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# MINNESOTA UNDERGRADUATE SCHOLARS



## Posters at St. Paul

March 2, 2017



# Welcome

It is my distinct pleasure to welcome students, faculty, staff, administrators, and government officials to the fourth 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 50 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,



Jennifer L. Schultz, Program Chair  
MN Undergraduate Scholars Posters at St. Paul

**MaKyla Culpitt** is an undergraduate student at Winona State University pursuing a Bachelors of Arts in History and a Philosophy minor in War, Peace & Terrorism. Through her studies at WSU, MaKyla found her academic niche in Genocide Studies and International Relations, which resulted in her researching the Rwandan genocide for her Senior Thesis. During her time at Winona State, MaKyla has traveled to Italy twice through WSU's Travel Study program. Her time in Italy instilled in her a love for art resulting in her teaching an art class and serving as a volunteer for WSU's "College for Kids". MaKyla currently serves as the President of the WSU History Association and is a member of the National History Honor Society, Phi Alpha Theta. Following graduation from Winona State in the May, MaKyla plans on serving as a volunteer for City Year before pursuing a Master's in Public Policy at George Mason University in Virginia.



**Hok Lam (Rachel) Ou-Yong '17** comes from Hong Kong and is currently an undergraduate student at Winona State University (WSU) in Winona, MN. Rachel is a Computer Science (CS) major with a Mathematics minor. She is a help desk technician at WSU Technical Support Center, and has worked as tutor, lab assistant and grading assistant. She is also an undergraduate researcher for WSU CS department. After graduation, Rachel plans to pursue her career in United States and attend to graduate school after few years working experience.

**Catherine Knudsen** spent her childhood in Omaha, Nebraska and then later moved to Minnesota for her middle school and high school education. She attended Anoka Ramsey Community College for a couple of years studying for an Associate's Degree where she took an Environmental Science class and discovered that she had a real interest in the environment and the outdoors. Catherine is currently a senior at St. Cloud State University Majoring in Environmental Science with a Minor in Geology. She has a passion for the outdoors, especially the earth, its history as well as rocks and minerals (she has a large rock and mineral collection). Catherine looks forward to finishing her degree and finding a job that links to her interests in the environment, geology, and the outdoors.



**Andrew Ray** is a student at St. Cloud State University where he is pursuing an Earth and Space Science Education Major with a Minor in Geology, and intends to graduate in the fall of 2017. Andrew is currently on the fence between jumping right into the 8th/9th grade Earth and Space Science teaching field after graduation and continuing his education by obtaining a Master's degree in glacial sedimentology. He grew up and went to high school in Osakis, MN and currently lives nearby in Alexandria with his wife and son. Living in Minnesota, with its glacially-derived landforms and billions of years old geologic history, is what really inspired him to study Earth sciences and his quirky child-like attitude found him a home in education.

## 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**

Mahmoud Al-Odeh

## **Inver Hills Community College**

David Higgins

## **Metropolitan State University**

Jennifer L. Schultz and Alex Layne

## **Minneapolis Community & Technical College**

Renu Kumar

## **Minnesota State University, Mankato**

Karla Lassonde

## **Minnesota State University, Moorhead**

Oscar Flores

## **Rochester Community and Technical College**

Heather Sklenicka

## **Southwest Minnesota State University**

Emily Deaver

## **St. Cloud State University**

Jennifer Howland and Jodi Kuznia

## **Winona State University**

Mingrui Zhang

**Kassandra Klasen** is from Inver Grove Heights Minnesota and graduated from Rosemount High School in 2014. She is currently a junior at St. Cloud State University and set to graduate in spring of 2018. She is double majoring in Biomedical Science and Biochemistry. She enjoys volunteering and staying involved on campus. She currently serves as the President of Chemistry Club and President of the Student Health Action and Advisory Committee. After graduation, she hopes to attend pharmacy school.



**Sruthi Shankar** is a 3rd-year, pre-med student at St. Cloud State University, double majoring in Biomedical Science and Biochemistry, with double minors in Ethics and Psychology. Sruthi has been conducting research with Dr. Latha Ramakrishnan's laboratory, since the summer of her senior year in high school. She emphasizes that research is a vital tool in helping undergraduate students develop a fuller sense of self and community, because patience, understanding and proper communication are necessary instruments of a good scientist. Sruthi identifies strongly as a feminist and as an ally of minority populations and, as a woman of color in the STEM field, hopes to re-route the paths of the scientific and medical communities to better serve the needs of the worlds marginalized.

## Participating Colleges & Universities

**Austin Johannes** is an Electrical Engineering student at St. Cloud State University (SCSU). He is currently in his junior year at SCSU. While in high school he took advantage of the PSEO program to attend SCSU. He decided to pursue a STEM career after competing in various robotic competitions. In August of 2016 he joined the “Visualization of Meteorological Data” project.



Bemidji State University

Metropolitan State University

Minneapolis Community and Technical College

Minnesota State University, Mankato

Minnesota State University, Moorhead

Rochester Community and Technical College

Southwest Minnesota State University

St. Cloud State University

Winona State University



**Emily Harrington** is a junior at St. Cloud State University studying meteorology. She is also minoring in Computing and pursuing a certificate in Information Systems. At SCSU, she is Vice-President of the St. Cloud State Chapter of the American Meteorological Society/National Weather Association Club, Vice-President of the Severe Weather Club, and a member of the Student Health Action Advisory Committee. In her free time, she enjoys doing research, being active, and spending time with friends. Before going to SCSU, she graduated from Inver Hills Community College with an Associate in Arts degree and Rosemount High School with her diploma in May of 2014.

# Schedule of Events

**Thursday, March 2**

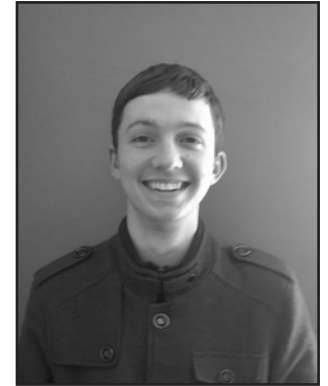
- 9:00–11:00am**                    **Student Meetings with Legislators**
- 11:00am-1:00pm**                **Poster Session in Capital Rotunda**
- 11:30am**                            **Welcome and Certificate Distribution**



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**Joseph Kelzenberg** is an Electrical Engineering student at St. Cloud State University (SCSU). He is currently in his junior year at SCSU and had previously completed an Associate of Arts degree at Anoka Ramsey Community College in thanks to the PSEO program for Minnesota high school students. This is his second year working on the “Visualization of Meteorological Data” project. In addition to finish his degree he plans to continue working on this project and possibly go into graduate school.



**Josh Benoit** is a Computer Engineering student attending Saint Cloud State University (SCSU). He is currently in his junior year and this is his first year working on the “Visualization of Meteorological Data” project. He plans on continuing on working on the project through the immediate future.

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**Cody Yeary** is a senior meteorology major at St. Cloud State University with an interest in tropical meteorology and improving weather communication to the public. Cody was born in Red Wing and is a life-long Minnesotan. He received the Hollings Scholarship from the National Oceanic and Atmospheric Administration (NOAA) in 2015. This allowed him to intern in the summer of 2016 at the National Hurricane Center in Miami where his research topic focused on storm surge. After graduation at St. Cloud State this spring, he will be attending graduate school to pursue an advanced degree in meteorology.



