

# STUDENT ACHIEVEMENT CONFERENCE 2017

APRIL 5<sup>TH</sup>



BEMIDJI  
STATE UNIVERSITY



**Dr. Faith Hensrud**  
President  
Bemidji State University

# WELCOME

Welcome to the 2017 Student Achievement Conference at Bemidji State University. This day of discovery marks another milestone of success in the intellectual development and personal growth of our students. It is testament to BSU's ongoing mission of teaching, exploration, and reflection all crucial to fulfilling our vision of preparing students to lead inspired lives.

This annual event presents the culmination of learning and accomplishment as demonstrated through the scholarship of discovery, creativity, and application. The conference reflects student success made possible by the university's rigorous, engaging academic environment and a highly interactive relationship between students and faculty.

Students' endeavors, and the dedicated faculty who teach and encourage them, bring honor to the university. The presentations, posters, and performances that are shared signify learning across the disciplines taught at Bemidji State. They also invite all who witness these works to gain new understanding of subjects both vital and fascinating. We are deeply grateful for this fine work and proud of what it represents.



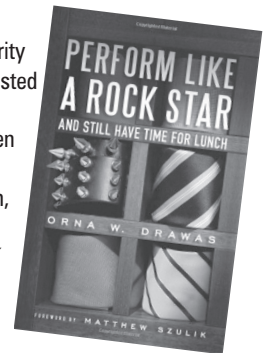
**Dr. Mahmoud Al-Odeh**  
Director  
Student Achievement Conference

It is my great pleasure to welcome you to the 2017 Student Achievement Conference, which celebrates students' high quality research and creative work. The conference is evidence of our extraordinary learning environment that we have at Bemidji State University. This is a great opportunity to show the significance of research and creative work across many fields and exchange ideas, methods, and views. A wide range of topics will be shared today including: scholarly research, case studies, community projects, art exhibits, and musical performances. I am very happy and grateful that so many distinguished students have come today to share their knowledge and experience. Thank you to all students, faculty, and staff members for their efforts in developing the presentations, and thank you to the many others who have generously helped plan this special day.



**Orna Drawas**  
Keynote Speaker

As a speaker, trainer, and coach focused on achieving high priority goals, Orna Drawas engages with business professionals interested in driving real and measurable results on a daily basis. Orna's Professional & Leadership Development courses have been given to business professionals across the country from companies such as General Mills, Honda R&D, United Technologies, Amgen Pharmaceuticals, National Institute of Health, FDA, AXA- Equitable and many other large and small organizations. The concepts of leadership and peak performance are highlighted in her book: *PERFORM LIKE A ROCK STAR and Still Have Time for Lunch* which was on Amazon's list of Top 10 Books for Business Success in 2011. Orna has over 30 years of business and management experience in sales and marketing with IBM, Sprint and Time Warner Telecom. Now a Peak Performance Expert, she focuses on speaking to groups and organizations interested in achieving extraordinary results and reaching individual Rock Stardom every day! Orna has a BS from Boston University and an MBA from Northeastern University and lives in Raleigh, North Carolina.





TIME

LOCATION

FACILITATOR

# MORNING SESSION

10:30 a.m. - 10:45 a.m.

HS 102

Facilitator: Jessica LeTexier

## *How Teachers Perceive Influence Over Their Students*

**Presenter(s):** Samantha Bittner, Shannon Combs, Larissa Donovan, Rikki Mays-Reak, Zachary Ruprech

**Sponsor:** Kelly La Venture

**Abstract:** The purpose of this study was to conduct research for Bemidji State University's Technology of Art and Design (TAD) department. By using an exploratory research design, we have been dissecting a problem involving one of the TAD department's programs: Exhibit Design. The issue we are addressing is the programs low enrollment and seemingly low awareness. The BSU program is one of the only in the country, and we are trying to determine how area high-school teachers might discuss the Exhibit Design program as an option for high-school seniors entering college. Our research will be qualitative and consist of in-depth interviews to determine how area high-school teachers influence their students' decisions for college choice. We used a convenience sample consisting of high-school art teachers in the 100-mile radius of Bemidji, MN. We have been working with Dr. Sachel Josefson, in the TAD department, for our Marketing Research class, under the direction of Dr. Kelly La Venture. We began our in-depth interviews on February 22nd, 2017. We have not concluded our research yet, but we are eager to share our results with the academic community of BSU.

10:30 a.m. - 10:45 a.m.

HS 105

Facilitator: Tiffany Hommes

## *Beyond Pluralism and Elitism: How Much Influence do Special Interests Have on the Content of Congressional Legislation?*

**Presenter(s):** Kyle Johnson

**Sponsor:** Patrick Donnay

**Abstract:** Do powerful special interests have too much influence over what is written in congressional legislation? There has been ongoing debate about how influence should be distributed between interest groups in affecting legislation. A central question in this debate asks whether interest groups with more financial clout have more influence in policy-making than interests that have fewer resources. Furthermore, much research has been on interest groups' influence on the lawmaker's vote instead of interest groups' influence prior to the vote. My research seeks to determine the extent to which interest groups influence the content of legislation in the U.S. Congress. My analysis is on legislation that has strong competing support among interest groups. I look at how much access to lawmakers interest groups have on a given piece of legislation and which interests contribute more to the actual content of the final legislation. I conduct analysis of six case studies to answer this question. My results indicate that interest groups with more resources have a stronger influence on the content of congressional legislation.

10:30 a.m. - 10:45 a.m.

HS 107

Facilitator: Mary Fairbanks

## *How BSU Students Utilize Social Media and How Our Campus Can Benefit From This*

**Presenter(s):** Nicole Pederson, Lindsey Wendt

**Sponsor:** Halbana Tarnizi

**Abstract:** As social media has become part of our life, studying how BSU students use social media could help the University in serving their students in a better way by utilizing various social media platforms. In this study, the use of social media among BSU students will be explored. The use of different platforms of social media, including Facebook, Twitter, Snapchat, Instagram, and LinkedIn, will be assessed. Surveys will be conducted among BSU students from a variety of backgrounds. The surveys will be made up of open-ended and closed-ended questions. These questions will cover, among others, the use of various social media platforms, time spent on them on a daily basis, and perception of connecting on social media within the University community. In addition, we will be looking at ways the University could benefit from social media use by students. Creative ideas and best practices from other institutions will be discussed, including how well those ideas and best practices could be applied to Bemidji State, based on the survey data we collect. An example of this would be an "Emergency Notification" as implemented at the University of Minnesota.

10:30 a.m. - 10:45 a.m.

HS 112

Facilitator: Dennis Lunt

## *Identification of Endogenous TCL Using Western Blots*

**Presenter(s):** Katlyn Briggs, Grace Young

**Sponsor:** Michael Hamann

**Abstract:** TCL is a Rho family GTPase implicated in promoting endothelial cell angiogenesis, as well as metastasis of malignant melanoma tumor cells. Previous experiments have shown that this protein is expressed in human umbilical vein endothelial (HUVEC) cells and WM115 cells, a malignant melanoma cell line. In this experiment, antibodies potentially capable of detecting TCL were tested using western blot analysis and protein lysates from HUVEC and WM115 cells. HeLa cell protein lysates were also produced as a negative control, as these cells have been shown to not express TCL. The western blot analysis showed that TCL may be present in the cells; however, the bands detected were very light or were located at a different molecular weight. Further research needs to be done to determine whether the bands indicate the presence of TCL or are the result of non-specific interactions.



TIME	LOCATION	FACILITATOR
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10:30 a.m. - 10:45 a.m. HS 113 Facilitator: Jennifer Atteberry

***Understanding the For Profit Healthcare Industry Through Marx's Analysis of Capitalism***

**Presenter(s):** Melvin Ametepe, Bryce Brittain, Peyton Mills, Cody Vigen

**Sponsor:** Rucha Ambikar

**Abstract:** Quality of healthcare in America today is definitely in the top tier of the world if you can afford to pay out-of-pocket or have insurance. Americans' relationship with healthcare has been an interesting one, and it has become even more so since the Affordable Health Care Act. Healthcare insurance is an important factor when determining to take a job, keep a job, or even leave a job. One way we could analyze the relationship between government and healthcare companies is to use Marx's analysis of capitalism to understand the for-profit motive of the healthcare systems. We will be discussing how Marx's understanding of capitalism could be applied to improving the healthcare system in America.

10:30 a.m. - 10:45 a.m. HS 230 Facilitator: Bill Joyce

***Strategies in Rock-Paper-Scissors***

**Presenter(s):** Taylor Kintigh

**Sponsor:** Colleen Livingston

**Abstract:** I will put the childhood game Rock-Paper-Scissors under the microscope by drawing comparisons between types of strategies, shown empirically through the use of a computer program I have developed. Real people are usually irrational in their strategy selection. I will show what the best strategy is to combat irrational behavior shown by the opposition.

10:30 a.m. - 10:45 a.m. HS 248A Facilitator: Debra Sea

***Invented Music Compositional Styles***

**Presenter(s):** Andrew McCormick

**Sponsor:** Miriam Webber

**Abstract:** Over the last year of my studies at Bemidji State, my fascination with musical composition has driven me to discoveries I could not have comprehended even at the beginning of my studies. Though Arnold Schoenberg's twelve-tone compositional technique initially piqued my curiosity, I gradually grew disinterested in the limited application of the mere forty-eight different combinations of the twelve notes. I eventually derived two novel methods utilizing the twelve-tone matrix Schoenberg created, both of which fall under the category of "Labyrinth" composition technique. The history of the second composition method I have synthesized dates back to the Renaissance. "Decoder Ring Compositions" (a working title) translates text into numbers and numbers into the twelve notes in Western music. I shall demonstrate how each method is applied and give a short excerpt of each example.

10:30 a.m. - 10:45 a.m. HS 248B Facilitator: Marty Wolf

***Characterizing the Role of the Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) in Cell Proliferation and Migration in Ovarian Cancer Cells***

**Presenter(s):** Taylor Manzella

**Sponsor:** Mark Wallert

**Abstract:** The Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) is a transmembrane protein activated in cancer cells that plays a role in sustaining proliferative growth. Three ovarian adenocarcinoma lines, SKOV-3, OVCAR-3, and CAOV-3, were characterized to determine NHE1's role in growth and progression. We have used proliferation assays to demonstrate NHE1 involvement in the regulation of cell growth in ovarian cancer cell lines. Cell growth is stimulated when cells are cultured in 10% serum compared to 0.5% serum, and this growth stimulation is blocked by the NHE1 inhibitor cariporide. The effects of four inhibitors that block specific kinases that phosphorylate NHE1 were investigated to evaluate their impact on cell proliferation. Specific inhibitors, MK2206 (AKT), Sch772984 (ERK), Y27632 (Rock), and B-ID1870 (RSK) were evaluated in the three ovarian cell lines to determine key pathways in regulating NHE1. Among the SKOV-3 and CAOV-3 cell lines, the RSK site inhibitor B-ID1870 demonstrated the largest impact of inhibition, while in the OVCAR-3 cell line, the AKT site inhibitor MK2206 demonstrated the greatest impact. Future work will include investigating CRISPR-CAS9 gene editing technology and ECIS migration assays to determine the role of NHE1 in ovarian cancer progression.



TIME	LOCATION	FACILITATOR
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10:30 a.m. - 10:45 a.m.	HS 249	Facilitator: Pete McDonnell
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***Exercising Tribal Sovereignty through Lacrosse***

**Presenter(s):** Melanie Childrey

**Sponsor:** John Gonzalez

**Abstract:** Tribal sovereignty is meant for indigenous tribes to be able to govern themselves within the borders of the United States and to be recognized as nations with government-to-government relations. One pressure point, where this sovereignty has been questioned, is through the game of lacrosse. The attitudes that are expressed from athletes of lacrosse, the second national sport of Canada, across the world towards athletes that come from First Nations and American Indian Tribal Nations is another example of how this sovereignty is questioned. In this presentation, I will discuss why it is critical for First Nation and American Indian Tribal Nations be able to freely express their national identity and have the same right to represent their own people, and they shouldn't have to be suppressed by the American or Canadian system due to travel visas and post-9/11 hysteria.

10:50 a.m. - 11:05 a.m.	HS 102	Facilitator: Jessica LeTexier
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***A Presentation of the Student Perspective on Creating a Marketing Plan for a Client***

**Presenter(s):** Erika Huff, Phung Huynh, Lindsey Wendt, Yixin Zhao

**Sponsor:** Kelly La Venture

**Abstract:** Working collectively, our team developed a framework to aid our client, a Midwestern organization, in marketing and developing their powder coating division. Our team created an image for the division to become the “#1 Powder Coating Destination in the North.” Research and ideas were presented to the client in the form of a marketing plan consisting of the following sections: executive summary, introduction, situation analysis, marketing strategy, financials, controls, and conclusion. By implementing the new marketing plan, our client hopes the division will achieve a 10% increase in sales by January 2018. This session will present our experience, the marketing plan created for our client, and the positive implications for the powder coating division.

10:50 a.m. - 11:05 a.m.	HS 105	Facilitator: Tiffany Hommes
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***Spoilers and Signatures: Ballot Access and Third Party Performance***

**Presenter(s):** Cameron Shepard

**Sponsor:** Patrick Donnay

**Abstract:** Third parties and independents face several hurdles to success in the United States because of the two-party system. One of those hurdles is state ballot access laws, which place obstacles in the way of minor candidates that major-party candidates do not face. Research into the phenomenon of third-party performance has shown that third-party candidates do better in non-competitive races when the possibility of causing the spoiler effect is small. However, very little research exists to show the difference in support for candidates listed on each state's ballot and those who are only allowed write-in access. Using the state and selected county results for the 2016 presidential election, where both major party candidates were historically unpopular, my preliminary analysis studying the third-party candidacies of Gary Johnson, Jill Stein, and Evan McMullin confirms the hypothesis that third-party candidates usually perform better in non-competitive races than in ones where they could act as a spoiler. However, further analysis is needed to assess the effects of a listed candidacy against one with only write-in access and to account for other factors that might better explain how those candidates performed in a given state or county.

10:50 a.m. - 11:05 a.m.	HS 107	Facilitator: Mary Fairbanks
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***Looking Towards Their Future***

**Presenter(s):** Alicia Christenson, Kelsey Jacobson, Eric Walls,

**Sponsor:** Faith Hensrud

**Abstract:** On Monday, March 27th, the President's Student Commission will have a chance to give 5th and 6th graders a taste of what it means to go to college and further their career after high school. It will get them thinking about into which career path they want to go. These students come from families who may not be able to attend to their children's needs and find the Boys and Girls Club a great place for children to learn different skill sets, while the mom or dad is working a job and may not be able to pay for child care. About twelve students from all types of majors make up what is called the President's Student Commission at BSU. With this project, we want to share our personal experiences from the event. At the event, each Commissioner will be highlighting their major of interest and will have the kids come play games that involve getting to know their career better. At Student Achievement Day, our group will present how the event went, what was done, and the response from the children involved using an oral presentation with a PowerPoint of video footage and pictures.



TIME	LOCATION	FACILITATOR
10:50 a.m. - 11:05 a.m.	HS 112	Facilitator: Dennis Lunt
<b>Scavenger Camera Trap Survey in Hobson Memorial Forest</b>		
<b>Presenter(s):</b> Tyler Guest, Erin Mapes, Spencer Peter, Evan Wilkins		
<b>Sponsor:</b> Brian Hiller		
<b>Abstract:</b> Camera traps have proven to be an effective way to overcome challenges of monitoring solitary or secretive animals in a non-invasive manner. We deployed camera traps in Hobson Forest to determine the diversity of winter scavengers and to examine differences in visitation based on bait type. In January 2017, we placed six cameras in Hobson Forest to observe winter scavenging on two different baits; we baited three with beaver ( <i>Castor canadensis</i> ) and three with white-tailed deer ( <i>Odocoileus virginianus</i> ). Our survey consisted of two-week trapping periods and ran for a total of six weeks. We compared which baits had the most visits, highest frequency of visits, as well as the diversity of species visiting each bait. Hobson Forest consists of many varieties of habitats including: small lakes, swamps, bogs, and a variety of upland habitats. Our data will be used to inform management decisions being implemented based on the recently completed Hobson Forest Management Plan.		
10:50 a.m. - 11:05 a.m.	HS 113	Facilitator: Jennifer Atteberry
<b>Investigating the Influence of the Rho-family GTPase TCL/RhoJ on Vesicular Trafficking</b>		
<b>Presenter(s):</b> Tami Jo Olson		
<b>Sponsor:</b> Michael Hamann		
<b>Abstract:</b> TCL/RhoJ is a Rho family GTPase that was recently shown to have a novel N-terminal sequence capable of regulating its localization to the cellular plasma membrane and vesicular compartments, as well as its ability to load with nucleotide. Additionally, the protein has been shown to have a role in endosomal recycling pathways. To better understand how the N-terminus of TCL may contribute to vesicular trafficking, WM-115 cells will be used in transferrin uptake and recycling assays. WM-115 cells are a continuous cell line derived from a human melanoma tumor and are believed to overexpress TCL. In order to manipulate TCL levels, the WM-115 cells were initially tested for their transfection efficiency using DNA containing Venus fluorescent protein and were found to have a 60% transfection efficiency. To study vesicular trafficking, WM-115 cells will be transfected with YFP-TCL constructs corresponding to the wild-type protein and an N-terminal deletion mutant, as well as constitutively activating and dominant negative mutants of TCL. Transfected cells will be tested for transferrin uptake and recycling using Alexa-647 transferrin and flow cytometry with gating on YFP-positive cells. These experiments will help determine how transferrin recycling rates are affected by TCL and better illuminate its role in vesicular trafficking.		
10:50 a.m. - 11:05 a.m.	HS 230	Facilitator: Bill Joyce
<b>Redd Habitat Selection for Brook Trout in the Necktie River Bemidji, MN</b>		
<b>Presenter(s):</b> William Varela		
<b>Sponsor:</b> Andrew Hafz		
<b>Abstract:</b> The presence of quality, suitable habitat is important for the success of naturally reproducing brook trout populations. Therefore, measuring redd habitat selection by brook trout was the focus of this study. Brook trout redds were observed during the spawning season of 2016; we identified a total of 18 redds in the Necktie River in late October and early November. Specific environmental variables associated with redd selection were measured: velocity, in-stream cover, canopy cover, bank overhang, river width, substrate type and size, temperature, and max-depth. The same environmental variables were measured for 30 randomly selected sites. Preliminary results showed redds were specific to the type of environment where located. Confirmed redds were located in riffles 85% of the time, and runs 15% of the time, whereas random sites varied in location. Redds were dominated by cobble and gravel ranging from 5-43 mm with a mean of 16 mm (SD=4.09), while random sites were dominated by clay and sand with particle size 2% or woody debris and dissolved organic matter. Mean velocity at redds was 0.19 cm/s (SD=0.089), and random sites 0.22 cm/s (SD=0.083). This is the first year of a two-year study.		
10:50 a.m. - 11:05 a.m.	HS 248A	Facilitator: Debra Sea
<b>Playing Baroque Flute Music</b>		
<b>Presenter(s):</b> Cameron Trott		
<b>Sponsor:</b> Kristina Cirks		
<b>Abstract:</b> This project combines research and musical examples in which flutists are able to learn how to use six different musical elements used in playing Baroque music, while also learning about the Baroque era and history of the flute. Covered in this book are sections on how to articulate, use dynamics, interact with other parts, breathe properly, style ornaments, and define tempos in Baroque style music. Each section is specifically oriented toward Baroque music to help the player in understanding how the music was originally performed and interpreted.		





