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2016 Minnesota Undergraduate Scholars Posters at St. Paul Abstract Booklet

Minnesota Undergraduate Scholars

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MINNESOTA UNDERGRADUATE SCHOLARS



Posters at St. Paul

March 17, 2016



Welcome

It is my distinct pleasure to welcome students, faculty, staff, administrators, and government officials to the third annual Minnesota Undergraduate Scholars Posters at St. Paul. I wish to congratulate all of our undergraduates on their scholarly accomplishments that have led to their presentations today. These students and their faculty mentors serve as stellar examples of the undergraduate research that is happening across the Minnesota State Colleges and Universities system. This year, presentations will be conducted by 38 students representing six Universities and two Community and Technical Colleges.

The purpose of this event is to provide undergraduate students the opportunity to share the results of their scholarly work with legislators and other leaders in state government. We believe the messages our students communicate to legislatures can impact the state of Minnesota and the broader global community. As you attend the poster session, you will see the many forms of undergraduate research that occur on several Minnesota State University and College campuses. The Council and I hope you gain an understanding of the tremendous impact that undergraduate research experience has on preparing students to become leaders and scholars in their future endeavors.

The conference has been planned through the combined efforts of the Minnesota Undergraduate Scholars Council. The vision, commitment, and contributions of the Campus Coordinators have made this event possible. We are grateful to the faculty mentors for the time and energy they have invested into the education of these students. In addition, we would like to commend the student presenters for their creativity, determination, and commitment to excellence.

Sincerely, _____

Karla A. Lassonde, Coordinator

MINNESOTA UNDERGRADUATE SCHOLARS

Minnesota Undergraduate Scholars is a consortium of institutions that supports the research, scholarly works and creative activity of undergraduates by providing avenues for funding, presentation resources and opportunities for undergraduates to present their work. We are committed to engaging undergraduate students throughout the Minnesota State Colleges and Universities system in scholarly activities that will enrich their collegiate experience, open doors to career opportunities and lead to a life-long love of learning.

Minnesota Undergraduate Scholars Council

Bemidji State University

Angela Fournier

Inver Hills Community College

David Higgins

Minneapolis Community & Technical College

Renu Kumar

Metropolitan State University

Jennifer Schultz and Sumiko Otsubo

Minnesota State University, Mankato

Karla Lassonde

Minnesota State University, Moorhead

Oscar Flores

Rochester Community and Technical College

Heather Sklenicka

St. Cloud State University

Carrie Barth

Southwest Minnesota State University

Emily Deaver

Winona State University

Mingrui Zhang and Jana Craft

Participating Colleges & Universities

Bemidji State University

Metropolitan State University

Minneapolis Community and Technical College

Minnesota State University, Mankato

Rochester Community and Technical College

St. Cloud State University

Southwest Minnesota State University

Winona State University

Schedule of Events

Thursday, March 17

11:00am–12:30pm Student Meetings with Legislators

1:30pm–2:00pm Registration

- ❖ Conference Room B
- ❖ Food and Refreshments provided

2:00pm–2:15pm Introductory Remarks and Welcome

2:00pm–4:00pm Poster Session in Veterans Service Building



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Palmitoylation of Na⁺- H⁺ Exchanger Isoform I (NHE1) as a Novel Regulator of Metastasis in Non-small Cell Lung Cancer

Amanda J. Kooiker

Mark Wallert, Faculty Mentor

Bemidji State University

Activation of invasion and metastasis has long been recognized as the predominant hallmark of cancer. As malignant tumors develop, they are initially defined as cancer in situ, tumors in place, that have not spread to surrounding tissues. Cells from these tumors then actively invade and metastasize to spread to surrounding tissue and throughout the body. The Na⁺- H⁺ Exchanger Isoform I (NHE1) is a key regulator in cell migration and therefore a key driver of invasion and metastasis. NHE1 moves to the leading edge of migrating cells to coordinate changes in both the intracellular and extracellular environment to regulate cell movement. We have identified for the first time, that NHE1 undergoes reversible palmitoylation, the addition of a palmitic acid residue to the cytoplasmic regulatory domain of NHE1. We hypothesize that this process will help NHE1 be targeted to the leading edge of migrating cells during invasion and metastasis and may provide a potential therapeutic target for cancer treatment. We will present the data demonstrating palmitoylation of NHE1 and the impact that blocking palmitoylation has on cell migration.

Effects of the "War on Drugs" in Minnesota

Emily Francisco

Stacie Jergenson, Faculty Mentor

Bemidji State University

This paper looks at the various ways the war on drugs has affected people in Minnesota, specifically. The 1980s brought with it tougher laws on people using drugs and longer sentences for those who were convicted. Stuart and Sykora address how long the sentences actually are; some being as long as sentences for arson and burglary. African Americans are also affected disproportionately. Percentage wise, more are being incarcerated than there are in the general population. The disparities in sentences for cocaine powder versus crack cocaine have greatly contributed to this. Families are tore apart and kept apart. Children are negatively affected if their parents are gone for long times. In Minnesota, of the approximately 10,000 people in jails and prisons, 17% of them are incarcerated for drug crimes. Incarceration rates cost tax payers billions of dollars yearly. In 2010, the cost of one inmate per year was approximately \$41,000. Hepatitis C and HIV/AIDS rates have risen because of the war on drugs, as well. But, something is beginning to be done; drug courts have contributed to lower incarceration rates and more drug offenders getting treatment.

The Role of Na⁺- H⁺ Exchanger Isoform I (NHE1) Phosphorylation in Cancer Development and Progression in Non-small Cell Lung Cancer

Taylor M. Manzella & Taylor M. Smith

Mark Wallert, Faculty Mentor

Bemidji State University

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

The Effects of Differential Doses of Human-Animal Interaction on Mood

Daniela Maltais, Kenia Torres, Kelli Kavanah, & Katelyn Mohagen

Angie Fournier, Faculty Mentor

Bemidji State University

A study was conducted to determine whether Human-Animal Interaction (HAI) affects mood and if so, to what extent. It was hypothesized that HAI would affect mood positively and furthermore, higher amounts of HAI would lead to higher positive changes in mood. Cluster sampling time slots ensured a random sample of participants who were gathered from an Introduction to Psychology university class. Each time slot corresponded to 1 of 3 conditions: No Condition, Low Condition and High Condition. Pre-test and Post-test measures were given to conduct this between-subject experiment. Results demonstrated that there was a significant difference in mood between pre-test and post-test, but not a significant difference between the No, Low and High conditions. A focus towards more basic research is needed in this field to further examine the nature of this relationship.