**Jessica McDonald** is a senior meteorology student at St Cloud State University. She loves to stay involved in her department through various activities such as teaching assistantships and mentoring roles. In addition, she is the president of the university's Student Chapter of the American Meteorological Society. This student organization helps young meteorology students better understand their field and the many opportunities available to them. Jessica has also taken part in several research projects, including the Hobart and William Smith Colleges Research for Undergraduates internship in Geneva, NY, and an Ernest F. Hollings Scholarship research internship at the Storm Prediction Center in Norman, OK. She will be headed to graduate school in the fall of 2017 to continue her studies in meteorology and hopes to eventually obtain a doctoral degree with a focus on severe weather research.

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**Paige Sabe** is currently in the RN to BSN Program at SMSU in Marshall, MN, and will graduate this spring 2017. Paige enjoys being a nurse, running, water sports and spending time with friends and family.



**Samson Chen** is a computer science and mathematics double degree seeker in Southwest Minnesota State University. He is currently in his final months of his bachelor's degree education which means that the fear and vast possibilities come next. So, skipping the endless possibilities and onto himself, Samson is simply and utterly, a nerd. He likes to play video games, analyze algorithmic structures, have awesome food and people watch. Did we forget to mention that Samson came from a country more than 8 thousand miles away?



**Tabitha Harazin** is a registered nurse attending Southwest Minnesota State University for her bachelor’s degree. Tabitha has been a registered nurse for 6 years now and worked in many different departments during her 6 years in a small rural hospital. Her plan when she graduates in May 2018 is to work for Renville County Public Health as the school nurse. Tabitha enjoys working with children and hopes to continue this dream of hers for many years to come!



**Carly Kramer Kubesh** is a Registered Nurse working at a rural critical access hospital. She works between the Medical/Surgical Unit, Emergency Room, and Obstetrics Department. Currently Carly is in the RN to BSN program at Southwest Minnesota State University in Marshall. Someday she hopes to pair her Bachelor of Science in Nursing degree with her Bachelor of Science in Business Administration and Management degree to hold more of a managerial position. In Carly’s spare time she enjoys spending time with her family.

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## Minnesota's New Guest

Brianna Graner

*Jeff Ueland, Faculty Mentor*

Bemidji State University

The Emerald Ash Borer (EAB) is an invasive beetle that preys on Ash Trees and has recently been found in Minnesota. It spreads through transportation of infected firewood as well as the insect's natural dispersion. This project assesses which areas of Minnesota are most susceptible to an EAB infestation. By identifying areas of risk, a prediction for future spread can be ascertained making it easier to monitor the beetle's disbursement throughout Minnesota

Using ArcGIS Modeling, different risk factors: distance from urban areas, distance from infected trees and cover type (meaning the plant growth characteristic for an area), were assigned a value indicating risk for potential spread. Finally, those risk levels were combined to display areas of least and greatest risk. The map displays small areas that are divided into three subdivisions, least, moderate and most at risk.

Among the challenges was limited data; there are limited collected data on the infested areas, an incomplete urban forest inventory and most cover type maps used in this project were broadly generalized. This map is useful in the field of conservation and forestry management to pinpoint areas most susceptible to an EAB infestation and to target any mitigation efforts. Spatial representations, like this, provides large amounts of information in a highly accessible format.

**Elisa Wright** grew up in southern Minnesota, moving frequently as a child. She is currently a senior in high school, while attending her second year at Rochester Community and Technical College. Elisa's plans involve transferring to the University of Minnesota, Twin Cities to major in chemical engineering.



**Lyndsey Brown** a senior in the BSN program at SMSU and will graduate in May. She currently works for an Integrated Health Partnership called Southern Prairie Community Care. Following graduation she plans to attend a graduate program in nursing, but has not decided which program yet.

**Desirea Thole** is a first year graduate student at Minnesota State University Mankato and has lived in Minnesota her entire life. Ms. Thole's research of monarch butterflies was conducted while she was an undergraduate. This research was carried out under a National Science Foundation funded internship at the Chicago Botanic Garden during the summer of 2015. Ms. Thole's current research interests include the effects of ultraviolet radiation on polyphenolic contents produced by uncommon crop plants. Upon completion of her master's degree, Ms. Thole plans to work toward a doctoral degree in which she would like to investigate climate change effects on uncommon crop plants.



**Kristian Kennedy** is a La Crosse, Wisconsin native, but has been a student in the Rochester public school district all her life. Kristian graduated from Mayo High School in 2015, while taking full time college courses at Rochester Community and Technical College (RCTC) and University of Minnesota Rochester (UMR) as a senior (through the PSEO program). Kristian is currently a sophomore at Rochester Community and Technical College (RCTC), studying liberal arts. In the spring of 2017, Kristian will be graduating from RCTC with her Associate of Arts degree in Liberal Arts. After graduating, Kristian will transfer to University of Minnesota Duluth, where she will be majoring in Biology with a minor in Spanish. Kristian hopes to pursue a career in the medical field, but is currently unsure of which medical career she plans to pursue. In Kristian's free time she works with children at the Rochester Athletic Club (RAC), enjoys working out, spending time with her family, and volunteering with organizations providing aid to homeless folks

## **Songs from the Snowbank**

Christine J. Grossman

*Jessamay Pesek, Faculty Mentor*

Bemidji State University

This display offers a representative collection of free verse composed by the researcher. A sampling of work dating to 1980, the assemblage ranges from ruminations on the demise and death of the poet's mother to a sprinkling of considerations on love, life and other matters of consequence. Influences include Sylvia Plath; Maya Angelou; e. e. Cummings; and T. S. Eliot, to name just a few.

## **The Role of the Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) and Calcineurin B Homologous Protein Isoform 2 (CHP2) on Cell Proliferation and Migration in Squamous Cell Carcinoma of the Lung**

Amanda Kooiker

*Mark Wallert, Faculty Mentor*

Bemidji State University

Lung cancer is a debilitating disease affecting thousands of people worldwide. Approximately 80% of lung cancers are comprised of non-small cell lung cancer (NSCLC). Of all NSCLCs, 30% are due to squamous cell carcinoma (SCC), a cancer that begins in squamous epithelium of the lungs before moving deeper into the tissue. The Na<sup>+</sup>-H<sup>+</sup> Exchanger Isoform 1 (NHE1) acts as a key regulator of cellular proliferation, migration, and metastasis in a variety of solid tumors, including those due to SCC. The calcineurin B homologous proteins (CHP1 and CHP2) appear to act as important cofactors in the regulation of NHE1. While both CHP isoforms have been found to bind to nearly the same amino acid sequence of the cytoplasmic regulatory domain of NHE1, differential expression has been observed. CHP1 is ubiquitously expressed, while CHP2 expression has been shown to be higher in tumor samples from SCC patients and cultured cell lines than in normal healthy tissue. Through proliferation assays, we have shown that the inhibition of NHE1, using cariporide, is able to lead to a decrease in cellular proliferation in SCC cells. In this study, CRISPR-Cas9 gene editing will be used to characterize the role of NHE1 and CHP2 by preferentially removing them from an SCC cell line (NCI-H520). We will present data evaluating cell proliferation, migration, and tumor formation in cells lacking NHE1 (H520 NHE1KO) and CHP2 (H520 CHP2KO).