TIME	LOCATION	FACILITATOR
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10:50 a.m. - 11:05 a.m.	HS 248B	Facilitator: Marty Wolf
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***If the Goal of Capitalism is to Maximize Profit, Why Discriminate Against Women?***

**Presenter(s):** Devin Barrett, Nicholas Raboin, Kaitlyn Vertina

**Sponsor:** Rucha Ambikar

**Abstract:** With the feminist movement following World War II and in the 1960s, women began entering the workforce in extremely high numbers. They assisted in helping the economy boom with the amount of jobs they filled. Yet, to this day, women still make change to every dollar a man earns. Why is that? Our presentation will discuss how Marx analyzed capitalism as a system which was made to maximize profit. We will also take a closer look at certain fields in which it is evident that women were paid less than men for the same exact job. This exists today in that we still aren't at the dollar to dollar ratio for wage, so we, as a group, will find what is essential to keep improving the wage gap among the rich and poor. Equality should be the norm of a society with a capitalist strategy to make profit. Capitalism seeks to enrich society and wants to gain maximum profit. Marx's Theory of Capitalism says the goal is to maximize profit; therefore, using feminist theories, we'll research and show why women are the target for exploitation.

10:50 a.m. - 11:05 a.m.	HS 249	Facilitator: Pete McDonnell
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***Obtaining the Ideal Artistic Reading***

**Presenter(s):** Megan Flaherty

**Sponsor:** Miriam Webber

**Abstract:** All too often, musicians have only a short performance to convey their interpretation of a work. If done correctly, the attentive listener is not only able to respond to the emotion emulated, but will also want to better understand the music represented. One method the performer and listener can take to fully appreciate the music is to attempt a three-stage analytical process, a concept presented in Edward Cone's article, "Three Ways of Reading a Detective Story or a Brahms Intermezzo." Cone explains that this method allows the reader to engage with music or literature in its artistic entirety. The first reading--whether it be a literal first reading/listening, or a return to a long forgotten work--centers on that initial experience. The second reading is strictly analytical, that is, the performer/listener combs through the piece again looking at how all the pieces fit together and why. Finally, the third reading returns to the experiential aspect of the first, combined with a fuller understanding and appreciation of the work's deeper structure. This presentation will include a performance of Richard Strauss's "Allerseelen" and how using Cone's method has enhanced both my understanding of music and my approach to its performance.

11:10 a.m. - 11:25 a.m.	HS 102	Facilitator: Jessica LeTexier
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***Knowledge, Skills, and Abilities Needed to Obtain a Position in Experiential Marketing***

**Presenter(s):** Benjamin Boser, Kortney Kenville, Angela Roberts

**Sponsor:** Kelly La Venture

**Abstract:** The purpose of this study was to answer the question, "How do trade show and exhibit design professionals describe the knowledge skills and abilities students need to obtain a position in the Experiential Marketing industry by obtaining an Event/Experiential marketing degree at a Midwestern University?" Working closely with a professor through the duration of our Marketing Research course, our group used an exploratory research design to conduct in-depth interviews with industry professionals over the age of 18, who hold design and marketing-related positions, to determine if an Event Marketing degree would be well-received within the industry. Investigators conducted eight interviews that ranged from twenty to forty-five minutes. The questions were categorized as follows: knowledge, skills, and abilities needed or valued in their positions. These questions allowed us to capture data related to industry needs and student preparation. After coding the interviews, three common themes emerged: effective communications, understanding of the marketing mix, and common language. Using these themes, we created a draft curriculum and presented this to our client. Data indicate there is a gap between industry needs and relevant programs.

11:10 a.m. - 11:25 a.m.	HS 105	Facilitator: Tiffany Hommes
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***The New Evangelicals: How Donald Trump Revealed the Changing Christian Conservative Base in the 2016 Republican Presidential Primary***

**Presenter(s):** Michael Herbert

**Sponsor:** Patrick Donnay

**Abstract:** I analyze how Donald Trump, who many see as an uncertain standard bearer of Christian values, given his colored personal life and various tortured exchanges on the Bible, became the champion of Christian conservatives. Using Pew data from a January 2016 survey, I analyze how the Republican presidential candidate went from the lowest rankings of religious association just 10 months prior to winning the highest white evangelical support since George W. Bush in 2004. More research will be conducted on how the specific group known as evangelical voters has changed, as well as what other variables, such as economic, gender equality, and international policy, played within the demographic that assisted in voting for president elect Donald Trump. This project will contribute to understanding the results of the 2016 presidential campaign and, specifically, the behavior of the white evangelical vote.



TIME	LOCATION	FACILITATOR
11:10 a.m. - 11:25 a.m.	HS 107	Facilitator: Mary Fairbanks
<b><i>Outreach and Career Readiness at The Boys and Girls Club</i></b>		
<b>Presenter(s):</b> Hunter Hames, Madison Hutchinson, Abby Sperr, Claire White, Eric Wunrow		
<b>Sponsor:</b> Faith Hensrud		
<b>Abstract:</b> The President's Student Commission's main goal for the year was to reach out to the Bemidji community in an impactful way. In order to complete this task, the Commission will be connecting with the Boys and Girls Club of the Bemidji Area to assist with the National Boys and Girls Club week. During this week, the organization focuses on three main pillars: academics, religion, and arts. Our commission will be fulfilling the academic pillar. We will be breaking up into major specific groups, and the Commission will be able to provide encouragement and career ideas for all areas of study that Bemidji State has to offer. Our goal is to show the students of the Club the obtainability of a college degree. As representatives of the Biology and Nursing departments, our group will provide information to the students regarding what courses to take and what activities in grade school will best prepare them for the field. Through mentoring these children, as well as serving as role models and information givers, we will create an impact that will be lifelong.		
11:10 a.m. - 11:25 a.m.	HS 112	Facilitator: Dennis Lunt
<b><i>The C-terminal Tail of TCL Localizes the GTPase to the Plasma Membrane of HeLa Cells</i></b>		
<b>Presenter(s):</b> Brooke Tader		
<b>Sponsor:</b> Michael Hamann		
<b>Abstract:</b> TCL/RhoJ belongs to the Rho family of GTPases, and it has been shown to contribute to angiogenesis and tumor growth. To better understand the inherent biochemistry of TCL, our lab has been investigating primary sequence differences between TCL and its closest homologs Cdc42 and TC10. Thus far, amino acids 17-20 in the N terminus have been found to be important for GTP-loading and localization of TCL to the plasma membrane, and mutation of this sequence leads to TCL localization to vesicles. To better understand how the TCL N-terminus, C-terminus, and GTP-binding regions contribute to membrane and vesicle localization independently of each other, expression constructs were generated that fuse the first 24 and last 21 amino acids of TCL to the fluorescent protein Venus. Interestingly, these constructs indicate that the C-terminus alone may be mostly responsible for the membrane localization. TCL constructs containing the GTPase core without the C-terminal tail suggest the GTPase region uniquely controls localization to vesicles. Additional mutations in the C-terminal tail will be generated to test how the C-terminal CAAX sequence and the polybasic sequence contribute to TCL localization. Overall, the results indicate TCL regulation and localization is uniquely distinct from its most closely related GTPases.		
11:10 a.m. - 11:25 a.m.	HS 113	Facilitator: Jennifer Atteberry
<b><i>Comparison of Sociopolitical Trends between a Northern Minnesota University and Current National Data</i></b>		
<b>Presenter(s):</b> Madison Schoephoerster		
<b>Sponsor:</b> Carla Norris-Raynbird		
<b>Abstract:</b> The purpose of this research is to see what sociopolitical trend comparisons can be made between students at a northern Minnesota university and current national data. Competing theories will then be applied to see which one has more explanatory power. A quantitative survey will be administered to a convenience sample of participants at the northern Minnesota university and analyzed with an SPSS statistical package. The information gathered from this study will be compared to current national sociopolitical data from the Pew Research Center and the Hart Research Associates. Political socialization theory and social learning theory will then be used as explanatory theories to see which theory is more powerful in explaining trend comparisons.		
11:10 a.m. - 11:25 a.m.	HS 230	Facilitator: Bill Joyce
<b><i>William Faulkner's Portrayal of Women</i></b>		
<b>Presenter(s):</b> Erika Lisardi		
<b>Sponsor:</b> Gary Rees		
<b>Abstract:</b> "William Faulkner's Portrayal of Women" provides an in-depth analysis of the role women play in two of Faulkner's major novels. Following the characterizations of Candace "Caddy" Compson in <i>The Sound and the Fury</i> (1929) and Charlotte Rittenmeyer in <i>The Wild Palms</i> (1939), my paper explores the meaning of being a woman in a patriarchal society. Connecting literary and social movements, such as modernism, the development and actions of the characters are explained in terms of the traditional versus modern woman. The text also called into question Faulkner's motives behind not fully giving his women literary independence. We see this in Caddy, who is never given a voice, but is instead shown to the reader through the eyes of dominant male characters and through Charlotte's incapability to be a mother. Though Faulkner attempts to embrace the modernist view of women, he cannot fully let go of a tradition that dictates that women are defined by men.		





TIME	LOCATION	FACILITATOR
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11:10 a.m. - 11:25 a.m.

HS 248A

Facilitator: Debra Sea

***Collegiate Jazz Improv Curriculum: The First Three Semesters*****Presenter(s):** Shelby Andrist**Sponsor:** Kristina Cirks

**Abstract:** The purpose of this research was to create a pedagogical tool to be used by college professors in effectively teaching jazz improvisation in a group setting. Throughout the history of jazz and jazz improvisation, many works have been created to aid in the individual's education and understanding of the art form. However, there have been no recent pedagogical works to aid the teacher in conducting group improvisation classes, as it has become the common method of instruction. The following presentation will detail the path I undertook to create a three-semester curriculum that is a combination of various research dating back to the 30's through today, spanning the genres of jazz music, jazz improvisation, and teaching. The research is informed via survey of various professors and jazz musicians across the United States and other individual method books, as well as online sources of knowledge.

11:10 a.m. - 11:25 a.m.

HS 248B

Facilitator: Marty Wolf

***Hypoxia and Serum-deprivation Impacts Calcineurin B Homologous Protein Isoform 2 Expression and Activity in Non-small Cell Lung Cancer*****Presenter(s):** Clarice Wallert**Sponsor:** Mark Wallert

**Abstract:** The  $\text{Na}^+/\text{H}^+$  exchanger isoform 1 (NHE1) is a key regulator of cell proliferation, migration, and invasion in several types of solid tumors. The calcineurin B homologous proteins (CHP1 and CHP2) are essential cofactors for NHE1 function. CHP1 is expressed ubiquitously in healthy tissue, while CHP2 is predominantly expressed in tumors. To evaluate the role of CHP2 in NSCLC cells we used NCI-H1299, derived from a carcinoma, as the parent cell line and developed two cell lines: H1299 CHP2KD (lacking CHP2) and H1299 NHE1KD (lacking NHE1). We hypothesized that CHP2 expression enhances cell survival and tumorigenic potential of these cells. We evaluated the impact of serum-deprivation and hypoxia on CHP2 expression and determined CHP2 levels increased when H1299 cells are grown in 0.5% serum and 1%  $\text{O}_2$  compared to cells grown in 10% serum and 21%  $\text{O}_2$  (normal conditions). The rates of proliferation and migration in low serum and hypoxic conditions of H1299 cells were about 50% of that seen in normal conditions, while H1299 CHP2KD rates were reduced to a rate equivalent to the H1299 NHE1KD. In a soft agar assay, increased tumor formation rates occurred for H1299 cells in 10% and 0.5% serum but not for H1299 CHP2KD or H1299 NHE1KD cells.

11:10 a.m. - 11:25 a.m.

HS 249

Facilitator: Pete McDonnell

***Mathematical Underpinnings of the Black-Scholes Options-Pricing Model*****Presenter(s):** Brent Hanson**Sponsor:** Eric Lund

**Abstract:** In this presentation, we will discuss the famous Black-Scholes options-pricing model for finding the value of derivative securities and also noted will be the importance of this model in the realm of qualitative finance. The presentation will include some of the mathematical ideas of continuous stochastic processes that lead to the derivation of the Black-Scholes equation; the options-pricing formula that results from a solution of the equation will also be discussed. The presentation will outline the details of the Black-Scholes model while keeping in mind its overall place in the realm of finance, including discussing improvements and criticisms of the model over the years.

11:30 a.m. - 11:45 a.m.

HS 102

Facilitator: Jessica LeTexier

***A Study to Explore Why Hispanic Students Enroll at a Midwestern University*****Presenter(s):** Georgiana Apostolou, Clara Lehner**Sponsor:** Kelly La Venture

**Abstract:** The purpose of this study was to explore why Hispanic students enroll at a Midwestern university. Exploratory research design involves examination of the problem. The investigators used cluster sampling to ensure the sample was divided into mutually exclusive and exhaustive groups. The investigators' sample consisted of students in a freshman-level lecture hall on certain days of the week over a two-day time frame. The survey consisted of 13 questions. The investigators collected 87 completed paper surveys. All information collected was kept confidential and all of the respondents were over the age of 18. Data indicate that 33% of respondents were most influenced by the location, 37% were influenced by major, and 36% were influenced by costs of a Midwestern university.



TIME	LOCATION	FACILITATOR
11:30 a.m. - 11:45 a.m.	HS 105	Facilitator: Tiffany Hommes
<b><i>Churchill's Argument Against Democracy: The Average Voter. Information Levels and News Sources among Americans</i></b>		
<b>Presenter(s):</b> Kyle Priest <b>Sponsor:</b> Patrick Donnay <b>Abstract:</b> A democracy needs an informed public. However, I investigate low levels of political awareness among Americans. I focus on whether people understand issues incorrectly or are simply disengaged and inattentive. There is an important difference between them. Those who are uninformed simply do not know, which would make it easier to turn them into informed citizens. All that would be needed is for them to access the right information. For those who are misinformed, however, it is a tougher task. They believe that their answer is right, and even though they are in fact wrong, they are more willing to fight the truth in order to validate what they feel is the right answer. I analyze this phenomenon with Public Mind Polling data from Fairleigh Dickinson University. I anticipate my results to show that less use of news media will decrease a person's level of knowledge and increase their degree of disengagement, while loyalty to a limited number of media sources is likely to increase a person's level of misinformation.		
11:30 a.m. - 11:45 a.m.	HS 107	Facilitator: Mary Fairbanks
<b><i>Weigh the Waste</i></b>		
<b>Presenter(s):</b> Jordan Lutz, Caitlin McClellan <b>Sponsor:</b> Anna Carlson <b>Abstract:</b> The Weigh the Waste campaign is a collaborative effort between the BSU Dining Services, Aramark, and the Sustainability Office. It is an initiative to measure the amount of food waste being created at both Wally's and Lakeside, and also to educate students, staff, and faculty about the impact of their dining choices and available alternatives to help them reduce their impact. This presentation will serve as a continuation of our education outreach, but also as an in-depth explanation of the entire Weigh the Waste process and a brief outline of the campaign's history.		
11:30 a.m. - 11:45 a.m.	HS 112	Facilitator: Dennis Lunt
<b><i>Artificial Nest Box Use by Waterfowl in Bemidji, MN</i></b>		
<b>Presenter(s):</b> Nathan Arnold, Charlotte Innis <b>Sponsor:</b> Brian Hiller <b>Abstract:</b> In the 1930s, wood ducks ( <i>Aix sponsa</i> ), were in danger of extinction due to over-hunting and extensive logging. Artificial nest boxes were used to provide nesting structures for wood ducks, as the natural cavities that they relied on were disappearing. The Minnesota Department of Natural Resources (MN DNR) has placed approximately 500 nest boxes throughout the Bemidji, MN, area. In order to assess the use of nest boxes around the Bemidji area, we surveyed approximately 10% of the available boxes to determine how many boxes are being used by ducks nesting around Bemidji, as well as the species using them and their success rate. Box use was determined by opening each box and examining the contents for egg membranes & shell fragments. The species using the box was determined based on color, size, and thickness of the shells. Success was based on the number of whole eggs, shell fragments, and membranes present. Our results indicate that the Bemidji area duck boxes are producing more common goldeneyes ( <i>Bucephala clangula</i> ) and hooded mergansers ( <i>Lophodytes cucullatus</i> ) than wood ducks. The results of this project will enable the MN DNR to better plan future locations of the duck boxes to maximize use and productivity.		
11:30 a.m. - 11:45 a.m.	HS 113	Facilitator: Jennifer Atteberry
<b><i>GTP-loading Activity of TC10/TCL Chimeras Underscores Important Allosteric Regulatory Regions of TCL</i></b>		
<b>Presenter(s):</b> Grace Young <b>Sponsor:</b> Michael Hamann <b>Abstract:</b> TCL/RhoJ is a GTPase that may function as a regulator of endothelial cell angiogenesis. TCL may also contribute to tumor growth and metastasis in certain cancers. For this reason, TCL is of interest, and it is important to understand the biochemistry of TCL activation and what makes TCL distinct for specific targeting purposes. TCL, a member of the Cdc42 subfamily of Rho GTPases, has an additional 20 amino acids in its N-terminus compared to Cdc42. Moreover, N-terminal deletions and mutations of TCL inhibit its ability to exchange guanine nucleotides; however, similar N-terminal deletions within its closest homologue, TC10, did not have a similar effect. Chimeras of TCL and TC10 identified that amino acids 121-129 (region R2c) influence the ability of TCL's N-terminus to regulate nucleotide loading. Chimeras were produced to determine if replacing the R2c sequence of TC10 would be sufficient to change the nucleotide binding characteristics of TC10 to mimic TCL. TC10/TCL chimeras exhibited loading like that of TCL ΔN, demonstrating the importance of those sequences on the N-terminus for GTP-loading. Additional chimeras were produced to test whether the addition of the N-terminus of TCL to TC10 restores nucleotide binding of TC10 carrying the R2c region of TCL.		



