Doorways and Opportunities

8th Annual

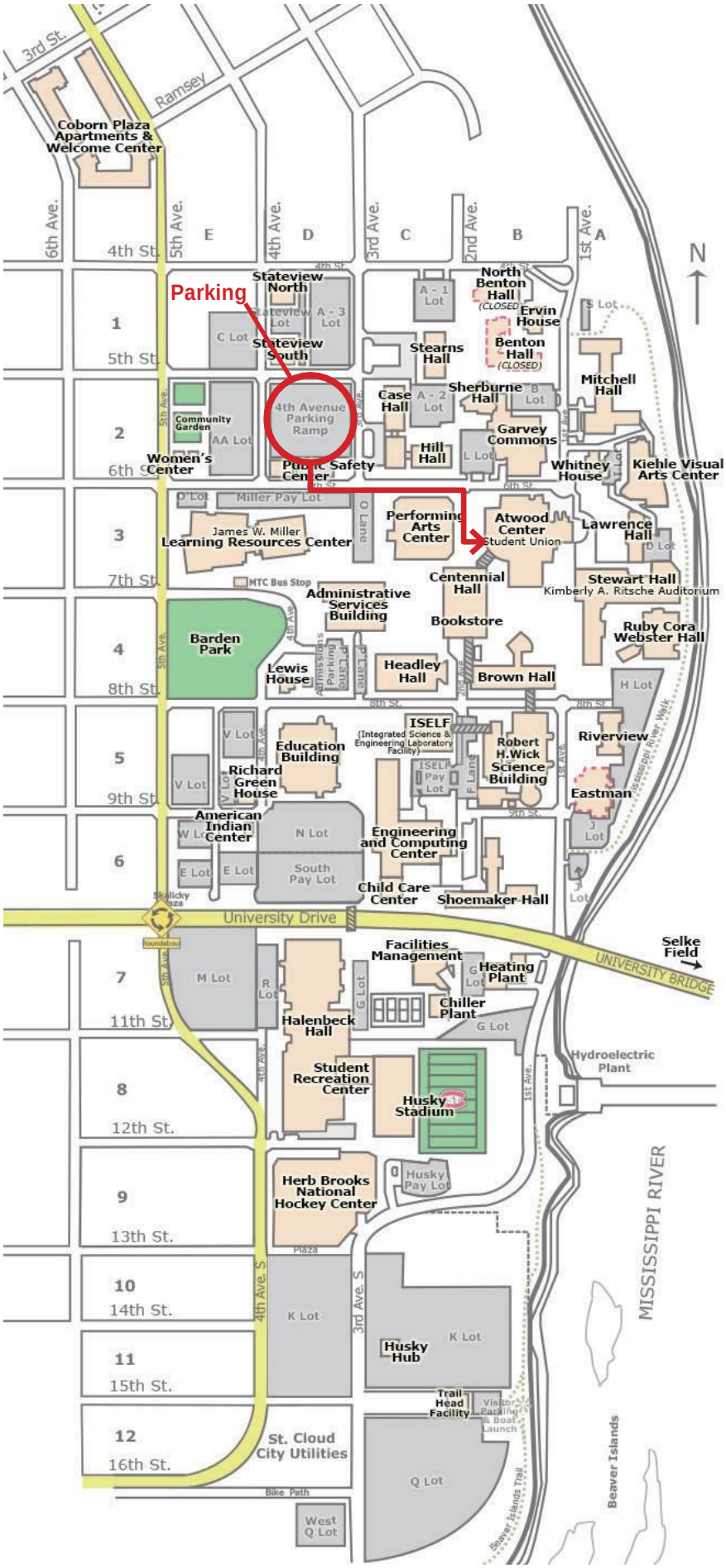
Minnesota Conference of Undergraduate Scholarly and Creative Activity

Monday
March
25th,
2019

ST. CLOUD STATE
UNIVERSITY
EDUCATION FOR LIFE.

MINNESOTA STATE

Parking


Parking
Coborn Plaza Apartments & Welcome Center
Ramsey
3rd St.
6th Ave.
5th Ave.
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13th St.
14th St.
15th St.
16th St.
E
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A
N
Stateview North
Stateview South
A - 1 Lot
A - 3 Lot
C Lot
North Benton Hall (CLOSED)
Ervin House
Benton Hall (CLOSED)
Stearns Hall
Mitchell Hall
Sherburne Hall
Case Hall
A - 2 Lot
B Lot
4th Avenue Parking Ramp
Community Garden
AA Lot
Women's Center
Public Safety Center
Hill Hall
L Lot
Garvey Commons
Whitney House
Kiehle Visual Arts Center
D Lot
Miller Pay Lot
O Lane
James W. Miller Learning Resources Center
Performing Arts Center
Atwood Center Student Union
Lawrence Hall
MTC Bus Stop
Administrative Services Building
Centennial Hall
Stewart Hall
Kimberly A. Ritsche Auditorium
Bookstore
Ruby Cora Webster Hall
Barden Park
Lewis House
Admissions Parking Lane
P Lane
Headley Hall
Brown Hall
H Lot
ISELF (Integrated Science & Engineering Laboratory Facility)
Riverview
V Lot
Education Building
Richard Green House
Robert H.Wick Science Building
ISELF Pay Lot
F Lane
Eastman
J Lot
American Indian Center
W Lot
N Lot
Engineering and Computing Center
E Lot
South Pay Lot
Child Care Center
Shoemaker Hall
Roundabout
University Drive
Facilities Management
Heating Plant
Chiller Plant
Selke Field
UNIVERSITY BRIDGE
M Lot
R Lot
G Lot
Halenbeck Hall
Hydroelectric Plant
Student Recreation Center
Husky Stadium
Husky Pay Lot
Herb Brooks National Hockey Center
Plaza
MISSISSIPPI RIVER
K Lot
Husky Hub
Trail Head Facility
Visitor Parking & Boat Launch
St. Cloud City Utilities
Q Lot
Bike Path
West Q Lot
Beaver Islands Trail
Beaver Islands

Table of Contents

MINNESOTA STATE

30 East 7th Street, Suite 350
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It is my pleasure to introduce you to the Eighth Annual Minnesota Conference of Undergraduate Scholarly and Creative Activity, sponsored by Minnesota Undergraduate Scholars, a consortium comprised of a number of Minnesota State colleges and universities that supports the excellent research, scholarly works, and creative activity undertaken by our undergraduates across the state.

The conference is an opportunity for undergraduate students from any of Minnesota State's 37 colleges and universities to present projects in a variety of ways, including presentations, oral papers, visual arts, displays, and performance art. Such projects offer students both personal and professional benefits, and there are also benefits for faculty members, because scholarly and creative projects are opportunities for faculty to spend time with and motivate undergraduates who are eager to take their work beyond the classroom setting.

I am deeply grateful that you are participating in the conference and celebrating the amazing accomplishments of these student-faculty collaborations!

Devinder Malhotra
Chancellor

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Office **of the President**
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T 320.308.2122 / F 320.308.5139
stcloudstate.edu/president

Welcome to St. Cloud State University. We are delighted to have you on our campus during our 150th anniversary celebration year.

From a chilly September day in 1869 when what was then the Third State Normal School opened its doors to 68 students until now, St. Cloud State has been an institution adapting and responding to the changing world around us. Throughout our sesquicentennial year we are shining a light on the university's heritage and traditions, as well as renewing our commitment to preparing our students to live lives of purpose with a well-rounded education.

We are delighted to be hosting the 8th Minnesota State Undergraduate Conference during this special time. The theme for this year's event, "Doorways and Opportunities," fits perfectly with the spirit of the conference and the commitment our Minnesota State colleges and universities make to preparing students to be educated citizens of the 21 st Century.

At St. Cloud State, that commitment is an interactive bond that works best when students take full advantage of the educational opportunities the university pledges to deliver. Ours is a commitment that is driven by the tenants of Our Husky Compact: Thinking creatively and critically, seeking and applying new know le dge, engaging as a member of a diverse and multicultural world, communicating effectively, integrating existing and evolving technologies and acting with personal integrity and civic responsibility.

Congratulations to the participants of the conference for creating and sharing your scholarly research and creative projects with your fellow undergraduate students. You represent the best of learners from across the state and we are proud to have you at St. Cloud State. We hope today will be a rewarding experience.

I' d also like to express my appreciation to the conference organizers and the faculty mentors who have generously given of their time and expertise to ensure the success of these very talented students.

Best wishes for a wonderful conference.

Robbyn R. Wacker, Ph. D.
President

MINNESOTA STATE | St. Cloud State University,
A member of Minnesota State

Conference Schedule

Monday March 25th, 2019

All events will be held in the Atwood Memorial Center (AMC)

8:30 - 9:30	AMC Theatre Lounge	Registration and refreshments
8:30 - 9:30	AMC Theatre Lounge	Poster set up
8:30 - 4:00	AMC Theatre Lounge	Art Exhibit: Celebrate with us 150 years of St. Cloud State University
9:30 - 9:45	AMC Theatre	Opening remarks
9:45 - 10:15	AMC Alumni	Let's go drumming!
10:15 - 11:45	AMC Theatre Lounge	Poster session
10:15 - 11:00	AMC Gallery	MN Undergraduate Scholars Council meeting: Undergraduate research and scholarly activities at MN State colleges and universities
11:45 - 1:15	AMC Cascade	Lunch
11:45 - 1:15	AMC Cascade	Keynote speaker and SCSU Alumni Panel on Undergraduate Research
1:15 - 2:40		Oral Sessions:
	AMC Alumni	Session A
	AMC Theatre	Session B
	AMC Gallery	Session C
2:45 - 3:00	AMC Theatre Lounge	Coffee break and refreshments
3:00 - 4:00	AMC Theatre	Awards and closing ceremony

Keynote Speaker

From the St. Cloud State University into the world…

We gather today at St. Cloud State University to share and celebrate research and scholarly activities. Your academic journey, started at one of our MN State colleges and universities, led you to hone the skills and knowledge in a discipline of your choice. Your hard work and fruitful partnerships with your mentors and peers will provide a doorway to opportunities for fulfillment of your dream career. Dr. Lowell Hellervik, a young fellow from Montevideo, just like you, started his journey at St. Cloud State University and… conquered the world. Let's hear Dr. Hellervik's life story to inspire you to continue on your own path.