Implementing Quality Control and Quality Assurance for a Local Service Industry

Roma Korzinksi

Mahmoud Al-Odeh, Faculty Mentor

Bemidji State University

The purpose of this research is to create a benchmark quality control study for a local coffee shop in International Falls utilizing proven quality control methods. Problems that will be faced within the study is, fitting the data to the model. Gauging quality and finding problems within the service industry is a daunting task that requires quantification of information that may or may not be understood unless interpreted properly. The problem this locally owned coffee shop faces is that it believes they are losing revenue. This study creates a benchmark model that the coffee shop can use in order to minimize profit loss and regain control of their profit margins. Through the use of data gathering, graphing, and various data analysis tools, this benchmark study will provide the shop owner with information that can readily be utilized and interpreted to create a long term plan of action that will mitigate the severity of the profit loss. This benchmark model will provide an adequate process by which the shop owner can successfully acquire the relevant information they need to either pinpoint specific weaknesses in their process which may be throwing it out of control, or alternatively to show that there is a need to systemically improve the process itself. With this model, it is our hope that we will be able to successfully establish all of the following: where and why mistakes are being made, the severity of the issue, the revenue impact of the errors, and whether the errors are an employee caused problem or a process limitation.

The Radioactive Nature Reserve: Exploring the Ecological Impact of the Chernobyl Disaster

Sarah Andrewson

Carolyn Whitson, Faculty Mentor

Metropolitan State University

This project examines claims made by a recent study called “Long-Term Census Data Reveal Abundant Wildlife Populations at Chernobyl,” through an ecologically inclusive lens. The study argues that without the usual human interference, animal populations are now thriving in the area surrounding the Chernobyl plant. This study, and many others, confirms healthy mammalian populations in the exclusion zones, possibly implying a remarkable silver lining to one of the world’s worst environmental disasters. However, further research into the ecology of the area reveals all-encompassing claims of wildlife abundance to be somewhat shortsighted. To fully examine the ecological impact of Chernobyl, this paper considers studies of abundance and health not only in mammal populations, but also among different types of animals including birds, aquatic organisms, insects and invertebrates. This expanded research reveals that various wildlife populations show a definite positive trend for certain types of animals in the exclusion zone but a negative one for others, revealing the subtle complexities laced throughout the post-Chernobyl community of life. It also gives us pause as we reflect on mankind’s ecological impact, leading us to question which is more harmful: everyday human activities or nuclear disaster.

Importance of Improving Employee Retention

Jessica Barthel

Jennifer Schultz, Faculty Mentor

Metropolitan State University

Employees can be a competitive advantage, yet human capital costs are often a firm's largest expense. Employee turnover expenditures can run as high as 200% of the employee's salary due to recruiting, training, lost time and other monetary expenses associated with losing talent. Preventing, and strategically managing, turnover (and intent to turnover) can have a significant impact on employee satisfaction, employee engagement, product innovation and result in increased profits. This research project reviews the academic literature on employee retention and provides solutions to firms and individuals on improving policies, practices and procedures to increase employee retention.

What it Means to be “Under the Sea”: Examining Body as Identity in a Metaphorical Transgender Narrative and the Damages of Accepting Binary Interpretations of Gender in Hans Christian Andersen’s “The Little Mermaid” and Disney’s *The Little Mermaid*

Annie Burkhart

Carolyn Whitson, Faculty Mentor

Metropolitan State University

This paper examines how the heroine of “The Little Mermaid,” in both the 1837 Hans Christian Andersen tale and the 1989 Disney film, undergoes a journey that serves as a metaphor for transgender experience and exposes the damaging effects of societal acceptance of binary constructs of gender. The author employs a body-as-identity-and-site-of-required-change method of critique, which runs parallel to the crux of the mermaid tale; the heroine discovers that she is unable to realize and fulfill her deepest desires while she remains in the body in which she was born and finds that altering her life’s trajectory inevitably means altering her body. Following the heroine through the steps of her transformation reveals each of four distinctive steps of her journey to run distinctly parallel to those of historical and modern transgender narratives. The application of feminist and queer literary critique to this analysis highlights the heroine’s struggle for selfhood, power, and agency and the degree to which the heroine suffers for the attempt to attain these things due to expectations and restrictions imposed by the dominant cultural group as well as to powerful patriarchal forces at work. In consulting and referencing both research on folklore and narratives of gender experience, this paper explores the ways in which the earliest stories to which children are exposed present them with often restrictive views of gender normativity and may limit the ways in which, throughout their lives, people are able to feel, understand, and express a genuine sense of self.

Full Disk, Mobile Message Encryption

Joseph Klein

Faisal Kaleem, Faculty Mentor

Metropolitan State University

In 1995 U.S. Diplomatic Security Services and Pakistani Intelligence Services raided Ramzi Yousef's Islamabad guest house, arresting him and seizing a cache of weapons. Yousef, considered one of the main perpetrators of the 1993 World Trade Center Bombing and known Al Qaeda supporter, was arrested and extradited to the United States. Along with his arrest and the seizure of bomb-making materials, security services obtained Yousef's encrypted computer hard drive. FBI special agents spent more than one year decrypting Yousef's hard drive, which eventually revealed details to bomb 11 U.S. airliners. Decryption of the hard drive foiled the airliner bombings and aided in the life sentences he is currently serving at the Florence, Colorado super max prison. Though data encryption and cryptography has received big attention in recent years, it is a far from a new conversation. Throughout computing history, encryption and government have had a complicated relationship, reaching as far back as 1975 to IBM's Data Encryption Standard (DES). Recent revelations of government surveillance and various high-profile data breaches have spurred private industry to increase encryption in more customer products. While increasing encryption has led to more secure data, it also brings new challenges to criminal investigation and thwarting terrorism. This research article details the complicated relationship between government and increasing encryption. This article investigates some of the most popular, and controversial, forms of encryption available to the public. It also seeks to leave the reader with the understanding that the conversation around increasing use of encryption is more complicated than we may think.

Comparison of Non-Parametric and Parametric Methods for Testing Changes in Likert-type Scale Assessments

Michael Shyne

Katherine Johnson, Faculty Mentor

Metropolitan State University

A test/control design study on self-care instruction methods was conducted with students in a graduate level nursing theory class. The outcomes were measured via self-care assessments consisting of Likert-type scale questions completed near the beginning of the term and again near the end. The question of interest was whether the test group assessment score difference ("post" minus "pre") increased more than the control group assessment score difference for seven score categories. Changes from "pre" assessments to "post" assessments were compared for each category score and by group using both non-parametric and parametric methods. Test group scores increases were greater for every category than control group score increases, though the difference was significant for only nutrition and spiritual growth (median increase difference (test-control) = 0.167; Wilcoxon signed rank-test $p=0.035$ and 0.222 ; $p=0.031$ for nutrition and spiritual growth, respectively). Parametric methods produced similar results ($p=0.035$ and 0.027 , for nutrition and spiritual growth, respectively).

