

Apr 4th, 8:00 AM - Apr 5th, 3:00 PM

2011 Abstract Booklet

Undergraduate Research Center, Minnesota State University, Mankato

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MINNESOTA STATE UNIVERSITY

MANKATO



April 4 & 5, 2011



UNDERGRADUATE RESEARCH CONFERENCE 2011



WELCOME

Welcome to the 13th annual Undergraduate Research Conference at Minnesota State University, Mankato. This conference provides an exciting opportunity for the University to showcase the research and creative activity of our undergraduate students. These projects, submitted by 230 students representing six colleges, are the result of collaboration between talented and motivated undergraduate students and their dedicated faculty mentors. This year there will be a total of 148 presentations affording a wide array of on-going, outstanding scholarly and creative activity on our campus. Abstracts of these oral, performance, or visual arts projects and posters accepted for presentation are contained in this formal publication. I applaud the work of these students and the 78 committed faculty members who served as mentors and encourage faculty, students, staff and guests to attend the formal presentations that will take place in the Centennial Student Union on April 4th and 5th, 2011. Our vision to be known as a university where people expect to go further than they thought possible is clearly demonstrated by these students and faculty. The entire University community celebrates the achievements of these outstanding undergraduate students and congratulates all participating students and their faculty mentors.

A handwritten signature in cursive script, reading "Richard Davenport".

Richard Davenport
President
Minnesota State University, Mankato

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A WORD FROM THE UNDERGRADUATE RESEARCH CONFERENCE OFFICE

First, we would like to welcome all presenters, mentors and attendees to the 2011 Undergraduate Research Conference. It is our pleasure and privilege to put forth what we see as a true celebration of the many forms of undergraduate scholarship. This conference began as a grassroots faculty movement to create an outlet for excellent student-mentor collaborations on campus. As the URC continues to diversify and evolve, the outstanding efforts of faculty mentors will be the one constant. URC student presenters are exceptional by definition of their presence here at what is perhaps the most visible example that MSU honors the strategic priority of enhancing academic excellence in undergraduate studies. They are those who choose to go above and beyond requirements and for that effort are able to access an enriched educational experience that can have profound impact on their time here at MSU and beyond.

Everything the URC oversees including the details of the conference events, the granting process, and the undergraduate journal would be impossible without the contributions of many beyond just this office. We are genuinely grateful for their donations of time and support.

Dawn N. Albertson

Chair, Conference Steering Committee

Ashley Brenke

Conference Graduate Assistant

Undergraduate Research Conference Committee Members:

Barb Bergman

Joye Bond

Emily Boyd

Aaron Budge

Kristie Campana

Kathy Dale

Dave Engen

Cindra Kamphoff

Steven Losh

Mark McCullough

Alex Panahon

Laura Riness

Kristin Scott

Todd Shanafelt

URC SPECIAL THANKS

Richard Davenport – President

Anne Blackhurst – Acting Vice-President, Academic Affairs

Terry Flaherty – Interim Dean, Graduate Studies and Research

Marilyn Hart – Director, Undergraduate Research Center

Annie LoPrieno– Director, Research and Sponsored Programs

Kristel Lynch - Grants Specialist and Pre-Award Coordinator

Jeane McGraw - Grants Specialist and Post-Award Coordinator

Douglas Mayo – Vice President, University Advancement

Ann Fee – Interim Chief of Staff, University Advancement

Ken Adams – MSU Site Coordinator, NorthStar STEM Alliance

Moderators and Judges

We would like to add a special thank you to the Minnesota State University, Mankato Foundation Board for six years of generous support of excellent undergraduate research, scholarship and creative practice.



FUNDING SOURCES FOR RESEARCH PROJECTS AT THE 2011 URC

Several of the research and creative projects presented at this year's Minnesota State University, Mankato Undergraduate Research Conference were awarded funding through a competitive grant review process. Funding sources include the generous contributions from two outside sources as well as monies allocated by the University. Awardees of these grants are noted with their abstract. The specific types of funding awards are outlined below.

Minnesota State University, Mankato Foundation Awards: up to \$2,000

These awards are from the Minnesota State University, Mankato Foundation Board to support high quality student scholarship at the University. Each student recipient is given \$1000 as a stipend and up to \$1000 for the supplies necessary for the completion of their project.

NorthStar STEM Alliance Awards: up to \$2,000

These awards are available to students from underrepresented ethnicities enrolled in specific science, technology, engineering and mathematics discipline majors. Each recipient was granted \$1000 in the form of a stipend and up to \$1000 in supplies. This funding was allocated as part of a larger, multi-campus National Science Foundation grant to encourage student research.

Undergraduate Research Conference Large Grant: up to \$1,000

A large grant includes funding for both a student stipend of \$500 and up to \$500 in supplies to aid in the successful completion of their project. These grants are funded by the University.

Undergraduate Research Conference Small Grant: up to \$500

A small grant includes funding for supplies to help aid in the completion of the proposed projects. These grants, like the large grants, are funded by the University.

URC MEDALS AND PRESENTATION AWARDS

Medals - Each student who participates at the URC is awarded a medal in recognition of their scholarly achievement to be worn at the students' graduation ceremony. A solid green ribbon is in recognition of presentation at the URC while a green and gold ribbon highlights recipients of the Foundation Awards.

Presentation Awards - Each poster and oral presentation session is judged by two judges who are graduate students, faculty, or other qualified individuals involved on campus. The best presentation in each session will be recognized with a "Best Presenter" certificate announced at the URC Luncheon. Winners are also noted on the URC website.

**Abstracts were written by the student author(s) and reviewed by faculty mentors. Any opinions expressed do not represent those of the URC Steering Committee or Minnesota State University, Mankato.*

Monday, April 4 Schedule of Events

8:00 – 3:00	Student Presenter, Moderator and Judge Check-in	Lobby by CSU 253/4/5
	Coffee and Snacks Available	CSU 202
9:00 – 10:30	Oral Session 1 Art	CSU 201
9:00 – 10:30	Oral Session 2 Chemistry & Geology, Electrical & Computer Engineering & Technology, and Geography	CSU 204
9:00 – 10:30	Oral Session 3 Accounting and Business Law	CSU 284A
9:00 – 10:30	Poster Session A Communication Studies, Ethnic Studies, Family Consumer Science, Gender & Women’s Studies, Health Science, Human Performance, Psychology, Special Education, and Speech, Hearing & Rehabilitation Services	CSU 253/4/5
11:00 – 12:30	Oral Session 4 Psychology	CSU 201
11:00 – 12:30	Oral Session 5 Mathematics & Statistics	CSU 204
11:00 – 12:30	Oral Session 6 Accounting & Business Law	CSU 284A
11:00 – 12:30	Poster Session B Biological Sciences, Chemistry & Geology, and Physics & Astronomy	CSU 253/4/5
1:30 – 3:00	Oral Session 7 Psychology	CSU 201
1:30 – 3:00	Oral Session 8 Automotive Engineering Technology	CSU 204
1:30 – 3:00	Oral Session 9 Gender & Women’s Studies and Sociology & Corrections	CSU 284A
1:30 – 3:00	Poster Session C Biological Sciences, Computer Science, Electrical & Computer Engineering & Technology, Iron Range Engineering, Mathematics & Statistics, and Mechanical & Civil Engineering	CSU 253/4/5

Tuesday, April 5 Schedule of Events

8:00 – 12:30	Student Presenter, Moderator and Judge Check-in	Lobby by CSU 253/4/5
	Coffee and Snacks Available	CSU 202
9:00 – 10:30	Oral Session 10 Art History and History	CSU 201
9:00 – 10:30	Oral Session 11 English and Human Performance	CSU 204
9:00 – 10:30	Oral Session 12 Computer Science, Mathematics & Statistics, and Mechanical & Civil Engineering	CSU 284A
11:00 – 12:30	Oral Session 13 Economics	CSU 201
11:00 – 12:30	Oral Session 14 Anthropology, Elementary & Early Childhood Education, Ethnic Studies, and Scandinavian Studies	CSU 204
11:00 – 12:30	Oral Session 15 Government	CSU 284A
12:30 – 2:00	Open House	CSU 253/4/5
2:00 – 3:00	Awards Ceremony	Ostrander Auditorium

Art

Artistic Pyrotechnics

Lisa Friedrich (Department of Art)

Elizabeth Miller, Faculty Mentor (Department of Art)

*Recipient of Undergraduate Research Conference Large Grant

National Museum of Iraq: Curating a New Identity

Ajay S. Kapadia (Department of Art)

Curt Germundson, Faculty Mentor (Department of Art)

Combing Printmaking Process with Ceramic Materials

Colin J. Klimesh (Department of Art)

Todd Shanafelt, Faculty Mentor (Department of Art)

*Recipient of Minnesota State University, Mankato Foundation Grant

A New Artform Combining Glass and Ceramics

Kristin J. Harsma (Department of Art)

Todd Shanafelt, Faculty Mentor (Department of Art)

*Recipient of Minnesota State University, Mankato Foundation Grant

A Contemporary Spin on Tradition: Xu Bing's Cultural Exploration

Karen Obermeyer-Kolb (Department of Art)

Alisa Eimen, Faculty Mentor (Department of Art)

Life Cycles and Order

Hope Thier (Department of Art)

Brian Frink, Faculty Mentor (Department of Art)

*Recipient of Undergraduate Research Conference Small Grant

Artistic Pyrotechnics

Lisa Friedrich (Department of Art)

Elizabeth Miller, Faculty Mentor (Department of Art)

*Recipient of Undergraduate Research Conference Large Grant

Fire has played an essential role throughout history. It has been used to create smoke for communication, give heat and produce light however, fire has the reputation of being dangerous and destructive; it carries many negative connotations. As a child I was scolded for having the inclination to play with matches. My mother continually reminded me “Nothing good comes from playing with fire.” I want to change the mindset that encompasses fire. I would like to show how “playing” with fire can create something beautiful. Artists use multiple types of media in creating their artwork. The media I have chosen is an abnormal one, fire. The materials I have chosen are matches and gunpowder. I have also melted foam and paper to create unique textures throughout my work. You are probably wondering the purpose of the materials I listed. These were not randomly chosen components. The matches were placed in a purposeful pattern to create a domino process as each match became lit. Smoke marks created images and the gunpowder explosions created unique shapes. The most special part of my project is the multiple steps used while creating this piece. I used video recording and pictures to catalog the achievement of this project. I chose to present this information for my audience because viewing the creative process helps create a better appreciation for the final project.