**Alissa Shape** is a first-year graduate student from Andover, Minnesota. She graduated from Minnesota State University, Mankato in May of 2016 with a Bachelor of Science degree in Gender and Women's studies. Her undergraduate research, "Perceptions of Safety within Residence Halls at a Midwestern College Campus," was presented in April at the MSU Undergraduate Research Symposium and published in the Journal of Undergraduate Research at Minnesota State University, Mankato. In addition to her academics, she is an activist. She dedicates her time to sexual assault advocacy, racial equity, and indigenous sovereignty.



**Kathy Thao** '24 from Saint Paul, MN graduated from Henry Sibley High School. From there she attended Minnesota State University-Mankato (MSU) and graduated with a Bachelor's of Science in Sociology with a minor in Social Welfare. She is the first of 12 siblings to graduate with a college degree and will be pursuing her Master's in Social Work at MSU in fall 2017. She was a very active student leader during her undergraduate years. She received the Institutional Diversity Asian American Affairs Leadership Award plaque in 2014. She was the Activities Coordinator for the Hmong Student Association, Ballroom Coordinator for the Asian Pacific American Conference in 2014 and served as an undergraduate mentor and educator under the Asian American Affairs Center for incoming Southeast Asian students at MSU.

**Peter Olson** grew up in Big Lake, Minnesota, and is currently a Finance major at Minnesota State University Moorhead. He is active in several groups on campus, including his work as the Treasurer of the MSUM chapter of the Financial Management Association (FMA). Peter is also a recipient of an upper class honors apprentice scholarship offered by MSUM. The apprenticeship entails participating in research with faculty, and Peter's work with Dr. Thomas Hanson has been focused on the area of financial literacy. As part of that ongoing research, Peter presented research findings at the Academy of Business Research conference in San Antonio, Texas, in November 2016. Peter would like to thank his family, friends, and professors for all their help on his educational path.

**Jenna Kalthoff** is a sophomore at Minnesota State University Moorhead (MSUM) majoring in Finance and minoring in Mathematics. She is originally from Richmond, MN. As an Honors Apprentice Scholar at MSUM, she is currently researching financial literacy and investment biases under the direction of Dr. Thomas Hanson. In November 2016 she presented research on this topic at the Academy of Business Finance conference in San Antonio, Texas, and her presentation was awarded top prize in her session. She is also involved on campus as a Mathematics Tutor and in the Financial Management Association (FMA). In her spare time, she enjoys camping, hiking, playing tennis, and reading. She is very grateful for all the support she has received from family, friends, and professors.



**Jonathan Rudolph** is from Shakopee, MN. He is a senior at Minnesota State University, Mankato, majoring in civil engineering with a minor in mathematics. Jonathan is involved with the American Society of Engineers, Engineers without Borders, and the Minnesota State University, Mankato's Geowall team in addition to undergraduate research.

## **Characterizing the role of the Na<sup>+</sup>- H<sup>+</sup> Exchanger Isoform 1 (NHE1) in cell proliferation and migration in ovarian cancer cells**

Taylor Manzella

*Mark Wallert, Faculty Mentor*

Bemidji State University

To sustain proliferative growth, cancer cells exhibit disrupted signaling pathways that compromise the ability of the cell to regulate homeostasis. 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 have been characterized to determine the role NHE1 plays in their growth and migration. We have used proliferation assays to demonstrate NHE1 involvement in the regulation of cell growth in these cell lines. Cells 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. Additionally, we investigated the effects of four inhibitors that block specific kinases to evaluate their impact on cell proliferation. Specific inhibitors, MK2206 (AKT), Sch772984 (ERK), Y27632 (Rock), and B-ID1870 (RSK) were evaluated to determine key pathways regulating NHE1. Amongst the SKOV-3 and CAOV-3 cell lines, the RSK site inhibitor, B-ID1870 demonstrated the largest impact while in the OVCAR-3 cell line, the AKT site inhibitor, MK2206, demonstrated the greatest impact. In addition to serum stimulation we are evaluating the ability of lysophosphatidic acid (LPA) and urokinase-type plasminogen activator (uPA) to activate NHE1 and stimulate proliferation in these cells. Further investigation of the role of NHE1 will include preparing an NHE1 knock out cell line using CRISPR-CAS9 gene editing technology as well as the evaluation of the role of NHE1 in invasion and metastasis using ECIS migration assays to define cell growth.

## Effect of developmental temperature on repeat-induced reporter gene silencing in *Drosophila melanogaster*

Emma Reiss, Teo Kalliomaa, and Joe Artus

*Andrew Arsham, Faculty Mentor*

Bemidji State University

Position Effect Variegation (PEV) occurs when a gene is placed close to the centromere of a chromosome near heterochromatin. We performed experiments on the 1198 strain of *Drosophila melanogaster*, which contains gene construct 1360. This includes 256 lacO repeats, the hsp70 promoter and the white gene. The construct was inserted into position 1198 near the centromere. Our strain exhibited temperature-dependent PEV. When kept at lower temperatures, a red eye phenotype was observed. At higher temperatures, a PEV was more manifest. We designed an experiment to determine whether the heterochromatin state surrounding our construct was established during the development of the flies. Flies began their life cycles at 25°C, and were moved to 18°C at a variety of different points between the larval and adult stages. Results showed high expression of the reporter gene when the flies were moved from 25°C to 18°C before the pupal stage. When moved during the pupal stage the eyes were more variegated showing a decrease in expression. These results conclude that the heterochromatin state could be established during the pupal stage of development. Greater temporal resolution within day 6 to 8 of developmental would further elucidate when the heterochromatin state is established.



A native of Alexandria, MN, **Kate LaBrasseur** is a junior at Minnesota State University Moorhead studying Early Childhood Education. During her college career she has been working alongside a Psychology faculty member as an Honors Apprentice. She has always enjoyed working with children because of their positive attitudes, and plans to use her degree to provide future students with the best education she can possibly give them so they can reach their full potential.



**Joshua Johnson** is from Dalton, Minnesota and received his undergraduate degree in Psychology from Minnesota State University Moorhead. He is continuing his education at MSUM in the School Psychology graduate program, and is aspiring to become a school psychologist in the Greater Minnesota area.

**Matthew Dakken** is a Junior at Minnesota State University Moorhead; majoring in Economics and minoring in Political Science. He currently resides in the same place, where he was born and raised, just across the Red River in Fargo, North Dakota. As a student at Fargo South High School his interest in the field of economics was piqued during an Advanced Placement Microeconomics class. In relation to that class he was a member of his school's Economics Challenge team; which placed 1st at the state level, and in the top 25 nationally. During his time as an undergrad he has had the luxury of being able to learn from many fantastic professors not just in the Economics and Political Science departments; but in every discipline he has had the fortune to take classes in. He has a particular affinity for the field of Behavioral Economics, which blends standard economics with disciplines like psychology and sociology to enhance the understanding of human behavior and decision making in economic settings. Upon completion of his Undergraduate degree he hopes to further pursue his studies in a Master of Arts program in Applied Economics.