Lowell Hellervik

Dr. Lowell Hellervik, Ph.D., is an internationally recognized business leader and expert on leadership talent management, as well as the co-founder of PDI Ninth House (PDI). Under Dr. Hellervik's leadership, PDI grew from a small, local consultancy firm to an international management consulting firm, headquartered in Minneapolis, Minnesota, with 750 employees in over 30 operating offices around the world. PDI was sold to Korn/Ferry in 2012. He is also the co-founder and chairman of OMNI, an HR software development firm with an expertise in talent selection and talent management.

A native of Montevideo, MN, Lowell Hellervik received his B.S. in History with a minor in Psychology from St. Cloud State University in 1956. He received his Ph.D. in psychology from the University of Minnesota. Dr. Hellervik was the original author of *Successful Manager's Handbook* and he co-wrote *The What and Why of Assessment*. He was instrumental in developing PDI's extensive multi-rater feedback business, and also made a significant contribution to the *Handbook of Industrial and Organizational Psychology* with his chapter entitled *Behavior Change*.

Dr. Hellervik served on the St. Cloud State University Foundation Board from 2001-2011. He received the Alumni Leadership Award in 2001 from the School of Social Sciences and the St. Cloud State University Foundation's Visionary Award in 2018. In 2005 Dr. Hellervik endowed the Hellervik Prize for Academic Innovation & Scholarship, St. Cloud State's the most prestigious faculty award.

SCSU Alumni Panel

Was it Worth Being Involved In Undergraduate Research?

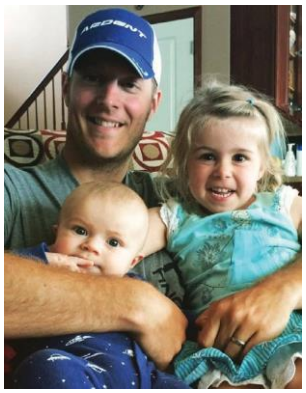
Lynsie Radovich ‘04

Undergraduate research in Dr. Sreerama’s laboratory, Chemistry, 2004;

Ph.D. in Biochemistry and Molecular Biology from Colorado State University, Fort Collins, CO in 2012.

Current position: Coordinator for the Whiteside Institute for Clinical Research at University of Minnesota Medical School Duluth Campus

Joe Hobbs ‘07



Undergraduate research in Dr. Cetkovic-Cvrlje’s laboratory, Biology, 2007;

M.S. in Cell and Molecular Biology from SCSU in 2011 (mentor Cetkovic-Cvrlje);

Current position: Senior Clinical Research Specialist at Medtronic, Minneapolis, MN.

Marin Schaible ‘10

Undergraduate research in Dr. Cetkovic-Cvrlje’s laboratory, Biology, 2007-2010;

M.S. in Cell and Molecular Biology from SCSU in 2014 (mentor Cetkovic-Cvrlje);

Current position: Clinical Recruitment Coordinator at Rebiotix, Inc., Roseville, MN.

Andrew Scott ‘13

Undergraduate research in Dr. Cetkovic-Cvrlje’s laboratory, Biology, 2011-2013;

Current position: Ph.D. candidate in Molecular Cancer Biology at North Dakota State University, Fargo, North Dakota.

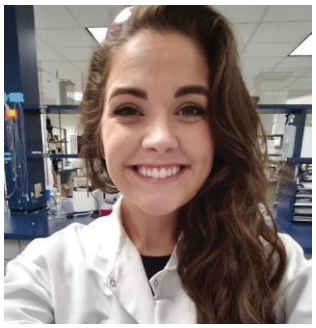
Sinduja Thinamany ‘14

Undergraduate research in Dr. Cetkovic-Cvrlje’s laboratory, Biology, 2012-2014;

M.S. in Cell and Molecular Biology from SCSU in 2016 (mentor Cetkovic-Cvrlje);

Current position: Bio Materials Scientist at Medtronic, Cardiac Rhythm & Heart Failure Division, Minneapolis, MN.

Kylie Bruner ‘16



Undergraduate research in Dr. Cetkovic-Cvrlje’s laboratory, Biology, 2014-2016;

Current position: Advanced Research Associate in Protein Purification at R&D Systems of Bio-Techne, Minneapolis, MN

Shana Rogan ‘16

Undergraduate research in Dr. Cetkovic-Cvrlje’s laboratory, Biology, 2015-2016;

M.S. in Cell and Molecular Biology from SCSU in 2018 (mentor Cetkovic-Cvrlje);

Current position: Starting PhD program in Environmental Health Sciences at Zibler School of Public Health, University of Wisconsin - Milwaukee.

Poster Session

10:15 - 11:45

AMC Theatre Lounge

Modeling Common Midwest Crops as Roughness Coefficients

Tyler Bache and Nathan Gebhardt

1 Advisor: Nazil Yilmaz-Wodzinski

Minnesota State University, Mankato

Currently wind energy is dominated by large scale wind farms. However, using horizontal axis wind turbines (HAWTs) can have negative impacts including but not limited to noise pollution and wildlife endangerment. Most of these negative impacts are minimized with vertical axis wind turbines (VAWTs). This research will obtain data on velocity profiles by modeling common Midwest crops as roughness coefficients to support beneficial placement strategies for VAWTs. An open channel will be used to study the development of the velocity profiles above miniature crop fields (roughness coefficients). The open channel is preferred over wind tunnel due to the scale of the experiment, because water has a higher viscosity than air. This will help researchers perform experiments with lower velocities. The crops and their placement orientations are selected as parameters that will affect the wind velocity profiles and thus the optimal placement position of VAWTs. The miniature crop models will be placed in the open channel with varying field design and density based on common farming practices. The channel will then be operated and 2-dimensional velocity profiles at different locations along the flow direction will be measured. This will mimic what would be seen with wind velocity profiles over real crop fields. After the data is collected and multiple velocity profiles are produced, the results will be used to provide accurate velocity information for the height selected. This will allow an average user to optimally calculate the energy production of VAWTs on their own land for small scale energy production.

MMAP-X: Mobile Multiplatform Application Production with Xamarin for Local Navigation

Greg Bowen and Brook Stang

2 Advisor: Shushuang Man

Southwest Minnesota State University

For many students, a new semester means finding where new classes are being held. Unfortunately, with confusing signage and unique room numbering schemes finding the correct room for a class can be a challenge. We propose the creation of a Campus Map App to guide students through the academic buildings via GPS. With a myriad of possible devices, such as Android, IOS, and Windows Phone, we have chosen to use Xamarin to build the app. Xamarin is a C# based framework for WODE (Write Once Deploy Everywhere) app development. It is capable of compiling for Android, IOS, Blackberry, Windows Phone, Windows, and OSX. We intend to explore the capabilities of Xamarin in order to create a GPS enabled pathfinding application to guide visitors around the buildings. Ideally, this project would be presented to the audience for their personal use and further beta testing once the project is completed.

The Relation of Surface Roughness and Absorption for Space Debris Removal

Chase Negen

3 Advisor: John Sinko

St. Cloud State University

The research project used a Nd:YAG (neodymium-doped yttrium aluminum garnet) laser to heat and ablate aluminum samples in the interest of assessing the viability of laser space debris removal. Currently, there are hundreds of thousands of man-made objects in orbit around Earth, of the size 1-10cm. These debris fragments pose a significant risk to existing satellites and future space missions, as a collision with a fragment of this size or larger would be deemed a catastrophic impact. Vaporization or deorbit of space debris using lasers promises to be an efficient method for getting rid of the debris. However, in space, debris is constantly being bombarded by dust, micrometeorites, and other man-made objects. This changes the surface roughness of the debris, and it has been found that the surface roughness of an object alters the absorption of incident laser energy. Before a laser debris removal system can be established, this relation of surface roughness and absorption must be determined. This research project has helped quantifiably determine how the surface roughness of an object affects the absorption of laser energy, and consequently the energy cost to remove space debris.

Continuous Nowhere Differentiable Functions

Brook Stang

4 Advisor: Matthew Zabka and Heather Moreland

Southwest Minnesota State University

In mathematics, a function is continuous if the graph can be drawn without picking up the pencil. A function is differentiable if the graph is smooth. So, if there is a sharp point on the graph, then the function is not differentiable at that point. Without picking up your pencil, try drawing a graph that has a sharp point everywhere. This is impossible to do, so intuitively it seems that functions that are continuous but nowhere differentiable do not exist. However, we will see that this is not the case and construct a couple of examples of these continuous but nowhere differentiable functions.

Correlation between reflectivity and phase change for thermochromic dyes

Donovan Bassett

5 Advisor: Kannan Sivaprakasam and John Sinko

St. Cloud State University

Thermochromic dyes, those that change color as a response to a change in temperature, aid in the efforts to reduce the cost of temperature control for buildings. When the dye is dark, it absorbs light and heats the building; when white, it reflects light. Dyes that have color transition points at 20, 25, and 30 degrees Celsius were forcibly heated and cooled using a simulated solar spectrum lamp. The reflectivity was monitored as a function of temperature. The dyes were also subjected to differential scanning calorimetry (DSC). The reflectivity and DSC tests showed that the color change and phase change occur around the same temperature. The result helps to better understand the dyes' ability to control heat from sunlight to moderate the temperature of a building.

Robots Finding Robots: Using Machine Learning to Distinguish Synthetic Speech from Human Speech

Greg Bowen

6 Advisor: Dan Kaiser

Southwest Minnesota State University

Advances in machine learning have allowed computers to utilize more realistic voices. Current technology allows for voices that sound so similar to a real person that other people cannot tell them apart. This raises a question: If people cannot tell the difference, could a machine? Our research focuses on the use of machine learning to isolate the differences between recorded human voice and popular synthetic voices such as Apple's Siri and Amazon's Alexa. Ultimately, this technology could be used to establish confidence in the authenticity of a caller, or to reduce the incidence of robo-callers in the telecommunications world.