National Museum of Iraq: Curating a New Identity

Ajay S. Kapadia (Department of Art)

Curt Germundson, Faculty Mentor (Department of Art)

In April 2003, the National Museum of Iraq was plundered and the substantial majority of its artifacts were looted. The Iraqi people have lost important elements of their socio-cultural identity; the recovery of these priceless items has been slow. By drawing on examples from past and current museum installations, this paper investigates how art has been used for identity formation. Adolf Hitler’s 1937 “temple of art” for example showed Germans as descendants of a Classical “master race.” Fred Wilson’s 1992 installation in Baltimore deconstructed the validity of such a master narrative, questioning the predominance of one discourse over another. This paper tries to argue that the restoring of the stolen artifacts and their display in terms of Iraq’s ethnic multiplicity is a vital step and an opportunity in the creation of a new and diverse Iraq, one in which the various ethnicities are given voice, counter to the identity pushed previously by Saddam Hussein. Thus, the reconceptualization of the National Museum of Iraq into a site of heterogeneous and diverse identity formation is one of many tiers that can be used to reduce what Hofstede calls the “Power Distance”, helping to shape a new Iraqi nation.

Combining Printmaking Process with Ceramic Materials

Colin J. Klimesh (Department of Art)

Todd Shanafelt, Faculty Mentor (Department of Art)

*Recipient of Minnesota State University, Mankato Foundation Grant

The Ceramic and Printmaking disciplines are two highly process and technically oriented fields that require a solid foundation and knowledge of fundamental skills. Ceramics and Printmaking both have histories rooted in tradition. However advancements in digital media technologies are rapidly being integrated into fine arts practices and the computer is becoming a powerful tool in the fine arts realm. By utilizing the computer to create and manipulate imagery, I have been able to use serigraphy, intaglio, and lithography techniques, in combination with inks mixed using ceramic colorants as pigments to transfer imagery to ceramic forms. Each printmaking process requires a different type of ceramic pigment, transfer method, and firing temp and in turn they all lend themselves to different applications and yield different results. Through the exploration of ceramic pigments, ink binders, and transfer papers, and firing methods I was able to successfully achieve and determine the optimal approaches and applications for each technique and medium and successfully integrate digital media into my ceramic and printmaking studio practices. The successful incorporation of graphic two-dimensional imagery on a ceramic surface has enabled me to pursue an interdisciplinary approach to my fine arts practice as well as cohesively utilize digital media as a tool in the Ceramics and Printmaking disciplines.

A New Artform Combining Glass and Ceramics

Kristin J. Harsma (Department of Art)

Todd Shanafelt, Faculty Mentor (Department of Art)

*Recipient of Minnesota State University, Mankato Foundation Grant

My goals and passion as an artist is to overcome boundaries between media of art as well as negative connotations between art versus craft and functional versus nonfunctional art. My primary medium has been stained glass which I have used three-dimensionally. With my latest work I have used glass with ceramics, two media that was previously thought to be incompatible despite the similar basic ingredients such as silica. The extremely different melting points and shrinkage rates have been the main obstacles to overcome in working with these two elements in the same finished work. My goal with this project was to have various sections of glass surrounded by the clay structure so that light can still pass through the glass. Through experimentation and research I have accomplished my initial goals with potential to continue refining my results during my early career as an artist. The workshop I attended in Santa Fe, New Mexico gave me the appropriate knowledge I needed to realize my ideas as well as providing me with valuable contacts for my future. This project has made and will continue to make a very significant impact on my artwork as well as prepare me for my career as an artist after I graduate in the spring of 2011.

A Contemporary Spin on Tradition: Xu Bing's Cultural Exploration

Karen Obermeyer-Kolb (Department of Art)

Alisa Eimen, Faculty Mentor (Department of Art)

This paper analyzed the artwork of Xu Bing and his exploration of cultural values, specifically of language in China. Chinese is one of the oldest written languages of the world, with forms established by 1000CE. One of the purposes of classical Chinese calligraphy was self expression. The Cultural Revolution of the 1960s and '70s brought a shift to this tradition by using large characters as propaganda. Xu Bing uses prominent symbols of culture and language, stemming from the classical teaching of his parents and his work experience during the Cultural Revolution, to convey views of society, as well as to challenge them. In "The Book from the Sky" he presents a confronting image of Chinese language in classical forms of scrolls and single sheets, which seems authentic but is in fact made with characters invented by the artist. The work shuns the idea of any meaning through reading and portrays the struggle of communication and keeping traditions alive. My paper argues that Xu Bing's artwork demonstrates how powerful cultural tradition can be in contemporary art. Culture provides the audience with easily recognized symbols and creates restrictions on the interpretation of the art.

Life Cycles and Order

Hope Thier (Department of Art)

Brian Frink, Faculty Mentor (Department of Art)

*Recipient of Undergraduate Research Conference Small Grant

Order and life cycles within nature are the fundamentals of its complexity. The project began by becoming more aware of the intricate designs and patterns that nature constructs. In a way, nature doesn't construct the patterns, humans do as a way of seeing nature itself. I enhanced and elaborated that concept by making ornate structures within the already given 'patterns' that nature offers. By doing so it makes them more apparent and more of a focal point. Within these 'patterns' life unfolds through birth, growth, and death creating its own order. The three paintings primarily depict the lifestyles, habits, and survival techniques of ants, worms and spiders. Learning more about them gave an insight into who they are as creatures rather than what is perceived of them. Each canvas started with an underpainting and through added layers developed a life all its own. They can be viewed separately, but together create a story and are much stronger.

Chemistry & Geology, Electrical & Computer Engineering & Technology, and Geography

Pleistocene Glaciation and Climate of the Little Prickly Pear Watershed, Western Montana

Tyler D. Boley (Department of Chemistry and Geology)

Chad A. Wittkop, Faculty Mentor (Department of Chemistry and Geology)

*Recipient of Undergraduate Research Conference Large Grant

Optimization of Reactive Ion Etching (RIE) Parameters for Selective Removal of MOSFET Gate Dielectric and Evaluation of its Physical and Electrical Properties

Hojoon Lee (Department of Electrical & Computer Engineering & Technology)

Samuel C. Wood (Department of Electrical & Computer Engineering & Technology)

(All researchers participated equally)

Muhammad A. Khaliq, Faculty Mentor (Department of Electrical & Computer Engineering & Technology)

Suitable Locations for Photovoltaic Solar Panels at Minnesota State University

Benjamin Mackedanz (Department of Geography)

Fei Yuan, Faculty Mentor (Department of Geography)

Pleistocene Glaciation and Climate of the Little Prickly Pear Watershed, Western Montana

Tyler D. Boley (Department of Chemistry and Geology)

Chad A. Wittkop, Faculty Mentor (Department of Chemistry and Geology)

*Recipient of Undergraduate Research Conference Large Grant

Field mapping and aerial photo interpretation of the Little Prickly Pear Watershed in western Montana allowed us to identify glacial features from the last glacial maximum of the Pleistocene Epoch, nearly 20,000 years ago. We also documented glacial features in the field, such as cirques (where the glacier originated on the mountain) and moraines (a feature left behind by a glacier that is mainly composed of gravel, sand, and clay). Lateral and terminal moraines were identified in the field by their shape, position, and clast composition, then located using GPS. By interpreting our field data through Microsoft Excel and Geographic Information Systems (GIS) techniques, we were able to reconstruct the thickness of glacial ice, the extent to which it flowed, and the equilibrium line altitude (ELA) of these glaciers. An ELA is the line on a glacier above which it does not melt during the summer. We hypothesized that our reconstruction of ice elevation and extent would be lower than that suggested previously by workers. The results were that the average thicknesses of glacial ice for several of the nearby cirques and the extent of ice were larger than previously described. These results suggested a colder Pleistocene climate in the region than previous studies indicate.

Optimization of Reactive Ion Etching (RIE) Parameters for Selective Removal of MOSFET Gate Dielectric and Evaluation of its Physical and Electrical Properties

Hoon Lee (Department of Electrical & Computer Engineering & Technology)

Samuel C. Wood (Department of Electrical & Computer Engineering & Technology)

(All researchers participated equally)

Muhammad A. Khaliq, Faculty Mentor (Department of Electrical & Computer Engineering & Technology)

The integrated circuit (IC) is dominated by technology using Complementary Metal-oxide-Semiconductor Field-effect Transistor (CMOSFET). In order to put over 300 million transistor on silicon chip requires selective removal of material by Reactive ion etching (RIE) which ensures vertical cut thereby increasing packing density of devices on the chip. The gate insulator of CMOS devices plays a crucial role in its electrical performance. In this research gate insulator of MOS FET has been etched by state-of-art technique RIE and its physical and electrical properties have been measured. The gate insulator etching by RIE give rise to charge accumulation on the gate dielectric resulting in change in threshold voltage. Also early breakdown of MOS devices is a direct consequence of charge accumulation on gate dielectric during RIE process.

The gate oxide of different thicknesses was grown in the Microelectronics Fabrication laboratory located in Trafton S194-196. The RIE etching was performed with Technic RIE unit, and it was optimized in respect of power, pressure, and composition of gases to achieve less charge accumulation, and stable threshold voltage. The physical properties such as thickness of insulator before and after etching were measured by Ellipsometer and NanoSpec, and charges accumulated on gate oxide was measured by HP high frequency capacitance-voltage (C-V) measurement system. Annealing of the RIE etched gate oxide were performed at suitable temperature to bring the charges to minimum level. Results of the research are presented in tables and figures.

Suitable Locations for Photovoltaic Solar Panels at Minnesota State University

Benjamin Mackedanz (Department of Geography)

Fei Yuan, Faculty Mentor (Department of Geography)

One of the biggest and hottest topics of today has been the ideas of going green and saving energy. There have also been problems with funding and budget cuts and the University should be looking into ways to lower spending. This project provides a solution for saving energy and preserving our environment by setting up solar panels throughout the campus rooftops. The areas throughout the campus that would be most suitable for the installation of Photovoltaic cells (solar panels) is mapped. A method for optimal sunlight and maximum production estimation is developed using GIS technique and remote sensing data. Very high resolution (1m) digital terrain surface and elevation data collected by LIDAR (Light Detection and Ranging) system is used to calculate areas that received 1kwh/m squared per day on average throughout the year. A spatial model is also created to automate the entire process. The method and model created in the project demonstrate an innovative way for energy saving. They can be easily adapted and used in many other green energy-related projects.