Genetic Analysis of Zinc Resistance in Bacteria Isolated From a Recycling Yard near the Mississippi River, Minnesota

Victoria S. Krawiec

Renu B. Kumar, Faculty Mentor

Minneapolis Community & Technical College

Currently 90% of zinc is produced hydrometallurgically in electrolytic plants. Reclamation of zinc and zinc waste through another method, bioremediation, could potentially mobilize and expedite zinc recovery and recycling. Bacteria SR-13-3 was isolated from soil and water samples from a recycling yard by the Mississippi river. Previous experimentation showed that the bacterium SR-13-3 has a maximum tolerable concentration (MTC) of 4mM ZnCl₂ on LB media. Since SR-13-3 is capable of growing on zinc media at such a high concentration, we wanted to identify the gene(s) responsible for zinc resistance. In order to complete the genetic analysis of zinc resistance, Transposon Mutagenesis was performed on SR-13-3 using a conjugation method with F+ *Escherichia coli* (*E.coli*) that contained a pRL27 plasmid. This suicide plasmid pRL27, contains sequences for: the Tn5 transposon element, oriT origin, tetAp promoter, tnp, oriR6K (origin of replication), and kanamycin resistance. This pRL27 plasposon (plasmid with minitransposon elements) randomly mutated the SR-13 genome, disrupting the gene(s) responsible for growth and resistance of ZnCl₂ at a concentration at 4mM. We hypothesize that by disrupting the genome of SR-13-3 through Transposon Mutagenesis, by a conjugation transfer with the pRL27 plasmid, we can phenotypically isolate mutants that we can analyze for zinc resistance genes. This project currently has generated a few mutants that are unable to grow on 4mM ZnCl₂ /LB media. These mutants are now being analyzed to identify the gene sequence(s) responsible for zinc resistance. Bio-informatics will be used to decipher the data and advance our understanding of zinc resistance to help us elucidate the mechanism responsible. Determination of these genes will also allow us to study gene products and perform future proteomic research.

Characterization of Lead (II) Resistance in Bacterial Isolate MR-13 and its Applications in Bioremediation

Mathew J. Kortuem

Renu B. Kumar, Faculty Mentor

Minneapolis Community & Technical College

Scientists are exploring biological ways to remediate lead contamination from polluted environments. In the current study the bacterial strain MR-13, isolated from the polluted environment near Mississippi river, has been characterized in complete LB agar as well as minimal M9 agar media for lead resistance and possible bioremediation applications are explored. The strain MR-13 was subjected to increasing Lead (II) nitrate concentrations in agar media to determine maximum tolerable concentration (MTC) and minimum inhibitory concentration (MIC). The MIC for MR-13 in solid media was determined to be 8.0 mM in both LB and M9 formulations. Macroscopic colony morphology on solid media changed from a translucent white to a translucent brown with increasing concentrations of lead. Within concentrations as low as 0.25 mM in liquid media, the brown pigment was also observed in bacterial sediment. Strain MR-13 exhibited exponential growth in both media, with and without exposure to lead. With increasing concentration of lead exposure, bacteria exhibited reduced growth, up to 43% less growth at 1.00 mM compared to 0.00 mM at 24 hours of growth. To investigate the mechanism of lead resistance, lead bioabsorption studies were performed by incubating the strain in LB broth with lead at concentrations of 0.00 mM, 0.25 mM, and 0.50 mM. After 24 hours of incubation at 37C. The liquid cultures were centrifuged at 2000 RPM for 30 minutes. The supernatant and bacterial sediment were separated, and the supernatant lead concentration was determined by atomic absorption spectrophotometry. Lead bioabsorption studies showed a reduction of lead concentration of 0.010 mM in 0.25 mM, and 0.034 mM in 0.50 mM. The study of the MR-13 strain has demonstrated the high Pb resistance and probable sequestration of lead. Bioaccumulation of lead by strain MR-13 makes it a good candidate for bioremediation purposes. Future studies will perform genetic analysis of lead resistance and additional research will explore the proteins involved in resistance so that this strain can be exploited for use in bioremediation of areas contaminated by lead.

Airfare in Domestic Non-Stop Hub-To-Hub Markets: A Time Series Analysis

Karl T. Stenerson

Ken Park, Faculty Mentor

Minnesota State University, Mankato

The purpose of our research is to analyze airfare determinants. The US airline industry provides 11 million jobs to the economy and accounts for 5% of US GDP. The ability of an airline to transport efficiently is an important driver of economic growth. Hence, it is valuable to understand the economic agents and market behaviors of the airline industry in terms of the US economy. In this paper, we analyze historical and present determinants of airfare and aim to deduce what forces have kept airfare high in a recent period of low fuel prices and continued efficiency gains in airplanes and route networks. This paper offers a brief history of the US airline industry since deregulation in 1978 and a review of important empirical research. Previous studies have suggested the consolidation and merging over the past decade has shifted the competitive nature of the market away from pure competition towards monopolistic and duopolistic. We conduct a time-series analysis of airfare in a hub-to-hub airport-pair market. We find that since 2001, legacy competition has become less influential on airfare, while low-cost carrier competition has maintained relatively large downward pressure. Our results also suggest that the Delta/Northwest merger has caused a significant increase in the 25th percentile ticket price for non-stop passengers in a hub-to-hub market. Our findings have important implications regarding the competitive nature of domestic airlines, which is a critical component of research into the efficacy of potential regulatory policies.

Biocompatibility of Hydroxyapatite and Stainless Steel Alloys

Mehedi Hasan & Clenton Ndonwie

Michael Bentley & Kuldeep Agarwal, Faculty Mentors

Minnesota State University, Mankato

The biomaterial used in medical implantable devices must sufficiently integrate within the biological system and be compatible with surrounding tissue. Stainless steel is commonly used, but due to its ability to corrode and cause allergic reactions, it is not commonly used for long-term implants. Hydroxyapatite (HA), a bioactive material that is a major and essential component of normal bone and teeth, is often used for coating metal implants to initiate infiltration. However, its bioactivity leads to high biodegradation when implanted alone, which can result in clinical implant failure. In the present study, our focus is on the biocompatibility of a mixture alloy of stainless steel and hydroxyapatite, fabricated by using a three-dimensional printer. To test the biocompatibility of the fabricated metal implant in vivo, one millimeter-sized metal pieces of high and low HA ratio mixture alloys were inserted on rat skulls through a small incision on the back made using a sterilized implantation surgery. After one month, the metal pieces were removed and observed under scanning electron microscopy to determine the degree of infiltrated bone and connective tissue. The surrounding connective tissues were also examined for inflammation and other tissue damages. The result showed that, the metal alloys that were fixed on the bone were encapsulated by dense connective tissue continuous with the periosteum without having any signs of inflammation or rejection. Furthermore, connective tissue infiltrated into spaces within alloy, between and around the spheres of stainless steel, to form a dense matrix of cellular and fibrous material throughout the implant. As further study, lattice structure alloy of stainless steel and HA will be implanted for better infiltration of bone growth and formation of vessel. Our findings will help improve medical device alloys for hip, femur and other implants.

