MINNESOTA UNDERGRADUATE SCHOLARS

Posters at St. Paul

February 26, 2014

Welcome

It is with great pleasure that we welcome students, faculty, staff, administrators, and government officials and to the FIRST Minnesota Undergraduate Scholars Posters at St. Paul. We are excited to showcase the excellent undergraduate research that is happening at seven Minnesota State Universities- Minnesota State University-Mankato, Minnesota State University-Moorhead, Winona State University, Southwest Minnesota State University, St. Cloud State University, Bemidji State University and Metropolitan State University and five Community and Technical Colleges- Rochester Community and Technical College, North Hennepin Community College, Inver Hills Community College, Minneapolis Community and Technical College, and Anoka-Ramsey Community College.

The purpose of the poster presentation is to provide undergraduate students the opportunity to share the results of their scholarly activity with legislators and other leaders in state government. As you attend the poster session, you will see the many forms of undergraduate research that occurs on Minnesota State University and College campuses and gain an understanding of the tremendous impact that involvement in undergraduate research has in the lives of students. We are grateful to faculty for their time and energy that they have invested into the education of these students and commend our students for their creativity, determination and commitment to excellence.

The conference has been planned for over a year, with the combined efforts of the Campus Coordinators. The vision, commitment and contributions of the Coordinators have made this event possible. In addition, we recognize the essential role that Minnesota State University-Mankato has played in the success of this event.

With Kindest Regards,

Marilyn Hart, Coordinator
MN Undergraduate Scholars Posters at St. Paul

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
Troy Gilbertson

Inver Hills Community College
David Higgins

Metropolitan State University
Jennifer Schultz (sabbatical)
Sumiko Otsubo

Minnesota State University, Mankato
Marilyn Hart (Coordinator)

Minnesota State University, Moorhead
Richard Lahti

St. Cloud State University
Linda Donnay

Southwest Minnesota State University
Emily Deaver

Winona State University
Mike Delong

Participating Colleges & Universities

Anoka-Ramsey Community College

Bemidji State University

Inver Hills Community College

Minneapolis Community and Technical College

Metropolitan State University

Minnesota State University, Mankato

Minnesota State University, Moorhead

North Hennepin Community College

Rochester Community and Technical College

St. Cloud State University

Southwest Minnesota State University

Winona State University

Schedule of Events

Wednesday, February 26

9:00–10:00am Student Meetings with Legislators

10:00–11:00am Poster setup in Rotunda
- ❖ Welcome – Marilyn Hart

11:00am–1:00pm Poster Session in Rotunda
- ❖ Concluding Remarks – Marilyn Hart
- ❖ Recognition of Scholars – Richard Lahti

1:00–2:00pm Celebration Lunch

MINNESOTA STATE COLLEGES AND UNIVERSITIES

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Identification of the Wolf Intestinal Microbiota to Investigate Susceptibility to Disease

Kelsie Becklin & Geri Mortenson
Paula Croonquist, Faculty Mentor (Department of Biology)
Anoka-Ramsey Community College

Sarcoptic mange is a highly contagious skin disease caused by mites (Sarcoptes scabiei) that burrow into the epidermis of the host animal. Allergic responses by the host to mites' excretions cause pruritis, and progressive skin damage. Mange has been detected and contributes to mortality in Gray wolves of Canada, Montana, Wisconsin, Minnesota and Mexican Gray wolves in Arizona. The relationship between the host and its intestinal microbes has been characterized as mutualistic as it plays a critical role in gastrointestinal motility, intestinal epithelium development, and the immune system. Furthermore, these microbes provide natural defense mechanisms against invading pathogens, supply nutrients such as vitamins, lactate and short chain fatty acids to host tissues, and stimulate intestinal angiogenesis. In addition, intestinal floras have been associated with disease, such as intestinal inflammation, cecal and colorectal cancers and multiple organ failure. We are interested in helping with prevention, early molecular diagnosis and management of Sarcoptic mange in a captive population of gray wolves at our partnering institution the Wildlife Science Center (WSC), in Columbus, MN. Our project's aim was to investigate how the gray wolf distal intestinal microbiota predisposes wolves to sarcoptic mange and disease in general. We captured, chemically immobilized, handled and collected scat samples from captive wolves at WSC. Scat was collected and utilized to identify the distal gut microbiota of two Great Lakes Region wolves (GLRW) by a culture-independent well established assay that involves sequencing 16S ribosomal RNA encoding gene (rRNA). This involved extracting genomic DNA from wolf scat, using PCR to amplify the 16S rDNA, TA cloning and sequencing of the amplicons and, identifying the bacterial genera by bioinformatics. Results confirmed and expanded preliminary data obtained by a culture-dependent assays. Future investigations will focus on comparing GLR wolf to the endangered Gray Mexican wolf gut's microbiota to ascertain its contribution to disease in these animals.

Use of Cast Nets and Seine Hauls to Estimate Abundance of Age-0 Yellow Perch

Michael Vaske
Andrew Hafs, Faculty Mentor (Department of Biology)
Bemidji State University

Knowledge about fish population dynamics is essential for developing management plans and evaluating management success. In many lakes, yellow perch (*Perca flavescens*) are the main forage for many upper level predators and recreational fish species. To better manage recreational fisheries, an accurate estimate of prey abundance is necessary. The objectives of the study were to sample the littoral and limnetic zone to better estimate population of age-0 yellow perch, and obtain an estimate of the proportion of yellow perch being missed by traditional littoral seining methods. Sample sites were chosen at random around the lake and transects were run from the shore to the deepest portion of the lake. A cast net was thrown 10 times at every 1.5 meter depth interval throughout each transect. Analysis of the data resulted in a population estimate of 7,393,811. This estimate was 4,581,500 more than the estimate from the seine data alone. This increase and more accurate estimate of age-0 yellow perch recruitment will result in better management decisions.

Species Diversity and Population Dynamics of Small Mammals on Grand Forks Air Force Base, North Dakota

Lynda LaFond
Elizabeth Rave, Faculty Mentor (Department of Biology)
Bemidji State University

We determined small mammal species diversity in several differently managed habitats (restored prairie, old field, idle hay field, and forested trail) on Grand Forks Air Force Base, ND, during summer 2013. After 2,698 trap nights, four species were captured: meadow vole (*Microtus pennsylvanicus*), *Peromyscus* spp., southern red-backed vole (*Myodes gapperi*), and meadow jumping mouse (*Zapus hudsonius*). Meadow voles and *Peromyscus* spp. were found at all four sites, whereas southern red-backed voles were found only on the forested trail and the single meadow jumping mouse was found only on the old field. Relative density (number of individuals per 100 trap nights) of meadow voles was highest in the restored prairie (6.44) and lowest on the forested trail (0.17). *Peromyscus* spp. were more evenly distributed among all sites (0.33 – 2.33). Determining species diversity in a variety of managed habitats on Grand Forks Air Force Base contributes to better management of natural resources and provides baseline data for future small mammal studies on the base.