Accounting & Business Law

Text Messaging While Driving: Is it time to make a change?

Jeffrey Boland (Department of Accounting & Business Law)

Cody Bergendahl (Department of Accounting & Business Law)

Suman Bhattarai (Department of Electrical Engineering)

Zac Bleninger (Department of Information Technology)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

Constitutionality of Obama's Mandate

Matt Kortuem (Department of Finance)

Gihanthi De Silva (Department of Communication Studies and Management)

Laura Larsen (Department of Marketing and Management)

Jon Monson (Department of Construction Management)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

Assisted Suicide

Joshua Quittem (Department of Accounting & Business Law)

Adnan Rafiq (Department of Accounting & Business Law)

Julian Ramirez (Department of Accounting & Business Law)

Jacklyn Rasmussen (Department of Marketing & International Business)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

Death Penalty Comparison study of China and the U.S.

Micheal Thielen (Department of Accounting & Business Law)

Nadia Sultana (Department of Accounting & Business Law)

Michael Tilton (Department of Accounting & Business Law)

Alisha Wakefield (Department of Accounting & Business Law)

Penny Herickhoff, Faculty Mentor (Department of Accounting & Business Law)

Text Messaging While Driving: Is it time to make a change?

Jeffrey Boland (Department of Accounting & Business Law)

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Zac Bleninger (Department of Information Technology)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

With people's busier lifestyles today, cell phone usage while driving in motor vehicles goes hand in hand. With this increasing cell phone usage while driving, the chances of distraction increase. This may lead to an increase in accidents. The purpose of this study is to find out how distracting cell phone use is while driving. 30 states currently ban handheld cell phone use while driving. Our research has shown that cell phone usage while driving is dangerous and leads to more accidents than need be.

Constitutionality of Obama's Mandate

Matt Kortuem (Department of Finance)

Gihanthi De Silva (Department of Communication Studies and Management)

Laura Larsen (Department of Marketing and Management)

Jon Monson (Department of Construction Management)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

Obama care has been defended as a proper exercise of government power under the Commerce Clause of the United States Constitution, which states that the United States Congress shall have power "To regulate commerce with foreign Nations, and among the several States, and with the Indian Tribes". Under the Commerce Clause, Article 1- Section 8, we have determined that President Obama's Health Care Reform Law is unconstitutional and is detrimental to the freedom of all American citizens. We have further determined that the Health Care Reform Law is a raw abuse of power by the federal government and a dangerous extension of the Commerce Clause.

Assisted Suicide

Joshua Quittem (Department of Accounting & Business Law)

Adnan Rafiq (Department of Accounting & Business Law)

Julian Ramirez (Department of Accounting & Business Law)

Jacklyn Rasmussen (Department of Marketing & International Business)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

Everyone has their own beliefs, and supporters of legislation legalizing assisted suicide claim that all persons have a moral right to choose freely what they will do with their lives as long as they inflict no harm on others. This right of free choice includes the right to end one's life when chosen. There are many who want to die, but whose disease, handicap, or condition renders them unable to end their lives in a dignified manner. When such people ask for assistance in exercising their right to die, their wishes should be respected. The debate lingers on whether to legalize assisted suicide. Committing assisted suicide is the most empathetic and moral option for individuals who are in constant state of pain and/or near death. Many would argue that people in this much pain or suffering are not in the right state of mind to make this decision. The fact is, if there is not a significant chance that a person is going to recover from their illness they should have the choice to end their suffering. We will look up Laws from countries and states that allow assisted suicide and see how they were able to enact these laws through the legal system as to prove it's' legality.

Death Penalty Comparison study of China and the U.S.

Micheal Thielen (Department of Accounting & Business Law)

Nadia Sultana (Department of Accounting & Business Law)

Michael Tilton (Department of Accounting & Business Law)

Alisha Wakefield (Department of Accounting & Business Law)

Penny Herickhoff, Faculty Mentor (Department of Accounting & Business Law)

China has more executions in death penalty cases than all other nations in the world. This research studied what kinds of crimes can result in death penalty in China and compared them the crimes that can result in death penalty in the 35 U.S. states and U.S. federal government death penalty laws. This research also compared the death penalty legal process and appeal process in both countries.

Communication Studies, Ethnic Studies, Family Consumer Science, Gender & Women's Studies, Health Science, Human Performance, Psychology, Special Education, and Speech, Hearing & Rehabilitation Services

1 - Communication and Web Design- A Critical Look at the Communicative Process of Web Design

Mahamadou Tahirou (Department of Communication Studies and Information Technology)

Kristen Cvancara, Faculty Mentor (Department of Communication Studies)

Kristen Treinen, Faculty Mentor (Department of Communication Studies)

2 - Communication Audit: Evaluating Communication Strategies for the INROADS Greater Lake Regions of Chicago, Minneapolis/St.Paul, Indianapolis and Milwaukee

Brittany Alexander (Department of Mass Communications)

Kebba Darboe, Faculty Mentor (Department of Ethnic Studies)

3 - Race and Psychiatric Services in Africa

Nasra Moalim (Department of Ethnic Studies)

Kebba Darboe, Faculty Mentor (Department of Ethnic Studies)

4 - What Do Students Know About Food and Nutrition and How Does That Affect Their Food Intake?

Chelsea Gauer (Department of Family Consumer Science)

Ashley Bohn (Department of Family Consumer Science)

Merideth Lamberger (Department of Family Consumer Science)

Sue Fredstrom, Faculty Mentor (Department of Family Consumer Science)

*Recipient of Undergraduate Research Conference Small Grant

5 - Runaway services and their shortcomings: Addressing the need for greater awareness of girl runaways in Minnesota

Danica Das (Department of English)

Katherine Day (Department of Gender & Women's Studies)

Allison Matthews (Department of Mass Communications)

Dawn Rae Davis, Faculty Mentor (Department of Gender & Women's Studies)

6 - Inconsistency of Law Enforcement in Minnesota: How the System Fails Victims of Domestic Violence

Katrina Culhane (Department of Social Work)

Brandon Kuphal (Department of Sociology)

Alesha Sullivan (Department of English)

(All researchers participated equally)

Dawn Davis, Faculty Mentor (Department of Gender & Women's Studies)

7 - Obesity Among Latino Adolescents: The Role of Acculturation

Paulina Manzo (Department of Health Science)

Judith Luebke, Faculty Mentor (Department of Health Science)

8 - Prospective mothers' awareness and knowledge of environmental impacts upon pregnancy

Amanda M. Vang (Department of Health Science and Biological Sciences)

Judith K. Luebke, Faculty Mentor (Department of Health Science)

9 - Does cold water immersion improve recovery of strength, power, and endurance following exhaustive exercise?

Kelsey Picha (Department of Human Performance)

Adam Scofield (Department of Human Performance)

(All researchers participated equally)

Patrick Sexton, Professor (Department of Human Performance)

10 - A Window into the Classroom: The Influence of A Virtual Window Environment on Attention

Britten Block (Department of Psychology)

Karissa Borchert (Department of Psychology)

(All researchers participated equally)

Karla Lassonde, Faculty Mentor (Department of Psychology)

*Recipient of Undergraduate Research Conference Large Grant

11 - Examining the Characteristics of School Psychology Programs Accredited by the American Psychological Association

Carissa A. Borchardt (Department of Psychology)

Amber L. Sanz (Department of Psychology)

Carlos J. Panahon, Faculty Mentor (Department of Psychology)

*Recipient of Undergraduate Research Conference Small Grant

12 - A Historical Job Analysis for Steward Position at a State Mental Hospital

Tony Cooley (Department of Psychology)

Andrea Lassiter, Faculty Mentor (Department of Psychology)

13 - Objective Measurement of Functional Analysis Data

Jessica A. Day (Department of Psychology)

Brianna D. Smith (Department of Psychology)

Carlos J. Panahon, Faculty Member (Department of Psychology)

*Recipient of Minnesota State University, Mankato Foundation Grant

14 - Lie Detection: The Role Likability Plays on the Liar and Truth Teller

Matthew Duggan (Department of Psychology)

Emily Stark, Faculty Mentor (Department of Psychology)

15 - Services Provided in Residential Treatment Centers for Children

Amanda Hurlbutt (Department of Psychology)

Nicole Draheim (Department of Psychology)

Eric Kuehn (Department of Psychology)

Carlos J. Panahon, Faculty Mentor (Department of Psychology)

16 - From Insane Asylums to Treatment Centers: Some Historical Points

John Grooms (Department of Psychology)

David Deaconson (Department of Psychology)

(All researchers participated equally)

Andi Lassiter, Faculty Mentor (Department of Psychology)

17 - Urinary Incontinence among College Athletes

Sarah Marsh (Department of Psychology)

Brianna McLaughlin (Department of Psychology)

Britta Fiksdal, Graduate Research Assistant (Department of Psychology)

Daniel Houlihan, Faculty Mentor (Department of Psychology)

18 - Mental Illness Diagnosis and Treatments of the Past and Present

Christopher L. Newman (Department of Psychology)

Andrea Lassiter, Faculty Mentor (Department of Psychology)

19 - Decision Making and Personality

Megan Petersen (Department of Psychology)

Amber Schramm (Department of Psychology)

(All researchers participated equally)

Emily Stark, Faculty Mentor (Department of Psychology)

20 - An In-Depth Exploration of the 1880 Fire at the Minnesota State Hospital for the Insane.