Cochlear Nerve Myelination in Mice Lacking Thyroid Hormone Transporters

Stephanie Peterson & Natalie Moses

David Sharlin, Faculty Mentor

Minnesota State University, Mankato

Up until the late 1970s, the leading cause of preventable intellectual disability was untreated congenital hypothyroidism. Although today every child born is screened for thyroid function at birth and treated if found congenitally hypothyroid, residual deficits remain, including auditory impairments. However, how TH controls development is poorly understood. Our lab has been investigating a group of proteins that mediate the transport of thyroid hormone (TH) across the cell membrane and recently found mice lacking two specific TH transporters (Mct8 and Oatp1c1) have normal cochlear development, but altered auditory processing. Specifically, this data demonstrated that the speed at which auditory signals pass from the cochlea to the brainstem was delayed. The most direct explanation for these findings is that the auditory pathway to the brain is hypomyelinated. Considering this, our experiments are designed to test the hypothesis that auditory deficits observed in animals lacking TH transporters Mct8/Oatp1c1 is due, at least in part, to altered myelination of the auditory pathway. Nervous and cochlear tissues from wildtype and mutant animals were processed for myelin-staining techniques and were used to determine the levels of myelination between central and peripheral nervous systems in our experimental groups. Our findings will have three important implications. First, this research will further define the need for TH and TH transporters in development of auditory function. Second, it will allow for either the prevention of auditory deficits due to lack of thyroid hormone (hypothyroidism) during development or potentially offer novel modalities for treating deficits associated with low thyroid hormone. Lastly, these findings may transcend to other neuropsychological disorders such as autism and ADHD as auditory processing deficits are frequently overlooked or ignored, but are often underlying factors in these well recognized disorders.

Hybrid Renewable Power Systems: Feasibility Analysis and Design

Katherine Rasley

Mohammad Fanaei, Faculty Mentor

Minnesota State University, Mankato

The Iron Range is a collection of towns located on the Mesabi Range Iron Formation in Northeastern Minnesota. Historically subject to fluctuations of the iron market, an innovative solution is needed to facilitate sustainable economic growth in this region. Our objective is to analyze the feasibility of a hybrid renewable power system that utilizes the natural resources of Iron Range communities to produce clean energy with minimal environmental impact. The system uses a pumped-storage hydropower (PSH) facility as a natural battery, which is integrated with renewable power resources. PSH systems are often used as utility-sized energy storage devices. Our proposed power production system integrates PSH and renewable power resources as follows: during off-peak hours, surplus electric energy produced using cheap and green resources such as wind and solar photovoltaic cells is used to directly pump water from a lower elevation reservoir to a higher elevation reservoir. The stored energy in the PSH system will be harnessed by running water to the lower reservoir, turning a turbine to generate electricity during peak hours. Two sources will be investigated for feasibility using statistical analyses to determine their power production capabilities: photovoltaic solar and wind power. These two technologies have no greenhouse gas emissions during operation, and the Iron Range region has invested in developing a workforce skilled in these fields. The broader social, economic, and political implications of implementing this project will also be investigated. Mathematical modeling is performed to understand the potential energy storage capabilities of several sites using GIS software. Statistical analysis was used to determine the feasibility of wind power by modeling the distribution of the wind speed as a Weibull and Rayleigh distribution. The National Renewable Energy Laboratory's GIS software will be used to analyze the photovoltaic power density of selected sites around the region. By combining renewable energy resources with PSH energy storage, a more environmentally sound power producing grid will be proposed.

Physics Comic Book: A Classroom Resource for Engaging Students

Jacob Bukkila

Ruth Dawley-Carr, Faculty Mentor

Minnesota State University, Mankato

For most students going through school, physics can be an intimidating course. Large and complicated textbooks are daunting, the material itself can sometimes be conceptually difficult, and on top of all that, physics uses the language of math to communicate ideas. Additionally, societal expectations have turned women away from the sciences, creating an unequal distribution of gender in science occupations. For these reasons, students are often intimidated by physics. The purpose of this project is to make physics more accessible to every student, especially women, through the use of a comic book. Comic books provide a multitude of advantages for engaging students in the classroom. Students are more likely to relate to a character in a story than they are to relate to a textbook; comic books can be used to incorporate art into a science classroom; and they can serve as a tool to discuss issues facing physics and society as a whole. Making connections between physics, the student's personal lives, and the society they live in is essential for fully engaging students in the classroom.

Carbohydrates and Artificial Sweeteners: A New Optical Rotation Laboratory for Allied Health Students

Daniel P. Heerema

Heather Sklenicka, Faculty Mentor

Rochester Community & Technical College

In our allied health second semester chemistry course students had access to polarity, but the lab was unsuccessful due to lack of engagement and inconsistency of results. An alternative activity was devised to educate in specific rotation of chiral carbohydrates with an investigative approach to identifying simple carbohydrates and artificial sweeteners against known solutions. Experimental specific rotations of pure glucose and fructose were collected to be used as standard solutions at a variety of concentrations. The optical rotation of Sprite, Sprite-Zero, Crystal Light, Mio and Propel solutions were measured. These will be used as potential unknown samples for experimental identification based upon carbohydrate and artificial sweetener content. Each unknown was tested at different concentrations following removal of carbonation, to optimize light transmittance in the polarimeter. This presentation will include preliminary results to determine the best unknowns for student use along with development of a lab to be implemented in Fall 2015.

Determining the Benefits of Alternative Haircare Conditioning Practices

Amber Godfrey

Heather Sklenicka, Faculty Mentor

Rochester Community & Technical College

There has been a significant shift in health and beauty practices in favor of more all-natural solutions. Among these shifts is the use of alternative conditioners, such as raw food items. These foods include, but are not limited to, the use of bananas, avocados, and honey, in lieu of traditional, commercial conditioners. By observing physical changes at the microscopic level, measuring initial and final hair thickness, and determining initial and final tensile strength, this research aims to validate anecdotal claims, which support the use of alternative conditioning agents.