Development of split-Venus reporter proteins for detecting cellular activation of the GTPase, TCL

Rebecca Florke
Michael Hamann, Faculty Mentor (Department of Biology)
Bemidji State University

GTPases are a category of protein frequently involved in the complex signaling events occurring inside of a cell. Detecting when and how GTPase activation occurs within cells is critical to understanding how signaling events are appropriately regulated in normal cells, but deregulated in abnormal cells due to various gene defects. TCL is a specific GTPase involved in signaling related to angiogenesis when it is activated, and may be implicated in the abnormal development of tumor vascularization. In order to understand TCL's function and activation in living cells, a detection system was designed using the fluorescent protein Venus. The coding sequence for Venus was split to produce two nonfluorescent pieces of the Venus protein. The two Venus sequences were then genetically fused to TCL and PAK, a protein which selectively binds to TCL when it is in an activated form. Fluorescent microscopy was then used to demonstrate that the two pieces of Venus regained fluorescence only when TCL was in an activated versus an inactive form, indicating the split-Venus reporter system will provide a reliable readout of cellular activation of TCL.

Pick A Therapy…Any Therapy?

Sarah Jensen
David M. Higgins, Faculty Mentor (Department of English)
Inver Hills Community College

People all over the world are affected by back pain. Many of these cases cannot be attributed to a specific disease or medical condition such as scoliosis or spinal stenosis. Chronic, non-specific low back pain (CNLBP) is extremely hard to treat because it has no specific cause, but studies have shown that up to 80% of people are affected by CNLBP. These individuals often consult a general physician first and are given pain medications or put in an outpatient pain management clinic. However, many studies have shown these measures to be largely ineffective at treating CNLBP and patients become frustrated from the lack of results. Because so many are affected by CNLBP and patients are often dissatisfied with general practitioners, many alternative forms of therapy have become more readily available. My project researched medical journals to examine four different types of alternative therapies for treating chronic, nonspecific low back pain. These four included massage therapy, acupuncture, chiropractic adjustments, and physical therapy. I analyzed methods of each therapy, the long and short term effects of each therapy, and well as possible risk factors for the patients associated with each treatment. I found that although there isn't a single "fix all" therapy, there are significant gains that can be made with each of these four types, and with this knowledge a patient may make an educated decision of which type of therapy would be best for them.

The Graveyard Exposure of Hamlet's Soul

Luke Zenker
David M. Higgins, Faculty Mentor (Department of English)
Inver Hills Community College

My research reveals how the profound uniqueness of Hamlet's character is illustrated at full blossom in the famous graveyard scene of Shakespeare's extraordinary play. The graveyard scene is the platform Shakespeare created for the purpose of unveiling Hamlet's motives. Three intertwined motives are revealed during the graveyard scene: fear of death, demonstrated by the symbolism of the graveyard itself; his emotional life, enshrouded by feelings of love for the mysterious Ophelia; and finally, his role as Prince putting him in a political position wherein he has to balance the vested interests of the state with the Christian code, his family's honor, etc. These motives are all the more clear when he proclaims what the skull of Yorrick means to him, when he reflects on the same mortality kings of old must bear as anyone else, and when he jumps into the grave in lamentation over the deceased, suicide-driven Ophelia. My project draws upon a range of scholarly articles/sources to supplement my own consideration of the entirety of the graveyard environment; the skulls, the dirt, the dead, Ophelia, and the gravediggers (as motifs). These cooperating elements represent an omen of impending doom along Hamlet's meandering path back to the court to face his fears, setting the stage to explore juicy topics about the world, a hero's journey, the profundity of the story itself, and humanity as a whole.

Planting Seeds of Inspiration and Hope in Newton, Connecticut: How 60 Fruit Trees Helped to Rebuild a Community

Troy Brule & Haan va der Wege
August Hoffman, Faculty Mentor (Department of Psychology)
Metropolitan State University

The purpose of the current study addresses the relationship and group experiences among eight individuals who participated in a community service work project by planting 30 fruit trees at the Newtown Victory Garden, located near the Sandy Hook Elementary School in Newtown, Connecticut. Participants (five students from Metropolitan State University and three participants from Inver Hills Community College) volunteered in a community fruit tree planting activity as a means to help community residents honor the memories of the victims that were killed on that day. Participants were interviewed and surveyed shortly after their work in Newtown, Connecticut regarding their experiences in completing the community service work. A Pearson Correlation Coefficient determined a significant correlation between perceptions of the importance of community service work activities and feeling connected to one's community (r = .802) and a willingness to participate in future community service work activities (r = .882). Results and suggestions are offered for future research.

Analysis of Conventional Undergraduate Lab Experiments For PicoSpin Compatibility

Anthony Coffey
Sarah Dimick Gray, Faculty Mentor (Department of Chemistry)
Metropolitan State University

Developing the ability to understand and interpret spectra produced by nuclear magnetic resonance is an integral part of any chemical or biological science education. Unfortunately, in the past, not all schools have had the space or finances required to incorporate hands on development of this skill into their undergraduate curriculum. The PicoSpin NMR spectrometer is a small, affordable 45 MHz HNMR that removes that limitation. The goal of this research was to determine the capabilities and limitations of the picoSpin NMR in regards to its analysis of compounds produced in standard, undergraduate level, organic chemistry experiments. A range of experiments were evaluated. They began with relatively simple solvent and mixture identifications, and concluded with brominating, oxidation, and extraction reactions. Spectra produced showed clear chemical shift, peak splitting, and proper molecular integration. Limitations included concentration requirements for solvated solid state compounds. It was found that the picoSpin is best suited for reaction products that are in the form of a neat oil or liquid state.

Gender Bias in the U.S. Astronaut Program

Debra Conley
Sumiko Otsubo, Faculty Advisor (Department of History)
Metropolitan State University

When President John F. Kennedy asked Congress in 1961 to commit itself to putting a man on the moon before the decade ended it can be assumed very few Americans thought about *why* that person would undoubtedly be a man. The Soviet Union had sent a man into space in 1961. Colonel John Glenn became the first American to circle the earth in outer space in February of 1962. The possibility of American women becoming astronauts crept very slowly into the consciousness of the country, and the reality of it took much longer. Two Soviet women had been sent into space by 1982. Yet it was not until 1983 that mission specialist Sally Ride took flight on *Challenger.* It would be another twelve years until a U.S. flight was piloted by a woman, then four more until a woman commanded a U.S. flight in 1999. What kept American women, with their long history of feminism, from accomplishing these feats for so long? Research suggests that a combination of social, political and economic reasons based on gender convinced both the National Aeronautics and Space Administration (NASA) and the general public that the negatives associated with allowing female astronauts into the U.S. space program outweighed the positives. This practice of 'embodied astronautics'--inclusion or exclusion in the astronaut corps based solely on the body--is highlighted in the research.

More than Christian: The Multicultural and Pagan Roots of the *Book of Kells*

Kathleen Donovan
Tammy Durant, Faculty Mentor (Department of English)
Metropolitan State University

Studies of the *Book of Kells* occasionally attempt to explain the presence of multicultural references and pagan symbols/imagery within a manuscript viewed as almost exclusively Christian in origin. My research suggests that the current categorization as Christian is inaccurate. Extant studies on the importance and meaning of this artifact fail to adequately address the overwhelming presence of various cultural mythologies and images embedded within its content. My paper asserts that the *Book of Kells* is not solely a Christian text, but is also an important cross-cultural history of human spirituality and mythology. Furthermore, my research suggests that as an important artifact, it was used politically to assimilate warring pagan factions and unify the church and monarchy during the medieval period. Working with one of the 340 folios (folio 129v), I demonstrate how the symbols and images originate not within Christianity, but within early pre-Christian cultures including the ancient Celts, Babylonians, Sumerians and Akkadians. Sources of research for this paper include various cultural mythologies, ancient literary texts, archeological artifacts and scholarly evaluations. In conclusion, this study is vital because it identifies and attempts to account for the largely unexplained presence of cross-cultural symbolism and numerous polytheistic mythologies within a literary artifact categorized as exclusively Christian. This research has far reaching implications for shedding light on a number of literary, cultural and spiritual questions related to the origin, history and purpose of this unique manuscript.