Amber L. Sanz (Department of Psychology)

Andi Lassiter, Faculty Mentor (Department of Psychology)

21 - Evaluating Teacher Perceptions of Rewards

Jaime J. Schroeder (Department of Psychology)

Amy Rempher (Department of Psychology)

(All researchers participated equally)

Kevin J. Filter, Faculty Mentor (Department of Psychology)

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22 - A Review of Two Potential Risk Factors Among Gifted Students

Melissa M. Sowers (Department of Psychology)

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Bonnie Lund, Faculty Mentor ((Department of Speech, Hearing, and Rehabilitative Services)

Communication and Web Design- A Critical Look at the Communicative Process of Web Design

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Kristen Treinen, Faculty Mentor (Department of Communication Studies)

With the tremendous advances in technology and the availability of the *internet*, many business owners saw the potential of bringing their stores to our homes through their *websites*. The internet nowadays is populated with numerous websites serving different purposes and targeting different audiences. This study examines the process used by most *web designers* in *web development* and proposes a more efficient option that incorporates a better analysis of the targeted audience. To better understand the actual approach used by most web designers, the content of six popular websites has been analyzed throughout the course of this study. In addition to the websites themselves, three manuals used by web developers have also been scrutinized. The application of the new web design process discussed in this analysis is expected to generate more efficient and user friendly websites, which in turn will increase the number of users and their satisfaction. This innovative method is also likely to cut the time spent in *web design* by filtering features and functionalities that are not solicited by the *end users*.

Keywords: Internet, websites, web Designers, web Development, web Design, end users.

Communication Audit: Evaluating Communication Strategies for the INROADS Greater Lake Regions of Chicago, Minneapolis/St.Paul, Indianapolis and Milwaukee

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Kebba Darboe, Faculty Mentor (Department of Ethnic Studies)

Practically, this study sought to evaluate the relationship between various methods of communication and their levels of effectiveness within a community organization following an organizational merger. The use of a communication audit helped to identify organizational communication practices and their level of effectiveness within internal communication. With the state of the current economy, many community organizations have been forced into mergers which threaten the strength of their organization. From this study, I hoped to find out whether preferential methods of communication within the community organization INROADS, impacted the overall level of effectiveness and identify areas in which communication within the organization could be improved. INROADS is an internship organization that has a mission to develop and place talented minority youth into business and industrial environments as a means to prepare them for corporate and community leadership. The organization has recently merged its offices within the greater lakes regions. The participants of the study were INROADS employees of the Greater Lake Regions, selected for their participation by current employment status with the organization. A questionnaire was used to assess their methods of communication. The questionnaire included a combination of qualitative and quantitative questions. Participants were asked to indicate the method of communication that best represented those that were most commonly used within the organization as well as those they felt should be used, however were not currently being used. Higher scores indicated greater levels of agreement regarding areas for improvement.

Race and Psychiatric Services in Africa

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Abstract: This project was designed to collect and share information in order to have a better understanding the connection between race and psychiatric services in Africa. This study involved in-person interviews with a psychiatrist and Somali elders between 40 and 80 years old. Elders provided personal stories and experiences of past generations. **Introduction:** This project was designed to collect and to share information in order to get a better understanding of the connection between race and psychiatric services in Africa. The project gave Somali elders an opportunity to share their personal struggles of being effected with a mental health disorder or having someone close affected. **Data analysis** was conducted to identify themes. **Project Goals:** Goals of the project included: To learn more about the health care system in Africa. To learn more about the psychiatric services available in Africa. To give Somali elders an opportunity to share their personal stories. **Research Questions:** This study involved two research questions: What types of health care system is available in Africa? What are the different methods of dealing with mental health disorders in Africa? **Significance of the Project:** People in Sub-Saharan Africa have the worst health, on average, in the world. The region has 11 percent of the world's population, 24 percent of the global disease burden, and lacks the infrastructure to provide even basic health care to its people. **Conclusion:** This project was designed to collect and to share information in order to get a better understanding of the connection between race and psychiatric services in Africa. The project gave Somali elders an opportunity to share their personal struggles of being effected with a mental health disorder or having someone close affected. Future studies might indicate similar results.

What Do Students Know About Food and Nutrition and How Does That Affect Their Food Intake?

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It is well known that college students do not follow healthy dietary practices. In prior studies, intake of fruits and vegetables has been shown to be less than optimal, while fat, sodium, and calorie intake is high. Lack of knowledge may be one reason for these habits. In this study, we assessed what traditional college students know about nutrition and how that knowledge impacts their food intake. We also asked students how they best obtain knowledge to make healthier food choices.

An on-line survey was sent out to 3,000 randomly selected MSU undergraduates, 268 responses (9%) were received. Survey questions asked about experiences with food, and included a comprehensive food and nutrition 'quiz' to determine their level of general knowledge. Findings show that 32% of respondents have taken a nutrition related class, 53% of respondents do all or most of their purchasing and preparation, and most (72%) want to learn more about nutrition. About half of the participants read labels paying attention to calories, fat and sodium. Quiz questions were answered correctly 31-81% of the time. We will also be conducting five focus groups of 8-10 volunteer students per session to discuss nutrition topics and their views. Food and nutrition knowledge, cooking experiences, portion sizes and potential forms of nutrition education will be discussed.

These results demonstrate a need for further nutrition education within the student body. Lack of knowledge may be one factor in poor nutrition, but students show interest in learning more about foods and nutrition.

Runaway services and their shortcomings: Addressing the need for greater awareness of girl runaways in Minnesota

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Katherine Day (Department of Gender & Women's Studies)

Allison Matthews (Department of Mass Communications)

Dawn Rae Davis, Faculty Mentor (Department of Gender & Women's Studies)

“The Nation Network of Runaway and Youth Services estimated that there are approximately 1 million to 1.3 million runaway and homeless youths each year in the United States.” (MacKay, Hughs, 2004) There are many services and organizations that strive to combat this issue, yet thousands of girls under the age of eighteen go under-served or are placed back into an environment of cyclical violence due to their age and parental rights issues. Further research highlights that access to alternative education, transportation, documentation/record retrieval services, and life skills education are services in high demand among runaway girls under the age of eighteen. When social services fail to offer programs that deal with these issues, homeless and runaways girls are subjected to further disenfranchisement and a lower quality of life. Using content analysis, we examined the available social services in south central Minnesota, highlighted areas in need of improvement, and considered ways to implement more complete programs for runaway girls. The benefit of our research included suggesting to south central Minnesota services the application of long-term programs that use a feminist lens to provide more comprehensive help for runaway girls.

Inconsistency of Law Enforcement in Minnesota: How the System Fails Victims of Domestic Violence

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Brandon Kuphal (Department of Sociology)

Alesha Sullivan (Department of English)

(All researchers participated equally)

Dawn Davis, Faculty Mentor (Department of Gender & Women's Studies)

According to the 2010 Femicide Report put out annually by the Minnesota Coalition for Battered Women (MCBW), 28 people were murdered in 2010 in Minnesota as a direct result of domestic violence. Of those, 15 women were killed by a “current or former intimate partner.” A third of these women had a known history of domestic abuse with their killer, prior law enforcement involvement, and/or an Order for Protection (OFP) in place at the time of the homicide. Of the 15 femicide cases, we compared those that had prior law enforcement involvement and those that did not. Our research shows that in cases where law enforcement was involved, opportunities for critical intervention were missed, and law enforcement allowed these victims to fall through the cracks into lethal violence. Women need better protection against threats and attempts to leave their abusers. Ten of the aforementioned femicides were separated from the perpetrator or attempting to leave when they were murdered. Our research shows and illuminates the need for better implementation of the existing domestic violence laws in Minnesota so that no one has to lose a family member, a loved one, or a friend to domestic violence ever again.

Obesity Among Latino Adolescents: The Role of Acculturation

Paulina Manzo (Department of Health Science)

Judith Luebke, Faculty Mentor (Department of Health Science)

Statistical data have shown that young Latinos have the highest rates of obesity among all ethnic groups. Obesity in the general population is a major health concern in the United States, but it is believed that acculturation plays an important factor in Latino adolescents. Acculturation is a process in which a person adapts to a new culture or environment. Research indicates that often, during acculturation healthy behaviors decline, leading to behaviors that result in a higher risk of obesity. This research study investigated cultural, social, and behavioral factors that can affect Latino adolescents' eating and health practices, which in turn influence obesity rates. Data about Latino parents' eating practices and food choices in the context of acculturation were also collected in this study. By including Latino parents as subjects, a broader understanding of the impact of acculturation upon food choice and eating behaviors with the family and across generations was achieved. The methods for this study were both qualitative and quantitative. Surveys were distributed to subjects at the high school, community learning centers and churches in Worthington Minnesota, a rural community with a large population of Latino residents. By learning more about the factors that affect obesity through the acculturation process; it is hoped that we can implement effective health education programs in our communities that will help lower the rates of obesity.

Prospective mothers' awareness and knowledge of environmental impacts upon pregnancy

Amanda M. Vang (Department of Health Science and Biological Sciences)

Judith K. Luebke, Faculty Mentor (Department of Health Science)

Healthy pregnancies and optimal fetal development are crucial to ensure a healthy future for not only the mother and child but for our society as a whole. In addition to personal health behaviors and genetic factors, environmental toxins can pose significant risks to the pregnant woman and her developing fetus. A recently initiated longitudinal study of children in Ramsey County, Minnesota seeks to investigate the long term health consequence of exposure to environmental pollutants including radiation and selected chemicals. (MPR NEWS, January 24, 2011 minnesota.publicradio.org/display/web/2011/01/24/national-childrens-study/) Prenatal education, including avoidance of environmental contaminants, for pregnant women can help reduce these risks and complications by informing pregnant woman about the impact of environmental factors. The purpose of this research was to determine prospective mothers' awareness and knowledge of environmental impacts upon pregnancy and fetal development. Data were collected by written survey from pregnant women attending selected prenatal education classes in both rural and urban Minnesota cities.

Does cold water immersion improve recovery of strength, power, and endurance following exhaustive exercise?