Effects of Four Weeks of Time Restricted Feeding on Peak Volume of Oxygen Uptake and Substrate Utilization in Healthy Adults

Corbyn Bendtsen and Megan Coyle

7 Advisor: Justin Geijer

Winona State University

Time Restricted Feeding (TRF) refers to the finite time to intake daily calories. While previous studies have identified potential health benefits, few studies have compared the impact of TRF on VO2peak. PURPOSE: The current study investigated the metabolic impact of TRF. METHODS: Twenty-one participants, ages 18-60, completed an eleven-week longitudinal study to examine VO2peak, substrate utilization crossover, and resting substrate utilization. Participants self-reported diet, exercise, sleep, and medications over two separate four-week periods. The first four weeks excluded TRF and the following four included a 9-hour window of TRF. A maximal exercise test and a resting metabolic test were performed three times, four weeks apart. A repeated measures ANOVA was performed to determine within-subject differences. A post-hoc analysis was performed to determine time effect. RESULTS: VO2peak was significantly lower during TRF ($p<0.001$). Mean pre-test VO2peak was 2.95±0.59 L/min. Non-TRF VO2peak was 3.14±0.68 L/min and 2.76±0.54 L/min during TRF ($p=0.002$). There was a significant difference between pre-test and TRF ($p=0.012$). Resting RQ showed a significant increase ($p<0.004$). Pre-test mean for resting RQ was 0.716±0.071 vs. 0.802±0.097 during TRF ($p=0.010$). Substrate utilization crossover showed a significant decrease ($p<0.03$) in fat usage during TRF. There was a significant difference between pre-test (123.9±30.1 watts) and TRF (98.8±30.1 watts; $p=0.05$). CONCLUSION: Early crossover of substrate utilization implies a decrease in fat metabolism and an increase in carbohydrate usage, therefore significantly lowering fat oxidation and VO2peak. Future studies are needed to further examine these physiological mechanisms.

Purification of Palmitoyl Protein Thioesterases and Acyl Protein Thioesterases for Use in In Vitro Depalmitoylation Reactions

Dave-Preston Esoe

8 Advisor: Kristina Cirks

Bemidji State University

Palmitoylation is the attachment of palmitate to protein cysteine residues and assists with protein localization to the plasma membrane. Palmitoylation is often a dynamic process and involves the attachment of the palmitate by palmitoyl transferases and removal of the palmitate by palmitoyl protein thioesterase (PPTs) or acyl protein thioesterases (APTs). Currently, the techniques to study palmitoylation are difficult to perform and involve the use of harsh chemical reagents like hydroxylamine (HAM) to depalmitate proteins, often leading to destruction of the proteins being studied. Recombinant, purified PPT/APTs could be used as an alternative reagent to depalmitate proteins. In order to purify PPTs and APTs, the coding sequences of human PPT1 and 2 were PCR amplified and cloned into a pGEX plasmid. The proteins were then purified as GST-tagged fusion proteins and analyzed for purity using SDS-PAGE. Results were not as expected, and PPT1 and 2 purified poorly with no detectable enzyme-activity. Currently, cloning procedures are being repeated with PPT cDNA for PPT 1and2 being cloned into a pMAL plasmid and expressed as maltose binding protein fusion proteins to potentially improve stabilization and purification of the proteins.

Seasonal Effects on Water Quality and Biota in the McFarland Pond

Cody Friedges

9 Advisor: Emily Deaver

Southwest Minnesota State University

The changing of seasons causes changes in wetland environments. Phenomena such as fall turnover and precipitation rates can have a drastic effect on water quality. Biota inhabiting these wetland environments are also affected by seasonal changes either directly or indirectly. LaMotte water quality test kits were used once weekly every Thursday in the early afternoon to measure dissolved oxygen, nitrogen, phosphate, alkalinity, and pH levels in the McFarland Pond near Southwest Minnesota State University. Observations of biota were recorded, and abundance and frequency were noted. Water quality results changed in response to heavy rain events. The biota of the pond also responded to seasonal changes as expected. As it grew colder vegetation began to go dormant or die, waterfowl became less common as time went on, and water bound organisms responded to water quality changes. Overall the wetland followed the expected trends for the seasonal change being observed.

An Attempt to Discover Novel Antibiotics Production in Antibiotic Resistant Bacteria

Jason Vaysberg, G.B. Rossi, Alma Boric and Victoria Kreweic

10 Advisor: Renu B. Kumar

Minneapolis Community and Technical College

Antibiotics are naturally occurring antimicrobial compounds. They are classified based on their cellular/molecular targets, bacterial processes they impede, or based on their structures chemically. Because of this, antibiotics do not behavior similarly to proteins, in that they are not encoded for by DNA and RNA, but rather, they undergo a biosynthesis pathway with many steps involving catalyzation and enzymatic processes that leads to modification of amino acids, fatty acids and sugars. These pathways allow for antibiotics to be classified in a variety of ways. In previous work, 47 bacterial colonies have been isolated from the soil gathered from the area near feedlot where feed-additive antibiotics are used, demonstrating antibiotic resistance. These strains have been purified using the streak-plate technique. The strains were classified morphologically and characterized for gram staining. These strains were then tested as resistant to ampicillin, penicillin, and sensitive to tetracycline. Current project desires to expand on this work in the hope to find novel antibiotics. Four strains that showed resistant to antibiotics were selected for this study as the most likely to produce antibiotics. These strains have been regrown, and purified 5 times, to ensure for isolation of pure strains. These strains were then further characterized morphologically using gram stain. The properties of these strains demonstrate a capability to resist antibiotic targets and it is the goal of this project to determine if they may be able to produce their own novel antibiotics.

Pulse Wave Velocity and Arterial Measures in Spinal Cord Injured/Disordered Subjects

Jonathan Dicke

11 Advisor: Jeffrey W. Bell

Southwest Minnesota State University

Cardiovascular dysfunction is a leading cause of death in individuals with spinal cord injury and spina bifida (SCI/D). This population shows worsened autonomic control, higher rates of peripheral arterial disease, and altered vascular function. Pulse wave velocity (PWV), augmentation index (AIx), and ankle brachial index (ABI) are well-known assessments of vascular status. These tests were performed at rest on 16 individuals with SCI/D and compared to 25 able-bodied controls (ABC). AIx, normalized at a heart-rate of 75 bpm, and PWV were measured by applanation tonometry with electrocardiogram-gated waveforms. Groups were compared using one-way ANOVA analyses. In ABC versus SCI/D, ABI (1.04±0.10 vs. 0.97±0.07, $p=0.02$) and AIx (-5.83±10.70% vs. 1.21±9.23%, $p<0.05$) were significantly different. Femoral-Tibial PWV (8.63±1.31 vs. 9.70±2.49 m/s, $p=0.08$), however, only approached significance. There was only one significant correlation between variables, indicating these assessments analyze vascular status differently and batteries of assessments should be used in clinical settings.

Effect of Sodium Bicarbonate Treatment on the Inflammatory Process in Type 1 Diabetic Mice

Jace Engelmann, Madeleine LaFond, Emma Nelson, Jenna Nelson, Logan Olson and Amira Zaher

12 Advisor: Marina Cetkovic-Cvrlje

St. Cloud State University

Type 1 diabetes (T1D) is an autoimmune disease where T cells destroy insulin-producing Î²-cells in the pancreas, leading to hyperglycemia. Some T cells directly kill Î²-cells, such as T-cytotoxic (Tc), or indirectly, such as T-helper (Th), while others, like regulatory T cells actually protect them. A recent study showed that sodium bicarbonate (SB) exhibited an anti-inflammatory activity by affecting macrophages, speculating its potential for treatment of autoimmune diseases. Since SB has never been tested in an experimental model for autoimmunity, we studied the effects of SB treatment on the development and severity of T1D, as well as on T cell subsets and T cell function. It was hypothesized that SB administration (200 mM, administered via drinking water) would decrease the incidence and severity of streptozotocin-induced T1D in 8-week-old C57BL/6 mice by its action on T cells. Glucose and body weight measurements were taken biweekly until mice were sacrificed four weeks later, and their spleens obtained for analysis of cell counts, viability, T cell proliferation, and quantification of T cell subsets by flow cytometry. Results showed significantly decreased glucose levels and delayed diabetes development in SB-treated mice compared to controls. Whereas there were no differences in splenic lymphocyte counts and viability, supporting a lack of SBâ€™s toxicity, there was a trend of decreased Th and Tc populations in SB-treated mice. These preliminary results support the initial hypothesis, suggesting beneficial effects of SB in prevention of mouse autoimmune T1D and highlighting the need for further study.

Amphipod density and correlation with macroinvertebrates in the Minnesota Prairie Pothole Region

Brad Morris and Ali Chalberg

13 Advisor: Debbie Guelda

Bemidji State University

Amphipods are aquatic invertebrates that serve as important food sources for wildlife, yet densities of these organisms have substantially declined across the Prairie Pothole Region located in the upper Midwest. Despite the importance of these invertebrates, factors affecting their distribution in Minnesota has yet to be thoroughly examined. The objective of this study was to assess macroinvertebrate diversity in three wetlands containing amphipods and three that did not. All wetlands range in size from two to thirteen acres. Specifically, we examined correlations between amphipod and other macroinvertebrate densities in these areas. Preliminary results suggest that wetlands having higher concentrations of amphipods have statistically more macroinvertebrates and a higher overall diversity.

Implementation of Greener Labs for the Organic Chemistry Curriculum

Rebecca Seemann and Thy Duong

14 Advisor: Heather Sklenicka

Rochester Community and Technical College

Developing safer labs is critical for students and the environment. Green chemistry aims to minimize the use of hazardous substances during lab procedure by using less toxic solvents or no solvent, optimizing atom economy, and utilizing sustainable resources. This method is used in engaging labs to develop safer labs as well as bring out the most effective learning and a reduced environmental impact. The goal of this project is to verify the outcome of two labs that have been published in a “Green Organic Chemistry Lab Manual” by Beyond Benign. These labs include the formation of an alkene from alcohol using a clay catalyst instead of sulfuric acid, and a lab focusing on polymerization of aspartic acid to create thermal poly(aspartate) (TPA), which is a biodegradable polymer alternative compared to poly(acrylate) polymers (PAC). Engaging green labs prepare students for the current workforce and help them be conscious of the environment.