**Ashley Doll** is a Senior at Minnesota State University Moorhead, majoring in Psychology and minoring in Special Education. Her hometown is Mandan, ND, which is right across the river from Bismarck, ND. Her future goal is to become a School Psychologist and work in an Elementary School.



## **A Medical Clinic within a new Refugee Camp for Syrian Kurds**

Kenneth Abbott

*Patricia Hoolihan, Faculty Mentor*

Metropolitan State University

Nearly five million Syrians have fled their country's ongoing civil war. Some of these made perilous journeys by boat from the Turkish mainland to Greek islands, hoping to take a Balkan route to more prosperous European countries. However, infrastructure problems and closure of the Macedonian border caused thousands of refugees to accumulate in northern Greece. The author traveled to this region in the summer of 2016 to volunteer in a medical clinic within a new refugee camp for Syrian Kurds. His poster presentation discusses the camp environment, sociological problems, and clinical challenges involving medications, resources, staffing, and interactions with the host nation healthcare system.

## Chance Meets Healthy Sustainable Choices: Community Gardening Encounters Fruit Trees in the Red Lake Tribal Nation

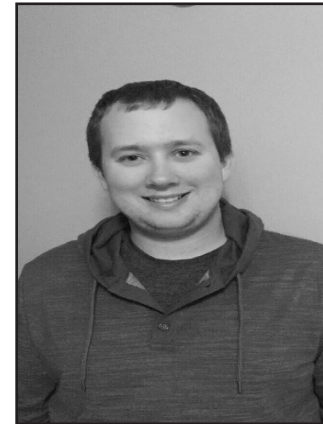
Richard Downs and Destiny Paseka

*August Hoffman, Faculty Mentor*

Metropolitan State University

This mixed-methods qualitative study examined how a fruit tree planting project may facilitate increased community connectedness among Red Lake Tribal Nation members located in Red Lake, MN (an indigenous Native American community) and diverse populations, while increasing understanding of the principles of environmental sustainability practices. University students, staff, and volunteers participated in a second year follow-up project; planting 40 locally donated fruit bearing trees (primarily northern-hardy apple trees varieties) in the Red Lake Nation Reservation. Participants (n = 22) were surveyed regarding their experiences after participating in the tree planting project (i.e., urban forestry) with their perceptions of sense of community. Results supported the hypothesis that a significant correlation exists ( $r = .738, p \leq .05$ ) between perceptions of CSW as important activities for all members and better understanding of the needs of the Red Lake Nation Community. A significant correlation ( $r = .652, p \leq .001$ ) also developed between better perceptions of “connectedness” to the Red Lake Nation Community and positive contribution to the Red Lake Nation Community. Additionally, a significant positive correlation ( $r = .454, p \leq .001$ ) was found between reports of improved, better “connectedness” to the Red Lake Nation Community and positive contribution to the Red Lake Nation Community. Further results and suggestions are offered regarding the application of theory to “real world” cognizance or impediments and for future or similar research.

**Victoria Krawiec** is currently attending Minneapolis Community and Technical College to finish her research project on metal resistant bacteria and publish her work in a scientific journal. Her research has open many doors to scientific research and given her the opportunity to present her research at national conferences NCUR and ASM as well as state level conferences like Undergraduate Scholars: Posters at St. Paul. She obtained A.S. degrees in Biology, Chemistry and Biotechnology from MCTC and recently graduated with bachelor’s degree in Biology with Cellular and Molecular Emphasis from Bemidji State University. She plans to attend graduate school to continue her research and education.



**Eric Benson** is from West Concord, MN. He graduated High School from Triton High School (Dodge Center, MN) in 2010 and currently a senior at Minnesota State University, Mankato where he is majoring in Civil Engineering with a minor in Economics. Eric’s focuses are Municipal and Transportation. While attending at Mankato, he is involved with the MNSU Student Section of American Society of Civil Engineering, a team member of the MNSU Steel Bridge and Concrete Canoe teams, team captain of the National Geowall Team, and President of the MNSU Badminton Club.



**Gregory Rossi** is currently attending Minneapolis Community and Technical College as they complete the Pre-Nursing curriculum for graduate studies in Clinical Nursing. Other research at the undergraduate level includes work on the intersections between urban development, visual media, and feminist/queer theory. Previous work as a case manager at a homeless shelter in downtown Minneapolis inspired them to pursue a nursing degree and sparked their interest in the public health aspect of microbiological research. G.B. earned a Bachelor of Arts in English and Gender, Women's, and Sexuality Studies from Grinnell College in 2010.



**Alma Boric** is an immigrant artist recently turned science major attending Minneapolis Community and Technical College. Alma is currently pursuing a Bachelor of Science in Nursing in order to study Midwifery. Recent endeavors into research provides her the ability to broaden her scope in microbiology, with specific interest in clinical application as a medical professional.

## **Work-Life Balance: A Win-Win**

Angela Elliott

*Jennifer L. Schultz, Faculty Mentor*

Metropolitan State University

The importance of achieving work-life balance has never been more prevalent with the leveraging of technology expanding the 9-5 workday into a 24/7 workday.

- 56% of global workers rank work-life balance at the top of their lists when defining career success
- Long work hours can increase mortality rates by almost 20%
- 67% of the millennial workforce report that managing personal and professional life as their second biggest challenge

Companies are taking a closer look at providing work-life balance to attract and retain key talent. Providing a work-life balance strategy makes solid business sense.

## Prevalence of Antibiotic Resistant Bacteria near a Feedlot Facility in Minnesota

Gregory Rossi, Alma Boric, Victoria Krawiec, and Renu Kumar  
*Renu Kumar, Faculty Mentor*  
Minneapolis Community & Technical College

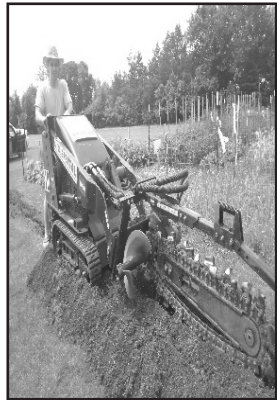
Feed-additive antibiotics are commonplace in industrial farming. They are used therapeutically and/or prophylactically to promote animal health especially in high-density, high-volume commercial farms. Previous papers have convincingly linked feed-additive antibiotics to specific resistant bacterial strains found in farm animals and food products. The relationship between antibiotic usage in animal feed and bacterial resistance is a continual subject of study, particularly as it relates to the transfer of resistant bacteria through the food chain - a major concern in terms of potential negative impacts on human health. According to the Centers for Disease Control (CDC), new infections are difficult to be treated with antibiotics. These antibiotic-resistant infections are responsible for at least 23,000 U.S. deaths per year. World Health Organization has declared emergence of antibiotic-resistant infections a threat to public health. Use of antibiotics in farms increases antibiotic resistant bacteria in the environment. In addition, people who are close to these environments harbor relatively high levels of resistant normal microflora on their skin or in their intestinal tracts. To develop an understanding of the prevalence of antibiotic-resistant microbes across a farm field, this project utilized public data provided by the Minnesota Pollution Control Agency on statewide feedlot facilities. Soil and water samples were collected at fence-line of one such location. From these samples we isolated and purified 47 bacterial colonies by using streak plate technique. These strains were characterized morphologically and were analyzed for gram staining. Majority of the strains are gram positive bacillus. Kirby bauer method was used to profile antibiotic resistance among these bacteria. Preliminary results indicate that several of these bacteria were resistant to ampicillin, penicillin and sensitive to tetracycline. This information will help us determine the correlation between the prevalence of antibiotic resistant microbes and the industrial farming. Detailed analysis of these environment can also provide insight into whether clinical outbreaks of antibiotic-resistant infections are linked to environmental reservoirs of resistant bacteria.