TIME	LOCATION	FACILITATOR
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11:30 a.m. - 11:45 a.m.	HS 230	Facilitator: Bill Joyce
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***Case Studies of Student Athlete Sexual Assault and Impression Management through the Media***

**Presenter(s):** Blake Holder

**Sponsor:** Carla Norris-Raynbird

**Abstract:** This study examines the relationship between social attitudes and the media, and the potential for media to be used to diffuse scandals on universities' athletic programs. Literature on sexual aggression argues that male student athletes are made an exception to standard rules when deviant behavior occurs. This research asks if impression management is aided by media outlet reporting of sexual aggressions by male student athletes. Three cases of sexual assault by student athletes from different geographical regions will be studied: Stanford University in California, Florida State University, and Baylor University in Texas. All of the case study data used in this research will be from electronic resources from a variety of media outlets. Impression management themes from the literature will be compared through content analysis of the case study data for consistency.

11:30 a.m. - 11:45 a.m.	HS 248B	Facilitator: Marty Wolf
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***Solving Optimization Problems Using The AM-GM Inequality***

**Presenter(s):** Alex Tuti

**Sponsor:** Eric Lund

**Abstract:** In optimization problems, we establish the largest and/or smallest value that a function can take on. With knowledge from calculus, most students can attempt to find solutions to such problems with a relatively low level of difficulty. The knowledge from calculus that helps us find such maximum and/or minimum values of a function is the fact that, for many functions, these values occur at points where the derivative of the function equals 0. In this presentation, I would like to show that we can achieve the same results in many cases by using the AM-GM (Arithmetic Mean - Geometric Mean) Inequality as an equally feasible alternative. This is an effective and useful alternative method of solution, especially in a case where finding the derivative of a function involves more than the normal level of difficulty, or where a student does not have a sufficient understanding of calculus.

## EXHIBITS

11:30 a.m. - 1:00 p.m.	M 280	Facilitator: Mitchell Blessing
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***TAD Design Exhibit***

**Presenter(s):** Zachary Fistrovich, Hope Wall, Hannah Sernett, Donna Ehnert, Madeline Treuer, Nicholas Lommen, Jacob Jensen

**Sponsor:** Mitchell Blessing

**Abstract:** An invitational display of TAD Design projects.

11:30 a.m. - 1:00 p.m.	M 280	Facilitator: Natalia Himmerska
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***Fine Art Exhibit***

**Presenter(s):** Brianna Boner, Tristen Carlson, Zachary Erickson, Shayna Fellman, Megan Gallagher, Angelina Grigoryants, Gurgen Grigoryants, Kelsey Jacobson, Seth Larsen, Klay Leister, Mavra Vasile

**Sponsor:** Natalia Himmirska

**Abstract:** An invitational collection of paintings and drawings created by students in TAD fine arts classes.

11:30 a.m. - 1:00 p.m.	M 280	Facilitator: Miriam Webber
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***Woodwind Quartet***

**Presenter(s):** Kyle Baldeshwiler, David Harris, Cameron Trott

**Sponsor:** Miriam Webber

**Abstract:** An invitational performance from the Music Department.



TIME

LOCATION

FACILITATOR

# POSTERS

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Travis Ricks

## *Modern Bureaucracy*

**Presenter(s):** Daniel Fletcher, Dallas Hansen**Sponsor:** Rucha Ambikar

**Abstract:** With the rise of capitalism came a new way of organization in the work place. This system is called a bureaucracy, and its aim is to maximize efficiency and production. Max Weber's theory on bureaucracy and capitalism helps us understand how these two systems function in society. This poster display aims to analyze Weber's theory to find out what positive and negative aspects these systems contain. Furthermore, we will be gathering data from professionals about the bureaucracies with which they have been involved. We selected this method because we have access to, what we consider to be, a unique sample of people to interview. We will use this information to see if people's experience in bureaucracies relate to Weber's theory and if the positives outweigh the negatives. Using all of this, we plan to make a solid presentation based on fact, evidence, and research to show just what we have accomplished.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Kate Larson

## *A Simple Adsorption Study*

**Presenter(s):** Nicholas Peterson**Sponsor:** Dragoljub Bilanovic

**Abstract:** The deterioration of quality of water in natural and urban systems is often because of pollution with organic compounds and suspended solids. Nano-composites can be used in removal of organic compounds from water. We investigated the capacity of xanthan-chitosan-kaolin nanocomposites to adsorb organic compounds from water. The adsorption rates of water, methyl red, and bromothymol blue on the nano-composites were measured using gravimetric and spectrophotometric techniques. This study was in part funded by Minnesota Space Grant Consortium.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Janet Moen

## *Communities and Ecosystems Respond to Changing Environmental Conditions*

**Presenter(s):** Mattison Pelland, Joshua Zachman**Sponsor:** Dragoljub Bilanovic

**Abstract:** The earth is made up of ecosystems in which various communities exist. The communities and the ecosystems change in response to disturbances induced by natural and/or human forces. Primary and secondary successions are recognized by ecologists. Primary ecological succession is a gradual establishment of a community and an ecosystem on previously uninhabited ground, such as earth exposed after a retreating glacier or cooled lava after a volcanic eruption. Secondary ecological succession is a gradual establishment of a community and an ecosystem on previously inhabited ground, such as soil after a clear cut or bottom sediments after bottom trawling. Secondary ecological succession is more common. Changes in vegetation are often discussed in ecological successions studies, but food supply, food chains, and distribution of animal species are equally affected. Data from literature will be used to discuss response of both communities and ecosystems undergoing ecological succession.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Travis Ricks

## *How Poaching Affects the World*

**Presenter(s):** Katrina Fessler, Bailey Luna, Justin VanHoutan**Sponsor:** Dragoljub Bilanovic

**Abstract:** Poaching is the illegal capturing of wild organisms for profit. Poaching rapidly decreases populations of hunted animals, speeding up their extinction, while destabilizing local ecosystems and human communities within them. We will study scientific literature on the subject of poaching and how this illegal activity affects the world. We plan to learn about the most frequently poached animals, their role and importance for the environment, and how poaching of these animals affects local ecosystems. We learned that animals are most often poached for novelty items and, more frequently, for false traditional beliefs that parts of the poached animals have medical or other characteristics. Poaching will not stop on its own; we, humans, must stop poaching if we are to avoid destruction of planetary ecosystems. It is our understanding that if we are to stop poaching, people should be globally educated about this terrible, environmentally destructive activity.



TIME	LOCATION	FACILITATOR
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11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Jeanette Lukowski

**Solar Energy****Presenter(s):** Lucas Day, Calli Yerbich**Sponsor:** Dragoljub Bilanovic

**Abstract:** Solar energy is a “hot topic” today. On one side are supporters who think solar energy should be the main source of power for humankind, and on the other side are opponents who do not want any change. Solar energy can be used in solar heating, photovoltaics, thermal energy, thermal architecture, molten salt power plants, and artificial photosynthesis. Minnesota has enough various alternative energy sources, including solar, so we will attempt to answer the question, “Why is Minnesota still burning coal?” We plan to also use information generated from this study to figure out pathways we could take to make Minnesota a coal-free society.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Travis Ricks

**The Great Pacific Garbage Patch: A Study of the Effects of Littering of the Ocean****Presenter(s):** Laura Halvorson, Kendra Kennebeck, Katherine Rogers**Sponsor:** Dragoljub Bilanovic

**Abstract:** The Great Pacific Garbage Patch, discovered in the 1980’s, has continued to grow in both size and concentration of garbage, mainly due to human carelessness, and it is currently about the size of Texas. The garbage patch provides a focal point to discuss the prevalent issue of marine littering. This study will analyze current scientific literature on the subject to compare the published data with the information given in the chapter 13 of a textbook used in the course (i.e. Tyler-Miller and Spoolman, Sustaining the Earth- an Integrated Approach). This approach will help us better understand the interference of the patch on marine life to make conclusions about the overall effect(s) of this particular patch, as well as other marine littering. In conclusion, we hope to gain broader insight into this disturbing phenomena and to educate and encourage our audience to take actions against marine littering as often as possible.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

**The Impact of Human Action on Climate Change****Presenter(s):** Aaron Carter, Derek Olsen, Zachary Wicker**Sponsor:** Dragoljub Bilanovic

**Abstract:** Humans are emitting about 40 gigatons of CO<sub>2</sub> into the atmosphere each year. The Earth cannot process this excessive amount of CO<sub>2</sub>. As a consequence of rising atmospheric CO<sub>2</sub> concentration, oceans are becoming more acidic, average global temperature is rising, frequency and severity of almost all natural disasters are rising, and there are many other unforeseen yet destructive consequences. We plan to analyze scholarly journals to compile scientific data which will become a strong platform of information to construct interview questions. We also plan to interview faculty at various colleges at Bemidji State University. The interviews will focus on climate change and the potential impacts of climate change on future generations. We speculated that the majority of faculty know and acknowledge that climate change is a real phenomenon. We also speculate that not all faculty could be proactive in helping reduce impacts of climate change. We think our results could contribute towards solidifying the fact that climate change is a real phenomenon, and society needs to be proactive now if we are to prevent further degradation of the planetary life support system and keep it habitable for future generations.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

**Wind Energy****Presenter(s):** Zachary Swank, Eshfaq Ullah, Zachary Whitecloud**Sponsor:** Dragoljub Bilanovic

**Abstract:** This project is about the benefits of wind power. Wind is an environmentally friendly resource which is available only when it blows and when the wind is strong enough to move the blades of the wind turbines. At a time when there is no wind, the electricity should come from other traditional or alternative energy resources. There are different strategies for positioning wind farms. The farms could be located both on and off shores. To minimize the effect of the noise which wind turbines make on human settlements, the wind farms could be located off-shore. Wind farms do not pollute the environment like coal, gas, oil and nuclear power plants. The farms are also cost effective sources of electricity. We hope to learn how to persuade communities to use more electricity generated by wind farms and other alternative sources of energy. There are also some negative consequences of introduction of wind farms. For example, in addition to the noise wind turbines make, some people consider them to be visual impediments, and some people claim the turbines kill birds. New generation of wind turbines, currently under development, are likely to minimize these problems.



TIME	LOCATION	FACILITATOR
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Kate Larson
<b><i>Xanthan-Chitosan Composites in Adsorption of Bromothymol Blue and Methyl Red</i></b>		
<b>Presenter(s):</b> Ian Anderson, Tyler Hanneman, Nicholas Myre, Kevin Rynearson <b>Sponsor:</b> Dragoljub Bilanovic <b>Abstract:</b> Xanthan, a microbial polysaccharide, can be used in preparation of foams, gels, and other materials. Xanthan can be cross-linked with glycerol to make adsorbents which are not toxic to the environment or organisms. Chitosan, another polysaccharide of biological origin, can be used in preparation of adsorbents. We test adsorbents made of xanthan, chitosan, and glycerol in removal of model organic substances from water. Bromothymol blue and methyl red were used as the model substances. Water uptake rate, pH, and adsorption of model substances were measured daily. Xanthan-glycerol-chitosan composites are not toxic, so they could be used in food, pharmaceutical, and other industries. This study was in part funded by Minnesota Space Grant Consortium.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Jeanette Lukowski
<b><i>Xanthan-Chitosan-Bentonite Nano Composites in Adsorption of Model Organic Compounds</i></b>		
<b>Presenter(s):</b> Matthew Capecchi, Bethany Erickson, Darren Gagne, Derek Jensen, Emily Rapp <b>Sponsor:</b> Dragoljub Bilanovic <b>Abstract:</b> Numerous organic substances, originating from both industrial processes and waste disposal, find their way into surface and groundwater systems. A multitude of these substances are toxic to humans and other organisms, and removal of these substances from water is often complex and expensive. Nanocomposites could potentially be used in removal of organic substances from water. Nanocomposites can be made from environmentally friendly materials. We studied nanocomposites made of xanthan, chitosan, and bentonite in adsorption of two model substances: bromothymol blue and methyl red. Gravimetric and spectrophotometric methods were used to measure adsorption of water, bromothymol blue, and methyl red on xanthan-chitosan-bentonite nanocomposites prepared locally. This study was in part funded by Minnesota Space Grant Consortium.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Jeanette Lukowski
<b><i>Northern Student Success</i></b>		
<b>Presenter(s):</b> Hannah Cook <b>Sponsor:</b> Valica Boudry <b>Abstract:</b> I have been writing for the Northern Student magazine since October of 2016 at Bemidji State and, in those five short months, I have noticed a major improvement in my overall writing skill. I would like to showcase this as a great opportunity for other students to realize the potential available to them.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Kate Larson
<b><i>Neonatal Abstinence Syndrome - What Is It, Why Is It Important, and What Can We Do About It?</i></b>		
<b>Presenter(s):</b> Ariana Karstens <b>Sponsor:</b> Tracy Caravella <b>Abstract:</b> The focus of this presentation will be on Neonatal Abstinence Syndrome (NAS). NAS is a condition in newborns of withdrawal from opiates taken by mothers during pregnancy. It is characterized by high pitched crying and the infant seizing and shaking uncontrollably. This syndrome is a byproduct of a much larger issue. Our country has seen a dramatic increase in individuals addicted to opioids, namely heroin. Sanford Health of Bemidji has identified the reduction of infants born addicted to opiates as a primary concern of the Bemidji area. This presentation will highlight the actions by Sanford Health to reduce incidence of NAS. In conclusion, audience members will learn what NAS is, what impact is has on the Bemidji community, and what steps can be taken to reduce the instances of NAS.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Julie Larson
<b><i>A Pilot Study to Examine the Animal's Role in Animal-Assisted Learning</i></b>		
<b>Presenter(s):</b> Clarissa Sletten <b>Sponsor:</b> Kristina Cirks <b>Abstract:</b> The purpose of this pilot study was to better understand Equine-Assisted Learning (EAL) and the role of the horses during learning sessions. Three different experiential learning (HAI) sessions were conducted. Six participants were randomized to a learning session with either horses, dogs, or no animals. Assessments were administered to examine mood, human-animal interaction, and learning. Results are discussed as they relate to the roles of animals in experiential learning.		





TIME	LOCATION	FACILITATOR
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11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Travis Ricks

***Well Known Euphoniumists and Their Contributions*****Presenter(s):** Cassidy Trott**Sponsor:** Kristina Cirks

**Abstract:** Euphoniumists have transformed the euphonium in many aspects throughout the past few hundred years of its existence and it is important to know how. After clarifying the euphonium from the baritone, the issue of how euphoniumists have contributed to the euphonium world and how they have shaped it is discussed. Nine euphoniumists from the past to the present are highlighted in order to display the ways in which each of them has given to the euphonium world and assisted in its success. From dictionaries, biographies, and blogs, I gathered the history and success of each musician to discuss the progression of the euphonium world.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

***Morphine Use in Pediatric*****Presenter(s):** Yunuke Nyanamba**Sponsor:** Season Ellison

**Abstract:** Around the globe, morphine is recommended as the first-line strong opioid for the treatment of persisting moderate-severe pain in children of all ages with medical illness, except those children who cannot metabolize morphine well, to whom an alternative use of hydromorphone is recommended. Morphine works by binding to opiate receptors in the central nervous system (CNS), altering the perception of and response to pain stimuli while producing generalized CNS depression. The therapeutic effect of morphine is to decrease the severity of pain. The aim of this research is to study why, according to the existing literature, morphine is considered a standard choice opioid in the treatment of moderate to severe pain in pediatric populations.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Janet Moen

***Just Scratching the Surface: Findings from an Experiment on Human-Animal Interaction*****Presenter(s):** Matthan Althiser, April Harrison, Nicole Huisenga, Catelyn Hulscher, Sarah Krahulec, Brianna Kucera, Allie Mechte, Clarissa Sletten, Krista Walstrom, Terris Williams, Brianna Willie**Sponsor:** Angela Fournier

**Abstract:** The purpose of the present study was to assess student attitudes towards animals and to further our understanding of the effects of human-animal interaction (HAI). Through a basic laboratory study, researchers investigated the effects of differing doses of HAI on the well-being of college students. Participants included 20 healthy male and female college students that were randomly assigned to experience a low level of HAI or a high level of HAI. Students were monitored for any changes in positive and negative emotions as a result of interacting with animals. Findings from this research shed light on the effects of HAI, which is important in furthering our understanding of animal-assisted interventions.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

***The 4-Legged Files: A System for Monitoring Animals used in Animal-Assisted Therapy*****Presenter(s):** Emma Leigh Pasiuk, Lori Winston**Sponsor:** Angela Fournier

**Abstract:** The process of psychotherapy involves recording a myriad of information on the client, including family history, health information, and behavioral observations. This information is equally important for each horse employed in equine-assisted psychotherapy (EAP), yet there are no standardized instruments or recording systems regarding horse health and behavior. This poster will present a uniform system to assist facilitators in recording and storing information specific to each horse in the herd. The system includes a paper-and-pencil instrument to record horse behavior during EAP sessions, as well as a method for cataloging strengths and weaknesses of each horse and signs of stress and burnout. Gathering objective data may inform practice decisions, allowing clinicians to provide the best care for their human clients and animal partners.