Characterization of Pseudomonas aeruginosa Bacteriophage Vanarele

Ashley Stiglich

15 Advisor: Holly LaFerriere

Bemidji State University

Pseudomonas aeruginosa is a gram-negative, asporogenous bacterium that may cause a variety of opportunistic infections especially in hospital settings. These include blood infections, pneumonia, and infections following surgery that may lead to severe illness or even death. *P. aeruginosa* is also a major cause of lung infection in cystic fibrosis cases. There has been an increase in multidrug resistant strains of *P. aeruginosa* and to combat the pathogen, the use of phage therapy is being investigated. Phage therapy is the use of lytic bacteriophages (bacterial viruses) to treat bacterial infections. There are a multitude of advantages for the use of phage therapy including: bacteriophage activity as bactericidal agents, decreased likelihood of introducing resistance especially with the use of phage cocktails, and minimal disruption of normal microbiota. Phage therapy studies rely upon the availability of many characterized bacteriophages. In the current study, a bacteriophage named Vanarele is being characterized. Vanarele is a novel bacteriophage isolated from wastewater. Characterization includes determining plaque morphology, phage morphology, host range, and the determination of the genome sequence and annotation of the genome. Additionally, the ability of the bacteriophage to prevent formation of *P. aeruginosa* biofilms was examined.

Desiccation survival and thermal tolerance of closely related genera in the Enterobacteriaceae family D

Jharef Hazir Tecsihua Tamariz

16 Advisor: Ryan Fink

St. Cloud State University

Salmonella enterica subsp. enterica ser. Typhimurium is able to acquire thermotolerance after extended exposure to low water activity. This adaptation raises significant public health concerns as it is able to survive common thermal food processing such as pasteurization. Prior studies have shown that *Salmonella* Typhimurium exposed to dry conditions differentially expresses 719 genes. Among them, two virulence genes (*sopD* and *sseD*) were identified to be critical to *Salmonella* Typhimurium's ability to survive desiccation. From those genes, *sopD* is conserved at the genus level whereas *sseD* is specific to the species *S. enterica. Escherichia coli*, though is a closely related genus within the *Enterobacteriaceae* family, does not acquire thermotolerance post desiccation. The main objective of this study is the evaluation of desiccation survival and thermotolerance of genera related to *Salmonella* Typhimurium to provide a concrete scientific basis to advise food safety control and thus safeguard public health. To accomplish our objective, we expose *Enterobacteriaceae* family members (*Citrobacter fruendii, Escherichia coli, Proteus hauseri, Shigella flexneri, Salmonella bongori, and all subspecies of S. enterica*) to low water activity (aw = 0.11) to determine their ability to survive desiccation. Finally, we heat shock the desiccated samples at 80°C, 85°C, 90°C and 95°C to determine thermal tolerance through cell enumeration and the calculation of D-values. Furthermore, we conduct a genome-wide association study to determine gene conservation across the *Enterobacteriaceae* family with respect to 290 up regulated genes identified from prior work with *Salmonella* Typhimurium. This allows for a predictive model of thermotolerance across the *Enterobacteriaceae* family. We hypothesize that a higher percentage of gene conservation between *Salmonella* Typhimurium, other subspecies of *Salmonella*, and other closely related genera would increase the potential for a similar general response to desiccation and thermal treatment.

Preliminary Study of Camera Trapping Methods Using Scent Lures and Different Camera Trap Types

Sarah Cook

17 Advisor: Kristen Genet

Anoka-Ramsey Community College

The following study was conducted in three phases over the course of a calendar year. Beginning March 15th, 2018, four Bushnell camera traps were placed in St. Croix State Park to gather preliminary data of natural wildlife behaviors in the area. In the fall of 2018, a scent lure experiment was implemented for approximately three months (about one season) until they were removed and two of the camera traps were changed to different types until the Spring of 2019. The purpose was to observe the capture rates of different North American carnivores and compare the overall photo quality between camera trap types in order to provide evidence for an ideal camera trap method. The scent lures experiment produced results that showed an increase in black bear (Ursus americanus) capture rates, while the no-glow, silent camera traps of the third phase were ideal for photo quality.

Water Uptake Capabilities of Sphagnum Moss

Mattie Osborn and Nikki Shaw

18 Advisor: Kristina Cirks

Bemidji State University

Sphagnum moss is well known for its water holding capabilities, in some cases absorbing more than 16 times its dry weight. Currently, 33 species of Sphagnum have been identified in Minnesota wetlands. The purpose of the research was to determine whether water uptake capabilities vary between different species of Sphagnum commonly found in northern Minnesota. Due to the similarities in size, habitat, and location of collection, no differences in water uptake capabilities were expected between the two Sphagnum species studied. Our results, however, indicated distinct variations in the amounts of water absorbed by different moss species. We found that Sphagnum capillifolium held 34% more water than Sphagnum fallax. Sphagnum capillifolium had an average uptake of 14.808 mL/g, and that Sphagnum fallax had an average uptake of 11.017 mL/g. Peatlands dominated by species that store more water are likely to have increased resistance to drying and prolonged hydroperiods. These results may have implications for selecting Sphagnum moss species in wetland restoration, or, if used in conjunction with climate change models and species distribution maps, to predict peatland loss.

The Differential Outcomes Effect in a Delayed Non-Matching to Position Task

Whitney McShane

19 Advisor: John Holden

Winona State University

When each stimulus-response (S-R) sequence in a biconditional discrimination task is followed either with the same outcome (common outcomes or CO) or unique outcomes (differential outcomes or DO), subjects trained under DO typically learn choice tasks faster and perform significantly better across delays than subjects trained under CO or non-differential outcomes (NDO; where two outcomes are used but presented randomly after either S-R sequence). This improvement in performance is referred to as the differential outcomes effect (DOE). While most studies employing DO have used either a matching-to-position task or a matching-to-sample task, the current study seeks to determine whether a DOE can be seen in a delayed non-matching to position procedure and establish a working procedure for future studies in our laboratory. Subjects were 17 male Sprague-Dawley rats, aged approximately 4 months old, reduced to 85% of the free-feeding weights through food restriction. Subjects were trained in operant chambers equipped a with pellet feeder, two retractable front levers and one fixed lever at the back, run off of a Med Associates interface connected to a Hewlett-Packard computer. Subjects were trained in either a DO or NDO version of the task. Once subjects learned this task to criterion (3 consecutive days at 85% accuracy or above), they were switched to a delayed version of the task, where the delay period between the illuminating of the back wall light and the time when the trial could be advanced was set to 1, 5,10, or 20 seconds on any given trial. The effect of group was significant, $F(1,15)=332.56$, $p<.001$, as was the effect of delay, $F(3, 45)=60.23$, $p<.001$, and the group x delay interaction, $F(3,45)=29.55$. We found the DOE with respect to short-term memory in the delayed-non-matching-to-position task. We plan to employ this task in future studies of behavioral pharmacology in our laboratory.

Four Minnesota Lakes as Sentinels of Climate Change

Alise Cook

20 Advisor: Kristen Genet

Anoka-Ramsey Community College

Since lakes have been seen to be reliable indicators of climate change, this study set out to see how temperature and precipitation impact lake level and ice-out over time. Historical climatological data were used to analyze their influence on lake level and ice-out date. Temperature was hypothesized to influence ice out and lake level, and precipitation to influence lake level. If long term trends towards warming and increased precipitation were seen, we predicted that ice-out would become earlier and lake level would increase over time. It was found that both precipitation and temperature are increasing over time in MN. Concomitantly, lake level has increased and ice-out was earlier. Climate change is significantly impacting lakes in MN. Given the number of lakes in MN and their environmental and economic importance, significant changes to lakes could profoundly influence the future of MN.

Effects of time restricted feeding on metabolism, depression, and circadian rhythms

Andrew Kezar and Emma P. Masiulewicz

21 Advisor: Justin Geijer

Winona State University

Time restricted feeding (TRF) is a form of intermittent fasting. TRF has been shown to affect substrate concentration and utilization at rest and exercise. Changing patterns in substrate availability and utilization can affect many different physiological functions. The purpose of this study was to evaluate the effects of TRF on overall physiological functioning, specifically sleep, resting energy expenditure (REE), resting respiratory quotient (RQ), and likelihood of depression. A longitudinal design was used to examine physiological changes associated with four weeks of TRF, with a 9-hour eating window, among 34 healthy adults, ages 18-60 years. Sleep was evaluated via self-report logs. The Brief Anxiety and Depression Survey was administered at each testing session. Variable differences within subjects were determined using a repeated measures ANOVA or paired samples T-test. A significant decrease in total sleep ($p=0.034$) and BADS scores ($p=0.046$) occurred between non-TRF and TRF. RQ values experienced a significant increase ($p=0.002$) between testing non-TRF and TRF ($p=0.034$) and pre-test and TRF ($p=0.008$). Direct correlations were found between BADS, total sleep and resting RQ. TRF may influence glucose utilization during rest. Past studies have shown that intermittent fasting results in more regulated circadian rhythms, allowing less glucose utilization. The results of the present study are in opposition of previous literature. Increased glucose utilization may have been a factor in the decrease in total sleep and depression. Future research is needed to verify if increased carbohydrate utilization at rest influences circadian rhythms changes, and depression occurrence.

Determining the Importance of Sex and Age on Scute Pair Fluctuating Asymmetry in Painted Turtles (*Chrysemys picta bellii*)

Andrew Bluth

22 Advisor: Kristen Genet

Anoka-Ramsey Community College

Fluctuating Asymmetry (FA) can be used to determine the health of an organism and if there are any stressors in the environment such as disease or pollutants. There is only one study that has investigated FA in turtles and two that looked at tortoises. These present studies, however, are not consistent with one another as two of them state that males exhibit higher levels of FA than females and the other one asserts that there is no significant relationship between male and female FA. However, there have been multiple studies that looked at FA in other animals such as frogs and they found that males have higher FA levels than females. In this study, the absolute difference between the left and right scute for the gular, abdominal, and anal scutes for 120 adult and 65 juvenile turtles were measured using ImageJ. In Western Painted Turtles, there is no significant difference between male and female FA. It is anticipated that the there will be a significant difference between adult and juvenile FA. This may be caused by scutes growing against each other which might cause higher levels of FA in larger turtles such as Yellow-Bellied Sliders or adults and lower levels of FA in smaller turtles like Western Painted Turtles or juveniles. FA is an important tool to utilize because it can give us information about the health of the environment and organism which allows us to better understand them.