**Destiny Paseka** is a recent graduate at Metropolitan State University with her Bachelor's degree in psychology, with an emphasis in family studies. Destiny hopes to continue her education in the psychology field, so she is able to work in a school setting as a psychologist or a professor. She discovered her passion to help others when she was introduced to Professor Hoffman. Since then, she likes to devote her free time in helping others around her in any way that she can. She is hard-working and passionate about making the community a better place for everyone to be in.



**Angela Elliott** is a senior at Metropolitan State University's College of Management, majoring in Human Resource Management. Over the last 20 years, Angela has worked for corporate and non-profit organizations spanning the financial, medical, and telecommunications industries. Throughout her work experiences, Angela realized the components of her previous vocations that she enjoyed the most all shared the human resource element. When returning to school in 2013, majoring in Human Resources Management was an easy and obvious decision. Equipped with her degree, Angela strives to continue develop employees through her passion for talent management. Angela is certain that her education and research conducted while Metropolitan State University has provided a comprehensive understanding of the complexities facing both employers and employees in today's labor market.

**Kenneth Abbott** is a Metropolitan State University student with an interest in global health. In addition to his studies, Kenneth works a full-time job and a part-time job here in the Twin Cities. He prefers to spend his vacation time volunteering abroad.



**Richard Downs** is a senior at Metropolitan State University's College of Community and Public Affairs; he is majoring in Psychology and is scheduled to graduate in spring 2017. Much of his interests, research and community projects have focused on the Red Lake Nation and the benefits community gardening and fruit tree orchards provide to disenfranchised people. During his academic journey, Richard has stayed active giving multiple oral presentations like that of the 2014 Northern Lights University of North Dakota Conference, describing his work in community gardening. He has also co-presented research in the psychological and community benefits of urban forestry and gardening programs at the Midwestern Psychological Association Conference (2015 and 2016); he also presented his work at the Society for Community Research Action (SCRA) Eco-Conference in October 2016. In terms of publications, Richard has co-authored the study:

- Hoffman, A. J., Doody, S., Veldey, S. & Downs, R. (2016). Permaculture, fruit trees and the "Motor City": Facilitating eco-identity and community development in Detroit, Michigan. *National Civic Review*.

## **Salinity of Snow Cast off of the North Star Bridge - Minnesota**

Eric Benson and Jonathan Rudolph  
*Stephen Druschel, Faculty Mentor*  
Minnesota State University, Mankato

Applying salt deicers for ice prevention and removal is a technique used on winter roadways since the 1940s. However, chlorides in the deicers can cause substantial environmental damage, particularly to roadside areas and drainage ways. Roadway maintenance crews put significant effort into limiting the amount of deicer into just the amount necessary, while at the same time protecting public safety and preventing vehicle accidents. A question of significance is what proportion of deicer remains on a roadway after deleterious effects of traffic and plowing operations that occur after deicer application. Plows scrape residual deicer off along with accumulating snows. Traffic causes deicer to become airborne (i.e., kick up from tires). However, neither of these effects have been quantified, nor has a "salt budget" been established by which to evaluate the migration of deicers from spreader to pavement to roadside to ditch and wetlands. This research focuses on figuring out the amount of the road salt does not remain on the bridge as a function of the distance away from the bridge parapet that the road salt lands. To conduct this research, multiple empty buckets will be placed underneath and along the North Star Bridge (US 169, Mankato, MN) with different distances before snowstorm. After that, buckets will be collected to the lab to test the salinity of the snow. Factors that can affect this research will be traffic density, temperatures, wind and other weather impacts. The result of this research will help the Minnesota Department of Transportation identify how much road salt does not stay on the road/bridge. With this, the department can have an adjustment for the placement of road salts.

## Perceptions of Safety within Residence Halls at a Midwestern College Campus

Alissa Shape

*Shannon Miller, Faculty Mentor*

Minnesota State University, Mankato

Sexual violence is a widespread issue in American society. Though sexual violence takes many forms, the topic of campus sexual violence is especially pressing as it has occupied a fair amount of controversy in American media. The experience of sexual violence for college students is often traumatic as they navigate through the administrative systems and criminal justice systems of their respective communities. From a feminist perspective, students that become victims of campus sexual violence are often met with institutional resistance and inadequacies. The purpose of this study was to assess college students' feelings of safety in residence halls. This research surveyed students in introductory-level Gender and Women's Studies courses at a Midwestern college campus and sought knowledge from its students on the topics of campus safety and sexual violence. The findings from this research help to critically address the climate of the college campus from the student's perspective and addresses the intricacies of identities and how those identities shape the experiences of both safety and violence.



**Emma Reiss** is a biology major at Bemidji State University.



**Teo Kallimaa** is a student working toward a BS in Biology. He likes working in the lab, and has thoroughly enjoyed several projects with his fellow lab partner. While he's not tipping vials, Teo's favorite way to relax is to forge steel products in his shop.



**Joe Artus** is a biology major at Bemidji State University.



**Amanda Kooiker** is a junior Biology Major at Bemidji State University. She is an active student in campus activities, including STEM Scholars, Road-Side Clean-Up Committee, Intramural volleyball, and Relay for Life, along with working part time as a Pharmacy Technician. In the future, she hopes to pursue a career in the medical field. Amanda is in her second year as a member of the Wallert Cancer Research Team. This fall, she presented her research at the Undergraduate Research in the Molecular Sciences 11 meeting where she won an award for outstanding poster which supports her presenting her research at the national meeting of the American Society of Biochemistry and Molecular Biology in April. In 2016, Amanda participated in the Summer Undergraduate Research Fellowship (SURF) program at the Mayo Clinic. During her free time, Amanda enjoys being outdoors.

**Taylor Manzella** is a junior studying Biology at Bemidji State University. On campus, Taylor is a member of the Wallert Cancer Research Team, where she has researched ovarian and non-small cell lung cancer for the last two years. She is also the Legislative/Internal Affairs chair on the Bemidji State University Student Senate, as well as the University Student on the Minnesota State Faculty Development Subcommittee. Off campus, Taylor works as a medical scribe at the Sanford Bemidji Emergency Department. After graduation, she plans to continue on to medical school in hopes of becoming a physician.