Undergraduate Research Projects from Biotechnology Program and STEM Internship Club at Minneapolis Community and Technical College (MCTC)

Felix Meyer, Jillane Frederick, Thor Eppler, Kendra Prum, Stephen Harrington, & Matthew Korteum
Rekha Ganaganur, Faculty Mentor (Department of Chemistry & Biotechnology)
Minneapolis Community and Technical College

The biotechnology program and the STEM Internship Club at MCTC have initiated research projects to provide students opportunities to integrate interdisciplinary learning and outcomes and better prepare for higher education and employment in STEM fields. Example of two such projects are DNA Barcoding and Comparative Analysis of Essential Oils. DNA barcoding involves identifying species using short, standardized gene region(s) and has two broad categories of applications: species-level taxonomic inquiry and identification of unknown species. We successfully conducted a pilot study using the barcoding locus *rbcL*, as an outreach effort to help identify 18 unknown species of plants growing in the backyards of MCTC's students and staff and a county park. Currently, through a collaboration with the Bell Museum of Minnesota, we are in the process of characterizing 15 species of Minnesota plants from the genus *Carex* using the *matK* locus, to determine phylogenetic relationships and to facilitate further research, as Minnesota *Carex* plants often play a large role in peatland ecosystems. A parallel ongoing project involves steam distillation of essential oils from various plants, their chemical analysis and comparative study of their biological effects. This project began as an investigative study on deriving plant essential oil extracts from a variety of fresh and dried plant matter. Ongoing and future steps include instrumental analysis, biopolymer interactions, and biological activities including *in vitro* cytotoxic potential on tumor cell lines and antimicrobial potential.

Metal Resistant Bacteria and its Application in Bioremediation

Shequaya Broadus*, Saris Ahmed*, & Michael Skinner*
Renu B. Kumar, Faculty Mentor (Department of Biology)
Minneapolis Community and Technical College

Modern agricultural practices and tremendous rise in industrialization are continuously increasing metal concentrations in the environment, which has direct impact on biotic communities, leading to the selection of these microbes through molecular mechanisms. We aim to understand the possible mechanisms of metal resistance and use those microbes for bioremediation. Different bacteria were isolated from water samples from two different polluted sites, the Mississippi River (under Hennepin Bridge) and a recycling yard near it. Of the hundreds of bacteria isolated from these sites, 31 were found resistant to .5mM of Zinc (Zn), 11 were resistant to 1 mM of Zn, 42 were resistant to 5mM Zn and 11 were found resistant to 1mM of Copper (Cu). Bacterial strains SR 13-1 and SR 13-2 have a MTC of 2.5 mM of Zn, MR-13 has a MTC of 2.5 mM of Cu, and MR-14 has a MTC on 8.5 mM of Cu. Bacterial strains were characterized using biochemical tests and showed that SR-13-2 and MR-14 are gram negative rods, aerobic, beta-hemolytic, motile, mannitol fermenters, and oxidase and catalase positive bacteria. In the absence of antibiotics, heavy metal can also contribute to antibiotic resistance. Therefore, metal resistant strains were characterized for various antibiotics resistance profile. Results indicated that SR13-1, SR13-2, MR 13 and MR 14 were found resistant to various concentrations of Penicillin G and Ampicillin, Streptomycin and Erythromycin. In order to decipher the mechanisms of metal resistance, bioaccumulation and uptake of metal studies are being done to characterize any morphological and ultra-structural changes and distribution of metal in the bacteria. This unique microbial activity is of interest because of its potential in recovery of metals from industrial effluents and bioremediation.

**All students contributed equally to research*

Influences of Student Mindset and Motivation on Study Habits and Learning Skills

Angela Graske and Jake Johnson
Emily Stark, Faculty Mentor (Department of Psychology)
Minnesota State University, Mankato

Mindset consists of how individuals perceive their own abilities (Deweck, 2006); meanwhile motivation involves the drive people have to perform an action (Gillet et. al., 2010). Individuals with a growth mindset are more likely to believe that they can improve their abilities through hard work compared to those with a fixed mindset, which could lead to improved performance. Similarly, intrinsic motivation, which connects to enjoying the activity itself, may lead to more persistence in learning than extrinsic motivation, where individuals are motivated only by external rewards. The results found that intrinsic motivation is positively related to growth mindset and also that these two concepts related to participants attitudes about school. By examining the types of mindsets and motivations students have for studying and learning, we can gain a better understanding of how individuals face challenges and the effects that has on their performance (Deweck, 2006). These results show it may be important to develop ways to increase a student's intrinsic motivation and develop a growth mindset because these two variables have shown to have an overall better impact on a student's performance and motivation in college.

The Effects of Montessori-Based Activity on Affect and Engagement in Persons with Dementia

Amber Hindt
Jeffrey Buchanan, Faculty Mentor (Department of Psychology)
Minnesota State University, Mankato

Activities for persons with dementia can provide many benefits such as cognitive and social stimulation and reduced agitation. Montessori-based activities are designed with specific principles in mind such as building on existing skills, repetition, and making tasks that are selfcorrecting. The purpose of this study was to compare the effects of a Montessori-based group activity to typically-offered activities in terms of the amount of active engagement and positive affect displayed. Eight individuals diagnosed with dementia and who lived in a memory care unit participated in the study. The study used an A-B-A-B experimental design where baseline (A) involved observing activities typically offered in the facility and the intervention (B) involved participants playing a Montessori-based activity called "Memory Bingo". Memory Bingo consists of four cards containing a picture and word linking to corresponding cards that are called out. Cards included pictures meant to stimulate long-term memory and evoke reminiscing among residents. If participants have the matching card, they flip it over. The game continues until someone flips over all their cards. During both phases, participant's affect and engagement were recorded through direct observation. Results of the study indicated that Montessori-based activity yielded greater levels of active engagement compared to typically-offered activities. Positive affect, however, remained relatively steady throughout all phases of the study. Results indicate that Montessori-based activities, such as Memory Bingo, may offer a promising alternative approach to activity programming for persons with dementia.

Effects of Strontium in the Bone Density of Mice

Kali Trukki, Ashley Ledding, & Breanna Ganther
Michael Bentley, Faculty Mentor (Department of Biological Sciences)
Minnesota State University, Mankato

Dietary strontium is readily incorporated into bone tissue of rodents. In prior studies dietary strontium has been shown to inhibit calcium metabolism and has further been shown to prevent osteopenia in ovariectomized rats. In the present study, we evaluate changes in bone density of mice receiving low calcium diet and strontium chloride in the drinking water. The study includes 14 of male mice. A surgical procedure was performed to remove the testes from all of the mice through two small incisions in the scrotal area. The mice were put under anesthesia using isoflurane gas and received 0.02 ml dosage of rimadyl post-surgery to help with pain. All of the mice are weighed by group on a weekly basis to document weight gain and consumption of water and chow. After two months of the water and diet regimen the mice will be euthanized by carbon dioxide inhalation and the long bones will be dissected for analysis with a JEOL 6510 scanning electron microscope (SEM) equipped with a Thermo Noran silicon-drift energy dispersive spectroscopy (EDS) system. This system provides a means to measure strontium, calcium, phosphorous, and other mineral elements in bone tissue. We anticipate finding strontium incorporation and increased bone density in the mice using the Strontium Chloride and low calcium water and food regiment.