The Generation Effect Integrated With Color

Liz Breyfogle, Jordyn Horn, Samantha Onken and Christina Rebstock

23 Advisor: Scott Peterson

Southwest Minnesota State University

Color's effect on the generation effect. The generation effect is a phenomenon where information that is generated from our mind is better remembered than if the information is provided for us. Participants were students from Southwest Minnesota State University. Participants were divided into two groups. The first group were shown thirty slides with a whole word on them and the second group were given fragments of those thirty words. The background of those slides was either blue, red, or white. We proposed three hypotheses. 1) Memory for words printed on a colored background will be better than for words printed on a white background. 2) Memory will be better for fragmented words (those that must be generated) than for whole words. This is the generation effect. 3) The generation effect will be greater for words printed on a colored background than for words printed on a white background. Blue slides created a greater generation effect than white and red slides. The generation effect was greater for fragmented than whole words.

Economic Success Among Post 9/11 Veterans

Ryan Bolduc

24 Advisor: Monica Garcia-Perez

St. Cloud State University

The war on terror is officially the longest conflict in United States history. Starting on September 11, 2001 it is estimated that nearly 2 million men and women have returned to civilian life after having served on active duty. Using data from the American Community Survey (ACS) 2016, this research paper examines the economic success of post 9/11 veterans when compared to their civilian counterparts. Economic success is defined as individual total income, income from wages, and college graduation. Empirical analysis shows that veterans, on average, have higher income from wages, higher total income, but are less likely to be a college graduate. With seemingly contradicting results it is still unclear whether being a veteran has a positive impact on economic success.

The Development of Entry-Level Communication Skills at University: A Cross Sectional Comparison of Student and Employer Perceptions

Carly Rhyner

25 Advisor: Nikolaus Butz

University of Wisconsin - Stevens Point

The ability to communicate effectively is an essential skill for entry-level workers; however, students and employers don't always have the same view on which competencies are most important. The purpose of this study was to assess employer perceptions about entry-level communication skill and compare those perceptions with those of undergraduate business students. Quantitative data were collected from 163 students and 100 employers in the Midwest United States. We identified the communication skills most valued by students and employers as well as those with which they are least satisfied. To this end we found that the mean scores for written, oral, negotiation, presentation, and computer-mediated communication skills may be of particular value in guiding the business communication curriculum. Overall, the findings of this study have the potential to benefit postsecondary administrators, employers, and job seekers.

Small cities and sustainable food system: A case for the city of Winona, MN

Sarita Gurung

26 Advisor: Krishna Roka

Winona State University

Food is vital for human survival; however, the production and distribution of food in the modern society comes with huge social and environmental impacts. As a result, there is a dire need for building a sustainable food system in urban areas, where majority of the people live today. This study examined Winona's Food System, with goals to creating a sustainable food system for the city. We looked at the current food system from social, economic, health, governmental and environmental perspectives. The social aspect looked into accessibility and affordability of fresh food to the general population in Winona. The economic aspect looked into the cost of importing food into Winona, assessed businesses that offer fresh food, conducted a cost-benefit analysis of growing food (in greenhouses) and calculated the amount families could save by consuming locally grown food. The health aspect looked at the general health of the population and how sustainable food system can improve their health. The governmental aspect explored and assessed existing policies on food and agriculture at local and state level and the role local government can play in promoting local food system. The environmental aspect focused on the ecological cost of importing food (carbon footprint of fresh food) and benefits of sustainable food system. The research found that Winona imports most of its food that cost the city economically, environmentally and socially; therefore, creating or developing a sustainable food system would mitigate the above impacts and improve the health and well-being of families and could become a model for other urban areas in the region.

Effects of Maladaptive Interpersonal Schemas on College Students' Performance

Katlyn Jaeger, Bianca Alvarez, Ibelizet Dominguez, Sierra Peters, Alexis Peralta, Esther Olcom and Linda Zheng

27 Advisor: Emily Stark

Minnesota State University, Mankato

Post-secondary education has seen a rise in students affected by mental health problems. Research has shown that college students experiencing mental health problems also see a decrease in academic performance and college satisfaction (Eisenberg et al., 2007). Previous research studies have supported a connection between high mental health issues and high maladaptive interpersonal schemas, negative representations of an individual's prior experiences that influence current perceptions, which represents a possible connection between maladaptive interpersonal schemas and college students' performance (Wright, et al, 2009). The internalization of maladaptive interpersonal schemas (MIS) has been shown to positively correlate with psychological distress, and therefore, measuring MIS is a useful approach to understanding current issues that students might be facing. The purpose of our study is to find a relationship between MIS and college performance which would determine whether MIS are prominent issues among college students. We hypothesize that college students with high MIS will have low academic performance and college satisfaction. We are currently finalizing data collection; we have over 200 completed participants and are moving into data analysis of college student's performance and MIS scores at this time. If results are found to be significant, we can further research how to advise college students with high MIS in finding tools to achieve academically and mentally. If our study identifies these schemas as a prominent issue, the next step would be to research why college students experience high MIS, and how students can develop more positive schemas to improve their academic performance and college satisfaction.

Social Desirability Bias in Relation to Academic Cheating Behaviors of Nursing Students: A Qualitative Study

Nicki Zahhos and Amy Skroch

28 Advisor: Amy Koehler

Winona State University

Although nursing programs strive to educate students at a high level, there is a significantly high amount of academic misconduct that is reported, specifically among undergraduate students. Therefore, it is important to understand reasonings for this behavior. This study is the qualitative arm of a larger mixed methods investigation that aims to understand academic cheating by nursing students. Additionally, it is a follow-up study to an initial project completed in 2015 that researched social desirability bias in relation to academic cheating behaviors of nursing students. Data collection occurred through conducting, transcribing, and analyzing the structured interviews completed with undergraduate and graduate level nursing students (n=8). To enhance data collection and create a novice theory of academic integrity, researchers utilized a constructivist approach when analyzing the data. Lewin's (1958) force field analysis was then implemented to represent the findings through a weights and measures model that shows drivers and inhibitors of cheating behaviors. This theoretical model suggests that students cheat due to overwhelming pressure and stress, lacking time and motivation, social desirability bias, making excuses, competing to stand out, wanting to help others, and doing whatever it takes. On the other hand, it suggests that students do not cheat due to familial influence, having a strong moral compass, valuing safety, realizing the importance of learning, fearing consequences, and finding confidence. Comprehending the motivations behind engaging in and not engaging in academic misconduct is essential, and this study helps to do just that.

The effects of childhood poverty in adulthood: Results from a random sample of Minnesotans

Regina Klages (Lighthall)

29 Advisor: Amanda Hemmesch

St. Cloud State University

Childhood socioeconomic status has a lasting impact that carries well into adulthood. Previous research has found that these effects are present across multiple domains of neurological and psychological development to the extent that it impacts later-life psychopathology (Hackman, Farah, & Meaney, 2010; Ursache & Noble, 2016). Our goal was to examine the effects of childhood poverty on adulthood mental health diagnoses. Telephone surveys were used to collect data from a sample of 502 adult Minnesotans (50% women, 92% white, age mean = 51.79 years, SD = 19.10) generated through Random Digit Dialing. Childhood food insecurity was used as a proxy for poverty. Participants were asked if their family worried whether their food would run out before they got money to buy more, and also self-reported if they had been diagnosed with a mental health condition. Approximately 9% of participants reported that their families often worried about food security in childhood; 25% of participants self-reported a mental health diagnosis. Our data is consistent with data from the state of Minnesota suggesting that approximately 12% of residents meet the criteria for living in poverty. This data suggests that there is a relationship between self-reported childhood poverty and adult mental health. Because the effects of childhood poverty are related to adult mental health, more interventions should be focused on reducing childhood poverty.

A Simulation Based Approach to Compensation Policy & Benefits Strategy Development at FASTCAT

Joseph Trombley

30 Advisor: Kubilay Gok

Winona State University

The purpose of this research project was to develop an internally aligned and externally competitive compensation and benefits strategy and develop policies and strategies to recognize and reward the contributions of individuals and teams to organizational performance. We conducted this research project in three phases. Phase I of the project entails cementing these goals in place as the pillars of the compensation strategy by formalizing the internal structure to enhance communication and efficiency through better-defined roles and duties. This also includes taking a closer look at departmental structures while developing a formalized job structure. We surveyed 24 jobs and estimated their relative worth for the company using the point-based job evaluation method. Phase II consists of the selection of a single structure which is of high importance to the company and developing a compensation system which is not only competitive but also creates a framework adapted to the remaining structures. The selection of relevant competitors occurs to determine market competitiveness is used to compare the recommended strategy utilizing R2 as the key measure. The pay grading system selected allows for transparency as well as solidifying the hierarchal system discussed in Phase I. Phase III looks closely into the dollars and cents. This process involves ensuring how to rate employee performance accurately to assure compensation in the form of merit raises and bonuses are not only a reward for hard work but also a motivator to improve. Finally, the justification of the compensation plan is outlined in detail.