## **Why Women Stay In Abusive Relationships**

**Kathy Thao**

*Afroza Anwary, Faculty Mentor*

Minnesota State University, Mankato

Intimate partner violence is a social issue that needs to be recognized and addressed. Nearly half of all women in the United States 48.4% (Domestic Shelters 2015) have experienced at least one form of psychological aggression by an intimate partner during their lifetime, with 40.3% reporting some forms of nonphysical abuse, or some form of coercive control (41.1%) by an intimate partner. Intimate partner violence is categorized as physical, sexual, emotional, and psychological harm and caused by a current or former partner or spouse. Cases of intimate partner violence often are unreported. When victimization of intimate partner violence is reported, it causes problems in the lives of victims, especially when victims decide to return to the abusive relationship. This research focuses on intimate partner violence against women in heterosexual relationships. By using the feminist theory, this research attempts to understand victims' resilience to the violence. It examines why women stay in abusive relationships.

## Monarch egg and larvae abundance across an urban gradient

Desirea Thole

*Christopher Ruhland, Faculty Mentor*

Minnesota State University, Mankato

Declining populations of pollinators has been a significant issue in recent years, and the monarch butterfly (*Danaus plexippus*) is the face of many efforts to educate the public involving repercussions of pollinator loss. Monarch butterfly populations have decreased by 80-90% within the last two decades. Members of the milkweed genus (*Asclepias* spp.) serve as the obligate host plant for monarch eggs and larvae. Numerous monarch conservation efforts have been focused in cities, such as the establishment of pollinator gardens. However, urban areas contain many environmental stressors that may fail to support monarch reproduction and survival. To investigate the impact of urbanization on monarch abundance, we monitored nine populations of *A. syriaca* spanning an urban gradient in the Chicago region. We chose *A. syriaca* specifically because it is the most widely used monarch host plant and is widely found in both urban and rural areas. We found no significant difference in monarch presence along the gradient. We found an unexpected negative correlation ( $r = -0.61$ ) between milkweed density and monarch abundance. These results indicate there may be many environmental dynamics influencing monarch abundance beyond the discrete driver of urbanization. Additionally, these results suggest that urban pollinator gardens may prove as successful as rural milkweed populations in supporting monarchs despite the added stressors of the urban environment.

## Student Presenter Biographies and Pictures

**Brianna Graner** is a sophomore at Bemidji State University where she is a Geography: GIS major. Brianna enjoys being outside, specifically in The North Woods, where she can camp, hike, hunt and fish. When she is not doing homework in the GIS lab at Bemidji State University, or outside in the woods, she can be found at her local theatre company where she stage manages, assistant directs and/or acts in musical productions each year.



**Christine J. Grossman** seeks secondary licensure in Communication Arts and Literature at Bemidji State University. She is a graduate of Forest Lake High School. She resides in Baxter, Minnesota, near Brainerd. She pursues field experiences at Forestview Middle School, in Minnesota School District 181. She is a member of the Heartland Poets, a regional division of the Minnesota State Poetry Society, which is a subsidiary of the National Federation of State Poetry Societies. She has published poems periodically in small magazines.

## **Lung Cancer**

Hok Lam Ou-Yong

*Mingrui Zhang, Faculty Mentor*

Winona State University

The research involves the redesign of the web-based Lung Cancer Treatment Outcomes Prediction Tool (LCTOPT). The current application was developed nine years ago and has been in active use at Mayo Clinic since then. It integrates R statistical package in Java environment, which introduced unnecessary software maintenance overhead. To simplify the design, a Java version of Cox Proportional Hazard model has been developed to compute the survival rate of patients. The Java implementation is used in the new design to calculate the survival rate based on patient information and treatments and present the survival curves. Patient information are collected and inserted into medical database. The extensive markup language is used to create a self-structured data form. This approach avoids a large number of csv files needed during the presentations of Cox survival curves. A responsive design approach was taken in the redesign of user interfaces to allow the displays of survival curves on different mobile devices.

## **Booyah! An Analysis of the Stock Recommendations of Jim Cramer**

Matthew Dakken

*Oscar Flores, Faculty Mentor*

Minnesota State University, Moorhead

I analyze both the market reaction to and long-term returns of stocks “buy” recommended by the enigmatic Jim Cramer on episodes of ‘Mad Money’, aired during the first half the 2016 calendar year. Through event series analysis I find that Cramer’s stock picking style is consistent with a positive-feedback strategy, favoring stocks which have displayed positive abnormal returns during the 10-day period subsequent to its recommendation. The announcement of his recommendation generates significant raw and abnormal returns; which spike during the overnight and one day periods following the announcement and then slowly dissipate over following months. Returns on recommended stocks become increasingly similar to the returns of the larger market as represented by the returns of the S&P 500 as the amount of time since announcement increases. This suggests that Cramer’s ability to outperform the market over the long-term is negligible. Analysis of the raw and abnormal returns of Cramer recommended stocks also gives evidence to support behavioral economic theories like De Bondt and Thaler’s (1984) Overreaction Hypothesis; which suggests that unexpected media attention relating to stocks has the ability to generate mispricing.

## **Using Math Words Matters: Math Concept Development in Preschool**

Ashley Doll, Kate LaBrasseur, and Joshua Johnson

*Lisa H. Stewart, Faculty Mentor*

Minnesota State University, Moorhead

Early math concepts and vocabulary are important predictors of later success in school in both reading and math. Explicit vocabulary teaching leads to growth in vocabulary use in young children, including the growth of math vocabulary. Combining vocabulary with hands on activities and practice increases the likelihood children will learn the concepts and use the vocabulary. In this study, 21 preschool-aged children were taught early math concepts and vocabulary using two different techniques. Twelve math activities were delivered to small groups during the preschool center day 2x per week for 6 weeks. These activities were age-appropriate, and asked children to manipulate, stack, sort, or count objects and use math concepts and words. Children in the study were randomly put into two groups. One group did typical preschool math small group activities. The other group did small group activities that included explicit teaching of math words and used those words and concepts during the hands on activities. The children in both the typical and vocabulary enriched math groups made gains in counting, identifying numbers, 1:1 correspondence, and comparing quantities. Both groups also made gains in their use of math vocabulary but as expected the vocabulary enriched group made significantly more growth in their ability to talk about the math concepts and identify or show them. Results of the study and implications for preschools and parents will be discussed.

## **100 Days of Misinformation: U.S. Newspaper Coverage and Intervention**

MaKyla Culpitt

*Juandrea Bates, Faculty Mentor*

Winona State University

The Holocaust is one of the most researched historical tragedies of the twentieth century, however it is not the only massacre to have taken place. Due to the overwhelming coverage of the Holocaust, other tragedies, such as Rwanda in 1994, have not received the scholarly attention that they deserve. The purpose of my research is to add to the existing, but limited, scholarship on the Rwandan Genocide.

To add to this scholarship I decided to research how U.S. newspaper coverage of Rwanda from April 1st 1994 to July 17th 1994 affected the Clinton Administrations intervention policy concerning Rwanda. For my research I examined Rwanda's history, the United States government's response to previous genocides, the United Nations Genocide Convention and national newspapers in the United States.

Through my research I have concluded that the Clinton Administration was able to circumvent intervention largely because of a restrained, and at times entirely absent, media narrative. Newspaper coverage of Rwanda was either lacking or downplayed the violence that was taking place producing both uninformed and misinformed U.S. citizens, resulting in the Clinton Administration not being morally challenged to intervene by the public.