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Adam Scofield (Department of Human Performance)

(All researchers participated equally)

Patrick Sexton, Professor (Department of Human Performance)

Content: The physiological effects of cryotherapy include; decreased cell metabolism, vasoconstriction, decrease nerve conduction, decrease muscle spasms, and decrease tissue temperature. In immediate care of injuries, cryotherapy is used to prevent inflammation, stimulate delta-A nerve fibers to reduce pain, and slow cell metabolism, which will decrease secondary tissue death due to hypoxia. In competitive athletics some athletes and coaches believe that the use of cold water immersion will accelerate recovery and enhance subsequent performance. This accelerated recovery appears to be at odds with the known physiologic effects of cryotherapy. **Objective:** The purpose of this study is to determine whether or not cold water immersion has an effect on the strength, power, or endurance of college-age male lacrosse athletes following an exhaustive exercise bout. **Design:** Randomized controlled experimental design. **Subjects:** Twelve male (mean age=19.9, SD =1.29) subjects from a University club LaCrosse team volunteered to participate in this study. **Setting:** A university athletic training facility and equipment were used for data collection. **Results:** Data collection is ongoing at this time; preliminary data via comparison of the means shows no difference in among the control and variable group subjects on objective measures. Subjectively all subjects in the experimental group reported feeling improvement in their post-test performance compared to their pre-test. **Conclusion:** There was no difference between the control and variable groups on objective measures. Subjectively the subject's perception of improvement following cold water immersion could be due to the widespread belief in the use of cold immersion as a means of improving recovery.

A Window into the Classroom: The Influence of A Virtual Window Environment on Attention

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(All researchers participated equally)

*Recipient of Undergraduate Research Conference Large Grant

This study examined the influence of virtual windows, used to simulate windows in a classroom, on attentional tasks. Forty undergraduates took the Trail Making Task (TMT) and Benton's Controlled Oral Word Association Test (COWA) in a classroom with either virtual windows displaying nature scenes, or blind-covered windows. Results on the TMT and COWA revealed that virtual windows had a positive influence on participants' ability to complete these tasks and that participants were more efficient at the TMT in the virtual window condition compared to the no window condition. These results indicate that virtual windows were not a distraction in the classroom and had a positive effect on performance. Implications for using virtual windows in classrooms without windows are discussed.

Examining the Characteristics of School Psychology Programs Accredited by the American Psychological Association

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Amber L. Sanz (Department of Psychology)

Carlos J. Panahon, Faculty Mentor (Department of Psychology)

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The current study examined the characteristics of the 61 school psychology doctoral graduate programs that are accredited by the American Psychological Association (APA). The researchers examined the general characteristics of the 55 Ph.D. programs and 6 Psy.D. programs by conducting an extensive review of each program's website. For example, the investigators examined the number faculty members, highest degree held by professors, and graduate school professors attended. In addition, the researchers looked at which department houses the school psychology graduate program. While examining the faculty currently working at these accredited programs, it was discovered that 22 out of the 61 programs have "homegrown" professors. That is, professors who earned their graduate degree at the university for which they are now employed. In total, 36.1% of professors in the 61 programs obtained their degree from the university at which they currently teach. The two universities with the highest number of "homegrown" professors are University of California, Berkeley and University of Missouri, Columbia. Additional findings will be discussed.

A Historical Job Analysis for Steward Position at a State Mental Hospital

Tony Cooley (Department of Psychology)

Andrea Lassiter, Faculty Mentor (Department of Psychology)

The purpose of this project was to analyze the career and personal life of an historical figure who worked at the first Minnesota Hospital for Insane, presently referred to as the Saint Peter Regional Treatment Center. This study consisted of conducting a historical job analysis for the position of hospital Steward. George W. Dryer was the first formal Steward at the hospital and held the position for 21 years. Data about him and the Steward position were collected from publically available state historical documents, and qualitative results are described in this presentation. Tasks, knowledge, skill, ability, and other characteristics are compared to present-day jobs with different titles, but similar roles. Results can be used to better understand changes in jobs over time, particularly those in mental health fields.

Objective Measurement of Functional Analysis Data

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*Recipient of Minnesota State University, Mankato Foundation Grant

A functional analysis (FA) is a procedure used to identify the trigger of a problem behavior, and the maintaining consequence/s of that behavior. Once the reinforcing consequences are identified, an intervention can be created by targeting each of those reinforcers. Within FA data, there may be more than one identifiable maintaining function. Although, at this point there is no objective criteria for determining what those primary functions are. In this study, we proposed an objective criterion of 30 percent. This means that any consequence that is associated with 30 percent or more of the targeted behaviors shall be considered one of the maintaining functions and should also be included in the intervention. We used FA studies that were published in *The Journal of Applied Behavior Analysis* prior to 2011 to complete this study. For each study that included a functional analysis, we collected the frequency of the problem behavior, the identified function/s included in each intervention and also the author's statement of the interventions success or failure in meeting its particular goal. We then applied our 30 percent criterion to each article's FA to decipher which articles did identify the same function/s as our criterion and which did not. We then used a one-way ANOVA to determine any statistical differences in regards to intervention success within articles that did and did not fit our criterion. Our results provide method of FA data analysis that will help create more effective interventions leading to more positive treatment outcomes.

Lie Detection: The Role Likability Plays on the Liar and Truth Teller

Matthew Duggan (Department of Psychology)

Emily Stark, Faculty Mentor (Department of Psychology)

Current popular crime dramas such as, "Lie to Me" make lie detection seem easy and scientific. However, there is much more to detecting lies than just looking at facial expressions. Trustworthiness and detecting lies and truth may be correlated to how others perceive the individual, that is, the person telling the truth or lie. Previous research has found that people with high credibility, are more likely to be believed than people with low or no credibility, even when high credibility people are lying (Bond and DePaulo, 2008). To examine this idea further, in the current study volunteers watched eight videos that presented either people lying or people telling the truth. Participants answered questions about how they perceived the storyteller, and whether they thought the person was telling a lie or a truth. Questions about the storyteller involved whether they thought the story was a lie, how much they liked the person in the video, and whether they trusted the person in the video. Specifically, they rated how much they liked the person in the video, and whether they trusted the person in the video. It is hypothesized that participants will rate individuals as being honest and trustworthy according to how much they like the individual in the video, such that people who are liked more are also perceived as more trustworthy.

Services Provided in Residential Treatment Centers for Children

Amanda Hurlbutt (Department of Psychology)

Nicole Draheim (Department of Psychology)

Eric Kuehn (Department of Psychology)

Carlos J. Panahon, Faculty Mentor (Department of Psychology)

This study conducted a review of the services provided to children in residential treatment centers in order to evaluate the strengths and weaknesses of the services offered in Minnesota. Many of the children who are placed in residential treatment centers exhibit aggressive behaviors, delinquency, anxiety, or depression. Evaluating the success of the programs in the residential treatment centers was difficult. There were a variety of types of residential facilities and the services provided at each vary greatly. Questions remain as to the effectiveness of the support provided for academic and social areas in the residential treatment centers. Additional areas of concerns included costs of receiving treatment, training of staff, appropriate interventions, communication with families, and the transition back to home and school. Additional research is recommended to develop a standardized method for developing and evaluating services to ensure overall success for the children in residential treatment centers.

From Insane Asylums to Treatment Centers: Some Historical Points

John Grooms (Department of Psychology)

David Deaconson (Department of Psychology)

(All researchers participated equally)

Andi Lassiter, Faculty Mentor (Department of Psychology)

Whether referred to as insane asylum, mental hospital, or treatment center, these facilities were created for the same basic purpose: to house the mentally ill. The first step in any project is to obtain enough funding to go ahead with the project. Next, space is needed as are facilities. Finally, there has to be a way to treat such individuals that have these mental illnesses. Each of these is essential for the other to exist. Without funding there can be no one to treat and no facility to treat at. Without a facility there can be no place for people to treat. Without treatments there wouldn't be a project to begin with. Each of these is intertwined within each other and must be looked at from an individual standpoint as well as an entanglement of all of them. The following report attempts to discuss the details of all three of the aforementioned aspects both separately and together.

Urinary Incontinence among College Athletes

Sarah Marsh (Department of Psychology)

Brianna McLaughlin (Department of Psychology)

Britta Fiksdal, Graduate Research Assistant (Department of Psychology)

Daniel Houlihan, Faculty Mentor (Department of Psychology)

Urinary incontinence is the involuntary loss of urine which results in social discomfort and poor hygiene. The causes include coughing, sneezing, physical activity, and sudden body movements (Dockter, Kolstad, Martin, & Schiwal). This study looks at the problem amongst athletes who were asked questions regarding the sport they participate in and their health. The population consists of both males and females ranging from ages 18 to 29 years old and there was a variety of ethnicities who participated. The purpose of the study was to see whether or not athletes are more prone to experiencing urinary incontinence compared to non-athletes and also if athletes are more willing to report urinary incontinence. Information about the sport the individual is in, how often they work out or exercise, whether or not they are sexually active, and whether or not they have experienced urinary incontinence or if anyone they know has experienced urinary incontinence and the frequency was collected through the survey. The data has been gathered and is currently being analyzed.

Mental Illness Diagnosis and Treatments of the Past and Present

Christopher L. Newman (Department of Psychology)

Andrea Lassiter, Faculty Mentor (Department of Psychology)

The Minnesota State Hospital for the Insane, in St. Peter, was established in 1866 during the “asylum era.” This era was caused by industrialization and population growth, which created a need for expansion in the number of state hospitals and asylums. The mental hospitals were quickly filled with patients who suffered from a variety of different ailments in order to relieve the overcrowded jail systems. Some of the alleged causes of insanity during the late 1800’s that would deem a person insane would not be considered that of an insane man today. As the field of psychology matured so did the understanding of diseases and cures of the mentally ill. The state hospitals started receiving fewer individuals who were not actually mentally ill. This enabled the hospitals to better attend to patients who actually needed to be institutionalized. This project analyzes the reason for admittance to Minnesota State Hospital during the late 1800’s and late 1900’s, as well as the treatments of mental disease during these two periods. The research will use annual reports from the hospital, newspapers, autobiographies, and other documents that the hospital recorded.

Decision Making and Personality

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(All researchers participated equally)

Emily Stark, Faculty Mentor (Department of Psychology)

Previously, research has shown that participants who relied more on their emotions when making decisions were more likely to be influenced by the wording of the decision options than participants who did not rely on their emotions as much (Stark et al., unpublished manuscript). The framing effect refers to how wording of a specific topic affects the conclusions people draw, but little is understood about how frame affects choice (Tversky & Kahneman, 1981). This research examines how intuitive and rational personality traits influence decisions regarding threats to human life and property. The college students who participated in this study were given various decision scenarios presenting threats to human life and property. After reading each scenario, participants were instructed to express their thoughts concerning two competing plans in an open-ended format. Participants were also asked to choose between two plans for each scenario. Finally, participants completed questionnaires detailing their individual personality traits. We are interested in comparing personality traits and the decisions made between the two types of scenarios with the open ended thought responses. We expect to find that participants who are more intuitive and emotional will make different choices and show a stronger framing effect than participants who are less intuitive and emotional.