Diet and Body Composition of SMSU Women's Basketball Team

Tiffany Gehl

Jeffrey W. Bell, Faculty Mentor

Southwest Minnesota State University

This study sought to determine whether diets of the SMSU women's basketball team meet energy and micronutrient recommendations when compared to Recommended Dietary Allowances (RDA). Diets were analyzed using nutritional analysis software (FoodWorks). A second aim was to determine relationships between body composition of players and their energy intake. The players completed 3-day food logs during preseason on two weekdays and one weekend day. Body composition measurements included height, weight, and body fat percentages using bioelectric impedance (RJL Systems). Daily intakes of carbohydrate, protein, and fat were lower than RDA (protein 60.5 ± 16.7 vs. 85.0 g/day, carbohydrate 254.0 ± 75.3 vs. 354 g/day, fat 66.1 ± 18.9 vs. 424 g/day, $p < 0.05$). Also, vitamin D levels were lower than RDA (0.79 ± 0.80 vs. 75 mcg/day, $p < 0.05$). Kilocalorie intake and macronutrient quantity determined by Pearson correlation was not associated with any body composition measures. These players' diets may not be adequate for players to achieve peak performance.

Seasonal Survey of Frog and Toad Species and Abundance at Multiple Sites near Lake Sarah, Southwest Minnesota

Devin Ryan

Emily Deaver & Thomas Dilley, Faculty Mentors

Southwest Minnesota State University

In the 1990's, scientists noticed that amphibians were declining at an alarming pace. National and state programs were created to monitor and resolve the decline. This study is part of the Minnesota Frog and Toad Calling Survey Program, which monitors populations in Minnesota during April, June and July. It was hypothesized that there would be a difference between the frog and toad species heard in April and June/July 2015. Ten sites were surveyed for frog and toad mating calls around Lake Sarah, Minnesota. Four of the seven species found in Southwest Minnesota were heard. Chorus Frogs were the most abundant and commonly heard species, and there was a difference in which species were heard in which month. Statistical analysis showed that the frog and toad populations have not significantly decreased or increased since 2003 at this location, indicating that this area has not been significantly affected by the amphibian decline.

Rocking the Rock Star Look: Gene Simmons, David Bowie, and Alice Cooper

Emilie Baartman

Sheila Tabaka, Faculty Mentor

Southwest Minnesota State University

Many rock and roll artists are best known for their songs or their number one singles. For a couple of rock stars, they are best known for their appearances, whether it is their crazy hair, or the make-up that they wear when they appear on stage. Three rock stars that are best known for their looks are KISS's Gene Simmons, David Bowie (his Ziggy Stardust persona), and Alice Cooper. Even though these appearances are best seen on stage, many individuals enjoy recreating the looks for Halloween, a costume party, or just for fun. Sometimes, it can be hard to recreate a famous look, but if the person recreating that rock star look focused on the symmetry and using the right symbols and shapes, he or she can easily pull the look off. If someone were to figure out how to recreate Simmons, Bowie, and Cooper's looks, he or she can either follow a step by step instruction sheet, or follow step by step and also have a visual or video clip of that step in action.

Gun Control Attitudes among Southwest Minnesota State University Students

Samantha Minter

Scott Peterson, Faculty Mentors

Southwest Minnesota State University

While gun violence seems to be increasing in college students and on college campuses, there appears to be very little research devoted to determining why this is or even how college students feel about guns. This study was intended to answer some vital questions associated with this topic, specifically having to do with students' attitudes about gun control and current gun laws. A 62 item survey was administered to 202 college students at Southwest Minnesota State University, attempting to determine which variables are significant predictors of gun control attitudes. Individual survey items were aggregated into two attitude scales: attitudes about gun control and satisfaction with current gun laws. Results revealed that gun ownership significantly influences students' attitudes about gun control and current gun laws. Those students who had guns in their households were found to be significantly less favorable of gun control and more satisfied with current gun laws. However, gun ownership was merely one significant predictor of gun control attitudes. Additional analyses were performed to examine other possible predictive variables.

Place Politics in the Creation of the Boundary Waters Canoe Area Wilderness

Theodore Rex

Gareth John, Faculty Mentor

St. Cloud State University

The more than one million acres that form the Boundary Waters Canoe Area Wilderness (BWCAW) in the northeast corner of Minnesota have become a desirable location for the more than 250,000 annual visitors looking to engage in such activities as canoeing, kayaking, hiking, camping and fishing. Prior to the area's designation as a wilderness area, however, many people called this area home and relied on the hunting, fishing, canoe trip guiding and other exploitations from the natural resources as not only their main source of income, but also as a natural way of life they had come to know. Drawing on archival analysis of documents that led to the passage of the Shipstead-Newton-Nolan Act (1930), the Wilderness Act (1964), and the Boundary Waters Canoe Area Wilderness Act (1978), personal letters, biographies, and personal interviews with local residents, my paper illuminates the politics over place between conservationists seeking to establish the wilderness area and the people that depended on the land for their sustenance in the creation of BWCAW. In particular I show how the history of the conflict over BWCAW's creation is represented, understood and experienced today.

Performance and Security Evaluation of Embedded Networked Systems using WirelessHART

Robert Finstad

Tirthankar Ghosh & Yi Zheng, Faculty Mentors

St. Cloud State University

The project investigates how WirelessHART network protocol stacks are implemented, and what communication modes and protocols are being used to transfer data in the network. Additionally, research is being conducted to investigate the security of the WirelessHART protocol stack, and ways to design attack vectors to compromise the network. The project has been funded by a grant from Emerson Process Management. The project also includes interdisciplinary senior design projects with electrical engineering students including integrating WirelessHART components with custom embedded systems.

**Results from the Spring 2015 Student Survey AND the Fall 2015
Omnibus Statewide Survey**

Megan Kalk & Josefina Abdullah

*Stephen Frank, James Cottrill, Ann Finan, Monica García-Pérez, Amanda
Hemmesch Breaker, Nadeesha Lihinikedu Arachchige, Steven Wagner, &
Sandrine Zerbib, Faculty Mentors*

St. Cloud State University

The spring survey is an annual survey of SCSU students. Student directors have been presenting results from this survey at the Undergraduate Research Colloquium since its beginning. At this time, the topic under consideration is SCSU students' views on local police and safety. The fall statewide survey is an omnibus survey of MN adults which is highly regarded nationwide. At this time, the topics will include MN views on the direction of the state, approval and job ratings of various state and national figures. We would like to include MN views on racial equality and feelings toward police in their community. Breakdowns can be done by age, education, religion, party, income, gender and others if permitted.