TIME	LOCATION	FACILITATOR
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11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Kate Larson

***Factors that Lead to High Black Crappie Populations in Minnesota Lakes***

**Presenter(s):** Amber Lepisto

**Sponsor:** Andrew Hafz

**Abstract:** Black crappie (*Pomoxis nigromaculatus*) is one of 162 native fish species in the state of Minnesota. With 87 counties in Minnesota, 75 have a known black crappie population within at least one of their lakes. MNLakefinder on the DNR website offered sufficient information to know each lake's population, based on their population sampling method with gill nets. To determine which factor leads to the highest populations, the population data from 336 lakes is compared to littoral area, max depth of the lake, and water clarity levels in feet. Regression tests will be run to show which variable had the highest impact on the highest populations. Elk Lake in Sherburne County had the highest gill net population of black crappie at 1,034. From personal fishing experience, a lake with higher eutrophication will lead to higher catch rates of black crappie, but the water clarity variable may prove me wrong. For the final analysis, I hope to find that a lake with a high max depth and high water clarity within a large littoral area leads to the largest black crappie population.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Kate Larson

***Light Intensity Affecting Probability of Capture and Stomach Weight in Walleye (*Sander vitreus*)***

**Presenter(s):** Lee Skajewski

**Sponsor:** Andrew Hafz

**Abstract:** Light intensity is the main factor influencing the feeding patterns of walleye. The objective of this study was to determine the probability of capture and stomach content in walleye in relation to light intensity on Lake Bemidji, MN. Data recorded from fish in the sample included wet weight, total length, and stomach weight in the size range of 350 to 500 mm. Probability of capture was highest at 60% with a light intensity of 0 Photon Flux Fluence Rate (PPFFR). Probability of capture was lowest at 5% with a light intensity of 150 PPFFR. Stomach weight was higher in morning samples compared to evening samples. Walleyes can successfully feed throughout the night which contributes to a high probability of capture when light intensities are low and stomach weights ranging higher in the morning.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Janet Moen

***Oxytetracycline Identification Accuracy in Age-0 Walleye.***

**Presenter(s):** Kylie St. Peter

**Sponsor:** Andrew Hafz

**Abstract:** Oxytetracycline (OTC) chemical marking is a practice commonly used by fisheries managers to mark walleye fry. This mark is necessary to determine stocked fry from naturally reproduced walleye. The process of determining if a walleye has been marked with OTC can be easily compromised when methods are inconsistent. This study tested the accuracy of two readers in determining marked and unmarked age-0 walleye from two rearing ponds in northern Minnesota. Otoliths were removed, cleaned, and mounted on a slide using superglue. The prepared slides were kept in a dark area until sanded and then examined for the presence of a fluorescent yellow ring when viewed under an ultraviolet light through a microscope. One hundred known marked and unmarked fish were read by each person. Both readers were 100% accurate using the methods listed.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

***Seasonal Fluctuations of Zooplankton, Dissolved Oxygen, and Temperature in Lake Bemidji***

**Presenter(s):** Cody Coyle

**Sponsor:** Andrew Hafz

**Abstract:** With the current influx of aquatic invasive species in Minnesota lakes, the status of zooplankton has become vital. Zooplankton are at the base of all food chains in aquatic ecosystems, ecosystems that vary greatly throughout a year's time. The purpose of this study is to track the patterns and location of zooplankton throughout an entire year. Water samples were collected at different depths in the southern basin of Lake Bemidji, while dissolved oxygen and temperature readings were also taken at this time and were correlated back to the zooplankton densities. Like other aquatic organisms, zooplankton are affected by oxygen levels, which can be directly related to where they are found in the water column. During fall turnover, temperatures remained constant through the water column with the oxygen levels at the surface being over 11 parts per million and below 10 parts per million at the 15-meter mark. Zooplankton counts averaged 29 specimens per 2-liter sample, with cladocerans significantly outnumbering copepods. Hopefully, these results will help fisheries managers and others interested in this field better understand the trends in zooplankton densities in lakes.



TIME	LOCATION	FACILITATOR
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11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Jeanette Lukowski

***The Effect of Abiotic Factors on Bluegill (*Lepomis macrochirus*) Size in Central Minnesota Lakes*****Presenter(s):** Ryan Henry**Sponsor:** Andrew Hafz

**Abstract:** Bluegill are the most targeted species of fish in Minnesota. In recent years, the abundance of slow-growing, small Bluegill has increased within the state. Angler harvest of Bluegill has shown to be capable of reducing the average length of Bluegill by four times (Beard & Essington 1999). Abiotic factors, such as maximum depth, average water clarity, the trophic state index, lake area, and littoral area, can influence the dynamics of a lake system. There has been no past research on whether these abiotic factors can influence the size structure of a Bluegill population. The objective of this study is to measure if there is a direct relationship between each of these abiotic factors and the average size of Bluegill in 9 central Minnesota lakes. Using Program R, each abiotic factor measurement for each lake will be run through a linear regression analysis with the average length of Bluegill for the corresponding lake. After collecting and analyzing the data, the expected results of this study are that there is not a significant relationship between abiotic factors and average Bluegill length. This would suggest that angler harvest is the primary factor contributing to average Bluegill length.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Jeanette Lukowski

***Boys and Girls Club TADT Presentation*****Presenter(s):** Mark Cobb, Ryan Holm, Benjamin Winkelman**Sponsor:** Faith Hensrud

**Abstract:** Three TADT students will present to the children at the Boys and Girls Club (BGC). Our goal is to get the BGC members to start thinking about their future and to start them on the path to get into college. As current TADT students at BSU, we have all learned and benefited from this department; therefore, we are going to present to the BGC members a few of the unique and interesting things we have done in our program. We aim to grab their attention and give them a better understanding of possible fields they can get into. A tri-fold poster board with pictures and information will be created for our event, and we will also utilize a few gadgets borrowed from the program with the department's consent. We will deliver an exciting presentation and foster a friendly environment in order to answer any questions they have for us in regards to the fields we are going into and our experience thus far at college. We will also present during the Student Achievement Conference to extend the representation for BSU President Faith Hensrud as part of her Student Commission Board.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Jeanette Lukowski

***The Next Generation of Leaders*****Presenter(s):** Zachary Erickson, Mercideze VanBruggen, Katelyn Westlund**Sponsor:** Faith Hensrud

**Abstract:** The President's Student Commission is about leadership and providing students with an opportunity to demonstrate leadership experience and knowledge. To do this, our group will be conducting hands-on activities for students (3rd through 7th grade) at the Boys and Girls Club of Bemidji. We will introduce college to young students and show the many benefits of college to help create a college-going culture within the community. Each person in our group will demonstrate and lead activities that he/she specializes in at Bemidji State. In doing this, the students at the Boys and Girls Club will have the opportunity to learn more about college and start thinking about the benefits of attending college. For our group, we will demonstrate leadership abilities by leading and discussing a topic with a small group to reinforce our verbal communication skills, which are important for a leader.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Jeanette Lukowski

***A Study to Determine if Alumni from a Northern Minnesota University Would Purchase a Tiny House*****Presenter(s):** Murphy Fellman, Marisa Johnson, Samuel Matter, Hailey Rhen, Mitchell Swanson**Sponsor:** Kelly La Venture

**Abstract:** The purpose of our study was to determine if alumni from a northern Minnesota university would purchase a tiny house. Investigators felt like they had a good understanding of the marketing situation; thus, they selected a descriptive research design. In collaboration with their client, investigators identified a convenience sample of 17,725 alumni to survey. Using an electronic survey as their primary research instrument, investigators collaborated with their client to send a 20 question survey to potential respondents. Through thorough data analysis and interpretation, investigators were able to determine if alumni would purchase a tiny house.



TIME	LOCATION	FACILITATOR
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Janet Moen
<b>An Alternative to Antibiotics</b>		
<b>Presenter(s):</b> Kaitlynn Goltz, Karin Peterson		
<b>Sponsor:</b> Holly LaFerriere		
<b>Abstract:</b> Bacteria are constantly mutating and becoming resistant to the antibiotics that are readily available. Phage therapy can be used as an alternative to antibiotics for bacteria that are quickly developing resistance. Mirai and KleverKiS are newly isolated mycobacteriophages that are able to lyse <i>Mycobacterium smegmatis</i> . Because these phages are able to lyse bacterial cells, they offer a possible alternative to treating a bacterial disease caused by members of the genus <i>Mycobacterium</i> , such as <i>Mycobacterium tuberculosis</i> . Mirai and KleverKiS were isolated from two separate soil samples and purified using several rounds of selection with the soft agar overlay method and serial dilutions. The titer was investigated using a spot test. <i>Mycobacterium smegmatis</i> was grown in favorable conditions and used for purification of the two phages. A high titer lysate must be obtained for each bacteriophage of $1 \times 10^{10}$ pfu/mL before phage morphology may be visualized using electron microscopy and DNA may be extracted for sequencing.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Kate Larson
<b>Isolation and Characterization of Bacteriophage Vanarele.</b>		
<b>Presenter(s):</b> Gary Wendlandt		
<b>Sponsor:</b> Holly LaFerriere		
<b>Abstract:</b> The goal of this research is to find a previously unidentified bacteriophage that infects <i>Pseudomonas aeruginosa</i> 15692. Bacteriophages are viruses that infect bacteria. Bacteriophages are used in phage therapy, which is the process of using a virus that specifically infects the bacterial species to render a bacterial cell destroyed. The bacteriophage Vanarele was propagated using an enrichment procedure. Vanarele was then isolated using soft agar overlay method. It was isolated from raw sewage, which was obtained from the wastewater treatment plant in Bemidji, Minnesota. Five rounds of purification were performed to produce an identical bacteriophage plaque morphology, which were on average 3 mm in size. The phage that was isolated is a lytic phage; this is determined by having clear plaques in the top agar, which represent lack of growth of bacteria. A high titer lysate was obtained, which was used for DNA extraction, and the DNA was sent off for sequencing. The lysate was also used to obtain electron micrographs to examine the morphology of Vanarele. The infectious capabilities of this phage on multiple strains of <i>Pseudomonas aeruginosa</i> and other selected bacteria, including both gram+ and gram- species, was also tested.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Kate Larson
<b>The Isolation and Characterization of the Bacteriophage Rosie and Its Implications In Phage Therapy</b>		
<b>Presenter(s):</b> Natalie Koan		
<b>Sponsor:</b> Holly LaFerriere		
<b>Abstract:</b> With the overuse of antibiotics, many dangerous pathogens are becoming resistant. Furthermore, an increase in the occurrences of biofilms, or bacterial communities that are more resistant to antibiotics, has been observed, especially in relation to hospital-acquired infections. One alternative to the use of antibiotics is the development of phage therapies. Phage therapy involves utilizing a bacteriophage, a virus that infects bacteria, as a treatment for resistant bacteria. In this experiment, the bacterium <i>Pseudomonas aeruginosa</i> PA01-LAC was used in the identification and purification of the bacteriophage Rosie. Rosie was isolated from raw sewage following an enrichment procedure. The soft agar overlay method, along with serial dilutions repeated six times resulted in a pure phage stock. Rosie is a lytic phage with small clear plaques. Testing the ability of a phage to breakdown a biofilm is the next phase of this experiment. The biofilm will be constructed from <i>P. aeruginosa</i> PA01-LAC, and then Rosie will, in theory, destroy the bacteria and dispel the biofilm. The final phase is to test the phage's ability to infect other strains of <i>P. aeruginosa</i> .		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Janet Moen
<b>Exploring Empathy: Where to Go, Where to Start?</b>		
<b>Presenter(s):</b> Michelle Wiuff, Lori Winston		
<b>Sponsor:</b> Kate Larson		
<b>Abstract:</b> Empathy can be a hard topic for discussion, especially when it comes to first examining it. Previous research on empathy has highlighted two basic types of empathy: cognitive and emotional empathy. Cognitive empathy refers to taking the perspective of another person, and emotional empathy refers to emotional responses to another person that are either like those responses the other is experiencing (parallel empathy) or are a reaction to the emotional experiences of the other person (reactive empathy) (Stephan and Finlay, 1999). The purpose of this project evolved from previous findings on college student empathy and local campus-wide investigations. At the completion of this survey, we discovered current empathy levels on campus and the potential for increasing the perspective-taking aspect of empathy. With this knowledge, we hope to explore potential interventions intended to increase perspective taking. The futuristic goal would be to build a more inclusive and diverse community environment that can embrace all students.		



TIME	LOCATION	FACILITATOR
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11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Janet Moen

***Mechanical Properties of 3D Printed ABS and PLA*****Presenter(s):** John Siebenaler,**Sponsor:** Michael Lund

**Abstract:** Recent tensile test experiments on bulk 3D printed ABS and PLA samples indicate that the relative stiffness and the strain to failure depend strongly on the raster angle, i.e. the angle at which the print head lays the material down. When the raster angle is parallel to the pull direction of the tensile test, the 3D printed sample has a larger relative stiffness and smaller strain to failure compared to samples with a raster angle at 45 degrees to the pull direction. These findings are a result of the internal structure of the 3D printed samples. Additionally, for both raster angles, the PLA samples have a larger ultimate tensile strength than the ABS samples. When considering the internal structure of the 3D printed samples, the measured ultimate tensile strength for PLA and ABS agree fairly well with their accepted values in literature.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Jeanette Lukowski

***Math Contest Grading Application*****Presenter(s):** Patrick Connolly**Sponsor:** Francois Neville

**Abstract:** The annual Northern Minnesota Math Contest is hosted by Bemidji State University with over 900 high school students participating from local high school math teams. There are two categories of tests supplied to lower- and upperclassmen students with a total of 40 questions on each exam. To determine the winning teams, the scores of the top three students are summed for each team. Our objective was to create an easy-to-use software solution that accepts a spreadsheet containing the solutions key, as well as participant responses. It automatically grades each contestant's submission to determine both personal and team scores and uses these results to generate customized reports for each participating school team. The results are packaged in a readable format, so that, with little background knowledge, a student, teacher, or event organizer could discern how individual students or the school as a whole did. This application is a successful end-product of the Software Engineering course taught in the Computer Science department in Fall of 2016.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Jeanette Lukowski

***Up, Up and Away*****Presenter(s):** Robert Susmilch**Sponsor:** Francois Neville

**Abstract:** Promotion of the Science, Technology, Engineering and Mathematics (STEM) disciplines is an influential and inspirational force for students in schools and universities across the country. One avenue to attract driven students to STEM programs is through scientific or engineering projects with real world applications. The Computer Engineering project highlighted here is a radio-controlled data-logger, utilized by Bemidji State University's Geology department in their High Altitude Research Balloon (HAB) launches. Educational opportunities involving a HAB are valuable and cut across multiple disciplines, such as computer science, chemistry, physics, and atmospheric science. These opportunities for students create excitement and pride in completion of a large undertaking. Atmospheric and near-space scientific research is routinely carried out via high altitude balloons. Weather balloons allow research into current and future atmospheric and climate trends. Balloons in near-space (120,000 ft.) allow research, such as submillimeter astronomy -- which is hindered by the surface atmosphere -- at a fraction of the cost of a real space deployment. Important topics and lessons discussed include: HAB and client requirement research, bare-metal hardware design and implementation, and software methodologies and implementation.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Kate Larson

***Environmental Impacts of Fracking*****Presenter(s):** Andrew Brunfelt, Anne Grierson, Tyler Martin, Scott Merschman, Madison Schoephoerster, Charles Wilson**Sponsor:** Carla Norris-Raynbird

**Abstract:** The purpose of this project is to express the idea that the use and practice of fracking should be banned and not considered as an alternative in the search for energy. The government and energy companies should invest in safer, cleaner energy sources, instead of fracking. Fracking has been proven to have negative environmental impacts, such as unsafe methane levels in groundwater and underground earthquakes occurring as a result of the abnormal pressures caused by fracking. This project will look at why fracking is being used, as well as the detrimental impact it has on the environment.



TIME	LOCATION	FACILITATOR
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Julie Larson
<b>Introduced Species: Consequences</b>		
<b>Presenter(s):</b> Kirby Borgen, Lukas Engel, Kelly Losh, Matthew Merklng, Christian Posch		
<b>Sponsor:</b> Carla Norris-Raynbird		
<b>Abstract:</b> An introduced species is a non-indigenous species that has been introduced outside of its native distributional range through some form of human contact, whether it be deliberate or accidental. When humans have deliberately introduced species to a new ecosystem, it has typically been part of an effort to counteract a perceived problem within the native ecosystem. While some introduced species have proven to be a successful addition, introducing a non-indigenous species to an ecosystem is a very complex matter. Introducing a non-native species that becomes established can often produce lasting, unintended consequences. Our research seeks to illuminate both successful and unsuccessful examples of deliberately introduced species. We will highlight different introduced species, as well as the reasons for introduction, the desired effect of introduction, methods of introduction, and the results following introduction. Our presentation will offer insight into the nuances of introducing non-native species, including both beneficial and devastating impacts on host ecosystems.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Kate Larson
<b>The Social Impact of Riparian Water Rights and Prior-appropriation Water Rights</b>		
<b>Presenter(s):</b> Steven Balmer, Alyssa Dervie, Garrett Kreb, Anthony McCartney, Alyssa Olson, Todd Sonnek		
<b>Sponsor:</b> Carla Norris-Raynbird		
<b>Abstract:</b> Water rights are at the heart of hotly contested terrain as water scarcity increases. There are two methods of conferring water rights in the United States: 1) Riparian Water Rights, which are conferred by ownership of land through which water flows and 2) Prior-appropriation Rights, which are conferred by first beneficial use of a water source. The legal origins of Riparian Water Rights and Prior-appropriation Water Rights are presented and contrasted, along with the social and environmental implications of these different bundles of rights. Examples of current applications are given.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Travis Ricks
<b>Detection of Hydrogen Sulfide by Fluorescence</b>		
<b>Presenter(s):</b> Kaitlynn Goltz		
<b>Sponsor:</b> Katie Peterson		
<b>Abstract:</b> Hydrogen sulfide ( $H_2S$ ) has most recently been identified as a gasotransmitter that, when produced in excess, is linked to neurological disease, such as Alzheimer's and Down syndrome. The exact concentration of $H_2S$ <i>in vivo</i> is highly disputed. Currently, no non-destructive detection methods that are both sensitive and selective with fast reaction kinetics are available. The goal of this project is to develop a fluorescent probe that enables the detection of $H_2S$ <i>in vivo</i> . First, the $H_2S$ probe, coumarin-DNP, will be synthesized and characterized by $^1H$ NMR. Coumarin and coumarin-DNP will be characterized by collecting fluorescence excitation and emission profiles. Then, the response of coumarin-DNP to $H_2S$ will be investigated. The hypothesis is that $H_2S$ will selectively remove the DNP group and regenerate the coumarin fluorophore. The sensitivity of the probe will be evaluated by measuring the magnitude of coumarin fluorescence in the presence of increasing concentrations of $H_2S$ .		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Jeanette Lukowski
<b>Fluorescent Detection of Hydrogen Sulfide</b>		
<b>Presenter(s):</b> Brooke Tader, Shane White		
<b>Sponsor:</b> Katie Peterson		
<b>Abstract:</b> Hydrogen sulfide ( $H_2S$ ) is an important neurotransmitter used in memory and smooth muscle relaxation. It is made from reactive cysteine residues within the human body. $H_2S$ is toxic in large amounts. Alzheimer's patients tend to have lowered levels of $H_2S$ , which reveals hydrogen sulfide's potential importance in dealing with such a prevalent disease. Real-time, <i>in vivo</i> detection methods for $H_2S$ are currently unavailable. The objective of this project is to synthesize a selective and sensitive fluorescent probe for $H_2S$ that responds with rapid kinetics. Coumarin-DNP, synthesized from the highly fluorescent coumarin, incorporates a dinitrophenyl (DNP) group that can be selectively removed by hydrogen sulfide to regenerate coumarin. Coumarin-DNP excitation and emission intensities fall far below that of pure coumarin. Thus, coumarin-DNP can fluorescently detect $H_2S$ . The synthesis of coumarin-DNP and its purification through thin layer chromatography and column chromatography are reported, while characterization results from $^1H$ NMR and fluorescence spectroscopy are analyzed. Additionally, the sensitivity and selectivity of the probe to $H_2S$ will be investigated.		