An In-Depth Exploration of the 1880 Fire at the Minnesota State Hospital for the Insane.

Amber L. Sanz (Department of Psychology)

Andi Lassiter, Faculty Mentor (Department of Psychology)

The purpose of this research was to describe, in a historical context, the effects of a devastating fire on the Minnesota State Hospital for the Insane. This fire in 1880 destroyed a large part of the asylum where patients lived and were treated for mental illness. Along with much property damage, there were many injuries and deaths. In particular, some of the “treatments” of the day included warm beds as well as seclusion and restraint, which caused confusion for patients during the fire. This project reviewed many historical articles and artifacts to detail the aftermath of this fire and its effects on the care of the mentally ill in Minnesota. This research revealed important findings for state emergency preparedness and patient care in state facilities.

Evaluating Teacher Perceptions of Rewards

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The aim of this research was to evaluate teacher perceptions of reward use among K-12 teachers. More specifically, we looked at whether or not teachers would use rewards to encourage appropriate behavior within the classroom setting. Though use of rewards has been supported by research, far and few are studies that report teachers' perceptions and attitudes for and/or against the practice. One could argue teacher perception is the most important viewpoint of all, as it is the teacher – not the researcher – who works closest with the children. To fill this research gap, we conducted a nationwide survey via e-mail using a K-12 teacher mailing list to assess not only the types of rewards used by teachers, but also their general attitudes towards reward use as well as their explanations for their attitudes. Our survey specified and separated tangible, social, escape, and privilege rewards to evaluate specific differences in use and perceptions. Results were analyzed in relation to basic demographic information such as grade level taught and years of teaching. By looking into this largely uncharted territory and understanding teacher perceptions, we hope to help improve student outcomes by developing strategies to increase the use of positive reinforcement within the classroom.

A Review of Two Potential Risk Factors Among Gifted Students

Melissa M. Sowers (Department of Psychology)

Brooklynn J. Fredericksen (Department of Psychology)

Carlos J. Panahon, Faculty Mentor (Department of Psychology)

Meeting the needs of exceptional students has a long history. Within this perspective, two gaps have persisted: (a) a consistent process for addressing the needs of gifted and talented students, and specifically, (b) strategies for addressing the needs of students who have also have learning disabilities or who underachieve relative to their potential within this population of students (Council for Exceptional Children, 2010).

This study reviewed some of the literature connected to gifted and talented students and two types of risks hypothesized to affect the academic progress of gifted and talented students. The first set of literature examined the parallels between risk factors for underachievement among gifted and talented students and for drug abuse among all students and in the gifted and talented student population. The second set of research addressed concerns voiced in the literature on twice-exceptional students that atypical reading skill development could pose significant challenges for intervention. The research that compared literature on drug abuse and under achievement risk factors showed clear parallels and specifically showed a link between underachievement and an increased risk of drug abuse. We considered that one reason this may have not received more attention among those assisting gifted students was based on the increased prevalence of protective factors among gifted students. The atypical reading skill development among twice-exceptional students was hypothesized to be a concern for jointly addressing needs for remediation and challenge. More direct research linking these factors across students was recommended.

Reasons for Insanity and Admission to Insane Asylums in Late 1800s Minnesota

Casandra Warman (Department of Psychology)

Andi Lassiter, Faculty Member (Department of Psychology)

This research project examines the records from the first mental hospitals in Minnesota to determine the most frequent reasons for admission for treatment. The state hospitals were located in St. Peter, Rochester, and Fergus Falls. Admission data, patient records and psychiatric logs from the late 1800s were reviewed and were the source for archival data. The results indicate some common reasons for entering the hospitals were masturbation and sexual difficulties, delusions and hallucination, epilepsy, and intemperance. Frequencies of insanity causes and the forms of mental disorders are presented in table format. The report also includes brief explanations of how patients were treated for these various illnesses. Findings from this research can be used in future studies comparing mental illnesses and their treatments then and now.

Intervention use of the Changing Criterion Design within Schools

Brianna D. Smith (Department of Psychology)

Jessica A. Day (Department of Psychology)

Alexandra Panahon, Faculty Mentor (Department of Special Education)

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The Changing Criterion Design (CCD) is a technique that helps teachers create an intervention for students exhibiting academic or behavioral difficulties. By finding a baseline for the student's behavior, incentives can be used to change the occurrence of the target behavior. CCD has been used with a wide variety of populations for a wide variety of behaviors making it a useful intervention tool for school use. Our study is designed to look at the use and perceived practicality of CCD interventions in the school setting. Practicing school psychologists were asked to respond to a survey related to their training in the CCD, their use of the CCD within schools, and their opinions about the efficiency of the CCD for school use. Descriptive and correlational analyses were conducted to evaluate the actual use and perceived utility of the CCD as an intervention tool within schools. Additional findings will be discussed.

Selective Language Skills of an Individual with Moebius Syndrome

Sarah A. Chapman (Department of Speech, Hearing, and Rehabilitative Services)

Bonnie Lund, Faculty Mentor (Department of Speech, Hearing, and Rehabilitative Services)

This project was designed to collect and share information in order to better understand the selective language skills of an individual with Moebius Syndrome. The study involved an interview with an individual with Moebius Syndrome. She provided reflections on social experiences, educational experiences, and how Moebius Syndrome has affected her life. Through qualitative research, data analysis was conducted to identify themes. Various experiences from the individual were organized around those themes.

Selected Language Skills of an Individual with Down Syndrome

Kristin Folk (Department of Speech, Hearing, and Rehabilitative Services)

Bonnie Lund, Faculty Mentor ((Department of Speech, Hearing, and Rehabilitative Services)

This qualitative study consisted of interviewing the parents of a child who has Down syndrome, transcribing the interview, and analysis of that interview and acquisition of results. The interview process aimed to answer two main questions, “How does the parent make sense of the experience of having a child with Down syndrome?” and “What is the parents’ ‘story’ with regard to living with a child with Down syndrome?”

After transcribing the interview verbatim, I coded the interview. Once the coding and analysis of the interview was complete, interpretation began and patterns emerged. A final assertion was made about the family’s experience.

Psychology

Differences in Mindset and Motivation among Athletes and Non-Athletes

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Emily Stark, Faculty Mentor (Department of Psychology)

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A Comparison of Risk-Taking Measures

Brittany Lang (Department of Psychology)

Dawn Albertson, Faculty Mentor (Department of Psychology)

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Violence Exposure, Self-Esteem and Alcohol Consumption in Adolescents

Leah Neubert (Department of Psychology)

Sarah Sifers, Faculty Mentor (Department of Psychology)

The Effects of Similarity, Accuracy & Adaptability of Shared Mental Models on Performance

Matt Schumann (Department of Psychology)

Andi Lassiter, Faculty Mentor (Department of Psychology)

Differences in Mindset and Motivation among Athletes and Non-Athletes

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Why do some individuals go on to develop their abilities, while others do not? Mindset is a relatively new concept, developed by social psychologist Dr. Carol Dweck, through her years of research on performance, motivation, and success. Mindset plays a role in athletic performance because those with a fixed mindset tend to believe their ability is “natural,” and cannot be improved. Conversely, athletes who have a growth mindset understand that their abilities can always be refined. They are better able to identify their weaknesses and put forth effort to improve them. This enables them to be more successful than their counterparts with fixed mindsets. The purpose of the current study was to explore the differences in mindset and motivation among athletes and non-athletes. Participants were asked to fill out a questionnaire consisting of demographic, mindset, and motivation questions. Preliminary data suggested that athletes were more likely to have a growth mindset compared to non-athletes. It also suggested that athletes who have a growth mindset are more intrinsically motivated than non-athletes. We expect that full analysis will show that athletes have a growth mindset with intrinsic motivation, and non-athletes have a fixed mindset with extrinsic motivation. We also expect that growth mindsets will be more strongly related to enjoyment of sports or academics compared to fixed mindsets.

A Comparison of Risk-Taking Measures

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Risk-taking is an important construct that correlates with many areas of study such as substance abuse, psychological disorders, life-span changes and military involvement. As risk-taking is such a broadly defined construct, there are many different means used to measure it. Ironically, there has never been a study done to see whether or not these measures are looking at the same type of risk-taking. Our study investigated the differences and similarities in three risk-taking measures, the Balloon Analogue Risk-Task (BART), the TCU Self-Rating Form and the Domain-Specific Risk-Taking scale (DOSPERT). We analyzed the results within each participant to see whether or not the same form of risk-taking was being evaluated by each measure.

Violence Exposure, Self-Esteem and Alcohol Consumption in Adolescents

Leah Neubert (Department of Psychology)

Sarah Sifers, Faculty Mentor (Department of Psychology)

This study examined exposure to violence, self-esteem and alcohol consumption in young adolescents. Two hundred sixth and ninth graders in the public schools of a Midwestern small metropolitan area completed the Search Institute Profiles of Student Life: Attitudes and Behaviors in their first period class. Being a victim/witnesses of violence was associated with more alcohol consumption. Self-esteem did not predict alcohol use nor did it interact with violence exposure in predicting alcohol use. Students participating in violence reported more alcohol use. Self-esteem interacted with participating in violence such that higher self-esteem increased the likelihood of alcohol use among youth participating in violence. It is logical both being a victim/witness of violence and participating in violence are risk factors for alcohol use. However, it appears that high self-esteem does not protect against alcohol consumption among youth who are victims/witness of violence, and in fact is a risk factor in adolescents who participate in violence. This suggests that intervening to reduce exposure to violence (as a victim/witness and perpetrator) may be helpful in reducing risk of alcohol use in young adolescents.

