates to closeness to an urban center. My research question is whether or not there is a relationship between developed land cover change and population density in the 7 county Minneapolis/St. Paul metro area from 1990-2010 in Minnesota. I will be using 1990-2010 US census data to find population densities and map block groups, and land cover data from the NLCD to map the percentage of developed area change within those block groups. I will look for a correlation between the population density and development percent, then compare it over 1990-2010. I the hypothesis will test to see if a relationship exists between developed land cover change and increasing population densities, and an increase over time.

Title of the Work: Bacteriophage Discovery – Isolation of Bacteriophage Mirai

Presenters: Samantha Vang

Faculty Sponsor: Holly LaFerriere

Abstract: The discovery of bacteriophages, which are viruses that are capable of infecting a bacterial cell, is an area that requires more research. The discovery of new bacteriophages can aid in phage therapy, a method to treat pathogenic bacterial infections. In this set of experiments, a newly identified bacteriophage, Mirai, was isolated from a soil sample from Laporte, Minnesota. The approach taken was to enrich the soil sample for bacteriophages that can infect the bacterium *Mycobacterium smegmatis*, by incubating the soil sample with this bacterial species and nutrients that support phage infection of this species. The bacteriophages were separated from the bacteria through filtration. The bacteriophage was then purified through four rounds of selection, followed by harvesting the lysate from a web pattern plate. The plaque purification protocol allowed for analysis of plaques. Plaques ranged in size from 1mm to 5mm and were clear which indicates the phage undergoes a lytic life cycle. The lysate was used for analysis of bacteriophage morphology via electron microscopy and for tests with a second possible bacterial host, *Mycobacterium phlei*, to examine host specificity. The lysate was also used for a DNA extraction and restriction enzyme analysis of the phage genome.

Title of the Work: Determining Qualifying Child or Relative

Presenters: Cassie Vollhaber

Faculty Sponsor: Sandra Kranz

Abstract: My poster will explain the difference between the dependent categories of qualifying child or qualifying relative. I will include tables that will help a taxpayer determine if someone could be his/her qualifying child or relative. I will also explain the different questions a taxpayer has to answer from the tables, what each question means, and what information a taxpayer needs to have in order to make a determination for the person in question. One question is whether the taxpayer provided more than half the person's total support for the year. Another question pertains to the person in question's income level. I will provide different scenarios to allow the taxpayer to see the outcomes of the test and how a qualifying child or relative is determined. This information is important for taxpayers because they could be missing opportunities to claim or be claimed as a qualifying child or relative. It would benefit them to know the differences between qualifying child and relative and how they could use the knowledge to their advantage in the future.

Title of the Work: Using Spatial Statistics to Observe the Success of Piping Plover Nests Based on Location

Presenters: Breanna Wagner

Faculty Sponsor: Jeffrey Ueland

Abstract: Piping Plovers (*Charadrius melodus*) are small shorebirds that were placed on the Endangered Species List in 1986 for the Great Lakes population as well as threatened in the Great Plains states such as North Dakota. The data utilized in this project was collected during the summer of 2014 and the summer of 2015 at Long Lake National Wildlife Refuge in North Dakota. This data is important to show a comparison between the two breeding seasons as well as observe the factors that influence the population. It is important to observe which sites are the most productive year after year

based on habitat and low mortality rates. To compare the Piping Plover data, Spatial Statistics will be used to observe which locations had the most success rates.

Title of the Work: Analysis of Drunk Driving in MN

Presenters: Adam Weishair

Faculty Sponsor: Jeffrey Ueland

Abstract: This study will conduct a spatial to develop a regression model that offers an explanation of DWI rates at the county level in Minnesota. The model will test to see if smoking rates, uninsured rates, chronic drinking, and percent under poverty are explanatory factors. The hypothesis for this project is: H1: DWI rates = smoking rates, uninsured rates, chronic drinking, and percent under poverty in Minnesota Counties. H0: DWI rates < or > smoking rates, uninsured rates, chronic drinking, and percent under poverty in Minnesota Counties. This is an important issue because it will allow us to gain some perspective on drunk driving and issue that might have some relation to it. The results could have some implications towards health policies and programs going forward. I will use SPSS to build my model and test for regions of spatial clustering using spatial autocorrelation techniques and then display the results on a map of Minnesota using ArcGIS.

Title of the Work: Waterfowl Migration Patterns in Northern Minnesota 2015

Presenters: Hunter Welinski

Faculty Sponsor: Mark Fulton

Abstract: For the last 3 years, BSU Biology students have collected wings from Bemidji area hunters to document patterns of waterfowl migration during the fall hunting season. Species, sex and age can be inferred from a wing; and date, location, and number of hunters in the party have also been recorded for each wing. My poster will present data from the fall 2015 hunting season between September 26 and November 24. I will also compare patterns from 2015 with data from 2014. In fall 2014, there was a clear pattern of species arrival with date; this may be different for 2015 due to the relatively warm fall. I will also present success rate from different lakes/locations and average group success from each hunt.

Title of the Work: Lycopene and Other Natural Anti-Cancer Agents

Presenters: Shane White

Faculty Sponsor: Katie Peterson

Abstract: As cancers continue to prevail as a leading cause of death, with 8.2 million cancer related deaths worldwide in 2012, the desire for methods to deter or cure the disease is as high as ever. This desire, paired with a societal movement towards removing chemically altered products from consumption, has led to an increase in the search for natural products that can be used to help in the fight against cancer. One known anti-cancer agent that can be found in natural substances is Lycopene. Lycopene is a carotenoid found in tomatoes and plays a part in giving tomatoes their bright red color. Although the molecule's success in fighting cancers has been thought to be related to its antioxidant properties, it has also been observed to interfere with proteins required for cancerous growth. While naturally acquired substances like Lycopene are doubtful to be the cure of all cancers, their success in the treatment and deterrence of cancers cannot be denied. The intent of the research performed is to

extract a sample of lycopene from regular tomato paste, and to perform analytical tests with which to prove the structure of the obtained product.

Performance Abstracts

Title of the Work: Cross the Line -- A Student-Athlete's Perspective

Presenters: Jolynne Denman

Faculty Sponsor: Marsha Driscoll

Abstract: Being a student-athlete for four years, you learn and develop as an individual and student at a swift pace. Most days for regular students end when classes are over. However, as a collegiate three sport athlete, my day is far from being finished. From the beginning of the season we have to time manage our schedules: fitting in practices and weight-lifting, classes, working a job or two, and making time to be with friends and family. Also, it is a struggle for some of us student-athletes when we have to be away from our classes due to competition; we consider it lucky if a professor understands our absence. Likewise, being absent from our family and friends is difficult and we miss out on some humorous activities. However, we student-athletes would not trade our college experiences for anything because we are among a large family, which is our team, and we grow to love and support one another throughout our four or five years of college. For my presentation I will be reading some excerpts from my Honors Creative Thesis project, detailing my experiences as a student-athlete, and a member of the Bemidji State Honors program.

Title of the Work: The Imagined Day

Presenters: Gabriela Lara

Faculty Sponsor: Marsha Driscoll

Abstract: Many, if not all, aspiring educators dream, imagine, and plan their first day of teaching well before time calls to do so. Amidst the dreaming, fear of becoming a bad or ineffective teacher arise. Ineffective teachers can hinder a child's academic success. Knowing the characteristics of effective teachers can help assess an educator's likelihood of classroom success and improve professional development. This piece creative piece identifies and provides methods for one to improve and develop these attributes. Coming into the presentation, one will become a student and experience a rollercoaster of emotions and thoughts in an aspiring teacher's imagined first day.