TIME	LOCATION	FACILITATOR
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11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Janet Moen

***Gd-complex for the "Catch-and-Release" of Phosphate*****Presenter(s):** Alaina Larson, Caitlin Zeller**Sponsor:** Katie Peterson

**Abstract:** Because of its growth-stimulating properties, phosphate is an important chemical component used in agricultural fertilizers. However, the runoff from fertilizer-treated soils can cause excessive amounts of this nutrient to enter water systems and develop toxic algal blooms. In order to alleviate this problem, phosphate recycling must be implemented. Sustainable phosphate usage can occur by developing a membranous structure affixed with a metal complex that is proficient at both catching phosphates from water systems and, later, releasing them under acidic conditions. The phosphate that is released from this filtration system can then be repurposed as fertilizer. The focus of this project is to identify a gadolinium-ligand complex that is capable of extracting phosphate from aquatic environments. The two metal-ligand complexes of interest are Gd-TREN-MAM and Gd-TREN-Gly-MAM. As Gd complexes alter the relaxation of bound water molecules, phosphate binding can be investigated by measuring the relaxivity ( $r_1$ ) of the complexes via nuclear magnetic resonance spectroscopy. Titrations will determine the phosphate-binding affinity of the complex in comparison to other Gd-ligand complexes. Ultimately, selectivity tests of the chosen complex will be conducted in order to verify the complex's affinity for phosphate over other ions that are naturally prevalent in water systems.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Janet Moen

***Synthesis of Gd(TREN-His-MAM) for the Recycling of Phosphate*****Presenter(s):** Austin MacRae, Daniel Paul**Sponsor:** Katie Peterson

**Abstract:** Excess phosphorus in lakes from fertilizer runoff causes eutrophication and the pollution of bodies of water with harmful toxins such as microcystin. A catch and release system for phosphate is proposed that features Gd-complexes appended to a membrane system. These Gd complexes need to be able to selectively bind phosphate while having an affinity that is pH dependent. This particular project aims to synthesize a novel Gd-complex, Gd-TREN-His-MAM, for the capture of these phosphates. It is hypothesized that this complex will have a greater affinity for phosphates as well as having a greater pH dependence than previously studied complexes, such as Gd-TREN-MAM. This is because the histidine moiety has a  $pK_a$  near neutral allowing it to be charged at pH 7, which should increase the affinity of the complex for the negatively charged phosphate. Gd-TREN-His-MAM will be synthesized according to the procedures published for the preparation of Gd-TREN-MAM with modifications to incorporate a histidine linker. The reactions will be monitored by TLC while synthetic intermediates will be characterized by  $^1H$  NMR and mass spectroscopy. Upon completion of the synthesis, the phosphate binding ability of Gd-TREN-His-MAM will be evaluated.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Janet Moen

***Using Metal Complexes to Recycle Phosphorus*****Presenter(s):** Yassin Abdi**Sponsor:** Katie Peterson

**Abstract:** The current industrial use of fertilizer is unsustainable as the world's phosphate supply is diminishing. Additionally, excess phosphorus from agricultural run-off contributes to eutrophication of lakes and the development of algal blooms. To simultaneously solve both problems, a method to capture excess phosphorus from lakes and recycle it into fertilizer is envisioned. The proposed system utilizes a membrane-bound metal complex capable of selectively binding phosphate in a pH dependent manner. To identify the optimal complex for the catch and release of phosphate, the response of Gd-TREN-MAM to phosphate is characterized. Gd-complexes affect the relaxivity ( $r_1$ ) of water, which can be measured by Nuclear Magnetic Resonance Spectroscopy (NMR). When Gd-complexes interact with phosphate ions, the relaxivity of the water will decrease, allowing determination of the phosphate binding affinity of Gd-TREN-MAM. Additionally, the selectivity of Gd-TREN-MAM for phosphate over other anions in water systems, including carbonates, sulfates, and nitrates, will be investigated.



TIME	LOCATION	FACILITATOR
11:30 am - 1:00 pm	M 240	Facilitator: Julie Larson

***Analysis of Aquifer Characteristics and Hydrological Time Series to Design a Preliminary Groundwater Monitoring Network for Red Lake Nation***

**Presenter:** Joshua Jones

**Sponsor:** Dr. Miriam Rios-Sanchez

**Abstract:** Monitoring changes in groundwater quality and quantity is an essential element for water-management decisions. Glacial and bedrock aquifers are the sources of groundwater in the Red Lake Nation. Although there is a general description of the hydrogeology of the area, detailed knowledge about the geometry of the aquifers and the temporal variations in water levels and chemistry have not been fully characterized. Without this information, the total amount of groundwater stored in the aquifers and its temporal variation in quantity and quality cannot be quantified. The goal of this study is to consolidate existing information about the aquifers in a conceptual model. Geostatistics will be used to map the lateral and vertical continuity of the aquifers. Density of sampling points and frequency are critical factors to having an effective monitoring network, so time series analysis will help to establish the short term and long term variations on groundwater levels and quality. The monitoring network will include density and sampling frequency and will state variables to be monitored for water quantity and quality purposes. The study will also include a proposal to improve this initial monitoring network with the location and depth of new wells proposed to be constructed.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

***Lego Mindstorms®, An Exciting Educational Opportunity***

**Presenter(s):** Alexander Danielson

**Sponsor:** Jason Schultz

**Abstract:** The advent of advanced technology and integrated computer languages has brought a new dawn of mathematical learning. The focus of this poster is to show how robotics can be utilized to innovate and learn simultaneously. From many disciplines in the Introduction to Computers II class, everyone will have a different method. Regardless of educational level, age, etc., anyone can learn science and math with basic robotic creation. It is all a matter of incorporating other learned applications, such as music, art, and design, into your own creation of natural and social science. By using LEGO Mindstorms® and a simple build block programming language, the hope is to show that math and science can be an exhilarating learning opportunity, which can also prepare the next generation of engineers, scientists, and mathematicians. The reason that most children and college students are not excited to learn mathematics is not understanding its usefulness in the workplace. Rather, schools and teachers need to support the implementation of robotics, which can be applied in the real world and the workplace.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Jeanette Lukowski

***Jack Pine in Minnesota: Utilizing GIS for Management***

**Presenter(s):** Aaron Thompson

**Sponsor:** Jill Stackhouse

**Abstract:** Within the state of Minnesota, forests are an iconic resource. A small yet distinct component of this treasured natural resource is the jack pine (*Pinus banksiana*), which makes up just 2% of the state's publicly managed forests. Due to a number of factors, including damage from forest insects, being outcompeted by other tree species, and a relatively short lifespan, jack pine requires unique management practices. At the disposal of forest managers, a Geographic Information System (GIS) is a powerful tool that can help forest managers make informed decisions and produce quality management plans. This poster will highlight the usage of GIS in forestry management and specifically focus on jack pines. I will provide overviews of two applications of GIS to jack pine management: using GIS to model for risk of jack Pine Budworm in jack Pine stands and performing geostatistical analysis on jack Pine regeneration rates after a major disturbance event. The poster will provide methods, relevant background literature, and results of my research.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Kate Larson

***Site Analysis: Where is the Best Place for Me to Live?***

**Presenter(s):** Natasha Lukacs

**Sponsor:** Jill Stackhouse

**Abstract:** Using census, unemployment, and housing data for Anoka county, I developed a series of maps that best represented where I might live after graduation. My maps are representative of both government data and personal choice. Using ArcGIS and a cartographic bivariate mapping technique to represent my findings, I was able to identify key areas in Anoka County that met my requirements. Since I will be graduating this year, I used my skills in GIS, data analysis and cartography to help me with this personal research. Although this poster was developed for my cartography final project, it is representative of several courses I have taken in the Geography Department.



TIME	LOCATION	FACILITATOR
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11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Jeanette Lukowski
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***Evaluating BSU Hockey Game Attendance among BSU Students: Creative Ideas on Making the Events More Attractive***

**Presenter(s):** Christopher Freund, Zachary Penn, Blake Rapienski

**Sponsor:** Halbana Tarmizi

**Abstract:** Currently, the home games of the BSU hockey team at the Sanford Center are not attracting huge crowds among BSU students, although hockey is one of the most popular sports in Minnesota, especially in Northwest Minnesota. Other institutions, such as the U of M, have been successful in making their home games attractive to its students. In this project, we are going to explore the reasons why BSU home games are not attracting students to attend. We will look into different angles of this issue, such as its marketing and advertising strategy, experience during the game, schedule and timing, and the use of social media for outreach to the student population. We are going to do bench marking with a number of other institutions, such as U of M, that have successfully marketed their hockey games on campus. Best practices and creative ideas will be discussed and shared with the BSU Athletic Department.

11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Janet Moen
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***YouTube as a Tool for Recruitment to Bemidji State University***

**Presenter(s):** James Blake, Cody McDonough

**Sponsor:** Halbana Tarmizi

**Abstract:** YouTube has experienced incredible growth since its conception in 2005, and it has become a burgeoning economic opportunity for businesses everywhere. Bemidji State University (BSU) should seize this chance to start developing relationships between potential and current enrollees. In terms of recruitment, this could help interested parties become more familiar with the University, especially those who are unable to visit the campus or attend a tour in person. Helping to eliminate the unknown for potential students could be an invaluable tool in the recruitment process and also help current students. For example, a short introduction interview with new professors could help students connect with their teachers before seeing them in class. Prospective students could also benefit from this, as a sit down with future professors would spur interest in a particular program and possibly lead to enrollment at the University. Our project would consist of researching YouTube for general marketing purposes, assessing the current use of YouTube to promote BSU, examining the profiles of top universities, and identifying best practices that can be used for BSU's recruitment efforts. We believe that this integration of YouTube into Bemidji State University's recruitment could potentially help boost interest and increase enrollment.

11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Travis Ricks
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***TAD Game Console***

**Presenter(s):** Ryan Holm, Tyler Johnson

**Sponsor:** Dave Towley

**Abstract:** As seniors at Bemidji State University in the School of Technology, Art & Design, Tyler Johnson and I, Ryan Holm, were offered the opportunity to plan, manage, and perform a project the department professors had proposed. This project was to design and fabricate a human centered experience, an arcade game console. The game console is designed to look as retro as a step back in time, similar to the ones from the 1970s and 1980s. This project required us to study human behavior in its natural setting, to learn from people through cooperative design activities and to examine the usefulness and suitability of potential solutions that satisfy the client's criteria for the project. In this way, we leveraged the six steps of the design process: define the problem, collect information, brainstorm, understand and analyze, develop solutions, present, and think of ways to improve the design and fabrication process. For our booth, we plan to have the physical project present at the conference. We will present a tri-fold poster board with a process explanation of the project with step-by-step pictures.

11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Jeanette Lukowski
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***A Spatial Analysis of Crime Rates and Alcohol Use in the United States***

**Presenter(s):** Nicholas Shaske

**Sponsor:** Jeffrey Ueland

**Abstract:** This project aims to examine the relationship between alcohol use and crime rates in the United States. Utilizing FBI uniform crime reports, data from the Center for Disease Control, and the Census Bureau, I will analyze these data for statistically significant relationships. The study will analyze data at the state level. This is an important study because the results can contribute to the dialog about these two important issues and the relationship between them.



TIME	LOCATION	FACILITATOR
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Janet Moen
<b><i>A Spatial Analysis of Emerald Ash Borer in the United States</i></b>		
<b>Presenter(s):</b> Brianna Graner		
<b>Sponsor:</b> Jeffrey Ueland		
<b>Abstract:</b> This study aims to examine the relationship between Emerald Ash Borer (EAB) outbreaks and temperature in the last ten years to assess whether EAB outbreaks co-vary with rising temperatures. Understanding EAB is important because large EAB outbreaks inflict widespread damage on ash trees, which are common in the Midwest, and stress forests. This analysis will be conducted at the county level in the United States. I will use temperature data from USGS and emerald ash borer from various sources including, but not limited to, the Minnesota Department of Natural Resources.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Travis Ricks
<b><i>A Spatial Analysis of Wolf Populations in Minnesota</i></b>		
<b>Presenter(s):</b> Randy Hoff		
<b>Sponsor:</b> Jeffrey Ueland		
<b>Abstract:</b> This study will examine the spatial dimensions of wolf populations in Minnesota. The wolf is a keystone species and has recently reestablished much of its territory within the state. It has also been the topic of much discussion as its status as an endangered species has been hotly debated over the last decade. This study will examine if there has been a statistically significant change in spatial dimensions of wolf habit in recent times. Data for this study will be collected from the Department of Natural Resources.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Julie Larson
<b><i>A Spatial and Temporal Analysis of Minnesota's Counties Health Outcome Index</i></b>		
<b>Presenter(s):</b> Scott Valerius		
<b>Sponsor:</b> Jeffrey Ueland		
<b>Abstract:</b> This study will examine Minnesota's composite health index at the county level from 2011 to 2016. In 2015, Minnesota ranked 4th in the national health, while areas such as the deep south had the lowest health ranking. Despite this fact, there is still variation among Minnesota's 87 counties in terms of overall health. The Minnesota Health Outcome data provides a comprehensive view of overall health at the county level. The data are comprised of several data sets including physical environment, health behaviors, clinical care, and socio-economic factors. This study will conduct spatial and temporal analysis to see if there has been a change in overall health across Minnesota. This study is important to help inform the broader discussion of health in Minnesota.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Kate Larson
<b><i>A Statistical Analysis of Obesity Rates in the United States: A Comparison of Coastal and Non-coastal States</i></b>		
<b>Presenter(s):</b> Dalton Lammers		
<b>Sponsor:</b> Jeffrey Ueland		
<b>Abstract:</b> This project aims to test for significant differences in the obesity rates of coastal and non-coastal states between 1990 and 2010. A secondary aim is to identify factors that might be related to these differences. It is important to assess if there are contrasting rates across time and space in order to theorize why some areas could be different due to factors such as geography, diets, and demographics. I will be utilizing various federal data sources and geospatial analysis to conduct this research. By utilizing tests of difference and correlation tests, I will see if there are any differences or relationships between these geographic locations.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Travis Ricks
<b><i>An Analysis of Grizzly Bear Mortalities in the Greater Yellowstone Area</i></b>		
<b>Presenter(s):</b> Aaron Ogle		
<b>Sponsor:</b> Jeffrey Ueland		
<b>Abstract:</b> This project will analyze data on grizzly bear deaths in the Greater Yellowstone Area. I will compare the location of death (county level) to the death type based on human demographics and environmental factors. This study is important because grizzly bears are not protected to the same extent outside of Yellowstone National Park. Other interests include ranchers and free-range livestock that inhabit the grizzly bear's territory and create additional interactions, which not only raises a number of social issues, but also economics issues in the Greater Yellowstone Area. The data, which record death type and location, was collected by the Northern Rocky Mountain Science Center which is powered by the USGS. Analysis of data will yield a risk map using points for grizzly bear deaths, based on the county in which they are found deceased, to help examine the policy behind grizzly bear protection.		