The Effects of Similarity, Accuracy & Adaptability of Shared Mental Models on Performance

Matt Schumann (Department of Psychology)

Andi Lassiter, Faculty Mentor (Department of Psychology)

In a team environment, shared mental models are crucial to team processes and outcomes (Cannon-Bowers, 1993; Mathieu, 2000). Shared mental models (SMM) are knowledge structures that facilitate team coordination. Although there four types of SMM, as outlined by Cannon-Bowers, I will be focusing on team-interaction and team knowledge SMM. The purpose of this study was to examine multiple measures of SMM and comparing different methods of measurement predicting team performance and effectiveness using existing, archival data. By focusing on concept maps that display team coordination, SMM were able to be scored and compared across teams. Performance was scored based on their ability to complete objectives in a computer war simulation game, *Command & Conquer: Red Alert*. I hope to find that teams who have more shared, more accurate, and those who have more shared-accurate mental models will perform higher. Also, I hypothesize that teams who improve mental model scores from time one to time two will perform higher. Finally, I anticipate that team-interaction mental models will predict team knowledge mental models (especially over time). Measures of shared cognition were collected in the previous research study, but this data has not been previously analyzed. SMM data was coded objective measures of sharedness, accuracy, and shared accuracy. After developing a coding scheme and training raters, three independent raters coded the content of various mental model measures. Interrater reliability statistics were used to ensure the ratings are consistent across evaluators. The results will determine if similar, accurate and adaptable SMM improve performance.

Mathematics & Statistics

Ising Model and its Applications

Nicholas Compton (Department of Mathematics & Statistics)

In-Jae Kim, Faculty Mentor (Department of Mathematics & Statistics)

Modeling the Spread of Johne's Disease in Cattle and the Effects of a Hypothetical Vaccine

Adam Edwinston (Department of Biological Sciences)

Kirsten Amberg (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

Classification of Childhood Cancer Subtypes from Microarray Data

Katie Groskreutz (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

*Recipient of Undergraduate Research Conference Small Grant

Mathematical Modeling of Caffeine Dependence Dynamics

Eric Olsen (Department of Psychology)

Casey Stamereilers (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

What does the network structure of power grids tell us about blackouts?

Jordan Tait (Department of Mathematics & Statistics)

In-Jae Kim, Faculty Mentor (Department of Mathematics & Statistics)

Ising Model and its Applications

Nicholas Compton (Department of Mathematics & Statistics)

In-Jae Kim, Faculty Mentor (Department of Mathematics & Statistics)

The Ising model is a mathematical model of ferromagnetism in statistical mechanics. This model consists of spins that can be in one of two states. The spins interact only with their nearest neighbors, and the interactions can be described by a graph. That is, the spins are the dots (called vertices) and interacting dots are connected by a line (called an edge). We studied the graph of spins, and its structural implication on the model. We have also investigated social network models similar to the Ising model, interacting locally and having two states, such as a model of opinion formation.

Modeling the Spread of Johne's Disease in Cattle and the Effects of a Hypothetical Vaccine

Adam Edwinson (Department of Biological Sciences)

Kirsten Amberg (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

Mycobacterium avium subsp. *paratuberculosis*, (Mpt) is the causative organism of Johne's disease, a mycobacterium infection of the small intestine of cattle, causing emaciation and eventually death. Unfortunately, Mpt is only detectable in the latter stages of Johne's disease, allowing the infection to spread to the herd. Dairy farmers must take preventative measures to ensure the disease does not grow unchecked. Infected animals must be removed from the herd and disposed of properly. This is caustic because the effects of Johne's disease include: the premature killing of exposed and infected livestock, decreased milk production, loss of marketing opportunities, possible breeding problems in infected animals, and veterinary costs. It has been estimated that every year in the United States the total losses caused by Johne's disease exceed 1.5 billion dollars. Since this disease currently has no vaccine, biosecurity procedures are the primary method cattle farmers use to control the spread of infection. In an effort to determine how fast a disease like Johne's can spread within a population, a compartmental model was developed. The purpose of this research attempted to model the spread of Mpt in cattle, and introduces a "vaccine effectiveness" variable. The goal was to determine if there was a level of vaccine effectiveness that would encourage the development of a vaccine, and if there is a way to contain the spread of disease. To reinforce the findings, two other diseases which have a vaccine were analyzed for comparison purposes these models helped better construct the model specifics for Mpt.

Classification of Childhood Cancer Subtypes from Microarray Data

Katie Groskreutz (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

*Recipient of Undergraduate Research Conference Small Grant

Neruroblastoma, rhabdomyosarcoma, non-Hodgkin lymphoma, and the Ewing family of tumors are four subtypes of childhood cancers. Each year more than 65,000 children are affected by these cancerous tumors. Symptoms may vary and are often fatal. Therefore, it is essential that these cancers are correctly diagnosed and classified because of different treatment options. However, these four cancers are often difficult to distinguish between and accurately identify by normal methods of diagnosis. A microarray analysis distinguishes between the cancers by determining which set of genes are active in an organism. The purpose of this research was to explore a statistical method called SCOOP (Shrunken Centroid Ordering by Orthogonal Projections) to see if it could accurately identify the type of cancer for each patient based on the information from the microarray data. Then, the method could be applied to new patients to accurately diagnose them.

Mathematical Modeling of Caffeine Dependence Dynamics

Eric Olsen (Department of Psychology)

Casey Stamereilers (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

Caffeine is the mostly widely used psychoactive substance in the world. It is estimated that 80% of adults in the United States consume caffeine daily. Tolerance to the psychostimulant effects of caffeine develops quickly for daily users. Regular caffeine use can also cause physical dependence, and a withdrawal syndrome may develop upon cessation of caffeine use. Withdrawal symptoms can include headache, fatigue, drowsiness, and irritability. These withdrawal symptoms, while generally mild compared to the withdrawal syndromes associated with other drugs, can last over a week and are a common reason that people fail in their attempts to discontinue caffeine use. The objective was to mathematically model and simulate blood caffeine levels over time in regular users using compartment modeling. This model can be used to determine an optimal schedule of dosing for those who wish to discontinue their caffeine use while minimizing withdrawal symptoms.

What does the network structure of power grids tell us about blackouts?

Jordan Tait (Department of Mathematics & Statistics)

In-Jae Kim, Faculty Mentor (Department of Mathematics & Statistics)

An electric power grid is a critical infrastructure. Without electric supply we cannot sustain our normal lives. Nowadays blackouts caused by cascading failure of the system is considered to be a national disaster. The electric power grid consists of electric generators and power lines connecting generators. By depicting the generators as dots and the power lines as lines, we can get a mathematical model (called a graph or network) representing a topological structure of a power grid. We will study how the network structure of power grids can contribute to the blackouts.

Accounting & Business Law

The Restricted Use of Cell Phones in Vehicles

Elizabeth Dornfeld (Department of Accounting & Business Law)

Patrick Dockendorf (Department of Accounting & Business Law)

Dan Felt (Department of Accounting & Business Law)

Brandon Hayes (Department of Accounting & Business Law)

Penelope Herickhoff, Faculty Mentor (Department of Accounting & Business Law)

City, state, and federal laws regarding civilians' rights in stops and searches in traffic stops

Beau Illikainen (Department of Accounting & Business Law)

Katelyn Fletcher (Department of Accounting & Business Law)

Anne Huebner (Department of Accounting & Business Law)

Barrett Herrig (Department of Accounting & Business Law)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

Arizona Immigration Law

Travis Nelson (Department of Accounting & Business Law)

David Perez (Department of Accounting & Business Law)

Benjamin Morgan (Department of Accounting & Business Law)

Patrick Mooney (Department of Accounting & Business Law)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

Status

Jeremy Sudbeck (Department of Accounting & Business Law)

Michael Steinkam (Department of Accounting & Business Law)

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The Restricted Use of Cell Phones in Vehicles

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As cell phones and other handheld devices are becoming more prevalent in our society, there are more concerns about safety of using such devices while driving. This study focuses on how cell phones are used and the effect it has on reaction time, along with the rate of traffic incidences. Random survey was used to accumulate data on cell phone use and traffic incident. Research was also conducted on other distracting activities that may be performed in a car. Studies have been conducted to determine whether there is a correlation between states imposing cell phone laws and rate of traffic incidences. Other studies observed include statistics among neighboring states with and without cell phone restrictions to determine crash rates. Cost-benefit analysis involving insurance records and law enforcement costs can provide great insight to the actual costs of enforcing such laws.

City, state, and federal laws regarding civilians' rights in stops and searches in traffic stops

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Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

We have reviewed city, state and federal laws to determine what police officers legally can and cannot do in simple traffic stops. We have further researched what questions the citizen legally has to answer and what other obligations drivers have under the law, as well as what the police officer has the power to do in routine stops.

Arizona Immigration Law

Travis Nelson (Department of Accounting & Business Law)

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Benjamin Morgan (Department of Accounting & Business Law)

Patrick Mooney (Department of Accounting & Business Law)

Vicki Luoma, Faculty Mentor (Department of Accounting & Business Law)

Arizona's controversial immigration law, and the general lack of understanding about it, motivated our group to present a detailed overview of its policies. The bill's importance has been shown through the media coverage dedicated to it, though its real impacts are often misinterpreted. Our goal is to understand both sides of the deeply divided argument over the law, and to help inform others to better make their own judgment concerning the topic.

The issues many people have with the law are that they violate individual's right to privacy, and enables racial profiling as a means of identifying illegal immigrants. Others would argue that the law is a necessary evil to deter what they perceive to be the larger problem of illegal immigration.

Status

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As Facebook and other social networking sites have become more commonplace, the possibility that future employers will view these sites for information for hiring decisions is very real. We have researched the various employment laws and have determined that although there are no specific laws prohibiting employers from searching networking sites that employers can find themselves on dangerous grounds for allegations of discrimination and disparate treatment of applicants in violation of employment laws.