Social isolation and mental health in Minnesota: Results from a random sample of Minnesotans

Holly Goodwin

31 Advisor: Amanda Hemmesch-Breaker

St. Cloud State University

Studies show that social connection, including quality supportive interactions, are important for physical and mental health for various groups (e.g., elderly, people of color, etc; Falk et al., 1992; Hayes et al., 2015; Houston et al., 2016; Lubben et al., 2006; Miyawaki, 2015). The goal of this study was to examine the association between self-reported mental health and two measures of social relationships: social isolation and satisfaction with support. Participants were asked two questions about their social relationships: one about how many family/friends people feel they can call on for help, and one about satisfaction with family/friend relationships. Participants also self-reported if they had been diagnosed with a mental health condition. Approximately 94% of participants reported being somewhat or very satisfied with the quality of their social relationships; 6% of participants reported having two or fewer people they could call on for help. Chi-square analyses revealed that there was a significant difference in relationship satisfaction by social isolation (chi-square = 17.79, $p < .01$): 24% of isolated participants were dissatisfied with relationships, compared to 5% of participants who were not isolated. Because social isolation and satisfaction with support were strongly related, hypothesis testing focused on social isolation. Data revealed that there was a significant relationship between mental health diagnosis and social isolation (chi-square = 3.96, $p = .05$): 40% of socially isolated participants self-reported a mental health diagnosis, compared to 24% of participants who were not isolated. This data suggests that most adult Minnesotans are not socially isolated, and that there is a significant relationship between social isolation and mental health.

Grit in the Rural Economy: Unlocking The Relationship Between Employee Selection and Success

Tyler Hillery

32 Advisor: Nikolaus Butz

University of Wisconsin - Stevens Point

Employee turnover is costly, time consuming, and unpredictable, especially in rural economies. Experts estimate that it can cost as much as twice an employee's salary to recruit, hire, and train a new worker. Furthermore, Low unemployment and the draw of urban living continues to erode the labor pool that rural economies need to operate. The best criterion for hiring long-term employees is not competency or experience, but rather the less-observable traits of passion and perseverance. To this end, the Grit Scale, a combination of passion and perseverance, provides a widely underutilized mechanism for predicting long-term employee success. The purpose of this study was to explore the value of grit as a hiring criterion in rural economies. Participants were 100 employers from a three-county area in the Midwest United States. The results indicated that an organization's size, location, and industry influenced it hiring process. Furthermore, the findings suggested that hiring for grit minimizes employee turnover along with the burdensome costs associated with it. Overall, this study offers insights for developing rural economies at the source of their strength: the labor pool.

Undocumented Women's Confrontation with Corporate Globalization

Tristin Ott

33 Advisor: Juandrea Bates

Winona State University

The past thirty years have been a transformative time for North American corporations, governments, and communities. The dramatic increase in economic integration, symbolized by the signing of NAFTA by the heads of state of Mexico, Canada and the United States in 1994, caused a shift in where people worked, what industries predominated, the role of the state in shaping national economies, and cultural formations as social groups grappled with these macro-level modifications in social structures. While scholars have investigated these facets of change wrought by free-trade policies, many of the more micro-level experiences of undocumented immigrants in the U.S., specifically of women, have seen less focus. My analysis of oral interviews and ethnographic research of undocumented women, supplemented by economic and state-policy research, demonstrates that discourses of femininity and illegality have combined to construct the "undocumented woman" as a target-subject of gender-based violence from state actors and intimate partners, and a more easily exploitable labor source. Furthermore, the identity-formation of individual undocumented women consists of a dialectic between these discourses and the material conditions of economic and political forces on the one hand, and the agency of these women on the other, as they react to and sometimes try to reshape them. Drawing on Marxist and Feminist social theory, my research seeks to lay out the ways that larger historical changes (like corporate globalization) produce subjects (like the undocumented woman) as they navigate the discursive and material transformations of their world.

Oral Session A

1:15 - 2:40

AMC Alumni

Suicide Intervention for Young Individuals with Mood Disorders in Minnesota

Hanmin Kim

34 Advisor: Younsook Anna Yeo

St. Cloud State University

Suicide is a result of multiple causes: mental illness, substance abuse, history of trauma, impulsive behavior. Many people are facing the risk of their lives, and the rate of suicide mortality shows an increasing pattern in the world, the United States, and Minnesota. The research has proven that population with the high rate of hospital treatment regarding self-harm is people at the age of fifteen to twenty-four years. Also, researchers showed that mental health illness has a high association with suicide. Minnesota currently offers therapies, medication, and Crisis Text Line; however, these efforts could not cease the rate of suicide mortality. The services provide some benefits to the population that is at the risk of suicide, but there is a weakness with the current intervention. Researchers have proven that the risk of suicide is increasing during the beginning of treatment with medication and the first contact with psychiatric in the first year. The state-wide hotline service is emergency intervention through the phone for people who need help in a crisis to prevent suicide, so it cannot provide an ongoing service. The research is going to focus how to improve intervention to reduce the suicide rate in Minnesota among young people with mood disorders, who are fifteen to twenty-four years by adding additional services based on the Social Bond Theory. The addition to the current Minnesota treatment utilizes healthy relationship, education for a future goal, personal development, and guideline or norm.

The History of the Occult in Dramatic Literature

Jordan Stangeland

35 Advisor: Sheila Tabaka

Southwest Minnesota State University

Since the beginning of the theatre, storytellers and playwrights have been fascinated by the occult. Whether it is casting spells in Medea or trading their soul for power like in Doctor Faustus, the occult has been a prevalent theme in many dramatic works dating back to ancient Greece. By providing various examples of past works that contain occult themes, we are able to analyze and discover why playwrights have been using these dark themes for centuries. While it may just be a fascination with the unknown, there are valuable lessons to learn about the spectacle of theatre and the intriguing history of the darker side of dramatic literature.

SNAP Coupon Reward Card (CRC)

Jennifer Jedlicka, Miranda Beutz, Dustin Becker, Melissa Whitcomb, Trisha Zimmerman

36 Advisor: Younsook Anna Yeo
St. Cloud State University

The supplemental food programs in Minnesota are lacking the ability to provide useful knowledge to the beneficiaries so they can use the assistance to the fullest potential (Minnesota Supplemental Nutrition Assistance Program, n.d). Our research hypothesis states, that if we change the existing SNAP program to include a better focus on educating participants on obtaining healthier lifestyles. We have created a program that will be an incentive for SNAP recipients to purchase healthier foods on a budget through a program called Coupon Reward Card (CRC).Our study population will include thirty families in the St. Cloud area that are already members of SNAP. The CRC program will include an in depth education piece to all recipients, we will offer hands on learning skills on how to: eat healthier, shop smarter and save money while doing this. For our study, we have two different data collection methods. These include gathering data off of the CRC and surveys. Each method is put in place to get as much accurate data as possible. They will be put in place to not only gather the participants reaction, but also gathering how they use the program to better their diets. In our research, we found by evaluating SNAP along with other food supplement programs that we were able to be innovative in developing our CRC Program. We discovered that the current program lacked the educational piece that was needed to connect the participants to the program (USDA, 2018d). By educating the participants about nutrition, they will be more equipped to use both SNAP and the CRC Program to obtain a healthier lifestyle.

Shakespeare in Love

Whittney McCamish

37 Advisor: Sheila Tabaka
Southwest Minnesota State University

Of the confirmed 37 plays that Shakespeare wrote in his lifetime, one that reflects the plot of a modern-day romantic comedy is A Midsummer Night's Dream. Various pairs of lovers face trials and tribulations including, but not limited to, an arranged marriage, a donkey-man, and a magical love flower, all in the course of a single day. With one of the main themes being love, it is displayed in a multitude of ways, such as parental, true, and spell love. However, Shakespeare's work was from the 17th century and his definitions of love differ from modern definitions. These relationships will be explained, along with examples of the characters who display them, and lines that support these love forms.

Oral Session B

1:15 - 2:40

AMC Theatre

The Impact of an Introduction to Social Work Class on the Cultural Competency of Undergraduate

Linnea Carlyle, Sarah Hagar and Nicole Stalcar

38 Advisor: Elizabeth Sandell and Debra Cohagan

Minnesota State University, Mankato

The present study examined the development of intercultural competency (ICC) among a group of university students in an undergraduate course, Introduction to Social Work. Clemens (2016) found that after taking a semester-long undergraduate course, “Cultural Diversity Practice,” in a social work program increased student cultural competence scores significantly. Faculty members want to prepare students to use their cultural competence to further their professional capacity. Investigators considered (ICC) as “the capability to accurately understand and adapt behavior to cultural difference and commonality”(Hammer and Bennett, 2010). The study responded to this research question: How does the ICC of undergraduate students change during their experiences in the introduction to social work course? Investigators used the Intercultural Development Inventory, developed by Hammer and Bennett (1998, 2001), based on Bennett’s Developmental Model of Intercultural Sensitivity (1986), which identified five orientations toward cultural differences: denial, polarization, minimization, acceptance, and adaptation. Previously collected data from undergraduate students enrolled in a Human Relations course between 2010 and 2018 was used for comparison. Additional data was collected at the beginning and the conclusion of the 16- week course, introduction to social work, in order to measure changes that occurred possibly as a result of the course experiences. Researchers expect that the engagement in a culturally informative course will yield improved ICC scores for each participant. The results of this study will help determine the efficacy of teaching methods used by the instructors to develop ICC.

Planting Ideas: Recognizing the Interdisciplinary Connection Between Women and the Environment

Elizabeth LeDoux

39 Advisor: Kandace Creel-Falcon

Minnesota State University Moorhead

Without realizing the effect that environmental change has on women, especially indigenous women or women living in the Global South who are most subject to the damaging effects of capitalist control over the environment, one cannot productively comprehend the role that commercial agriculture has on the environment and the lives of women who are left with the consequences. In this paper I argue that in order to fully understand either feminism or environmentalism, it is essential that we are aware of the interdisciplinary connection between them. There cannot be one without the other. Through analysis of secondary sources, I encourage the recognition of women’s heightened repercussive relationship with the environment and the need to recognize this relationship globally by exploring the historical connection women have to nature, the effects that environmental degradation has on women, and the representation of women in the environmental movement. I present the urgency of centralizing global women and the impact the environment has on their daily lives.

Determinants of order selection error rates in a broadline food distribution warehouse: Does cultural bias matter?