TIME	LOCATION	FACILITATOR
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11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

***An Analysis of Spatial and Temporal Volatility of Ocean Sea Surface Temperatures*****Presenter(s):** Timothy Newcomer**Sponsor:** Jeffrey Ueland

**Abstract:** This project aims to analyze ocean sea surface temperatures by comparing past temperatures and current temperatures to determine if there are areas with significant change. This project has importance in the aspects of climate change, which has become a great concern in recent times, as to what the future of Earth will look like, particularly the future outlook of the planet's oceans. This project will utilize spatially specific, monthly sea surface temperature estimates from National Oceanic and Atmospheric Administration (NOAA) for the last several decades. This study will conduct a spatial analysis to identify locations in the ocean where sea surface temperatures have varied outside the expected range.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Kate Larson

***Analyzing Twin Cities Public Transit as it Relates to Vehicle Ownership Choice*****Presenter(s):** Mason Fetterer**Sponsor:** Jeffrey Ueland

**Abstract:** The distribution of households with no vehicles by choice is a very important factor in determining effectiveness of transit. By focusing on areas of higher than median income, issues of poverty may have less influence as a reason for not owning a vehicle. To this end, this study will test if there is a correlation between the average distance from transit stops and the number of households that have no vehicles by choice. This analysis will examine its findings in light of smart growth policies as they relate to reducing automobile dependency. The data used in the project will include census block group level vehicles per household, average distance from transit stops in the Twin Cities metro area, and median income data. The hypothesis that will be tested is to examine if there is a correlation between readily accessible transit and households that are more likely to have no vehicle by choice. The areas that are well served will be mapped out to determine locations of successful transit-based smart growth.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

***Difference in Population Levels for Barred Owls in Northern Minnesota*****Presenter(s):** Kaysie Gallup**Sponsor:** Jeffrey Ueland

**Abstract:** This study will examine the population levels and distribution of barred owls in the northern part of Minnesota. The overall goal of this project is to look at population levels over the past twenty years and see if there has been a significant difference or shift in those levels. I will also present the change in habitat that these owls prefer and whether there is a relationship to density and distribution. To this end, data will be collected from the Minnesota Department of Natural Resources website and from the United States Forest Service. This study will help inform the current status of barred owl populations and offer a general understanding of population trends over time.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Julie Larson

***Factors Related to the Severity of the Mountain Pine Beetle in Montana's Forests*****Presenter(s):** Brian Mason**Sponsor:** Jeffrey Ueland

**Abstract:** The coniferous forests of the western United States and Canada have recently experienced an outbreak of mountain pine beetle. This study seeks to identify if there is a relationship between precipitation/drought patterns or tree species composition and outbreak severity within the affected region. This study will analyze if the beetles have disproportionate infection rates in specific species of trees or if trees stressed by drought have statistically different rates of infection than those that do not. It has been estimated that the mountain pine beetle has infected approximately 88 million acres of pine stands in the western United States and Canada, disturbing the wood-producing industries and sensitive wildlife ecosystems in the region. Understanding what areas are more at risk of infection can aid foresters in slowing or stopping the destruction of forest stands and help preserve the resource for the future.



TIME	LOCATION	FACILITATOR
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Travis Ricks
<b><i>Largemouth Bass Maximum Growth Size Among States</i></b>		
<b>Presenter(s):</b> Chad Ziegler <b>Sponsor:</b> Jeffrey Ueland <b>Abstract:</b> This project will compare Minnesota's state largemouth bass records with all the other states that have a state record of largemouth bass. All states in the United States, except Alaska, have largemouth bass populations, and largemouth bass has become one of the most important freshwater game-fish species in the United States. It is important to show how largemouth bass in Minnesota are growing compared to other parts of the country, as it might provide some insights into issues related to management of this species. I will run comparisons among geographical, climate, environmental, and physiological aspects to see if there is a relationship among them and the size of largemouth bass across the United States. I will also run a comparison of Minnesota with the other states' records.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Travis Ricks
<b><i>Presidential Election Voting Trends Amongst Rural and Urban Counties of Minnesota</i></b>		
<b>Presenter(s):</b> Spencer Johnson <b>Sponsor:</b> Jeffrey Ueland <b>Abstract:</b> This study aims to test if there is a difference in voter partisanship in presidential elections between rural and urban populations in Minnesota. It also will examine if any spatial trends in this analysis have changed in recent elections. This project is important in that it will provide a representation of how rural populations and urban populations of Minnesota tend to vote and also whether rural populations favor a specific party's candidates in presidential elections. It may also provide a glimpse into how presidential voting has evolved over time and if a consistent trend exists relative to party preference among voters. This study will employ data from the United States Census Bureau and the Legislative Coordinating Commission.		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Kate Larson
<b><i>The Development of Cell Lines Expressing Mutant Human NHE1 to Study the Impact of ERK Signaling</i></b>		
<b>Presenter(s):</b> Michael Chambers, Hunter Hames, Daniela Maltais, Evan Rowe <b>Sponsor:</b> Mark Wallert <b>Abstract:</b> The Na <sup>+</sup> -H <sup>+</sup> Exchanger Isoform 1 (NHE1) is a transmembrane protein that exchanges one extracellular Na <sup>+</sup> for an intracellular H <sup>+</sup> . NHE1 plays a significant role in pH regulation in cells, and when this function is dysregulated, it activates the cell's ability to invade and metastasize. Therefore, the role that pH imbalance and NHE1 play in changing the physiology of the cell often contributes to various cancers. NHE1 has been shown to support two of the six hallmarks of cancer: sustaining proliferative signaling and activation of invasion and metastasis. Our experiments investigate the regulation of NHE1 through phosphorylation by the protein kinase ERK (Extracellular Signal Regulated Kinase). ERK phosphorylates NHE1 at the amino acids serine (S) 770 and 771. To understand the role of ERK in NHE1 regulation, we genetically engineered Chinese hamster lung fibroblasts to express human NHE1 with S770 and S771 both mutated to alanine (S770A/S771A). We demonstrate the production of this cell line using western blots to show protein expression. Then we compare proliferation rates and migration rates compared to control cells, which express human NHE1 without mutations (PSN cells).		
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Janet Moen
<b><i>The Effect of Proline Rich Tyrosine Kinase 2 Activity on the Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 Regulation of Cell Proliferation and Migration.</i></b>		
<b>Presenter(s):</b> Kyle Bagnell <b>Sponsor:</b> Mark Wallert <b>Abstract:</b> The Na <sup>+</sup> -H <sup>+</sup> exchanger isoform 1 (NHE1) is a 12-pass transmembrane protein that functions by exchanging one extracellular sodium ion for one intracellular proton. The transmembrane domain of NHE1 is involved in ion exchange, and the cytoplasmic tail is the regulatory domain, where various kinases and proteins bind to alter transport activity. One of the kinases believed to directly or indirectly lead to the phosphorylation of NHE1 at S602/S605 is proline-rich tyrosine kinase 2 (PyK2). To evaluate the role of PyK2 in NHE1 regulation, we prepared three cell lines derived from Chinese hamster lung fibroblasts lacking NHE1 expression. These cell lines are PSN (PS120 cells expressing human NHE1), PSN S602A/S605A and PSN S602D/S605D. In PSN cells stimulated with lysophosphatidic acid (LPA), it has been shown that inhibition of PyK2 increases the LPA-induced increase in pH <sub>i</sub> . Here we evaluate the impact of PyK2 inhibition and mutation of the PyK2 phosphorylation sites on proliferation and migration. Our results suggest that serum stimulation enhances cell proliferation and PF431396 inhibition of PyK2 in serum-stimulated cells decreases proliferation rate. To further evaluate these responses, we will evaluate PSN and PyK2 mutant cells for proliferation and migration stimulated by serum and LPA.		





TIME	LOCATION	FACILITATOR
11:30 a.m. - 1:00 p.m.	M 240	Facilitator: Janet Moen

***The Phosphorylation of the Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) and Its Role in the Regulation of Cell Proliferation and Migration***

**Presenter(s):** Tayler Smith

**Sponsor:** Mark Wallert

**Abstract:** The Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) supports two of the hallmarks of cancer, sustaining proliferative growth and the activation of invasion and metastasis. NHE1 is a transmembrane protein that exchanges one extracellular Na<sup>+</sup> for one intracellular H<sup>+</sup>. The rate of transport activity can be altered through the phosphorylation of the cytoplasmic regulatory domain of the protein. Here, we evaluate the role of NHE1 being phosphorylated by five distinct protein kinases in seven defined locations. These kinases and the locations they phosphorylate are: 1) Pyk2 at both S602 and S605, 2) AKT at S648, 3) ROCK at T653, 4) RSK at S703, and 5) ERK at both S770 and S771. To evaluate the role of these phosphorylation sites in the regulation of cell proliferation and migration, we have created a series of Chinese hamster lung fibroblast cell lines expressing human NHE1. The PSN cell line expresses normal human NHE1, the PSN-7A cell line expresses human NHE1 with all seven phosphorylation sites mutated, and PSN-T653A have the Rock phosphorylation site mutated to an alanine. We will present data on the production of cell lines and evaluate the impact of these mutations on cell proliferation and migration.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Travis Ricks

***The Regulation of the Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) by Palmitoylation: A Novel Regulator of Cell Proliferation and Migration***

**Presenter(s):** Emily Halberg, Stephanie Hanowski

**Sponsor:** Mark Wallert

**Abstract:** The Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) is a key regulator of cell proliferation and migration in a range of cell types from both healthy and diseased tissues. Activation of NHE1 is an initial step in the development of the transformed phenotypes of cancer cells and, therefore, a key driver for tumor development and cancer progression. NHE1 also contributes to two of the hallmarks of cancer: the activation of invasion and metastasis and sustained proliferative growth. Our laboratory has identified, for the first time, that NHE1 undergoes reversible palmitoylation, or the addition of a palmitic acid residue to the cytoplasmic regulatory domain of NHE1. We hypothesize that this process regulates NHE1 activation and will play a role in the control of cell proliferation and migration. This suggests that targeting the potential palmitoylation sites on NHE1 may provide a therapeutic target for cancer treatment. Our work characterizes the role of palmitoylation of NHE1 in cell growth and migration. Using the palmitoylation inhibitor 2-bromopalmitate, we evaluate cell growth and migration in the presence and absence of palmitoylation. We will present data demonstrating that inhibiting the palmitoylation of NHE1 decreases both cell proliferation and the rate of cell migration.

11:30 a.m. - 1:00 p.m.

M 240

Facilitator: Travis Ricks

***Exploring the Prevalence and Awareness of Concussions in Bemidji State University Club and Intramural Sports***

**Presenter(s):** William Juul, Aaron Trunt

**Sponsor:** Jim White

**Abstract:** Diagnosed concussion injuries have been greatly on the rise over the past decade. Much of the research has been completed on concussion incidence and the prevalence rates among high school and collegiate athletes, but limited research has been published on concussion rates of the many club and intramural sports (CIS) athletes, who participate in the same sports with the same risks. The purpose of this study is to determine if sports-related concussions (SRC) in Bemidji State University's CIS athletes are a problem, any prior history of SRC, and the awareness of SRC among these athletes. A 29-question survey, designed to explore this research topic, was developed by modifying questions published by researchers from the University of Arkansas. Approval was obtained from BSU Institutional Review Board. We also received approval from and the assistance of BSU's Campus Recreation management. An email with a link to the Survey Monkey survey was then sent to CIS athletes. Survey respondents included 60 CIS athletes. Preliminary findings indicate that 6.9% of these athletes reported having a SRC during participation. Participating in competitive sports has always had, and always will have, risks. Select statistical tests will be used to analyze difference. Final results will be presented.



TIME

LOCATION

FACILITATOR

# SPEECH CONTEST

## Speech Contest Judges:

Dr. Mahmoud Al-Odeh

Dr. Season Ellison

Dr. Donna Pawlowski

1:00 p.m. – 2:00 p.m.

BN 100

Facilitator: Kesiena Uz-Ikelegbe

### *Using Metal Complexes to Recycle Phosphorus*

Presenter: Yassin Abdi

Sponsor: Katie Peterson

**Abstract:** The current industrial use of fertilizer is unsustainable as the world's phosphate supply is diminishing. Additionally, excess phosphorus from agricultural run-off contributes to eutrophication of lakes and the development of algal blooms. To simultaneously solve both problems, a method to capture excess phosphorus from lakes and recycle it into fertilizer is envisioned. The proposed system utilizes a membrane-bound metal complex capable of selectively binding phosphate in a pH dependent manner. To identify the optimal complex for the catch and release of phosphate, the response of Gd-TREN-MAM to phosphate is characterized. Gd-complexes affect the relaxivity ( $r_1$ ) of water, which can be measured by Nuclear Magnetic Resonance Spectroscopy (NMR). When Gd-complexes interact with phosphate ions, the relaxivity of the water will decrease, allowing determination of the phosphate binding affinity of Gd-TREN-MAM. Additionally, the selectivity of Gd-TREN-MAM for phosphate over other anions in water systems, including carbonates, sulfates, and nitrates, will be investigated.

1:00 p.m. – 2:00 p.m.

BN 100

Facilitator: Veronica Veaux

### *Collegiate Jazz Improv Curriculum: The First Three Semesters*

Presenter: Shelby Andrist

Sponsor: Kristina Cirks

**Abstract:** The purpose of this research was to create a pedagogical tool to be used by college professors in effectively teaching jazz improvisation in a group setting. Throughout the history of jazz and jazz improvisation, many works have been created to aid in the individual's education and understanding of the art form. However, there have been no recent pedagogical works to aid the teacher in conducting group improvisation classes, as it has become the common method of instruction. The following presentation will detail the path I undertook to create a three-semester curriculum that is a combination of various research dating back to the 30's through today, spanning the genres of jazz music, jazz improvisation, and teaching. The research is informed via survey of various professors and jazz musicians across the United States and other individual method books, as well as online sources of knowledge.

1:00 p.m. – 2:00 p.m.

BN 100

Facilitator: Angela Fournier

### *A Presentation of the Student Perspective on Creating a Marketing Plan for a Client*

Presenter: Erika Huff

Sponsor: Kelly La Venture

**Abstract:** Working collectively, our team developed a framework to aid our client, a Midwestern organization, in marketing and developing their powder coating division. Our team created an image for the division to become the "#1 Powder Coating Destination in the North." Research and ideas were presented to the client in the form of a marketing plan consisting of the following sections: executive summary, introduction, situation analysis, marketing strategy, financials, controls, and conclusion. By implementing the new marketing plan, our client hopes the division will achieve a 10% increase in sales by January 2018. This session will present our experience, the marketing plan created for our client, and the positive implications for the powder coating division.

1:00 p.m. – 2:00 p.m.

BN 100

Facilitator: Angela Fournier

### *Grand Reentry*

Presenter: Sterling Knox

Sponsor: George McConnell

**Abstract:** In recent years, mass incarceration has become an area of great concern, and the U.S. has landed the award for the highest incarcerated population. The U.S. also maintains a national recidivism rate of 67%, 30% of which were re-convicted of a new crime. This rate becomes inflated on tribal lands, reaching upwards to 80% nationally, with some individual reservations above 90%. The challenges unique to tribal re-entry do not fit the research mold, resulting in a lack of resources, preparation, and community involvement, which is key to successful reentry. In recognition of this crisis, this presentation serves to explore the re-entry process, its programs, and what changes can be made to increase the chances of success for tribal re-entrants.



TIME	LOCATION	FACILITATOR
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1:00 p.m. – 2:00 p.m.

BN 100

Facilitator: Angela Fournier

### *Running with the Beast*

**Presenter:** Gabriela Lara

**Sponsor:** Season Ellison

**Abstract:** Running a marathon can be a grueling, inspiring, and life changing experience. For some, marathon running is a test of willpower and physical strength. For others, marathon running is what gets them up in the morning. Whatever the reason for running, a runner's first marathon is monumental and will forever be ingrained in their minds and slow beating hearts. This piece delves into the mind of one marathon runner and explores the motivation that powered her to run, the obstacles she had to overcome, the self-determination formed, the life lessons learned, and the joys of completing a 26.2-mile race.

1:00 p.m. – 2:00 p.m.

BN 100

Facilitator: Kesiena Uz-Ikelegbe

### *Characterizing the Role of the Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) in Cell Proliferation and Migration in Ovarian Cancer Cells*

**Presenter:** Taylor Manzella

**Sponsor:** Mark Wallert

**Abstract:** The Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) is a transmembrane protein activated in cancer cells that plays a role in sustaining proliferative growth. Three ovarian adenocarcinoma lines, SKOV-3, OVCAR-3, and CAOV-3, were characterized to determine NHE1's role in growth and progression. We have used proliferation assays to demonstrate NHE1 involvement in the regulation of cell growth in ovarian cancer cell lines. Cell growth is stimulated when cells are cultured in 10% serum compared to 0.5% serum, and this growth stimulation is blocked by the NHE1 inhibitor cariporide. The effects of four inhibitors that block specific kinases that phosphorylate NHE1 were investigated to evaluate their impact on cell proliferation. Specific inhibitors, MK2206 (AKT), Sch772984 (ERK), Y27632 (Rock), and B-ID1870 (RSK) were evaluated in the three ovarian cell lines to determine key pathways in regulating NHE1. Among the SKOV-3 and CAOV-3 cell lines, the RSK site inhibitor B-ID1870 demonstrated the largest impact of inhibition, while in the OVCAR-3 cell line, the AKT site inhibitor MK2206 demonstrated the greatest impact. Future work will include investigating CRISPR-CAS9 gene editing technology and ECIS migration assays to determine the role of NHE1 in ovarian cancer progression.

1:00 p.m. – 2:00 p.m.

BN 100

Facilitator: Veronica Veaux

### *Morphine Use in Pediatric*

**Presenter:** Yunuke Nyanamba

**Sponsor:** Season Ellison

**Abstract:** Around the globe, morphine is recommended as the first-line strong opioid for the treatment of persisting moderate-severe pain in children of all ages with medical illness, except those children who cannot metabolize morphine well, to whom an alternative use of hydromorphone is recommended. Morphine works by binding to opiate receptors in the central nervous system (CNS), altering the perception of and response to pain stimuli while producing generalized CNS depression. The therapeutic effect of morphine is to decrease the severity of pain. The aim of this research is to study why, according to the existing literature, morphine is considered a standard choice opioid in the treatment of moderate to severe pain in pediatric populations.

1:00 p.m. – 2:00 p.m.

BN 100

Facilitator: Kesiena Uz-Ikelegbe

### *Equine-Assisted Psychotherapy: An Investigation of Process and Outcome*

**Presenter:** Emma Leigh Pasiuk

**Sponsor:** Angela Fournier

**Abstract:** The presentation will describe findings of a field study on Animal-Assisted Therapy (AAT), specifically Equine-Assisted Psychotherapy (EAP). The findings are based on a study that investigated human-animal interaction (HAI) and metaphor as they occur in EAP. A total of 112 men and women participated in a correlational study, permitting the use of self-report data from EAP sessions within the model of the Equine-Assisted Growth and Learning Association (EAGALA). This field study was designed to describe the range and frequency of behaviors reported during an equine session and investigate their relationship to other therapeutic factors. Participants reported a range of interactions between humans and horses, and the quantity of human-animal interaction was a significant predictor of reduced subjective distress. Findings on the direct and indirect effects of HAI will be discussed.