By examining the devastating outcomes that can result from the complex relationship between media, public opinion and government, my research has given the Rwandan Genocide the scholarly attention that it deserves by adding to the existing, but inadequate, scholarship.



## **Lake Victoria Sediment Core VICSURK16-4A-1C-1: Evidence for Lake Sedimentation History**

Catherine Knudsen and Andrew Ray

*Kate Pound, Faculty Mentor*

St. Cloud State University

A series of lake cores were retrieved from Lake Victoria, Alexandria, Minnesota using a piston-coring method. The aim of this research is determination of the sedimentation history for Lake Victoria from the lake sediment core, so that the context for an archeological bison-bone discovery is known. Data collected and interpretations will be integrated with a parallel research project using three of the Lake Victoria Cores. The initial technique used to collect data was the use of a multi-use coring contraption (MUCC) to retrieve the core. This core is 74 centimeters long and was extracted from a water depth of 11.34 meters at the location 45° 52' 20.73" N, 95° 20' 43.50" W. Within the sample collected, composition, grain size, organization, and bedding were all observed. Lab work includes sieving, and extended grain size analysis. 1-2mm diameter grains are separated out and observed under a binocular microscope to help determine the source area of the sediment. Smear slides are used to discover what the silt and clay fractions were composed of. Geophysical data was collected at the University of Minnesota at the Limnological Research Center provide gamma-ray density data, magnetic characteristics, and resistivity of the core. The results of this data will assist with interpretation of sediment source, and depositional history within Lake Victoria. The data will be integrated with a larger parallel research project evaluating the context for the bison bones.

## **Financial Literacy, Privacy, and Investment Biases**

Peter Olson and Jenna Kalthoff

*Thomas Hanson, Faculty Mentor*

Minnesota State University, Moorhead

A person's level of financial literacy has an outsized importance on financial decisions and well-being, yet college-aged students often display a limited level of financial literacy (Chen & Volpe, 1998). This two-part study analyzes survey responses from 110 college students to probe the causes and implications of financial literacy.

Part one explores theories of family communication patterns (Ritchie & Fitzpatrick, 1990) and personal privacy orientation (Petronio, 2002) as contributing factors to the level of financial literacy as measured by the Consumer Financial Literacy Survey (National Foundation for Credit Counseling). Results suggest that families with a conversation orientation and individuals with lower privacy boundaries are associated with higher levels of financial literacy. These findings imply that family conversations about financial matters can have a substantial influence on college students' knowledge regarding personal finance, so hands-on, conversation-oriented pedagogy might enhance the effectiveness of financial education programs.

Part two analyzes resulting financial behaviors by asking survey respondents to create a stock portfolio from a small number of fictional assets. Behavioral financial theories have identified a number of common biases, including naïve diversification (Benartzi & Thaler, 2001), disposition effect (Shefrin & Statman, 1985), and loss aversion (Tversky & Kahneman, 1991). Survey results demonstrate an attenuation of all three of these biases for respondents with higher levels of financial literacy.

By simultaneously considering the causes and implications of financial literacy, this research contributes to a broad understanding of financial literacy that could help shape education and training to improve financial outcomes for college students.

## **Dihydroxylation of Limonene**

Kristian Kennedy

*Heather Sklenicka, Faculty Mentor*

Rochester Community & Technical College

Currently, RCTC students in Organic Chemistry 2128 perform a dihydroxylation lab on cyclohexene. To make this lab more interesting, cyclohexene was replaced with limonene, a natural compound found in lemons. Using limonene creates a more interesting lab because its source found in everyday life and the compound has more double bonds, making it an improved starting material. The goal of this project is to compare the products found using the three methods of dihydroxylation (Woodward, potassium permanganate, and oxone) and the thin layer chromatography (TLC) process. The reaction process was completed using the cyclohexene which produced one or two products for each method. Then the lemon peels were steam distilled, in order to obtain the Limonene. The limonene was then used in place of the cyclohexene, in order to establish the efficacy. After collecting the limonene, the student ran the dihydroxylation reactions (and TLC process) using the same three methods- the Woodward, oxone, and potassium permanganate. Additionally, the results also showed that the potassium permanganate method provided the most products of all three methods. Progress towards purification and structural determination will be presented.

## **Delivery of SiRNA using cationic polymeric nanoparticles to understand the localization and function of GABAergic neurotransmission in planaria**

Kassandra Klasen, Sruthi Shankar, and Hannah Ginter

*Latha Ramakrishnan, Faculty Mentor*

St. Cloud State University

Imbalance of neurotransmitters within the human brain results in hyperexcitability which may be manifested as a seizure. Invertebrate flatworms (planaria) possess a primitive brain (considered as an ancestor to the human brain) and a bilaterally symmetric nervous system, which is analogous to the vertebrate nervous system. The planaria also possess components of GABAergic neurotransmission, the fundamental molecular machinery targeted by the majority of anti-epileptic drug development research. The planarian flatworms have shown significant seizure-like movements upon exposure to convulsive drugs such as picrotoxin (selective GABAA receptor inhibitor) and others; however, the structure and function of the GABAergic protein targets of these drugs have not yet been studied in the flatworms. In order to determine the expression and localization of the GABAergic neurons, a proof of concept experiment was first conducted to investigate whether polymeric nanoparticles can be viable modes for the transport of siRNA across the lipid bilayer which surrounds cells. Small interfering ribonucleic acid (siRNA) which targets green fluorescent protein (GFP) was introduced into Human Embryonic Kidney 293 (HEK 293) cells using polymeric nanoparticles (p(H2N-Ala-EMA)-b-PMMA). Examining the silencing of GFP mRNA by siRNA delivery will allow analysis of whether GABAergic genes in planaria can also be silenced by the use of the polymer nanoparticle complexed with appropriate siRNA. The success of this proof of concept study will allow investigation of how GABAergic proteins are expressed and localized in the flatworms' simple nervous system. Studies elucidating the functional properties of GABA in the planarian flatworm will provide clues in identifying the evolutionary mechanisms of GABAergic neurotransmission from flatworms to higher vertebrates. Further, these studies will help us to understand the molecular basis of seizures-like movements exhibited by the worms upon exposure to convulsive drugs.

### **Visualizing Meteorological Data Using Virtual Reality**

Joseph Kelzenberg, Josh Benoit, Austin Johannes, and Emily Harrington  
*Mark Petzold & Alan Srock, Faculty Mentors*  
St. Cloud State University

The purpose of our research is to improve the way meteorological data is represented to students. Traditionally, weather is displayed through two-dimensional images of three-dimensional atmospheric concepts. Our goal is to make a simple, effective, and scientifically accurate way to visualize weather data in 3D. Our team of meteorologists and engineers work across disciplines and use our strengths in our respective fields to build a better visualization product. The engineers mainly code and deal with performance issues, while the meteorologists validate the output and discuss optimal ways to visualize the data. The software-development method used in this project is a spiral model employed in software engineering. The project starts with creating a simple weather feature. It is then deployed into virtual reality and the spiral begins: new components are added, and performance issues are fixed. Then to finish the iteration we deploy to virtual reality, to check and make sure we are properly displaying the data. Through that process, we built a basic working virtual-reality thunderstorm in a game engine called Unity3D. This high-resolution thunderstorm model has been output to 3D virtual-reality platforms including the Google Cardboard, HTC Vive, and Visbox.