Substitution of Calcium by Lanthanum (Ill) in Synthetic Calcium Vanadate Apatite

Hilary Deragisch
Lyudmyla Stackpool, Faculty Mentor (Department of Chemistry)
Minnesota State University, Mankato

Apatites form a large group of solid isomorphs with the general formula $M_5(EO4)_3X$ where M was univalent to trivalent cations (Ca, Sr, Ba, Cd, Eu, La, Na, K, and others); E was tetravalent to hexavalent cations (P, V, As, Si, Ge, S, Cr, and others); and X represented anions (OH^-, F^-, Cl^-, Br^-, I^-, and O^{-2}). Apatite compounds are widely studied due to the possibility of their use as biomaterials [1], catalysts [2], luminescent materials [3], ionic conductors [4]. Calcium oxovanadate apatite $Ca_{10-x}La_x(VO_4)_6\square_{1-x/2}O_{1+x/2}$ modified by lanthanum is the only one whose electrical properties are described in literature. As shown in [5] oxygen vacancies make oxide-ion conductivity possible along the c axis of the hexagonal matrix. The electric conductivity of lanthanum hydroxovanadates $Ca_{5-x}La_x(VO_4)_3(OH)_{1-x}O_x$ modified by REE (rare earth elements) has not been studied yet. However, it was shown in [6] that the electrical conductivity may grow more than an order of magnitude due to heterovalent substitutions in the apatite structure. In this work we have studied the isomorphic substitution of La^{3+} for Ca^{2+} in hydroxovanadate with apatite structure under the scheme: $Ca^{2+} + OH^- \rightarrow La^{3+} + O^{2-}$ in order to refine the limits of isomorphic substitutions which were reported earlier [7] as $0<x<0.65$. Isomorphic substitutions in system $Ca_{5-x}La_x(VO_4)_3(OH)_{1-x}O_x$ were studied by X-ray powder diffraction analysis. Samples were prepared by nitric-tartaric solutions method and calcined at final temperature of 750°C. In the system Ca5.xLax(V04) 3(0H)1.xOx complete solubility was found (O<x<l.O). This result is in a good agreement with relative size factor (less than 8% for complete solid solutions). The difference in radii of two ions Ca^{2+} and La^{3+} is 3.2%.

Comparison of Inter-Cultural Competency Between American And Russian University Students

Elizabeth Lohrenz
Elizabeth Sandell, Faculty Mentor (Department of Elementary & Early Childhood Education)
Minnesota State University, Mankato

Intercultural competency influences the quality of international education as cultural perceptions impact individual and collective attitudes and levels of participation. Research addressing differences and causes of varying levels of cultural competency could ultimately improve the role of international education. The purpose of this study was to compare American university students' cultural competency to that of Russian university students. The analysis of the cultural competency of Russian students acted as a comparison variable in the continued research of cultural competency in the classroom among American university students. This research was based on the Developmental Model of Intercultural Sensitivity, developed by Bennett (1986). The DMIS described six stages of cultural competence: (a) Denial or Unaware; (b) Polarization or Defense; (c) Minimization; (d) Acceptance; (e) Adaptation; and (f) Integration. Subjects for this study included 26 persons, 18 to 30 years old, who were enrolled in the North-Eastern State University, Magadan, and 26 persons, 18 to 30 years old, who were enrolled in Minnesota State University, Mankato. This study assessed cultural competency with the IDI (Hammer & Bennett, 1998, 2001). Based on the DMIS, Hammer and Bennett (1998, 2001) developed the Intercultural Development Inventory (IDI) consisting of fifty, Likert-type items. All students completed the IDI on-line in their first language. The investigators used the group mean scores on developmental scales to evaluate whether any significant indicators of differences or similarities were observed in these areas of intercultural development. Results indicated statistically significant differences in orientation to cultural diversity between Russian and American university students.

Evaluating the Potential of the Na^+/H^+ Exchanger Isoform 1 as a Therapeutic Target for the Treatment of Non-small Cell Lung Cancer

Clarice H. Wallert, Scott Buchholz & Kristina Anderson
Mark A. Wallert, Faculty Mentor (Department of Biosciences)
Minnesota State University, Moorhead

Calcineurin B homologous protein isoform 1(CHP1) is expressed in nearly all human tissues. Calcineurin B homolgous protein isoform 2 (CHP2) is primarily expressed in cancer cells. CHP1 and CHP2 are essential cofactors for the Na^+-H^+ Exchanger isoform 1 (NHE1), a key protein involved in the transformation of a normal tissue to a malignant tumor. PSN cells over-express NHE1, while PS120 fibroblasts do not express NHE1. Thus these two cell lines are used as positive and negative NHE1 binding controls for CHP1 and CHP2. The aim of this study was to determine the relationship between CHP2 expression and binding to NHE1 and progression of non-small cell lung cancer. By transiently transfecting cells with a GFP-CHP fusion protein, we will assess and measure the location of CHP in cells with and without NHE1 expression. This work will determine the mechanism CHP1 and CHP2 interact with NHE1 and how this interaction affects cell proliferation and migration.

Nuclear Magnetic Resonance in $MnSO_4$+H_2O

Iwnetim Abate
Ananda Shastri, Faculty Mentor (Department of Physics and Astronomy)
Minnesota State University, Moorhead

A major obstacle to the study of fundamental properties of candidate cathode materials is the morphological complexity of the electrode-electrolyte interface in fuel cells. This complexity prevents a true determination of the catalytic mechanisms. To address this challenge, photolithography patterning technique has been used to make considerably simplified and well-defined electrode geometries. However, the time required for such fabrication is extreme. In this work, we employ a simple shadow-mask-patterning method to fabricate a perovskite oxide-metal composite structure. First, a dense thin film of $SrCo_{0.9}Nb_{0.1}O_3$ (SCN) is grown on a $Y_{0.16}Zr_{0.84}O_{1.92}$ (YSZ) single crystal substrate by pulsed laser deposition. Patterned metal layers are subsequently deposited by DC sputtering with a shadow mask. Thermal stability and electrochemical properties of the fabricated composite cathodes are investigated by optical microscopy, scanning electron microscopy and AC impedance spectroscopy (ACIS).

MSU Moorhead Diversity Endorsement Program Proposal

Katrina Brekke & Chu Yi
Donna Brown, Faculty Mentor (Department of Human Resources)
Minnesota State University, Moorhead

Studies have shown that by having a significant understanding of diversity and culture, students can appreciate cultural pluralism and increase awareness toward social inequalities. Possessing this knowledge benefits individuals as well as communities and has the potential to cause positive changes in society. By researching examples from universities in the U.S., analyzing current organizational structure and programs of the institution, and conducting qualitative and quantitative research, this study examines the feasibility of implementing an optional "proficiency in diversity understanding" endorsement at MSUM.

Predictability of Food Supply, but Not Ration, Increases Exploratory Behavior

Evangeline Holley
Brian Wisenden, Faculty Mentor (Department of Biosciences)
Minnesota State University, Moorhead

Individual zebrafish (Danio rerio) were assayed for exploratory tendency in a serial open field test before and after being maintained on one of the four diet treatments that differed in ration and in predictability of food delivery. Zebrafish became more exploratory after being maintained on a diet with a predictable delivery schedule. There was no effect of ration. Thus, exploratory behavior is inducible by environmental influences independent of genetic predisposition or social interactions. These results have implications for management of correlated behavioral syndromes of exploratory/boldness of animals reared in captivity for later release into wild populations.