TIME

LOCATION

FACILITATOR

# AFTERNOON SESSION

2:00 p.m. - 3:15 p.m.

HS 100

Facilitator: Cory Renbarger

## *"Speed Dating Tonight!" Opera Performance*

**Presenter(s):** Derek Bebeau, Tayler Borders, Mariah Coan, Leandra Craigmile, Joscelin Eischens, Megan Flaherty, Kathryn Freyberg, Savanna Hagerty, Noah Harstad, Hannah Jenson, Evan Johnson, Aaron Kolb, Lindsay Marketon, Andrew McCormick, Dezeræe Medina, Katilynn Meine, Daniel Nelson, NikkiLee Nolden, Kari Norheim, Joshua Sorenson, Zachary Swank, Samantha Velde

**Sponsor:** Cory Renbarger

**Abstract:** In early December, the cast of "Speed Dating Tonight!" got their hands on the scores of this unique masterpiece and have since put in countless hours to bring the music to life. This show marks the fifth annual Bemidji Opera Theatre production and our first production of 21st-century opera. The score was written by the American composer Michael Ching, and it first premiered in 2013. This show truly has no lead role. Each character has their own solo portraying the ridiculous, and yet relatable, life of a speed dater. Ching also opted for a modest use of both acoustic and electronic instruments. In this presentation, the performers will explain the process of learning, memorizing, and staging this challenging score. Select musical numbers will be performed, and a slideshow display of pictures from rehearsals, performances, and backstage will be provided.

2:00 p.m. - 2:55 p.m.

HS 247

Facilitator: John Ellis

## *Life on the 20th Century Native American Reservation in Minnesota; The Dawes Act*

**Presenter(s):** Brandon Boomgard, Zachary Erickson, Robert Pollitt, Todd Sonnek

**Sponsor:** John Ellis

**Abstract:** The Dawes and the Reorganization Act geographically and culturally shaped the reservations of Minnesota. To this day, the reservations are continually re-shaping both geographically and culturally, causing the Native Americans to consolidate on or to emigrate off the reservations, which has impacted their social, political, cultural, and economical lives.

2:00 p.m. - 2:15 p.m.

HS 102

Facilitator: Keith Gora

## *A Study to Explore Student Interest in an Event/Experiential Marketing Program at a Midwestern University*

**Presenter(s):** Laura Willhite

**Sponsor:** Kelly La Venture

**Abstract:** The purpose of this study was to explore student interest in an event/experiential marketing program at a Midwestern university. By selecting an exploratory research design, investigators were able to conduct a preliminary examination into the interest of a new program and identify parameters to be studied further. A convenience sample, consisting of current upper undergraduate students in business administration and marketing communication programs over the age of 18, was selected. Using a survey research instrument, investigators collected data from 275 respondents during a two-week time period. Upon data analysis and interpretation, data indicate 64.23% of respondents would like to see a specialized marketing program offered at the Midwestern university; 66.18% respondents would like to learn more about experiential marketing; 66.05% respondents would like to work with design students on an experimental project; 34.2% of respondents said they would enroll in the program today if offered. Join us for this session to learn more about the study, conclusions, and positive implications of a new event/experiential marketing program at a Midwestern university.

2:00 p.m. - 2:15 p.m.

HS 105

Facilitator: Wendy Grosskopf

## *Analyzing the Role of Income Inequality in American Political Polarization*

**Presenter(s):** Jake Wheeler

**Sponsor:** Patrick Donny

**Abstract:** In recent years, two major factors have become more noticeable in the United States: 1) the polarization of our two major political parties, Republicans and Democrats, and 2) the increase in income inequality. While the gap ostensibly widens, in terms of both political polarization and economic disparity, I question how these two variables interact with one another and the reach of their effect. Utilizing Harvard's Cooperative Congressional Election Study, I track how individuals in each state, including the District of Columbia, voted in the 2014 election in comparison to their income, allowing for a clearer view of how income affects polarization and vice versa. Understanding how political polarization and income inequality affect one another is important in determining whether the variables are correlated or effectively cause the divisiveness of our political climate. I compute an economic polarization score for each state to compare with each state's political divisiveness. Early results show a correlation between political polarization and income inequality; however, demonstrating causation will require further analysis.



TIME	LOCATION	FACILITATOR
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2:00 p.m. - 2:15 p.m. HS 107 Facilitator: Andrew Hafis

***Project-Based Learning: Using the High Altitude Balloon Project to Engage Middle School Students in Science***

**Presenter(s):** Mary Comfort

**Sponsor:** Tim Kroeger

**Abstract:** Middle school students participating in BSU's High Altitude Ballooning Project (HAB) are engaged in scientific reasoning and experiment design. The project allows middle school students to meet college students, learn how scientists design experiments, relate classroom learning to real-life examples, and become excited about engaging in scientific work. This presentation reviews how students applied scientific inquiry through project-based learning to design and implement scientific experiments. Student experiments examined how radiation, temperature, and sunlight affected common objects and plants, as well as testing to see if popcorn would pop due to radiation and how succulents and ferns withstand cold temperatures. After the HAB launch, students determined how, and speculated why, things changed. They recorded their information in their science journals and shared their results with the class. The BSU HAB project is described, including the project goals and how the balloon and data collection equipment function. Flight data are shared to explain student results. I will discuss how student's understanding of atmospheric science benefited through an active inquiry process, asking questions, researching information, creating an experiment, testing hypotheses, and reviewing results.

2:00 p.m. - 2:15 p.m. HS 112 Facilitator: Troy Gilbertson

***Slut Shaming and the Rape Culture***

**Presenter(s):** Tia Hinz

**Sponsor:** Jay Passa

**Abstract:** Rape culture is something that emerges in our everyday life and very few dare to challenge this norm. Rape Culture is so drenched into our social norms that most of us do not even notice it most of the time. As a sexual assault prevention peer educator on campus, I have found that it is up to all of us to help prevent sexual assault and to support the victims. I believe a great place to start is debunking the rape culture and challenging the norm.

2:00 p.m. - 2:15 p.m. HS 113 Facilitator: Bonnie Higgins

***TAD Mobile***

**Presenter(s):** Kerry Anderson, Mark Kloskey

**Sponsor:** Dave Towley

**Abstract:** Our presentation will cover a project that was completed by students of the School of Technology, Art, & Design: the design and manufacture of a velomobile. A velomobile is a human-powered vehicle that incorporates an aerodynamic shell for reduced effort and protection and is derived from recumbent bicycles and tricycles. This project comprised research designed to meet specific performance criteria throughout the design and fabrication process. While initially conceived of as a project for students in the Technology Project Management program, it evolved to include collaboration between students within both the Technology and Design programs. Through trial and error, the velomobile was improved and successfully finished over the course of three semesters at Bemidji State University. The velomobile itself will be used as a promotional vehicle, called the TAD Mobile, to represent The School of Technology, Art, & Design in various venues and activities to promote the school to prospective college students. Our presentation will share information related to the design and fabrication process using a PDF or PowerPoint format and will contain photographs of the design and fabrication as they evolved. The completed product will also be available for review.

2:00 p.m. - 2:15 p.m. HS 230 Facilitator: Dianne Narum

***Assessing the Ride Sharing Initiative Among BSU Students***

**Presenter(s):** Kayla Campobasso, Laurel Denney, Amanda Tronick

**Sponsor:** Halbana Tarmizi

**Abstract:** We will assess the interest for a ride sharing initiative among students on campus. We will survey students to see how they would perceive a ride sharing app and whether they would use that service if it were offered here on campus, as well as how often it would be used. The survey will be distributed to diverse BSU student populations, and we will attempt to gather accurate data about BSU's variety of students. The results of the survey will be used to explore the possibility of implementing a ride share initiative on the Bemidji State campus. Implementation ideas will be discussed, including creating a free app, safety, rules and regulations, pick-up and drop-off times, meeting points, and local or state regulations that could have a potential impact on this kind of service.



TIME	LOCATION	FACILITATOR
2:00 p.m. - 2:15 p.m.	HS 248A	Facilitator: Pete McDonnell

***The Role of the Na<sup>+</sup>-H<sup>+</sup> Exchanger (NHE1) and Calcineurin B Homologous Protein Isoform 2 (CHP2) on Cell Proliferation and Migration in Squamous Cell Carcinoma and Adenocarcinoma of the Lung***

**Presenter(s):** Amanda Kooiker

**Sponsor:** Mark Wallert

**Abstract:** Lung cancer is a debilitating disease affecting thousands of people worldwide. Approximately 80% of lung cancer is comprised of non-small cell lung cancer (NSCLC). Of that 80%, 50% is composed of adenocarcinoma, or a tumor that originated within a gland, while 30% is due to squamous cell carcinoma, or a cancer that began at an epithelial lining. The Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) acts as a key regulator in cellular proliferation, migration, and metastasis in a variety of solid tumors. The calcineurin B homologous proteins (CHP1 and CHP2) act as important cofactors in the regulation of NHE1. While both CHP isoforms have been found to bind in the same region of NHE1, differential expression has been observed. CHP1 is ubiquitously expressed, while CHP2 expression has been shown to be higher in tumor samples than in normal healthy tissue. XTT assays have shown that the inhibition of NHE1 is able to lead to a decrease in cellular proliferation. CRISPR-Cas9 technology will be used to characterize the role of NHE1 and CHP2 by preferentially removing each gene from both an adenocarcinoma cell line and a squamous cell carcinoma line. Cell proliferation, migration, and tumor formation can then be studied in cells lacking NHE1 and CHP2.

2:00 p.m. - 2:15 p.m.

HS 248B

Facilitator: James White

***Natural Spider Repellents***

**Presenter(s):** Natasha Lukacs

**Sponsor:** Anna Carlson

**Abstract:** Although these repellents would probably work towards other insects, I am focusing on talking about spiders in relation to the campus and the use of pesticides. Throughout the presentation, I will give some information about how to make natural spider repellents, as well as talk about the current use of pesticides.

2:00 p.m. - 2:15 p.m.

HS 249

Facilitator: Larry Swain

***A Rubik's Cube Solving Robot***

**Presenter(s):** Justin Warburton

**Sponsor:** Jason Schultz

**Abstract:** A Rubik's cube is a 3x3x3 puzzle cube, where you move the little cubes around the puzzle by spinning the faces until you've either solved it or scrambled it even more. It is a puzzle that has stumped people for decades, and I made a robot that solves one for me. Building a robot is a challenging task that is made easier by using LEGO Mindstorms®. The Mindstorms® kits have easy to assemble parts that clip together. This ease of use mixed with the wide array of available parts means you are only limited by your imagination when it comes to making something with the kits. Building a robot capable of solving a Rubik's cube is a relatively simple task. The hard part comes with the programming of it. Because the LEGO Mindstorms® kits use a simplified programming language, I am limited in what I can and cannot do with it.

2:20 p.m. - 2:35 p.m.

HS 102

Facilitator: Keith Gora

***A Marketing Plan to Help Increase Employee Ranking Within a Skincare Company***

**Presenter(s):** Brianna Boner, Trey Johnson, Haley Pollock, Margaret Tweten

**Sponsor:** Kelly La Venture

**Abstract:** Working collectively, our Marketing Tek group developed a plan for our client and her team that incorporates the increased usage of social media to help the team members boost their profits within the high-end skincare industry. The objectives of the plan are to: (1) increase each consultant's ranking in the company and (2) increase the client's and consultant's profits by year-end 2017. Tek will present an overview of the plan, including the following sections: executive summary, introduction, situation analysis, marketing strategy, financials, controls, and conclusion.





TIME	LOCATION	FACILITATOR
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2:20 p.m. - 2:35 p.m. HS 105 Facilitator: Wendy Grosskopf

***American Immigration: Differing Views of the Threat from Immigrants***

**Presenter(s):** Carl Karpinski

**Sponsor:** Patrick Donnay

**Abstract:** Immigration has been a hot button issue in politics across the world, especially in recent years in the United States. People's views on immigration vary broadly among political parties and every corner of the country. Why do people believe the things they do about immigrants? I researched this question to determine why immigration is at the forefront of American politics and how different aspects of one's life affect his or her sentiments. Using General Social Survey data, I explored why some people feel threatened by immigrants coming to their country and others do not. Variables analyzed include income, race, church attendance, education level, political party, and age. Hypotheses based on previous research suggest that education levels, political affiliation, and one's income are the social and economic factors that lead to one's intolerance or acceptance of immigrants coming to the United States. These people often congregate on a larger level and share the same views with those who are like-minded.

2:20 p.m. - 2:35 p.m. HS 107 Facilitator: Andrew Hafs

***Assessing Awareness and Use of Lynda.com Among BSU Students***

**Presenter(s):** Benjamin Best, Matthew Johnson, Jeffrey Sprunk

**Sponsor:** Halbana Tarmizi

**Abstract:** In this study, we will be assessing the awareness of Lynda.com among BSU students. Lynda.com is an online education company offering thousands of video courses in software, creative, and business skills. BSU has been offering free access to these videos for students and faculty. Therefore, a survey will be conducted to assess the awareness of availability of the videos among BSU students by asking about their awareness and use of Lynda.com. Ideas and best practices to raise awareness and increase the use of that valuable resource will be discussed. The role of professors to spread the use of Lynda.com among BSU students will also be highlighted.

2:20 p.m. - 2:35 p.m. HS 113 Facilitator: Bonnie Higgins

***My Journey for Diagnosis: A Nonfiction Story of POTS***

**Presenter(s):** Cheyenne Tordsen

**Sponsor:** Mark Christensen

**Abstract:** Disability is a theme that has impacted my life in a variety of ways, but the most important one is invisible. The project I will read is a creative nonfiction story showcasing how I came to be diagnosed with a physical disability called Postural Orthostatic Tachycardia Syndrome (POTS), and the struggle I went through for eight months before a doctor would believe me. POTS is considered an invisible illness, meaning that the physical symptoms are not outwardly obvious but painfully so to the person who has it. Throughout the exceptionally long diagnosis period, I met many characters who acted as if this was all a game, that I was playing someone else, someone who would fake what was going on around them. Writing this story not only helped me heal the wound that my journey left me, but I also managed to educate people on a physical condition that is invisible. The world is harsh; people don't care. But dealing with ignorance is a fact of life, and I would rather weed through all the negativity to educate one person than avoid conflict and change nothing. That is why my project is important.

2:20 p.m. - 2:35 p.m. HS 230 Facilitator: Dianne Narum

***Running with the Beast***

**Presenter(s):** Gabriela Lara

**Sponsor:** Season Ellison

**Abstract:** Running a marathon can be a grueling, inspiring, and life changing experience. For some, marathon running is a test of willpower and physical strength. For others, marathon running is what gets them up in the morning. Whatever the reason for running, a runner's first marathon is monumental and will forever be ingrained in their minds and slow beating hearts. This piece delves into the mind of one marathon runner and explores the motivation that powered her to run, the obstacles she had to overcome, the self-determination formed, the life lessons learned, and the joys of completing a 26.2-mile race.



TIME	LOCATION	FACILITATOR
2:20 p.m. - 2:35 p.m.	HS 248A	Facilitator: Annie Butler Ricks
<b><i>Analysis of the Impacts of Geology and Fluvial Processes on the Development of Drainage Networks on the Tharsis Volcanic Region, Mars</i></b>		
<b>Presenter(s):</b> Alexander Danielson		
<b>Sponsor:</b> Miriam Rios-Sanchez		
<b>Abstract:</b> One of the most striking topographic and geological features of Mars is the Tharsis Volcanic Region. The current topography of the region is associated with geological processes evidenced by the development of the canyon systems of Valles Marineris. The canyon displays large tectonic structures with an extension of several thousand kilometers across the equatorial region. Besides geological activity, meteorite impact and fluvial factors have played a role in the development of Martian topography. The mapping and characterization of the drainage network, correlated to the tectonic characteristics of the region, will shed light on the dominant factors controlling the evolution of the canyons. Digital terrain analysis has been used broadly as part of structural mapping, tectonic, and geomorphology studies on Earth and other planets.		
2:20 p.m. - 2:35 p.m.	HS 248B	Facilitator: James White
<b><i>W.E.B. Du Bois' Theories of Racism</i></b>		
<b>Presenter(s):</b> Sara Achen, Tristan Cofer, Alexandra Erickson		
<b>Sponsor:</b> Rucha Ambikar		
<b>Abstract:</b> We will discuss the ideas, beliefs, and developed theories of W.E.B. Du Bois on the topic of racism. We plan to lay out his "double consciousness" and the "need for color" theories in great enough detail so the audience will have a good understanding of the topic. We will then explain how we believe these theories relate to today and how we can still use social theory to explain phenomena we experience in 2017. We want to show how the "need for color" is potentially the cause of the "double consciousness" problem. This "double consciousness" causes a degree of alienation that causes people who are affected by racism to feel separate from the rest of their respective society as a whole. While racism did not always exist in its current form, this "need for color" in capitalist society manifests itself in the need for exploitation for profit. We aim to use W.E.B Du Bois' theories to explain whether or not people of color still feel the "double consciousness" in the U.S. today and if we will ever be able to escape it.		
2:20 p.m. - 2:35 p.m.	HS 249	Facilitator: Larry Swain
<b><i>The Church and the Realm: Development of Sovereignty in Medieval Sweden</i></b>		
<b>Presenter(s):</b> Pheeraphong Jampee		
<b>Sponsor:</b> Brendan McManus		
<b>Abstract:</b> In late medieval Sweden, the need for political stability translated to an epoch beginning with the introduction of the Kalmar Union, a dynastic union between Sweden and Denmark-Norway in the 1390s. It involved many attempts at instituting a strong royal regime and the consequent conflicts between monarchs and clerical power elites. The Kalmar Union ended in the 1520s with the establishment of a permanent national monarchy by King Gustav Vasa I in Sweden and the introduction of the Reformation into the realm. The Swedish realm could not survive without a strong monarchy centered in the capital, Stockholm. The fifteenth century and the beginning of the sixteenth century have been considered as an era of growing monarchical power in Europe; repeated challenges to the Royal authority were largely overcome. As in other parts, this monarchical advance in Sweden came to several halts and was not uncontested. The struggle between monarchy and aristocratic interests is traditionally regarded as the defining political issue of the Swedish fifteenth century. In this presentation, I will be looking at the Kalmar Union and the power struggles thereafter.		
2:40 p.m. - 2:55 p.m.	HS 102	Facilitator: Keith Gora
<b><i>A Study to Explore Student Usage of Information Technology Services at a Midwestern University</i></b>		
<b>Presenter(s):</b> Samuel Danek, Brandon Hachten, Caleb Trongard, Eric Walls		
<b>Sponsor:</b> Kelly La Venture		
<b>Abstract:</b> The purpose of this study was to explore student usage of information technology services (ITS) at a Midwestern university. By selecting an exploratory research design, investigators were able to conduct preliminary research in regard to student usage and future needs for ITS. A judgment sample consisted of current students at a Midwestern University over the age of 18. Using a survey research instrument, investigators collected data from 157 respondents during a two-week time period. Upon data analysis and interpretation, data indicate 63% of respondents are unfamiliar with the university's Active Learning Classrooms at the Midwestern university; 94% of respondents were unfamiliar with the university's Skype. The investigators also included an open-ended question that asked respondents "Are there any specific programs or services that you would like offered from the university's ITS department?" Of all respondents, 62 answered the open-ended question, and the investigators were able to group the responses into eleven categories. This presentation will explain the study, the conclusions, the recommendations and limitations, and the significance of the research.		