Effects of a Persistent Organic Pollutant PCB-153 on the Development of Autoimmune Murine Type 1 Diabetes

Kylie Bruner, Taylor Schmit, & Ashley Bisping

Marina Cetkovic-Cvrlje, Faculty Mentor

St. Cloud State University

Type 1 Diabetes (T1D) is an autoimmune disease, also known as juvenile diabetes for its tendency to be diagnosed in children and adolescents. T1D results in the elevated blood glucose levels due to the destruction of insulin-producing pancreatic beta cells by the particular type of own immune cells called T-cells. Due to the recent increase in prevalence of T1D, researchers believe environmental factors, such as persistent organic pollutants (POPs), may play a significant role in the onset of T1D. Polychlorinated Biphenyl-153 (PCB-153) was a compound utilized in the mass manufacture of many products, such as capacitors, paints and pesticides. Although usage of PCB-153 was banned in the United States in 1979, due to its POP's properties of long half-life and bioaccumulation, this compound is still found everywhere around the world, including being identified in human blood. Recent studies have shown the potential for PCB-153 to trigger metabolic responses involved in the development of type 2 diabetes. In contrast, there is no data showing the association of PCB-153 exposure and T1D. The objective of this study is to determine the effects PCB-153 on the development of autoimmune T1D in non-obese diabetic (NOD) mice, the best experimental model for studying T1D. Mice will be exposed to low (0.125 mg/kg) and high (12.5 mg/kg) doses of PCB-153 twice a week intraperitoneally, from eight to 24 weeks of age. Glucose levels, body weights, composition of different immune cell types (including several T-cell subtypes), as well as T-cell functions will be studied at several time points during the study. Our results will for the first time provide an insight about the diabetogenic potential of PCB-153 and its mechanism of action in the context of immune system cells in a murine model of T1D.

Is Minnesota Living the American Dream?

Oksana Carlier

Kara Lindaman, Faculty Mentor

Winona State University

Robert Putnam discusses the decline of the American Dream in his book *Our Kids* (Putnam, 2015). The following study will explore the American Dream in Minnesota through income mobility. As a blue state with the highest minimum wage in the Midwest, Minnesota is a relevant state to analyze in order to see the impact of minimum wage laws on income. Minnesota will be examined on the county level using a regression model and will focus on one time spot before, and one time spot after, 2007. The hypothesis is that Minnesota is closer to the American Dream post 2007 minimum wage laws. Findings from the study will show whether or not Minnesota citizens are living the American Dream.

Effects of Pornography Exposure on American Youth

Kelly Highum

Rafael Narvaez, Faculty Mentor

Winona State University

This project examines the normalization of pornography in American society, particularly as a consequence of the rapid expansion of communication technologies such as the Internet, and the potential ramifications of pornography exposure, especially among male digital natives who watch, on average, 50 pornographic clips per week. I discuss the mainstream American pornographic industry and the systematic commodification, objectification, and stereotypical displays of women, racial minorities, and sexual minorities. I also examine research on the negative psychological and physiological effects of pornography on both men and women, as well as the correlation between pornography and violence against women, domestic violence, and rape. Lastly, I examine the concept of “pornography addiction,” defined as a “behavioral addiction,” associated to the dopaminergic effects of pornography, as well as an “arousal addiction,” characterized by the need to intensify the pornographic content. As noted, pornographic narratives that include misogynistic and racist themes have become largely normalized in the United States. However, critical examinations of these narratives have been scarce in the literature as well as in popular media. As a result, the negative psychological and physiological effects associated with pornography consumption are largely ignored within American society.

Student Presenter Biographies and Pictures

Amanda Kooiker is a sophomore who is majoring in Biology with a Chemistry minor at Bemidji State University. She is originally from Pipestone, Minnesota. Amanda is active in other campus activities, including Relay for Life, STEM Scholars, and intramural volleyball. In her free time, she enjoys spending time with friends and family, as well as staying active, and being outdoors, with activities such as camping, hiking, or fishing.



Emily Francisco is from a small town in northern Minnesota called Bigfork. This year she is a senior, graduating in May, with a Bachelor's degree in criminal justice, emphasis in corrections, and a minor in chemical dependency. She has also begun classes to become a licensed alcohol and drug counselor. Ultimately, her goal is to become a probation officer. She may also look into becoming a drug and alcohol counselor at some point. She currently works at a juvenile center as a corrections officer and is excited to continue her career in criminal justice.



Taylor Manzella is a sophomore at Bemidji State University, where she is pursuing a Bachelor's Degree in Biology. Taylor is currently a member of the Wallert Cancer Research team at BSU researching non-small cell lung cancer. Taylor is also involved in the Bemidji Love Your Melon Campus Crew and the BSU Relay for Life event. After graduating, she plans on attending medical school and achieving her goal of becoming a physician.

Taylor Smith is from a small town in East Central Minnesota. She moved to Moose Lake from Texas in the fourth grade. It was there that her high school science teacher helped to form her passion for science. She is majoring in Biology with a cellular and molecular emphasis and minoring in chemistry. With her degree from Bemidji State University she plans on becoming a genetic researcher. Her goal with this degree is to help people find ways to potentially help improve lives and help those with similar disabilities as her own. The work she does with Dr. Wallert will help her achieve this goal.





Kelli Kavanagh is from Otsego Minnesota, and graduated from Monticello High school in 2012. She is a senior at Bemidji State University. She is majoring in Psychology and minoring in Chemical Dependency and Business. After graduation she would like to work with service or therapy animals. She is considering working with Autism service dogs and increasing their prevalence or opening up an Animal-Assisted Therapy Camp for individuals with special needs.

Kenia Torres is a senior in psychology at Bemidji State University. She is from the small town of Milan in southern Minnesota. She comes from a small Mexican family that consists of her parents and an older sister. After she graduates from BSU she plans on going to graduate school to work her way into attaining the training necessary to practice clinical psychology. She is unsure of where she wants to complete her graduate studies or what she wants to specialize in.





Daniela Maltais is currently a sophomore at Bemidji State University. Originally from Colombia, she moved to the United States permanently at a young age, in the state of Minnesota. At her university she has had the opportunities to become a McNair Scholar, an Honor Student and to work in various research programs. Once she graduates, she aspires to go to graduate school and gain her Ph.D. She is interested in the fields of Behavioral Neuroscience, Cognitive Psychology and Developmental Psychology.

Katie Mohagen is from St. Cloud, MN and is currently a senior at Bemidji State University studying psychology and studio art. She hopes to someday go on to graduate school to pursue a degree in art therapy. She wants to work in children's hospitals with long-term patients and with those who suffer from Alzheimer's and dementia.





Roma Korzinski currently lives in International Falls, MN. He has a beautiful wife, Ashley and three amazing children, Chelsea, Myles, and Henry, they are 9, 6, and 3, respectively. He was part of a massive layoff at the local paper mill in town that allowed him to further his education towards a B.A.S. in Applied Engineering, and a B.A.S in Technology Management. As it stands, he is in his last semester of school, and is on track to graduate at the semester's end. After he graduates, his plans are to start a specialized 3D printing company in the Falls.