Random Transposon Mutagenesis Reveals Gene Functions in *Chromobacterium violaceum*

Hayat Ahmed
Paul Melchior, Faculty Mentor (Department of Biology)
Tamara Mans, Faculty Mentor (Department of Biosciences)
Minnesota State University, Moorhead & North Hennepin Community College

Biologists doing functional genomics use experimental approaches to interpret the vast amount of genomic information in databases. We are studying the genetic basis of multiple metabolic functions in *Chromobacterium violaceum.* We used a transposon to generate a large library of *C. violaceum* mutants. We are identifying losses of several metabolic functions in these *C. violaceum* mutants through selective media and growth screening approaches. We will identify the gene sequences responsible for the functions, by identifying the points of mutation in the genomes. The organisms' genomic DNA will be extracted, and fragments of DNA carrying the mutagenic transposons, plus the surrounding *C. violaceum* DNA, will be cloned into a host organism, then sequenced. The DNA sequences will be compared to those in Genbank; genes will be identified and their annotations will be examined. The annotations, which were hypothesized gene functions, can be supported or adjusted in light of our experimental results.

Photooxidation of DNA and Its Prevention by Natural Antioxidants: Development and Implementation of an Undergraduate Laboratory Experiment for Biochemistry Students

Alison Seemann
Heather Sklenicka, Faculty Mentor (Department of Chemistry)
Rochester Community and Technical College

Research was conducted to develop a multi-week laboratory experiment for allied health biochemistry students to study and explore the effects of antioxidants on preventing DNA cleavage. The goal is to replace several of the current "cookbook" style labs with the opportunity for students to study the effectiveness of various antioxidants by finding and choosing their own natural, everyday sources of antioxidants. In the presence of light, DNA is photooxidized by the photosensitizer proflavin. These damaged DNA bands can then be separated from the supercoiled DNA using gel electrophoresis. It was found that as light exposure increases, the quantity of the damaged DNA increases. Antioxidants from natural sources were then used to prevent the DNA damage. Several antioxidants were tested, including coffee, green tea, cocoa, and fruit juices, and were compared for their ability of preventing the DNA cleavage, which ranged from complete protection from oxidation to no protection at all. One of the challenges to the implementation of this research project included optimizing the procedure while minimizing the costs. The first implementation of this laboratory experiment occurred in Fall 2013 at the Rochester Community and Technical College in Rochester, Minnesota. A pre- and post-lab survey was given to the students who participated in performing this experiment in order to assess their interest in and knowledge gained from this experiment. The results of this assessment will also be presented.

Exploring African-American Spirituals Through the Lenses of the Three Major Sociological Perspectives

Erin Reps
Kerry Livingston, Faculty Mentor (Department of Sociology)
Southwest Minnesota State University

African-American spirituals are songs that speak of the history and the suffering of a people. Through rhythm and song, the African-American slaves of our nation's past rebuilt their broken identity, resisted oppression, and left their own mark on the world of music. The importance of these spirituals was examined in light of the three major sociological perspectives: structural-functionalist, conflict, and symbolic interactionist theories. Six works of literature on the subject were reviewed. Based on this literature: 1) African-American spirituals served a number of functions in various societal institutions (functionalism), 2) they were used as a tool to resist the oppression that African-American slaves faced (conflict perspective), and 3) spirituals stood as a means to preserve the social identity of those who sang them (symbolic interactionism).

Comparison of Macroinvertebrate and Planktonic Populations in a Newly Constructed Stormwater Holding Pond and an Existing Stormwater Holding Pond

Jared Wagner
Emily Deaver & Thomas Dilley, Faculty Mentors (Department of Environmental Science)
Southwest Minnesota State University

Stormwater holding ponds mitigate rainfall runoff issues and serve as habitat for aquatic species. A stormwater holding pond constructed in 2012 and a similar pond constructed in 1976 in Marshall, Minnesota were sampled summer 2013 for macroinvertebrates and plankton. Plankton samples were collected biweekly using a 153 µm plankton net, and macroinvertebrate samples were collected monthly using Hester-Dendy samplers from June through September 2013. It was hypothesized that the older pond would have a higher diversity of organisms. It was also expected that both ponds would show a shift in dominant algal species from green to blue-green to diatoms over the study period. The Shannon-Weaver Diversity Index showed phytoplankton, zooplankton and macroinvertebrates were more diverse in the older pond. Data also showed differences in dominant species present between the ponds for all three types of organisms. Algal succession in both ponds showed seasonal shifts in dominance, although blue-greens were never abundant in the newer pond.

Defining Faces for All Spaces

Jessa Roberts
Sheila Tabaka, Faculty Mentor (Department of Theatre)
Southwest Minnesota State University

What many people do not realize is that what they are seeing when they go to a theatrical performance is only the tip of the iceberg. There are a lot of things that happen before the performance even starts. One of these things is applying makeup. This poster examines the differences between Crème and Cake makeup. In theatre, the size of the space you are working in effects the makeup designer's choices. In a large theatre, crème makeup helps to make more of the actor's features stand out and is a better reflector of light. If a play is performed in a smaller house where the audience is closer, cake makeup is the better choice. It is much smoother and looks more natural. The application of each of these makeups is also important. Crème is applied directly to the face and needs to be powdered so it will not smear or wipe off. Cake makeup on the other hand is activated with water and dries quickly. This poster will also take you through the process of applying basic highlight and shadow with each of the different types of makeup. After having read this poster, you will be able to differentiate the use of each makeup and know the basic application of each.

Health Halo Effects from Diet and Zero Calorie Sodas

Joshua Hughes & Gena Stevens
Scott Peterson, Faculty Mentor (Department of Psychology)
Southwest Minnesota State University

The “health halo” effect refers to people’s tendency to overgeneralize nutrient content and health claims made about food products. For example, it has been shown that labeling a snack food as “low-fat” results in increased consumption of that food, larger perceived serving sizes, and lower calorie estimates. Similarly, the same overgeneralizations have been shown in studies examining production attributes (e.g., “organic” or “fair trade”) instead of nutrient claims. It has been suggested that health halos result in increased food intake and thus may contribute to the problem of obesity in America. Two experiments were conducted to investigate whether similar health halo effects can be observed for beverages, in particular, diet and zero calorie sodas. In the first experiment, participants read a brief story about a person consuming a particular beverage. Participants were asked to rate the “healthiness” of the beverage and judge various hypothetical decisions made by the person. As compared to Regular Coke, participants rated Diet and Zero Calorie sodas as healthier and more nutritious. Participants generally disagreed with the target person making decisions that were inconsistent with her health-related goal regardless of her beverage choice. Participants judged having a dessert or skipping a workout to be the least acceptable of the target scenarios. The second experiment expanded upon the first, examining the effects of both dessert and beverage choices on participants’ attitudes toward skipping a routine workout.

Emerging Markets More Innovative than Developed Markets

Marian Stephnie Fernando
Adesegun Oyedele, Faculty Mentor (Department of Marketing)
St. Cloud State University

Emerging markets show more interest in innovating than the developed markets. Currently, actual innovation in developed markets is much higher than in emerging markets. In the past few years, emerging markets have become more innovative, even though they are not close to the innovation done by developed countries. Emerging markets are increasing their innovativeness because they are open to new ideas whereas the developed markets are mostly happy consuming the products that are already created. Also emerging markets are forced to become more innovative since consumers in these economies try to find cheaper but high quality products every day. Therefore, businesses in these markets work hard to keep up with the consumer demands and stay in business. The research was conducted after reading several business articles and newspapers available online. What was found in the research was that emerging markets are increasingly becoming more innovative and will create a big threat to the developed markets. This is also one of the biggest reasons as to why some of the leading businesses in developed markets are moving/expanding their business operations to the emerging markets.