### **Assessing Students Ability to Explain Laboratory Measurement**

Elisa Wright

*Heather Sklenicka, Faculty Mentor*

Rochester Community & Technical College

Informal observations indicate that students' comfort level when making simple laboratory measurements is lower than desired. To address this issue, students were required to prepare a video tutorial demonstrating how to properly obtain measurement readings from a graduated cylinder. Prior to filming, students did basic research on graduated cylinders, first formally introduced in the week three lab. The videos were uploaded to the classroom management system and were assessed with rubric evaluation. Results from the rubric evaluation and a student self-survey will be presented.

## **Can Ofirmev Reduce the Need for Opioids?**

Lyndsey Brown, Tabitha Harazin, Carly Kramer Kubesh, Paige Sabe, and  
Brittany Fisher-Rossell

*Nancyruth Leibold, Faculty Mentor*

Southwest Minnesota State University

Opioid misuse and abuse is becoming a pandemic in the United States. Stories are appearing almost daily in the media about people overdosing on opioids. Opioid analgesics are the most commonly prescribed medication for postoperative adult patients. Ofirmev given preoperatively has shown to decrease patients' pain postoperatively. In 36 of 44 patients, pain was effectively managed when given Ofirmev preoperatively and no opioid analgesics were needed postoperatively. Managing patients' pain with the use of Ofirmev decreases the need of opioids to manage pain which in turn decreases the chance of adverse side effects and possibility of addiction.

## **Insights into Predicting Tornado Development Using NEWS-e Vorticity Forecasts**

Jessica McDonald

*Tony Hansen and Alan Srock, Faculty Mentors*

St. Cloud State University

This project seeks to determine if the low-level vorticity forecasts generated by the NSSL Experimental Warn-on-Forecast System for ensembles (NEWS-e) offer clues for predicting tornadic activity. The vast amount of data produced by NEWS-e requires filtering to provide meaningful results that can be used in forecast decision-making. Here, the authors create a storm object filter and apply it to forecasts provided by NEWS-e for six (6) different severe weather events. Candidate storm objects must exceed a maximum relative vorticity of  $0.006 \text{ s}^{-1}$  and a mean updraft speed of  $5 \text{ ms}^{-1}$ . They are classified as tornadic if any part of the storm object is within 30 km of a tornado report. The vertical profiles of vorticity in each storm object reveal consistent mid-level vorticity maxima that vary little in height and strength across all storm objects. Any low-level vorticity maxima exhibited by the storm objects have much greater structural variability. Analysis of these structures show that the low-level maxima in tornadic storm objects are slightly lower in height and stronger than those in non-tornadic objects. At the storm-scale, the profiles that contain low-level vorticity maxima in tornadic storm objects tend to be grouped together in a cohesive manner, whereas the profiles containing these maxima in non-tornadic storm objects are infrequent and randomly distributed. It is hoped that this study will provide information on how to best utilize the NEWS-e vorticity forecasts for short-term tornado prediction.

## **Analyzing P-Surge Exceedances to Improve Storm Surge Watches and Warnings**

Cody Yeary

*Tony Hansen and Alan Srock, Faculty Mentors*

St. Cloud State University

Storm surge accounts for nearly half of all direct tropical cyclone fatalities in the United States. In recent years, the National Hurricane Center's Storm Surge Unit has developed products to help communicate the threat of storm surge. A probabilistic storm surge model (P-Surge) is used by perturbing various characteristics of a tropical cyclone such as intensity, size, forward speed, and direction to create an ensemble. Previous research was performed in an attempt to identify which exceedance(s) could be used operationally for a storm surge watch and warning. This research is expanded by using P-Surge model runs that were run retroactively for a handful of Atlantic hurricanes. By combining Python with Esri's ArcGIS software, I was able to effectively process surge values for tens of thousands of grid points. Comparisons between model outputs at various exceedances over time and observed values at landfall were used to compare accuracy. In particular, an attempt was made to find if the onset of significant storm surge (> 3 feet inundation) could be accurately forecast in P-Surge. Initial findings suggest that using a ten percent exceedance 36 to 48 hours before landfall is ideal. However, as landfall approaches a twenty or even thirty percent exceedance may be the most useful. More storms will need to be analyzed to yield a statistically significant sample size.

## **The Gamma Function and Volumes in Higher Dimensions**

Samson Chen

*Heather Moreland, Faculty Mentor*

Southwest Minnesota State University

Special functions are an area of advanced mathematics that are prolific in the fields of physics, chemistry, and engineering. These functions arise from considering relatively simple problems. For example, if we know the volume of a 3-dimensional sphere, can we compute the volume of a higher dimensional sphere? Following the work of Azose and Nunemacher, we present a solution to this problem that involves special functions. This solution involves one of the more famous examples of a special function called the Gamma function, also known as the factorial function. We introduce the Gamma function and look at some of its interesting properties. Then, along with another special function called the Beta function, we seek to answer the question "What is the volume of a higher dimensional sphere?".

## **SMSU Students' Understanding of Civic Engagement: A Qualitative Analysis**

Destiny Fredricks, Mo Faqhi, and Vernel Wingate

*Christine Olson, Faculty Mentor*

Southwest Minnesota State University

This study made use of qualitative and quantitative analyses to assess students' understanding of civic engagement before and after having completed an upper division course titled "Contemporary Issues: Self as Citizen". Data from one in-class section (Sp2013) and one online section (Su2016) were analyzed. Students responded at Pre-test (first week) and Post-test (last week) for up to ten minutes to a one question prompt, "What does civic engagement mean to you?" In coding for themes, three emerged: differentiated understanding of civic engagement; efficacy for social change; and motivation for civic engagement. Pre- and Post-test responses were reanalyzed, using Likert Scales specific to each of these civic engagement constructs. Gains on the primary construct of interest, differentiated understanding of civic engagement, were found at Post-test. Likewise, there were increases in efficacy for social change and motivation for continued civic engagement. Implications for curriculum development and limits of the study are discussed.

## **Literature and Media Today: Authors and Writings That Continue to Inspire Us**

Danial Slowey

*Marianne Zarzana, Faculty Mentor*

Southwest Minnesota State University

Over the centuries, authors have written literature, such as poetry, plays, short stories, and novels, which continue to inspire writers today. By reviewing selected works from classical, horror, and world literature alongside contemporary works, we can gain a deeper appreciation for both the originals and the pieces they inspired. From Shakespeare's Hamlet, to Dante's Inferno, up to horror novels such as Stephen King's The Shining, strong writing endures and has relevance today. Examples include musicals, such as The Phantom of the Opera and Les Misérables, movies such as Don Quixote and TV series such as "The Simpsons." Consumers of contemporary media may be unaware of the literature that influenced current movies, musicals and TV shows, but the best literature is continually reborn in new forms. This presentation shows how the threads in literature's grand tapestry are rewoven time and again.