Sarah Andrewson is currently pursuing her Bachelor of Arts degree in English at Metropolitan State University. She holds an Associate of Applied Science degree in Marketing, the field in which she is currently employed. Sarah is passionate about her literature studies, but a childhood in the Wisconsin outdoors, coupled with a course in ecology led to an academic interest in environmental studies. She has recently declared a minor in Environmental Communications.





Jessica Barthel is a senior at Metropolitan State University's College of Management, she is majoring in Business Administration with a Minor in Human Resource Management. For the past 7 years Jessica has been a stay at home mother to her and her husband Jason's four children: Lauren (9), Wyatt (7), Claire (5), and Evelyn (2). Previous to staying home, Jessica was a nursing assistant who worked her way into a Staffing Coordinator position at a local home care agency. Three interests were sparked here: an interest in Human Resources, an interest in Business, and a passion for caregiving. Equipped with her degree, Jessica and her husband Jason are pursuing a dream of owning a Private-Duty Homecare Agency. Jessica feels that her education and research conducted at Metropolitan State University has given her a solid foundation to stand on as a new business owner.

A native of Mankato, MN, **Annie Burkhardt** is pursuing a Bachelor of Arts in Literature at Metropolitan State University and will graduate in the fall of 2016. She currently works as a freelance copyeditor and proofreader. Annie's research reflects her passion of mining the literary landscape for pertinent concerns regarding human rights and gender issues.



Joseph Klein is a Minnesota native currently pursuing a Bachelor of Arts degree in Liberal Arts at Metropolitan State University in Saint Paul. A passionate life-long learner, Joseph's intellectual interests span a wide range of subjects. Political engagement, local community development and international aid are his most enjoyed pursuits. His academic passions include the fields of intercultural communication, politics and information security.



Michael Shyne is a senior at Metropolitan State University and will graduate in May 2016 with a B.S. in Applied Mathematics and a minor in Applied Statistics. He hopes to pursue graduate studies in Biostatistics. He lives in Saint Paul with his wife and two daughters.



Victoria Krawiec is a 24 year old undergraduate student with A.S. degrees in Biology, Chemistry and Biotechnology. She is currently enrolled at Minneapolis Community and Technical College so that she can complete her MnTC requirements and continue researching metal resistant bacteria. In addition to MCTC coursework, she also attends Bemidji State University at North Hennepin Community College in pursuit of a Bachelor's degree in Biology with Cellular and Molecular Emphasis. Her immediate goals involve graduating in Fall of 2016, applying for a Master's program that focuses on Genetics or Microbiology, and getting a job at a Biotechnology company.

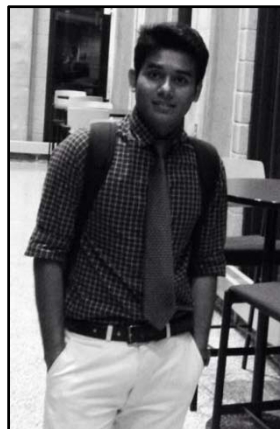
Mathew Kortuem earned an Associate's of Applied Science degree in Medical Laboratory Technology, and a medical laboratory technician certification from the American Society for Clinical Pathology in 2012. He has previously presented his undergraduate research on Lead-resistant bacteria at the American Society for Microbiology conference in 2015. He is currently continuing his education to continue on a medical laboratory career.

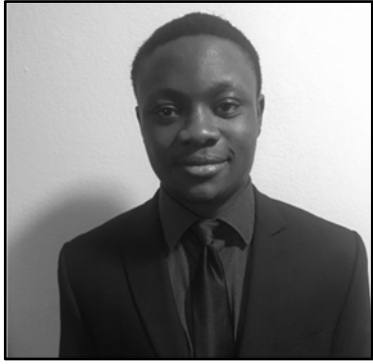




Karl Stenerson attends Minnesota State University, Mankato. He is graduating this May, with a BA in Economics and minor in Mathematics. Originally he is from Prescott, WI. He has a passion for data, research, and analytics. After graduation, he intends to work in the Twin Cities metro area within a company that will utilize and invest in his skills. In his free time he enjoys hiking and reading. His proudest accomplishments are thru-hiking 200 miles on the North Country Trail, his undergraduate research project, and his wonderful three year old daughter Eden.

Mehedi Hasan is an international student from Bangladesh. He is a senior at Minnesota State University-Mankato pursuing a Bachelor of Science degree in Medical Laboratory Science with a concentration in pre-medicine and a minor in chemistry. He is currently doing undergraduate research on Biocompatibility of Hydroxyapatite and Stainless Steel Alloys with Dr. Michael Bentley in the Department of Biological Science and Dr. Kuldeep Agarwal in the Department of Automotive Engineering and Manufacturing.





Clenten Ndonwie is Senior from Minnesota state university Mankato. He is Pre-Medical student with aspirations of attending Medical school so he could give back to the Underserved communities. He's originally from Cameroon West Africa and moved to the United States in 2010. He currently is part of a research team under the mentorship of Michael Bentley and Kuldeep Agarwal.

Stephanie Peterson is a junior at Minnesota State University, Mankato. She is majoring in Biomedical Sciences and German with a minor in Chemistry. After she completes her undergraduate degree she plans to attend graduate school in order to pursue a PhD in Biomedicine so that she can be a researcher as well as a professor. Outside of school she enjoys reading, playing and listening to music, hiking, and spending time with her family.





Natalie Moses is a junior at Minnesota State University Mankato majoring in biomedical sciences with a minor in chemistry. Her goals for the future involve a career focused on both medicine and research, especially related to surgery and physiology. She presently volunteers at Mayo Clinic. Her current research is focused on the thyroid hormone and its relation to auditory deficits. Natalie enjoys yoga, hiking, and spending time with friends and family. She has a love for both warm weather and all types of animals.

Katherine Rasley was raised on a small farm in Deer River, MN from where she graduated with honors. She is in her final semester of Minnesota State University, Mankato's Iron Range Engineering program. As a community-orientated, lifelong learner who values inclusivity and diversity, she has been actively involved in many aspects of her student body: helping start two student clubs, serving as an officer for two existing clubs, and organizing a campus-wide recycling program, as well as, several outreach events. Having discovered a passion for electronics, renewable energy, and power systems, her ultimate goal is to utilize her skills and energy to better her community.





Jacob Bukkila is a student at Minnesota State University, Mankato in pursuit of a physics education degree. From a young age, he loved to take things apart to see how they worked. He was curious about things that he could not see and eager to find answers to his questions. This led him to a love for science and ultimately a passion for physics. His passion for physics extends further into a desire to help others explore and appreciate physics. He is currently a physics lab TA, and a physics tutor at MSU.