Effect of Student Loan Debt on Homeownership

Katherine Kotschevar
King Banaian, Faculty Mentor (Department of Economics)
St. Cloud State University

The housing market is on a slow recovery route, but high levels of student loan debt threaten to stagnate recovery's growth. Most students graduate with substantial debt; leaving them with insufficient disposable income and the credit score necessary to purchase a home. I utilize the National Longitudinal Survey of Youth 1997 survey data. Using homeownership as a binary dependent variable I employ a logistic regression of student loan debt among other independent variables on homeownership. There was a greater likelihood of a person owning a home if they were: married, had a child, lived in the Midwest, had higher income, and more financial assets. At age 30 if the person had a higher amount of student loan debt, they were less likely to own a home. The implication of student loan debt on the purchasing power of the future generation of consumers is troublesome for many industries, and particularly the housing industry. With tightening mortgage requirements restricting the allowance of contracts many graduates will boomerang back home or rent with friends until owning a home is a possibility.

Rethinking Classroom Participation among Hmong Students

Vang Mong Xiong
Emily Schultz, Faculty Mentor (Department of Anthropology)
St. Cloud State University

Socialization is the process in which children learn the cultural norms that are deemed appropriate in their community. Different communities have different strategies of socialization. When children enter the educational system, they bring the cultural norms of their household with them. However, the culture of the classroom, often times, is not the culture of linguistically and culturally diverse students (LCD); the culture of the classroom is the culture of the teachers and the educational system. As a result of this, LCD students cannot fully participate in school classrooms and are disadvantaged within the educational system. Drawing on Shirley Brice Heath's (1982) discussion of "ways of taking," a process in which children learn and take meaning from their environment, and her discussion of how certain ways of taking are privileged within the educational system, I argue that Hmong students are disadvantaged within the educational system because their ways of taking does not follow the way of the classroom; the way of the hegemonic educational ideology. In school classrooms, *oral participation* is part of the k-12 educational experiences. It is the essence of classroom interactions (Heath, 1982). Hmong students, however, perceive classroom oral participation differently. In the Hmong culture, being a "good child" implies following direction, paying attention, being respectful and modest to others. When Hmong students attend school, they behave accordingly to what is expected of them in their household. They treat their teachers with respect by listening to them. The notion of a "good child," even though acceptable and desired in the household, can actually contradict aspects of *oral participation* in school classrooms as Hmong students would not frequently participate in school interactions. As a result of the cultural discontinuity and the way that they are perceived and treated, Hmong students are disadvantaged to some extent within the MN educational system.

Synthesis of a Chemotherapeutic Drug: An Analogue of Goniothalamin

Curtis Payne
Mark Mechelke, Faculty Mentor (Department of Chemistry and Physics)
St. Cloud State University

Cancer is the leading cause of death in world. Goniothalamin, a natural product isolated from the dried stem bark of Malaysian plants of the genus *Goniothalamus*, has been shown to induce apoptosis in cancer cells. The bioactivity of this molecule is thought to be due to its ability to react with thiols. One mechanism involves its reaction with glutathione, a natural antioxidant found in all cells. By inhibiting glutathione, a high concentration of free radicals develops, inducing apoptosis in cancer cells. The other mechanism involves the inhibition of nuclear factor-kappa B, a transcription factor involved in cell proliferation. The inhibition prevents cancer cells from dividing. Using a four step sequence of published reactions, a novel gamma-lactone analogue of goniothalamin has been prepared that replaces the endocylic double bond in the lactone core of goniothalamin with an exocyclic double bond. It is anticipated that this alteration will allow the compound to react more rapidly with thiols and increase its cytotoxicity towards cancer cells. Further work includes testing the newly synthesized analogue against cancer cell lines and comparing its cytotoxicity with goniothalamin.

The Impact of Nutrient Content Labeling Education on Eating Choices and Measurements of Dietary Fat Consumption in Cardiovascular Rehabilitation and Prevention Patients

Dani Bachmann & Brittany Bredlau
Susan Zeller, Faculty Mentor (Department of Nursing)
Kent Hansen, Faculty Mentor (Department of Health, Exercise Rehabilitation Sciences)
Winona State University

Cardiovascular disease (CVD) is the number one leading cause of death for adults in the United States. One major risk factor for CVD is a high consumption of dietary fat. A factor leading to an overconsumption of dietary fat is the consumer's understanding and knowledge of nutrient content label claims on food products. Our study is testing the following hypothesis: Subjects receiving education on food label claims will choose foods lower in fat, and reduce their dietary fat intake, which will reduce their risk factors for having a cardiac event. The purpose of the study is to evaluate an educational intervention for its effectiveness in reducing fat intake within a group of Winona State University's cardiovascular rehabilitation and prevention program. Our educational program focuses on interpretation of food label claims and types of dietary fat. Although our research is currently in progress, conclusions will be evaluated by the end of December. We wish to see the effect of our intervention on dietary fat reduction and short-term lifestyle change. We anticipate that our results will show that dietary fat intake was reduced following the nutritional content claim education, therefore reducing the patient's chance of a further CVD complication.

Perceptions of Siblings of Individuals Diagnosed with Smith-Magenis or Williams syndrome: An Emerging Adult Vignette Study on Stigma as a Social Contagion

Hunter S. Schepper
Rebecca H. Foster, Faculty Mentor (Department of Psychology)
Winona State University

Stigmas are common among individuals with mental, genetic, and other health disorders, and people are judged by their association with these individuals. Therefore, this study assessed perceived traits of typically-developing siblings based upon filial relationships with individuals diagnosed with Smith-Magenis (SMS) or Williams syndrome (WS) (i.e., rare genetic disorders) compared to individuals with no genetic disorder (NGD). Emerging adults (N=102, Mage= 19.78 years, SD= 1.82, range: 18-24 years) rated perceptions of siblings' traits based on three vignettes including a typically-developing sibling of an individual with 1) SMS, 2) WS, and 3) NGD. Overviews of syndrome features, including cognitive, developmental, and socioemotional concerns, were provided. Paired sample t-tests indicated no significant differences in ratings of siblings of individuals diagnosed with SMS compared to WS. Therefore, these groups were combined and compared to the NGD group for all additional analyses. Compared to the NGD group, siblings of individuals diagnosed with SMS/WS were rated as more reliable, adaptable, and trustworthy ($p \leq .002$). However, siblings of individuals with SMS/WS were less likely to be invited to a party if the sibling with SMS/WS attended ($p < .001$). Those with a sibling with a genetic disorder were rated as less relatable ($p < .001$). Although siblings of individuals diagnosed with a genetic disorder were perceived more favorably on several traits, social challenges exist (e.g., perceived relatability). Future research should focus on developing interventions emphasizing perceived strengths and disclosure timing/content of individuals with siblings diagnosed with genetic disorders and educating the public to minimize perceived differences that may result in stigmas.