TIME	LOCATION	FACILITATOR
2:40 p.m. - 2:55 p.m.	HS 105	Facilitator: Wendy Grosskopf
<b><i>The Supreme Court's Counter-majoritarianism: What Impact Does Public Opinion Have on Supreme Court Decisions?</i></b>		
<b>Presenter(s):</b> Evan Tompkins <b>Sponsor:</b> Patrick Donny <b>Abstract:</b> Although normative questions about the role of the Supreme Court as a counter-majoritarian institution have been commonly debated in political science research, an updated empirical question on Mishler and Sheehan's (1993) study on public opinion and its impact on the Court must be asked. It has been 25 years since the publication of their study and numerous high profile cases, such as Bush v. Gore, Citizens United v. FEC, and Obergefell v. Hodges, have brought nationwide attention to the Supreme Court and how it interacts with public opinion. Results from empirical measurements of the Supreme Court's decisions and the impact of public opinion indicate no existence of a significant relationship. The Supreme Court's ideological composition changes in response to the ideological orientation of the president, rather than a shift in public opinion. Mishler and Sheehan described the Court's ideological balance since 1981 as being upset and undermined because of an unbroken string of conservative-to-moderate appointments. In the 25 years since the study, the counter-majoritarian trend they noted at the beginning of the early 1990s seems to be continuing.		
2:40 p.m. - 2:55 p.m.	HS 107	Facilitator: Andrew Hafs
<b><i>An Analysis of Flower and Pollinator Relationships in Bemidji, Minnesota</i></b>		
<b>Presenter(s):</b> Jolie Richter <b>Sponsor:</b> Richard Koch <b>Abstract:</b> The role of the pollinator is an important aspect in any terrestrial ecosystem. From their work in fertilizing blooms to their role as prey for predatory insects and arachnids, pollinators play a part in a variety of niches. As populations of bees and butterflies, the most common pollinator families in Northern Minnesota, are experiencing a decline, it is important to understand what pollinators are in the area and what they are pollinating. To identify which types of pollinators can be found in the Bemidji area, samples of insect pollinators and the flower species they were pollinating were collected each week at the Bemidji Slough from June 8 through September 2, 2016. Specimens were collected in the field using both netting and direct capture techniques. Once in the lab, the genera and species of the insects captured were determined using dichotomous keys. Statistical analyses were performed to assess 1) pollinator relationships to flower taxa and 2) temporal variations in pollinators and flora.		
2:40 p.m. - 2:55 p.m.	HS 112	Facilitator: Troy Gilbertson
<b><i>Equine-Assisted Psychotherapy: An Investigation of Process and Outcome</i></b>		
<b>Presenter(s):</b> Emma Leigh Pasiuk <b>Sponsor:</b> Angela Fournier <b>Abstract:</b> The presentation will describe findings of a field study on Animal-Assisted Therapy (AAT), specifically Equine-Assisted Psychotherapy (EAP). The findings are based on a study that investigated human-animal interaction (HAI) and metaphor as they occur in EAP. A total of 112 men and women participated in a correlational study, permitting the use of self-report data from EAP sessions within the model of the Equine-Assisted Growth and Learning Association (EAGALA). This field study was designed to describe the range and frequency of behaviors reported during an equine session and investigate their relationship to other therapeutic factors. Participants reported a range of interactions between humans and horses, and the quantity of human-animal interaction was a significant predictor of reduced subjective distress. Findings on the direct and indirect effects of HAI will be discussed.		
2:40 p.m. - 2:55 p.m.	HS 113	Facilitator: Bonnie Higgins
<b><i>Improving the Quality of Supply Chains Using Axicon 1500 Barcode Verifier</i></b>		
<b>Presenter(s):</b> Benjamin Winkelman <b>Sponsor:</b> Mahmoud Al-Odeh <b>Abstract:</b> The quality of supply chain management (SCM) depends on several factors, such as availability of material, regulations, and technology. Technological innovations (e.g. internet, information systems, and RFID) improved the quality of supply chain management practices by improving customers' satisfaction and sharing more information with partners in the chain. One technology that has improved the quality of supply chains and customers' satisfaction is barcode verifiers. This technology is used to ensure the quality and resolution of printed barcodes and labels. For this project, I used an Axicon barcode verifier to test different common item barcodes. The importance of using the proper printing techniques for printing labels and barcodes will be discussed in my presentation. In addition, I will explain the importance of traceability and verification in barcodes. Using barcode verifiers also plays an important role in identifying barcode defects by testing different parameters, such as contrast, reflectance, and decode ability in barcodes. I will be exploring the different industries that are using barcode verifiers. In addition, I will discuss the value added benefit achieved by using this innovative technology. Lastly, I will share my findings from the test that I ran using the Axicon 1500 Series scanner on three common everyday products.		



TIME	LOCATION	FACILITATOR
2:40 p.m. - 2:55 p.m.	HS 230	Facilitator: Dianne Narum
<b><i>Assessing Concealed Campus Carry Policy at Bemidji State University</i></b>		
<b>Presenter(s):</b> Kameel Al-Khouri, Michael Juneau, Nicole Kaumans		
<b>Sponsor:</b> Halbana Tarmizi		
<b>Abstract:</b> The goal of this research is to assess student and faculty perceptions on concealed carry policies that have been implemented in several states. We are also going to compare how the policies or laws have been implemented in several higher education institutions. We will include views from local law enforcement, as well as from BSU Campus Security. The thought behind this is that the status quo for emergency situations is not effective at deterring and/or stopping a threat on campus. Currently, the options for avoiding a threat on campus are to either run or hide. These options do not provide students an adequate safety alternative in the event of a dangerous threat on campus. We will also conduct a survey on BSU campus to get a sense of students' views on this issue, while also maintaining a non-bias questionnaire. We will display the current university policy and put forth a new policy to replace it. We believe that this policy could have benefits for student safety on campus by putting the security of our students literally into their own hands.		
2:40 p.m. - 2:55 p.m.	HS 248A	Facilitator: Annie Butler Ricks
<b><i>Remote Sensing Analysis to Study the Effects of a Terrestrial Crude Oil Spill on Water and Soil Physical Properties (National Crude Oil Spill Research Site in Bemidji, Minnesota.)</i></b>		
<b>Presenter(s):</b> Bethany Erickson		
<b>Sponsor:</b> Miriam Rios-Sanchez		
<b>Abstract:</b> Ground-water contamination by hydrocarbons is a widespread problem. An oil spill near Bemidji, MN, occurred in 1979 when a pipeline transporting crude oil broke, leaving 400,000 liters of oil in the unsaturated zone and near the water table after cleanup efforts. Interdisciplinary research, sponsored by the USGS, began in 1983 to study the crude-oil spill site directed toward understanding the physical, chemical, and biological processes controlling the hydrocarbon contaminants in the subsurface. What has not been assessed, however, is how the movement and fate of hydrocarbon phases have affected soil, water, and vegetation over the years. Landsat satellite imagery is ideal for this type of assessment since the images provide views of the Earth and its main surficial components at broad ranges of wavelengths, scales, and temporal resolutions. Fifteen Landsat images were analyzed ranging from 1979 to 2015 using methodology techniques such as radiometric corrections, tracking seasonal changes in vegetation, and spectral signature analysis for one transect including the spray zone and the north oil pool. The aim of this work is to establish relationships between the spectral responses and the variations on soil properties, water content, and vegetation associated to the transport and fate of the remaining crude oil.		
2:40 p.m. - 2:55 p.m.	HS 248B	Facilitator: James White
<b><i>A Case Study on the Effect of Bicycle Crank Length on Performance</i></b>		
<b>Presenter(s):</b> Mathew Steichen		
<b>Sponsor:</b> Christel Kippenhan		
<b>Abstract:</b> This case study will look at the effects of bicycle crank length on performance. The subject's $VO_{2max}$ while cycling, and again while running, was recorded on two separate dates. Three composite tests were also done where the subject cycled for 20 min and then ran for 10 min at an intensity of 87% of the second ventilator threshold: (1) with the original crank (170 mm), (2) immediately after switching to the new crank (155 mm), and (3) about 5 weeks after switching to the new crank. The study will look at the effect of the crank length on $VO_{2max}$ and kinematic variables, as well as the subjective reports of the subject while cycling and running during the composite test.		
2:40 p.m. - 2:55 p.m.	HS 249	Facilitator: Larry Swain
<b><i>Monsters: What Are They Good For?</i></b>		
<b>Presenter(s):</b> Jon Geimer		
<b>Sponsor:</b> Larry Swain		
<b>Abstract:</b> In my paper, I explore the role and importance of monsters and beasts throughout literature. I look at why they are so prevalent in mythology and folklore, and why such creatures are still popular today. By examining their function in storytelling, I explore why monsters and beasts help us examine civilization and human morals.		



TIME	LOCATION	FACILITATOR
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3:00 p.m. - 3:15 p.m.	HS 102	Facilitator: Keith Gora
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***A Study to Identify What Strategies Can Be Used to Market Premium Skincare Products to the 30 and Under Age Group***

**Presenter(s):** Sarah Erickson, Trey Johnson, Haley Pollock, Margaret Tweten  
**Sponsor:** Kelly La Venture  
**Abstract:** The purpose of our study was to identify what strategies can be used to market premium skincare products to the 30 and under age group. By selecting an exploratory research design, investigators were able to conduct a preliminary examination into which strategies were preferred by the 30 and under age group for marketing premium skincare products. Investigators used cluster sampling of current students and faculty aged 18 to 30 at a Midwestern university. Using a survey research instrument, we collected data from respondents. Upon data analysis and interpretation, we were able to determine the best way to market premium skincare to the 30 and under age group.

3:00 p.m. - 3:15 p.m.	HS 105	Facilitator: Wendy Grosskopf
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***Capture Theory and State Regulation of Animal Cruelty***

**Presenter(s):** Kyla Henderson  
**Sponsor:** Patrick Donnay  
**Abstract:** I theorize that regulatory capture impacts animal cruelty laws in several different ways. Capture theory is the process by which regulatory agencies eventually come to be dominated by the industries they were charged with regulating. Regulatory capture happens when a regulatory agency, formed to act in the public's interest, eventually acts in ways that benefit the industry it is supposed to be regulating, rather than the public. Animal cruelty regulations are an important factor in the way that everyday products are produced. Capture theory affecting animal cruelty regulations is an important look at the growing concern with animal rights. In analyzing the 50 American states for their strengths in regulations having to do with animal rights and animal cruelty, many factors have been produced that may influence them. These factors include the size of various industries, political parties, contributions, etc. I anticipate finding that where agricultural products industries are strong, the regulation of animal cruelty will be weak.

3:00 p.m. - 3:15 p.m.	HS 107	Facilitator: Andrew Hafs
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***Johnson Grass***

**Presenter(s):** Mitchell Gindele  
**Sponsor:** Mark Fulton  
**Abstract:** I spent last summer working at the Big Muddy Wildlife Refuge Headquarters in Columbia, Missouri. My main task was invasive plant species control, and one of the main species I worked on was Johnson grass (*Sorghum halepense*). Johnson grass is a widely distributed and very competitive invasive species which tends to occur in low river bottoms, fallow fields, and forest edges. Johnson grass was introduced to the U.S. mainly because it grew fast and stabilized the soil near roads. The best known control practice is herbicide, typically glyphosate. If the herbicide is properly used according to instructions and safely guidelines, it is not a dangerous method for the ecosystem and the workers. Other practices have been attempted to control Johnson grass, but these are ineffective or too expensive. Fire does not work because Johnson grass will be more abundant after a burn. Hand picking is too much effort and is very slow. Using herbicide seems to be a bad direction, but it is efficient and a cheaper way to control target species; the Big Muddy Wildlife Refuge uses safe practices. The refuge is about 16,697 acres, and we only treated a fraction of it over the summer.

3:00 p.m. - 3:15 p.m.	HS 112	Facilitator: Troy Gilbertson
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***Social Media and Impression Management***

**Presenter(s):** Anne Grierson  
**Sponsor:** Carla Norris-Raynbird  
**Abstract:** Do students carefully cultivate the information they present on social media, or do they post without a filter? My research investigates how students use social media to manage impressions. I seek to identify the ways in which students use social media and examine the strength of explanatory social theories, such as affect control theory, in explaining these behaviors. A convenience sample of students from Bemidji State University will be asked to complete a survey on how and why they use social media in managing their identities. Data will be analyzed using an SPSS package.



TIME	LOCATION	FACILITATOR
3:00 p.m. - 3:15 p.m.	HS 113	Facilitator: Bonnie Higgins
<b>Why Study Economic and Cost Analysis?</b>		
<b>Presenter(s):</b> Kirk Bryan, Scott Smethers		
<b>Sponsor:</b> Mahmoud Al-Odeh		
<b>Abstract:</b> The science of using mathematics and economics principles in real-life applications is one definition of economic cost and analysis. It is a set of tools used by engineers and technology managers to make decisions on a wide variety of topics such as checking accounts, price discounts, markups, payroll calculations, simple and compound interest compounding, mortgages, labor analysis, material analysis, breakeven analysis, and cost analysis. Why is this discipline so important? Business personnel have to constantly make decisions on what projects to enter into, how many employees to have on hand, what kinds of equipment they should use, and the terms used in acquiring that equipment. These are some examples of the everyday need for cost and analysis in the business world, but the average person trying to make life as fruitful and feasible as possible would benefit from the use of these principles as well. It is always advantageous to acquire the things we need at the best price possible. An individual can plan on buying a house, a car, or even get a loan for a small business by applying the cost analysis principles.		
3:00 p.m. - 3:15 p.m.	HS 230	Facilitator: Dianne Narum
<b>Grand Reentry</b>		
<b>Presenter(s):</b> Sterling Knox		
<b>Sponsor:</b> George McConnell		
<b>Abstract:</b> In recent years, mass incarceration has become an area of great concern, and the U.S. has landed the award for the highest incarcerated population. The U.S. also maintains a national recidivism rate of 67%, 30% of which were re-convicted of a new crime. This rate becomes inflated on tribal lands, reaching upwards to 80% nationally, with some individual reservations above 90%. The challenges unique to tribal re-entry do not fit the research mold, resulting in a lack of resources, preparation, and community involvement, which is key to successful reentry. In recognition of this crisis, this presentation serves to explore the re-entry process, its programs, and what changes can be made to increase the chances of success for tribal re-entrants.		
3:00 p.m. - 3:15 p.m.	HS 248A	Facilitator: Annie Butler Ricks
<b>The Role of Word of Mouth (WOM) in Student Recruitment in the Digital Age</b>		
<b>Presenter(s):</b> Hunter Larson, Zoe Reich, Kyle Rosendahl		
<b>Sponsor:</b> Halbana Tarmizi		
<b>Abstract:</b> "Oral or written recommendation by a satisfied customer to the prospective customers of a good or service. Considered to be the most effective form of promotion, it is also called word of mouth advertising which is incorrect because, by definition, advertising is a paid and non-personal communication." - BusinessDictionary.com In today's digital age, colleges and universities are marketing their schools through Facebook, Instagram, YouTube, Google advertisements, and a variety of other media platforms. With the click of a button, you can read hundreds of reviews on any secondary school. While this can be helpful for prospective students because of its easy accessibility, the digital reviews may not help students understand why that specific university will be a good fit for them. Based on research, our team aims to find out how big of an impact word of mouth marketing has on picking a secondary school. In this study, we will analyze what draws a prospective student towards secondary education. Does word of mouth marketing still have value or has social media and advertising become the cornerstone for recruiting students?		
3:00 p.m. - 3:15 p.m.	HS 248B	Facilitator: James White
<b>Assessing Physical Limitations and Fear of Injury in DII Female Track and Field Athletes</b>		
<b>Presenter(s):</b> Josette Nelson, Alec Weis		
<b>Sponsor:</b> Jim White		
<b>Abstract:</b> The primary purpose of this research project is to identify physical limitations or asymmetries in regular body movement using the Functional Movement Screening (FMS) system on the Bemidji State University (BSU) female track athletes (BSUFTA). A secondary purpose is to examine if fear of injury influences FMS overall scores. The FMS test examines strength, range of motion, and flexibility asymmetry. The FMS has been frequently used in the exercise and medical communities as a means to assess physical attributes of active individuals. The research intent is to identify how the FMS can be used to recognize skeletal muscle and joint deficiencies resulting from physical training methods of BSUFTA, as well as their fear of injury assessed through a survey. Methods: Approval of BSU's Institutional Review Board was obtained before beginning. The BSUFTA were divided into groups based on the events they compete in, including long distance runners, throwers (shot put, etc.), hurdlers, and sprinters. Descriptive and demographic findings will be presented. Statistical analysis of the survey and research questions will be provided. Findings will examine if there is a difference in physical asymmetries in relation to competitive events and if the fear of injury/re-injury affect the athletes' FMS score.		



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