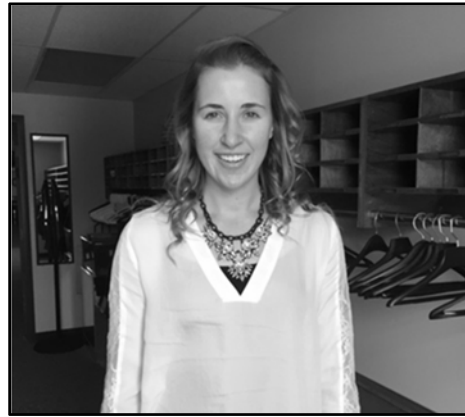
Daniel Heerema began his education at Bethel University, studying for a degree in Biology with the desire to pursue medical laboratory sciences and his interests in pathology and medical illustration. After working with the Mayo Clinic and Rochester Community and Technical College, he is pursuing his interests in medical and natural sciences towards a degree in Chemistry Education.





Amber Godfrey was born in Iowa City, IA and moved to Rochester when she was two years old. She went to Lincoln K-8 Choice School from kindergarten – 8th grade. In her 4th grade year, Lincoln partnered with the Mayo Clinic to study zebrafish and develop programs for schools. Then she went, and currently attend, Century High School. She also attends RCTC in PSEO. She plans to graduate this spring with an AS and high school diploma. Then she will move to the University of North Dakota. While there, she plans to double major in Medical Laboratory Science and Forensic Science.

Tiffany Gehl is from Fulda, MN. Her major is Exercise Science at Southwest Minnesota State University, and after graduation in May she is going to physical therapy school at the University of Wisconsin-La Crosse.



Devin Ryan is from Slayton, MN. He is currently a senior Environmental Science major at Southwest Minnesota State University. After graduation in May, he plans to find a job in his field of study and begin a career in Environmental Science.



Emilie Baartman is a junior from Brandon, SD, who is studying Broadcast and Digital Media and Theatre at Southwest Minnesota State University. As of now, she plans to graduate from Southwest Minnesota State University in 2017. She also plans on either staying in the Sioux Falls area working at a local television station, KSFY, or moving to Los Angeles to focus on film, a career she is very interested in.

Samantha Minter is a third-year senior at Southwest Minnesota State University. Originally from Saint Clair, Minnesota she is currently majoring in psychology. Post-graduation, she plans on attending Minnesota State University of Mankato and enrolling in their Mental Health Counseling program. Through this program, she will obtain a Master's degree and become a certified Mental Health Counselor and perhaps be licensed as a Marriage and Family Therapist as well.



Theodore Rex currently resides in Buffalo, Minnesota. He was medically retired from the U.S. Army in 2014 after serving more than 15 years and is a veteran of Operation Iraqi Freedom. He is married to his wife Jamie of 13 years, and has two sons who are 11 and 9. He enjoys all outdoor activities and is interested in environmental issues, especially those of northern Minnesota. He will graduate with a BES in Geography in the spring of 2016, and plans on going straight to graduate school.



Robert Finstad is a senior at St. Cloud State University graduating in May with a major in Information Technology Security and minors in computer science and communication studies. He has volunteered as an IT intern at Boys and Girls Club of Central Minnesota. He has been an interdisciplinary undergraduate research assistant between IT and Electrical Engineering for 1.5 years. He has been in the SCSU IT Security club for nearly 5 years and is currently the President. He will be competing as a team member in the Collegiate Cyber Defense Competition for the 3rd time and has also worked in a team consisting of students from Electrical engineering, computer engineering, mechanical engineering to develop smart more for wireless sensor network, sponsored by Emerson Inc.

Megan Kalk is from Onamia, Minnesota. She has been the Lead Student Director and Assistant Lead Director of the SCSU Survey for 2 years. Megan is interested in gauging attitudes toward police, racial equality, and immigrants.





Josefina Abdullah is a transfer student from Kuala Lumpur, Malaysia. She started off as a student caller and then went on to being the Assistant Lead Director of the SCSU Survey. She loves working with people and is highly interested in the social problems that exist today. Other than that, her hobbies include travelling and meeting new people to learn about their culture and their views or thoughts on the world.

Taylor Schmit is currently a senior at St. Cloud State University (SCSU) majoring in Biomedical Science and minoring in Psychology. She spends most of her time working as a teaching assistant for the psychology department, acting as a volunteer and fundraising coordinator, conducting research in cell culturing in Dr. Cetkovic-Cvrlje's research lab, and working as a phlebotomist. It is a combination of her undergraduate experience at SCSU and her overwhelming desire to help people that has led her to pursue graduate school and conduct research in essential oils as a form of alternative medicine.





Kylie Bruner is a senior biomedical science student at St. Cloud State University and after graduation she plans to gain experience in industry. She has been researching the effects of persistent organic pollutants on autoimmune disorders under the supervision of Marina Cetkovic-Cvrlje MD-PhD for the past 2 years, and it has vastly expanded her interest in pursuing research in the biomedical sciences and immunology. She is also a teacher's assistant for organic chemistry, a biology tutor and employee at Walgreens. Helping others through her passion in biomedical science, while challenging herself through research, is a great aspiration in her life.

Ashley Bisping is currently a senior at St. Cloud State University (SCSU) majoring in Biomedical Science. Her goal with this degree is to pursue clinical research with a desire to work in the cancer research field. She has been actively involved in Dr. Cetkovic-Cvrlje's research lab at SCSU for over a year studying the effects of organic pollutants on type 1 diabetes. She believes that the scientific skills from research combined with the interpersonal skills from working with others will benefit her greatly moving into the clinical research field after graduation.





Oksana Carlier is a senior at Winona State University with a double major in Political Science and Public Administration. Carlier enjoys getting to know new students and planning events on campus in her role of President of Pi Sigma Alpha – Rho Alpha Chapter. Most recently, Rho Alpha Chapter hosted an Alumni Dinner for Political Science students and Alumni to connect. As a representative of the American Democracy Project, Carlier organizes, moderates and participates in various forums to create deliberative dialogue within the Winona community. During her time at Winona State, Carlier completed an internship with a nonprofit organization in Washington DC and an internship in the City of Ramsey, Minnesota and enjoyed learning along with getting work experience. Carlier is set to graduate in May of 2016 and hopes to work in city government.

Kelly Highum is a junior at Winona State University. She is double majoring in Sociology and Communication Studies, and double minoring in Global Studies and Intercultural Communication. She plans to attend graduate school in Arizona and gain her doctorate in urban sociology with a focus in postmodern capitalism.