Jared Weber

40 Advisor: Oscar Flores-Ibarra and Tonya Hansen
Minnesota State University Moorhead

In a high-volume broadline fo–od distribution warehouse, employee errors add up quickly and become expensive. Employees called a selector's account for nearly 40-60% of warehouse direct labor budgets (Miller, 2004), while not included in direct labor budgets is the cost of reshipping product sent in error. The formula to calculate order-selection error rates is Err=(TotalErrors/Totalcases)*1000 and can be influenced by various determinants. This research identifies the determinants of error rates in a broadline food distribution warehouse located in the upper Midwest and analyzes whether error rates are greater for foreign-born order selectors due to cultural bias. Cultural bias is a form of ethnocentrism in which people from different ethnic backgrounds judge the outside world through a viewpoint based on their own cultural standards. As a means of assessing an order selector's understanding of the English language, and whether the individual was born in a foreign country, order selectors completed a Short on load/Mispick written test during the second week of employment in 2018. These data, in combination with input from industry experts, permit comparisons to variables recognized for influencing selector error rates in previous literature. While previous research focuses on self-assessed, personality traits of the selector, this research also considers the selector's cultural background as an influence in order-selection rates in order to identify cultural bias.

Intercultural Competencies Among Undergraduates in the College of Arts & Humanities at Minnesota

Olivia Thomas and Jonathon Arndt

41 Advisor: Elizabeth Sandell and Christopher Brown

Minnesota State University, Mankato

The study is examining the impact of an intercultural communication course in Arts & Humanities on the Intercultural Competency (ICC) among a group of university students. ICC was defined as "the capability to accurately understand and adapt behavior to cultural difference and commonality." Globalization has led to increased contact between different cultures, so individuals must know how to communicate between one another and to understand the culture behind the communication (Melles & Frey, 2017). Students must strive for acceptance and understanding of religion, language, communication style, music, or any other aspect of culture. This project addressed: (1) What is the starting level of ICC among students in the intercultural communication course? Data was collected using the computer-based, online Intercultural Development Inventory (IDI), developed by Hammer and Bennett (1998, 2001), which identifies five orientations toward cultural differences: denial, polarization, minimization, acceptance, and adaptation. Data was collected at the beginning and will be collected at the conclusion of the 16-week course, in order to measure changes that occurred possibly as a result of the course experiences. This will provide baseline and comparison data. Investigators expect that the study may show that the instructional methods of the professors and the course work in the College of Arts & Humanities leads to a positive growth in Intercultural Competency among undergraduate students. The study will offer insight to help determine the efficacy of teaching methods to develop ICC. Results were shared among faculty members seeking to infuse instruction with strategies to foster ICC.

Oral Session C

1:15 - 2:40

AMC Gallery

Detection of Hydrogen Sulfide with Coumarin-based Fluorescent Probes

Zachary Baker

42 Advisor: Katie Peterson

Bemidji State University

Hydrogen sulfide (H2S) is endogenously produced in the body by a few enzymes, allowing it to act as a signaling molecule. Studies of the enzymes responsible linked H2S to diseases like Alzheimer's disease, Down syndrome, and diabetes. While some estimates about the exact concentration of H2S in cells have been proposed, a way to directly, accurately, and easily test for H2S in cells has not been established. Past research has shown promise in using fluorescence to be both selective and sensitive in H2S detection. Here, a fluorescent molecule with various deactivating groups attached to "turn off" the fluorescence is investigated. H2S reacts with the probe to restore the original molecule, "turning on" fluorescence. Coumarin-based fluorophores are paired with deactivating groups dinitrobenzene (DNP), sulfonyl dinitrobenzene (S-DNP) or an azido group. The DNP and S-DNP probes have been synthesized and characterized by 1H NMR and fluorescence spectroscopy. The DNP probe shows no response to H2S. However, the S-DNP functionalized probe showed an increase in fluorescence in the presence of increasing H2S as well as selectivity over other analytes of concern, such as ROS and biological thiols. The azide probe will be synthesized and analyzed in the same conditions as the other probes.

Improving the quality of landfill waste

Jon Barcenas and Aili Kultala

43 Advisor: Mahmoud Al-Odeh

Bemidji State University

After conducting multiple years of waste audits on trash and recycling in Bemidji State University's Hagg Sauer Hall. Data shows there is a large percentage of recycling in the trash. The problem is that there is potential for more recycling and the reduction of recyclables put in regular trash receptacles. We analyzed contamination trends of compostable materials, fiber, containers (plastic), liquids, and brown paper towels that are introduced into the garbage destined for the land fill. These products all have potential to be diverted from the landfill and be recycled or composted. Landfill waste is a cost burden for BSU and by reducing recyclable contamination we can increase recycling rates and turn waste into profit. In Beltrami county landfill waste cost $218.49 per ton and the cost for clean recyclables is $150.55 per ton. We have recommendations to improve trash quality produced at BSU and processed by Beltrami County Waste Management.

Does *Garcinia Kola* Treatment Exhibit Anti-diabetic Properties in a Mouse Model of Type 1 Diabetes?

Kholood Abuhadid, Emily Barbaro and Kate Kopeck

Advisor: Marina Cetkovic-Cvrlje

44 St. Cloud State University

Type 1 diabetes (T1D) is an autoimmune disorder that results with self-reactive T cell-induced pancreatic beta cell damage. Since beta cells no longer produce insulin, an elevation of glucose levels in blood (hyperglycemia) occurs. In West Africa, seeds' extract from the native Garcinia kola (GKE) plant is consumed, as it is believed that it provides numerous health benefits, including lowering hyperglycemia and alleviating inflammation. Based on a literature review about GKE, we hypothesized that this extract would prevent diabetes development and reduce hyperglycemia in an experimental moue model of T1D. To test potential anti-diabetic effects of GKE through its influence on inflammatory T cells, male 7-wk-old C57BL/6J mice received GKE (100 mg/kg) in their drinking water, followed by induction of T1D with streptozotocin. GKE treatment continued until 13 weeks of age. Throughout experimental period, glycemia and body weight measurements were performed biweekly. Results showed that GKE treatment did not reduce T1D incidence, nor the severity of disease. At the experimental endpoint, mice were sacrificed, their spleens removed, and splenocytes isolated to characterize T cells and their subsets by flow cytometry and examine their function through proliferation assay and cytokine production. Whereas a significant reduction in all T cell subtypes, and their proliferation was observed, the analysis of cytokines revealed an increase of pro-inflammatory-type cytokines. In conclusion, these results suggested neither anti-diabetic nor anti-inflammatory effects of GKE. However, they provide support for the usage of GKE, based on its observed pro-inflammatory properties, in the treatments of infectious diseases and allergies.

Response of Daphnia magna to Different Algal Food Sources

Spencer Erickson, Moses Ogundipe and Rabina Saud

Advisor: Alyssa Anderson

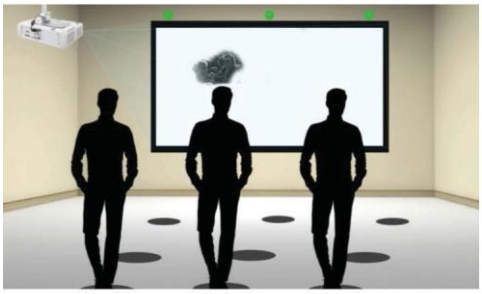
45 Southwest Minnesota State University

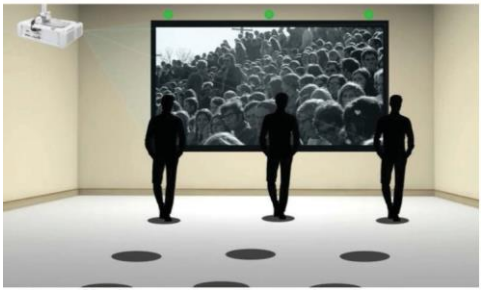
Daphnia magna, a parthenogenetic member of the zooplankton community, is an important biological indicator that can be used to assess the health of aquatic ecosystems. Algae are an important food source for D. magna and play an important role in their growth and reproduction. We investigated whether feeding D. magna different algal species would affect their reproduction over several generations. Twenty D. magna were placed in flasks containing pond water from the SMSU/ADM Environmental Learning Area and fed Scenedesmus obliquus, Chlorella vulgaris, or nothing every three days. Random samples were taken after nine days to estimate the number of offspring in each treatment group. Initial results indicate no significant difference between the treatment groups in the number of offspring produced per individual. Our results suggest further research utilizing other algal species is needed to determine the ecological impacts different algal food sources may have on D. magna populations.

Student Art Exhibit

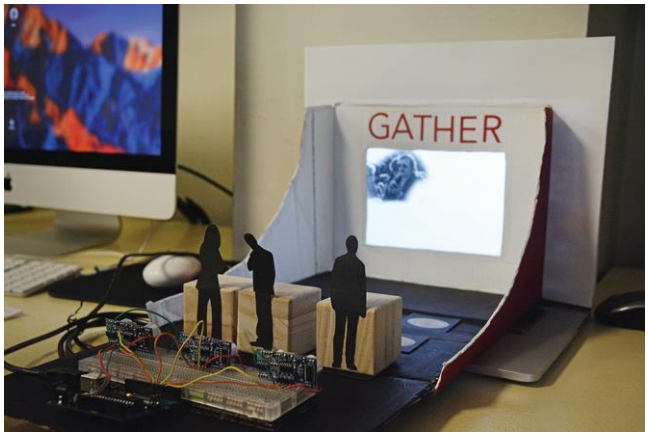
St. Cloud State University is 150-year-old…

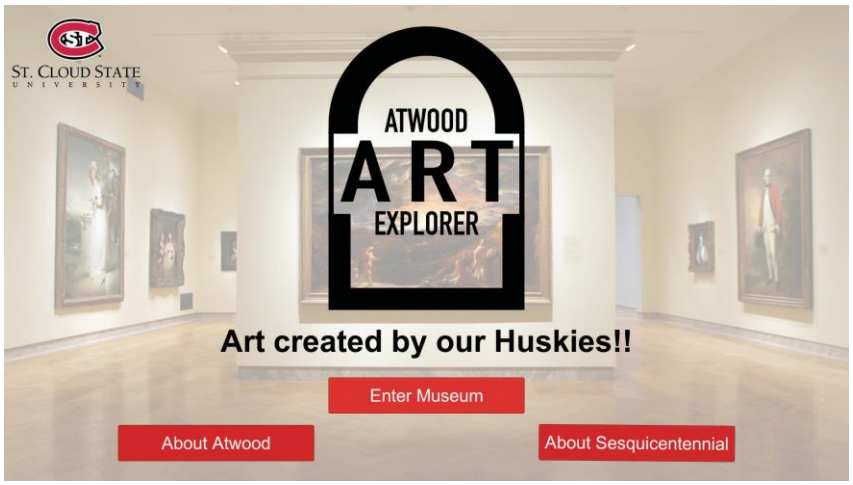
We welcome you to join us for the sesquicentennial celebration of St. Cloud State University! Two projects, designed by senior graphic design students in Dr. Bill Gorcica's class, Research and Investigation with Technology, were directed to find a way to show the history of the university in a way people could interact with it through technology and design.