Analysis of the Expression of *B*-Amyloid in Alzheimer's Disease and Down Syndrome

Maria F. Noterman
Francis M. Mann, Faculty Mentor (Department of Chemistry)
Richard A. Deyo, Faculty Mentor (Department of Psychology)
Winona State University

B-amyloid accumulation and the subsequent loss of neurons has been linked to a profound set of cognitive impairments in both Down syndrome and Alzheimer's disease. The mechanism triggering *B*-amyloid accumulation remains a mystery in both disorders. Understanding and preventing this process is considered to be a critical therapeutic goal necessary for treating these two devastating disorders. The present study completed an analysis of the genetics and expression of *B*-amyloid and its effects on the development and survival of neurons in two animal models in which the human genes for these disorders had been inserted. An analysis of the psychological status of subjects from models of Down syndrome and Alzheimer's disease revealed significant memory impairments compared to controls. Analyses of the brains revealed a pattern of neuropathology that mimicked the human form of these disorders. Both disorders were associated with a loss of cells in the cerebral cortex and the presence of *B*-amyloid plaques that was linked to the expression of the genes for presenilin-1 and amyloid precursor protein. Subjects exhibiting Down syndrome also showed abnormal synaptic connections (i.e., fewer dendritic connections and fewer dendritic spines) as well as an overall increase in relative brain weights hypothesized to be due to excess accumulation of white matter. These findings suggest that treatments designed to target the production of presenilin-1 and amyloid precursor protein may prevent or reduce the symptoms of Alzheimer's disease and Down syndrome.

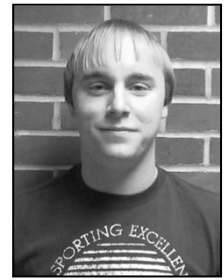
Monitoring Water Quality using Satellite Images

Nathan Guggenberger, Yichen Jiang, & Scott Olson
Mingrui Zhang, Faculty Mentor (Department of Computer Science)
Winona State University

Water quality is an important issue for lakes and rivers in the agriculturally dominated Minnesota. Most monitoring of water quality is done by sampling the water at pre-selected permanent sampling sites. The cost of sampling quickly goes up when the number of samples need to be collected increases. Satellite images cover large geographic area, they have been widely used to monitor changes in land for developing environmental management practices by local and federal agencies. However, quantitative assessment of water quality on satellite images still has a long way to go. Water quality is affected by several factors, such as the amount of material suspended in the water (turbidity). Using European Space Agency (ESA)'s BEAM project as an open-source platform, we have developed software plug-in to retrieve inherent optical properties as the first step toward the derivation of water quality index for ocean waters. Since 2012, we have developed another algorithm and implemented it as a plug-in for deriving water clarity index for large lakes. With those extensions to the BEAM project, we are able to analyze MERIS satellite images collected by ESA and produce an image of water clarity for Lake Erie.

Kelsie Becklin is a non-traditional, working student at Anoka-Ramsey Community College who is also a single parent with incredible discipline in time management, communication, goal prioritization, and dedication. Kelsie was awarded the "Biology Student of the Year" at ARCC for the 2012-2013 academic year and was selected to participate in the merit –based Independent Research Summer Program in partnership with the University of Minnesota.

Geri Mortenson is a graduate of Centennial High School, Circles Pines, MN. While attending Anoka-Ramsey Community College (ARCC), Geri works in the veterinary field specializing in nutrition. Geri successfully balances work and academics and has found research opportunities to link the two together.



Michael Vaske is a senior at Bemidji State University where he is studying Aquatic Biology with an emphasis in Fisheries Biology. After graduation, he plans to attend graduate school and receive a Masters in Fisheries Biology.

Rebecca Florke earned an A.A. degree from Iowa Lakes Community College in May 2011. She is currently a student at Bemidji State University, majoring in Biology and Chemistry with a medical sciences emphasis and a minor in Psychology. Upon graduating in May 2014, she plans to attend medical school.

In 1999, **Lynda LaFond** joined the United States Air Force and remained on active duty until 2009 during which she was deployed to Iraq and Turkey. Lynda is currently pursuing two Bachelor degrees from Bemidji State University: Biology, wildlife management emphasis and Environmental Science with minors in Biochemistry and Toxicology.

Sarah Jensen is currently a student at Inver Hills Community College, finishing an associate in arts degree with an emphasis in Biology. Next fall she plans to attend the University of Minnesota in the College of Education and Human Development and major in Kinesiology with a minor in Psychology. She will then be applying to the Doctor of Physical Therapy program at the University of St. Catherine and hopes to work in pediatric physical therapy in a clinical setting.

Luke Zenker obtained an Office Administration Certificate upon graduating from the Hubert H. Humphrey Job Corps Center and has been actively involved in the Twin Cities theater scene, recently stage managing the Inver Hills production of Sweeney Todd. At Inver Hills Community College, he is completing his Associate's Degree with plans to transfer to the University of Minnesota, Twin Cities to study English and theatre.

Troy Brule received a BA in Psychology from Metropolitan State University in December of 2013. His research interests include mate selection preferences in online dating contexts, and the effects of community service activities on the volunteers who partake in them.

Haan van der Wege attends Metropolitan State University and will receive his BA in Psychology this spring. He has an interest in community organizing and works with the St. Anthony Park Foundation, assisting with campaigns, fundraising and general community planning.

Anthony Coffey is currently studying Chemistry at Metropolitan State University. His research involves finding experiments that produce products identifiable on the school's NMR spectrometer, and additionally analyzing the viability of the experiments in the undergraduate Organic Chemistry courses.

Debra Conley is pursuing a Bachelor of Arts in History at Metropolitan State University and will graduate in the spring of 2015. She currently works in regional planning, focusing on data collection and research.

Kathleen Donovan is a Minnesota native currently pursuing a Bachelor of Arts degree in English at Metropolitan State University in Saint Paul. A passionate life long learner, Kathleen's intellectual interests span a wide range of subjects. Her academic passions include the fields of linguistics, anthropology and literature.

From left to right: Felix Meyer, Jillame Federick, & Thor Eppler

Felix Meyer is pursuing a Biotechnology A.S. degree at Minneapolis Community and Technical College (MCTC). He plans to transfer to a four-year university to study chemistry and biology.

Jillane Frederick is a returning student pursing the new field of biotechnology at MCTC. She has a Bachelors of Science Degree from Minnesota State University, Mankato, with a major in Technical Communication and a minor in Biology. She anticipates graduating with the A.S. Degree in May of this year and hopes to get a laboratory position in medical sciences.

Thor Eppler is a biotechnology program student at MCTC and will be graduating this spring. He is a former high school Biology teacher with a bachelor's degree in Zoology and master's degree in Education, but he enrolled in this program to gain hands on laboratory skills and additional experiences so that he can change careers into laboratory research positions.

Kendra Prum is currently a student enrolled at Minneapolis Community and Technical College pursing associates degrees in the areas of chemistry, biotechnology, and biology. Her future plans include transferring to a four-year university to obtain a bachelor's degree in Genetics and Cell Development.

Stephen Harrington is currently enrolled in the Chemistry program at MCTC. His future goal is to pursue the Materials Science and Engineering program at the University of Minnesota in the fall of 2014.

Mathew Kortuem is a second-semester student at MCTC pursuing an Associate's degree in Biotechnology. He served as a medical laboratory technician in the US Air Force, and has continued in this profession after returning to Minnesota. He intends to earn a Bachelor's degree in Microbiology at the University of Minnesota.