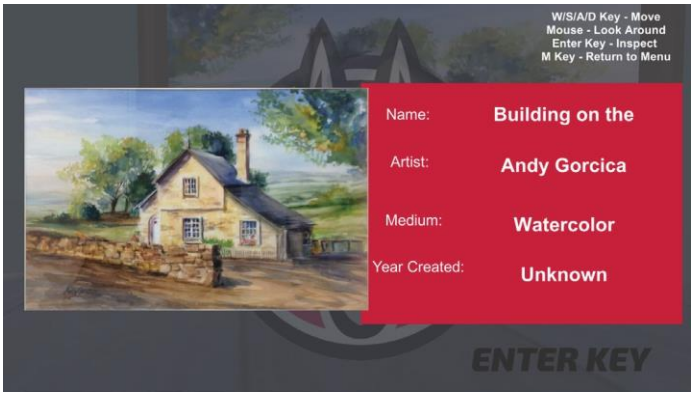


Gatherings by Anne Chase tells you that everything that causes students to GATHER leaves an imprint on St. Cloud State University's history and makes it unique. This project aims to gather participants to experience this sense of belonging and to highlight how St. Cloud State University has built a strong and diverse community. Using Arduino technology and ultrasonic sensors, three participants will gather together to reveal a historic photograph on screen and hear a piece of St. Cloud State University history associated with the photograph. The three participants will need to move together and rely on each other to activate the piece. They will start from a marker toward the back of the room. As they move closer to the screen, more of the photograph will be revealed. Once they all make it to the front, the full photograph will appear. Along with the photograph, a related historical piece of audio will play once all three participants are in the correct positions.





Atwood Art Explorer is a game designed by Josh Thomes to showcase how technology can preserve an artwork, as well as display what the Unity Engine is capable of. It is a first-person explorer that lets you go through a virtual museum displaying paintings from the Atwood Building of St. Cloud State, by working with a keyboard and mouse. It was developed in the Unity Game Engine. Whenever you walk to a painting's pedestal, you can hit the enter key so that the image will take a larger scale on your screen, and you can get info based on the painting that you are inspecting.



Minnesota Undergraduate Scholars Council

Anoka-Ramsey Community College
Angie Anderson and Kristen Genet

Bemidji State University
Mahmoud Al-Odeh

Inver Hills Community College
David Higgins

Metropolitan State University
Alex Layne and Thanaa Ghanem

Minneapolis Community & Technical College
Renu Kumar

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St. Cloud State University
Marina Cetkovic-Cvrlje, Megan Robillard and Jennifer Howland

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Kubilay Gok and Mingrui Zhang

Acknowledgments

I would like to thank the St. Cloud State University Foundation Board for the grant that provided financial support for the 8th Minnesota Conference of Undergraduate Scholarly and Creative Activity. Many thanks to Anna Anderson, senior graphic design student, for designing this brochure and the conference poster. Many thanks to everyone who helped to make this conference happen: from our distinguished keynote speaker Dr. Lowell Hellervik; undergraduate research panelists: Lynsie Radovich and my former undergraduate researchers - Joe Hobbs, Marin Schaible, Sinduja Thinamany, Drew Scott, Kylie Bruner and Shana Rogan; drumming circle director Dr. Terry Vermillion; Dr. Bill Gorcica and his art students; Interim Associate Provost for Research and Dean of Graduate studies Dr. Latha Ramakrishnan, judges for poster and oral presentations; staff in the Office of Research and Sponsored Programs (especially Megan Robillard), Center for Continuing Studies for conference logistics and organization support, Atwood Memorial Center for hosting; and to all of my colleagues who unselfishly helped in many ways.

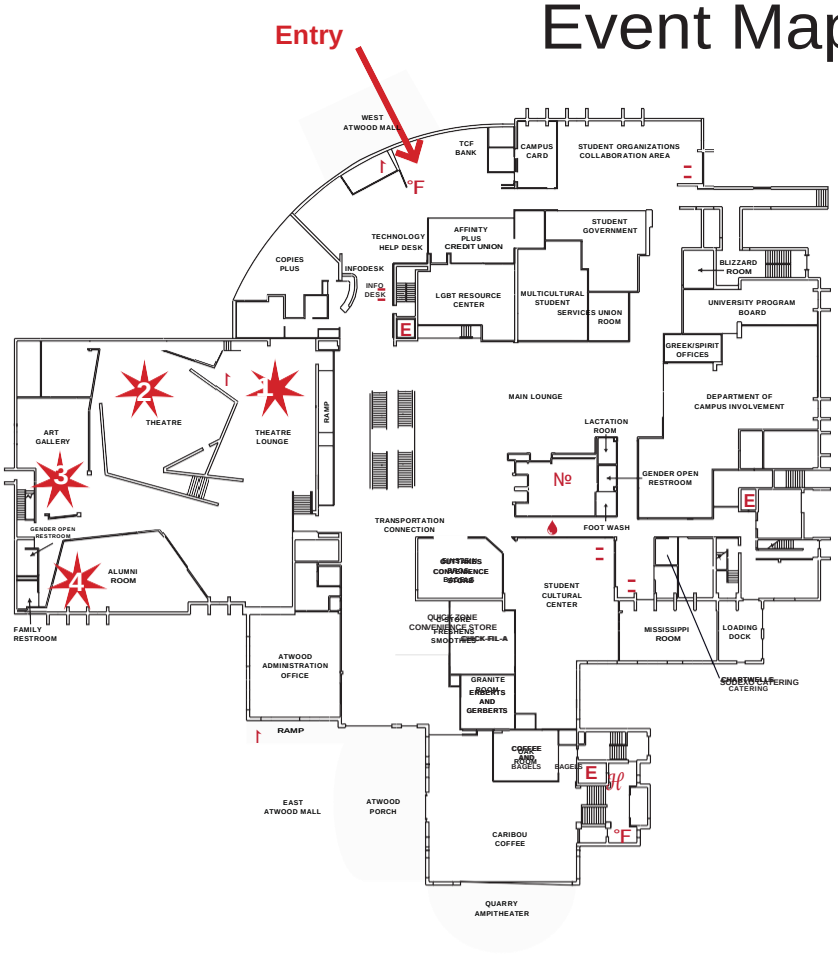
Thank you all!

Marina Cetkovic-Cvrlje
Conference Chair

Event Map

MAIN LEVEL

ATWOOD MEMORIAL CENTER

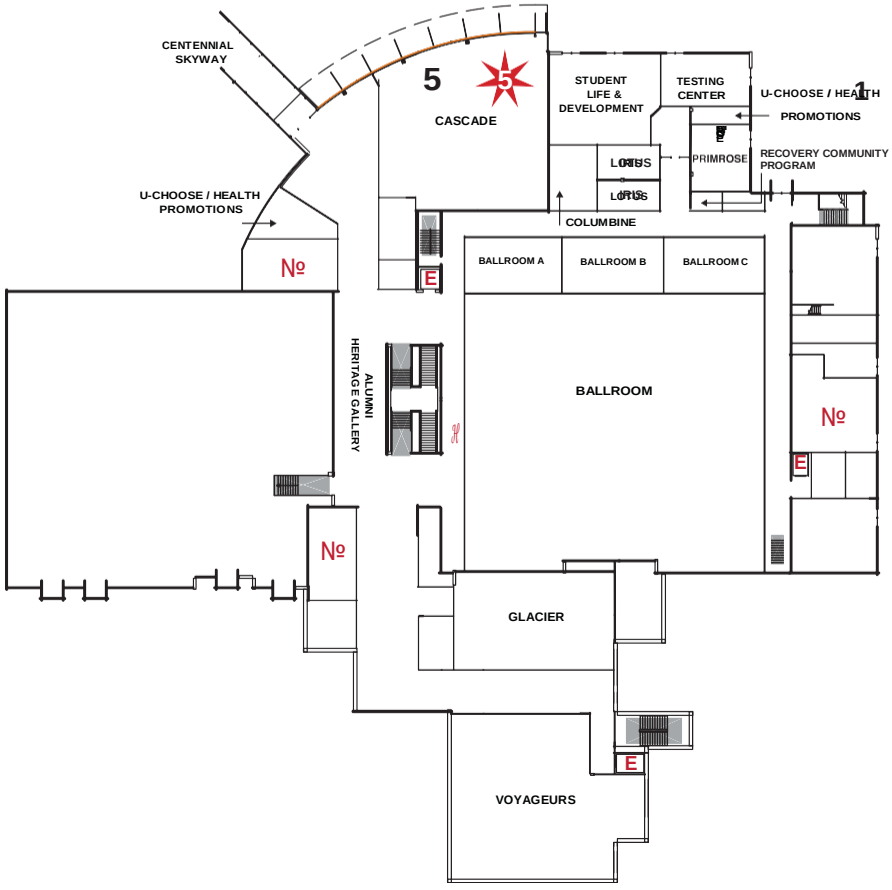


1 Registration, Coffee Break, Poster set up, Poster session, Art Exhibit

2 Opening Remarks, Oral Session B, Awards and closing ceremony

3 MN Undergraduate Scholars Council meeting, Oral Session C

4 Let's do drumming!, Oral Session A



5 Lunch, Keynote speaker and SCSU Alumni Panel on Undergraduate Research

UPPER LEVEL

ATWOOD MEMORIAL CENTER