Shequaya Broadus is a lab assistant with two years of experience in Microbiology lab preparation and experience in tutoring various biology and chemistry courses at MCTC. She has served as a student member of the STEM Career and Internship Club, the Science Club, the Student Senate and the Phi Theta Kappa Honors Society.

Saris Ahmed is a biology student and undergraduate researcher studying towards Bachelor's degree in Biology with experience in microbiology and relevant lab techniques. He is currently a microbiology lab preparation assistant at MCTC and member of the

Michael Skinner is studying Chemistry and Biotechnology at Minneapolis Community and Technical College. Prior to this he was an automobile assembler at Ford motor company. His future plans involve transferring to the University of Minnesota to gain a master's degree in Biotechnology.

Angela Graske plans to graduate from Minnesota State University, Mankato in May of 2014 with a Bachelor of Science degree in Psychology. She is currently applying to a few Master programs for Industrial Organizational Psychology and would like to enroll next fall.

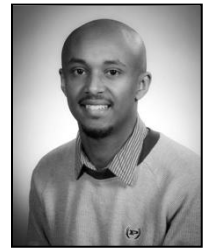
In spring of 2014, **Jake Johnson** will be graduating with a Bachelor of Science degree from Minnesota State University, Mankato in Psychology. He plans to apply to graduate programs in the field of counseling.

Amber Hindt will be graduating from Minnesota State University, Mankato with a major in Human Biology and minors in Chemistry and Psychology. Amber will be attending Salus University in August 2013 to obtain a Master of Medical Science in Physician Assistant Studies.

Kali Trukki is a fifth-year student at Minnesota State University, Mankato and is completing a Bachelor of Science in both Biology and Psychology. She plans to continue her studies by pursuing a Ph.D. program in Clinical Neuropsychology.

Hilary Deragisch is a junior at Minnesota State University, Mankato majoring in Chemistry and completing her pre-pharmacy requirements. She plans to pursue a doctorate degree in Pharmacy and become a retail pharmacist.

Elizabeth Lohrenz is a senior at Minnesota State University, Mankato. Elizabeth will graduate with a Bachelor of Arts degree in International Relations and Geography.



Iwnetim Abate has taken advantage of the many partnerships available through MnSCU. In addition to completing undergraduate research at MSU Moorhead, he has completed two summer Research Experiences for Undergraduates (REUs) at CalTech, he will also be completing a dual degree program (physics at MSU Moorhead and Material Science and Engineering at U of Minnesota)

While working with a research team, **Clarice Wallert** says that she has learned to understand and respect other's personalities and capabilities while also being able to utilize and blend everyone's skills and talents. She feels that this is important for when she begins her career and needs to work as a team with her employer and coworkers.

In addition to his research, **Yi Chu** has been active in leadership through student senate (VP), the campus office of Diversity and Inclusion, the city of Moorhead Human Rights Commission, and as a multiple award winning Microsoft Windows UCrew Intern.

Like several MSU Moorhead students before her, **Evangeline Holley**'s research has moved beyond a graduation requirement and has become part of the body of knowledge in her field, as her manuscript titled "Predictability of food supply, but not ration, increases exploratory behavior" is to be published in the Journal of Fish Biology.

Hayat Ahmed moved to Minnesota eight years ago from Ethiopia, and is the first in her family to attend college or university in the U.S. She is earning her B.S. in Biochemistry and Biotechnology from Minnesota State University, Moorhead through its partner program at North Hennepin Community College. Hayat has thrived in lab research, and is now looking forward to entering a Ph.D. program.

Alison Seemann has been doing student research at Rochester Community and Technical College in Rochester, Minnesota for the past four semesters (since Fall 2012). She is currently planning on majoring in Biochemistry. She has lived in the Rochester area her entire life and now lives near Zumbro Falls.

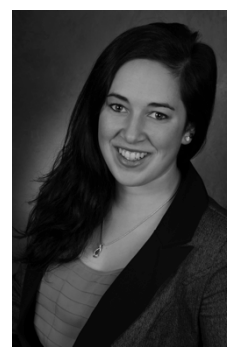
Erin Reps is a junior at Southwest Minnesota State University majoring in Sociology with a minor in Public Relations. At SMSU, she is in the Honors Program and regularly attends sociology club meetings and events.

Jared Wagner is from Osakis, Minnesota and is an Environmental Science major, with a Biology minor at Southwest Minnesota State University. He is President of the Environmental Awareness Club at SMSU as well as a member of the Biology Club.

Jessa Roberts is from Minneota, Minnesota and is a Theatre Arts major at Southwest Minnesota State University. She is President of the Drama Club and Theatre Club and is the Lead Center Teacher at Discovery Daycare Center and Preschool.

Josh Hughes grew up in the city of Sartell, Minnesota with three younger siblings. He majors in Environmental Science at Southwest Minnesota State University. He spends his free time reading, fishing, doing crossword and Sudoku puzzles, and hunting.

Marian Stephnie Fernando is a senior at Saint Cloud State University, double majoring in Marketing and International Business with an emphasis on Management. She will be completing her undergraduate degree by May 2014. Her future plan is to gain work experience in managing a business and then obtain an MBA.



Katie Korschevar is currently a senior partaking in the 4+1 BA/MS Applied Economics plan at St. Cloud State University. She completed her undergraduate degree fall 2013 and plans to complete her graduate degree in spring 2015. After completing her graduate degree, she may complete a PhD in a related field, or enter the world of Big Data Analytics.

Curtis Payne is a senior at Saint Cloud State University, graduating in the spring semester of 2014 with a degree in Biochemistry. He is an active member in the Chemistry and Physics Department, working as a tutor, teaching assistant, and learning assistant. Curtis has applied to chemistry graduate programs and is currently patiently waiting for acceptance notifications.

Vang Mong Xiong graduated from St. Cloud State University with a bachelor's degree in Anthropology. He plans to obtain a master's degree in Elementary Education and work as an elementary school teacher. He also plans to pursue a doctoral degree in Educational Policy with an emphasis in Anthropology.

Dani Bachmann is senior nursing student at Winona State University. She plans to work as a registered nurse at Gundersen Lutheran Hospital and eventually hopes to get a job as a labor and delivery nurse. After a few years of experience, she plans to return to school and get her Masters and PhD in Nursing.

Brittany Bredlau is a senior nursing student at Winona State University from Owen, WI but would like to move to the Twin Cities area following graduation. She plans to work as a registered nurse in an intensive care unit for a few years to gain some experience and then attend graduate school to become a Certified Registered Nurse Anesthetist.

Maria Noterman graduate from Winona State University in the spring of 2014 with a degree in Biochemistry. She is originally from Adams, MN where her family farms.

Nathan Guggenberger is currently in his final semester of undergraduate study at Winona State University. He will earn a Bachelors of Science degree in Computer Science in May of 2014. Nathan's experience includes internships as a Software Developer for ImageTrend Inc. and a Computer Support Specialist for Starkey Hearing Technologies.


WINONA
STATE UNIVERSITY


SOUTHWEST
MINNESOTA STATE UNIVERSITY


North Hennepin
Community College


ST. CLOUD STATE
UNIVERSITY


Minneapolis
Community
& Technical
College


BEMIDJI
STATE UNIVERSITY


MINNESOTA STATE
UNIVERSITY
MANKATO


Inver Hills
Community College


ANOKA-RAMSEY
COMMUNITY COLLEGE


MINNESOTA STATE UNIVERSITY
MOORHEAD


Metropolitan
State University


Rochester
COMMUNITY AND TECHNICAL
College