Biological Sciences, Chemistry & Geology, and Physics & Astronomy

1 - Rubidium uptake in rat heart tissue

Stacy DeBaere (Department of Biological Sciences)

Emma Grossi (Department of Biological Sciences)

Hayley Olson (Department of Biological Sciences)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

2 - Determination of Strontium Incorporation in Bone

Cassandra Fischer (Department of Biological Sciences)

Danielle Kral (Department of Biological Sciences)

(All researchers participated equally)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

3 - Isolation of phytochelatin synthase and metallothionein-like protein cDNA from the cattails *Typha latifolia* and *Typha angustifolia*

Dustin Hack (Department of Biological Sciences)

Jordan Gurter (Department of Biological Sciences)

Daniel P. Toma, Faculty Mentor (Department of Biological Sciences)

Zachary W. Bateson, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Large Grant

4 - Microvasculature of Transgenic Mouse Hearts Lacking Actin Capping Protein

Leah Michaels (Department of Biological Sciences)

Kyle Sonnabend (Department of Biological Sciences)

(All researchers participated equally)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

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5 - The effect of sub-lethal concentrations on *Bacillus cereus*

Adeline Ngum (Department of Biological Sciences)

Dorothy Wrigley, Faculty Mentor (Department of Biological Sciences)

6 - Coelomocyte control of bacteria population by phagocytosis in *Eisenia fetida*

Anna B. Novak (Department of Biological Sciences)

Dorothy Wrigley, Faculty Mentor (Department of Biological Sciences)

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7 - Implications of Eating Habits, Social Class, and Lifestyle to Make Diabetes Less Prevalent in African American Culture

Julian Phipps (Department of Biological Sciences)

Edward Williams, Faculty Mentor (Department of Biological Sciences)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

8 - Effect of Water and Methanol Extracts of Common Buckthorn Berries on the Germination and Growth of Lettuce and Native Grass Seeds

Jordy Veit (Department of Biology Sciences: Environmental Science)

Beth Proctor, Faculty Mentor (Department of Biological Sciences)

9 - Investigation of the Anatomical Role of Schlemm's Canal and Collector Channels in the Eye

Betlehem A. Semahge (Department of Biological Sciences)

Michael Bentley Faculty Mentor (Department of Biological Sciences)

10 - Effect of Increased Water Temperature on Warm Water Fish Feeding Behavior and Habitat Use

Eric M. Walberg (Department of Biological Sciences)

Shannon J. Fisher, Faculty Mentor (Department of Biological Sciences)

*Recipient of Minnesota State University, Mankato Foundation Grant

11 - Preparation of some new Aryl Diethyl Phosphate and their use in Metal- Catalyzed Reaction

Emmanuel Asamou (Department of Chemistry & Geology)

Michael Lusch, Faculty Mentor (Department of Chemistry & Geology)

12 - Exploration of the Interaction between Benzaldehyde in Almonds and Our DNA

Megan Geitz (Department of Chemistry & Geology)

Danaé Quirk Dorr, Faculty Mentor (Department of Chemistry & Geology)

*Recipient of Undergraduate Research Conference Small Grant

13 - Exploring Potential Chemopreventive Properties of the Natural Food Derivative Curcumin

Keely Hamann (Department of Chemistry & Geology)

Danae Quirk Dorr, Faculty Mentor (Department of Chemistry & Geology)

*Recipient of Minnesota State University, Mankato Foundation Grant

14 - The Effect of Lowered Aldosterone on the Expression of Mineralocorticoid Receptor Isoforms α , β and γ

Lyndee Heidecker (Department of Chemistry and Geology)

Theresa Salerno, Faculty Mentor (Department of Chemistry and Geology)

*Recipient of Minnesota State University, Mankato Foundation Grant

15 - Cycloaddition of an isomuchnone compound and stilbene

Patrick Hovda (Department of Chemistry & Geology)

Michael J. Lusch, Faculty Mentor (Department of Chemistry & Geology)

16 - NMR Study of Hydroxymethylfurfural (HMF) Reactivity toward Nucleosides of DNA

Cameron Hovey (Department of Chemistry & Geology)

Danaé Quirk Dorr, Faculty Mentor (Department of Chemistry & Geology)

17 - Using Q-PCR To Measure Effects of Nitrogen Supplementation on the Expression of Lipoxygenase Isoenzymes in Soybeans

Hyuck Jin Lee (Department of Chemistry & Geology)

James Rife, Faculty Mentor (Department of Chemistry & Geology)

*Recipient of Undergraduate Research Conference Small Grant

18 - The Effect of Wounding And Methyl Jasmonate on the Expression of Lipoygenase in Soybean Leaves

Kayo Kurahashi (Department of Chemistry & Geology Department)
Minh Nhat Hoang (Department of Chemistry & Geology Department)
(All researchers participated equally)
James Rife, Faculty Mentor (Department of Chemistry & Geology)

19 - Exploration of the Mesabi Iron Range

Ryan Rague (Department of Chemistry & Geology)
Steven Losh, Faculty Mentor (Department of Chemistry & Geology)

20 - Quantifying Sedimentary Iron Mineral Abundance with X-Ray Diffraction

Brady L. Lubenow (Department of Chemistry & Geology)
Chad A. Wittkop, Faculty Mentor (Department of Chemistry & Geology)
*Recipient of Minnesota State University, Mankato Foundation Grant

21 - Differentiating ABO Genotypes by Using qPCR Genotyping Methods

Kristirose Renwick (Department of Chemistry & Geology)
Theresa Salerno, Faculty Mentor (Department of Chemistry & Geology)

22 - Cellulosic Ethanol from Cattail Leaves

Daniel Sanchez (Department of Chemistry & Geology)
James Rife, Faculty Mentor (Department of Chemistry & Geology)
*Recipient of Minnesota State University, Mankato Foundation Grant

23 - Expression of Lipoygenase (LOX) 1 Ps: 5 and LOX G in Pea Leaves after Mechanical Wounding

Sandra Tambi (Department of Chemistry & Geology)
Theresa Salerno, Faculty Mentor (Department of Chemistry & Geology)
*Recipient of Undergraduate Research Conference Small Grant

24 - Investigation of the Effects of Cinnamaldehyde and Vanillin on 2'-Deoxyguanosine and 2'-Deoxyadenosine

Katelyn Taylor (Department of Chemistry & Geology)
Danaé Quirk Dorr, Faculty Mentor (Department of Chemistry & Geology)
*Recipient of Undergraduate Research Conference Small Grant

25 - Identification and stability of fluoroquinolone antibiotic complexes involving heavy metals, ciprofloxacin, and phenolic degradation products: Relevance in ground and waste water systems

Indumini A. Weeramantri (Department of Chemistry & Geology)
Trent P. Vorlicek, Faculty Mentor (Department of Chemistry & Geology)
*Recipient of Minnesota State University, Mankato Foundation Grant

26 - Laboratory exercise demonstrating systematic error in instrumental analyses: Aberrant atomic absorption spectroscopy of cadmium

Derek Whitaker (Department of Chemistry & Geology)
Trenton Vorlicek, Faculty Mentor (Department of Chemistry & Geology)
*Recipient of Undergraduate Research Conference Small Grant

27 - Isomorphous substitutions of Calcium by dysprosium in the structure of synthetic vanadate apatite

Jin-Ho Yun (Department of Biological Sciences and Chemistry & Geology)

Lyudmyla Ardanova, Faculty Mentor (Department of Chemistry & Geology)

28 - Production of ^{13}N for Radiotracer Synthesis

Christopher Prokop (Department of Physics & Astronomy)

John Clymer (Department of Physics & Astronomy)

Nick Compton (Department of Physics & Astronomy)

Henry Dam (Department of Physics & Astronomy)

Adam Hanson (Department of Physics & Astronomy)

Justen Pautzke, Graduate Research Assistant (Department of Physics & Astronomy)

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Rubidium uptake in rat heart tissue

Stacy DeBaere (Department of Biological Sciences)

Emma Grossi (Department of Biological Sciences)

Hayley Olson (Department of Biological Sciences)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

Rubidium is a congener for potassium and although it has a higher atomic mass, cells handle it in the same way as potassium. The purpose of this research is to determine the incorporation of rubidium chloride (RbCl) in excised rat hearts. To excise the hearts, the rats were anesthetized with Inactin (0.2 mL/100g). The aortas of the hearts were cannulated and infused for one hour using a Krebs Henseleit (KH) solution that mimics the pH and oncotic pressure of blood. A Langendorf infusion system was used to maintain constant physiological conditions such as oxygen, pressure, and temperature. Control hearts were infused with the KH solution containing normal amounts of KCl (4 mEq) and experimental hearts were infused with the KH solution containing 4 mEq RbCl instead of KCl. The hearts were frozen in liquid nitrogen, freeze-dried and examined using a scanning electron microscope. Rubidium incorporation into the heart muscle cells was determined by energy dispersive spectroscopy. The results indicate that rubidium is taken up by the heart tissue and replaces potassium in the cell. This technology will provide a means to study potassium incorporation in cardiac muscle during experimental disease conditions.

Determination of Strontium Incorporation in Bone

Cassandra Fischer (Department of Biological Sciences)

Danielle Kral (Department of Biological Sciences)

(All researchers participated equally)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

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Strontium is a bone-seeking, trace element that has been shown through previous experiments to be a “valuable safe alternative” for calcium absorption tests. To determine the replacement of calcium with strontium in C57/B16 mice, mice were given distilled water with 0.15 g strontium chloride per 100 mL for different periods of time. Some of the mice were also given a low calcium chow to reduce the amount of calcium available to them through their environment. Control mice were given distilled water and normal chow, or 0.105 g calcium chloride per 100 mL drinking water with normal or low calcium chow. After being on the specific diets for 3 weeks or longer, the mice were euthanized by CO₂ inhalation and dissected to examine their femurs. The long bones were removed and stored in 2.5% glutaraldehyde, buffered with 0.1 M phosphate (pH 7.2) until they were ready for analysis by Energy Dispersive X-ray Spectroscopy (EDS) to determine elemental content of strontium. Early results have shown the presence of strontium in mice tibias. Further analysis of the various diets will lead to a better understanding of the effects of strontium chloride water with or without a low calcium diet.

Isolation of phytochelatin synthase and metallothionein-like protein cDNA from the cattails *Typha latifolia* and *Typha angustifolia*

Dustin Hack (Department of Biological Sciences)

Jordan Gurter (Department of Biological Sciences)

Daniel P. Toma, Faculty Mentor (Department of Biological Sciences)

Zachary W. Bateson, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Large Grant

Typha latifolia and *Typha angustifolia* can be used as tools for understanding hybrid vigor, invasiveness and the potential for biomass ethanol production. *T. latifolia* and *T. angustifolia* are rapidly expanding across North America most likely in response to the increased disturbance of wetlands. *T. angustifolia* is sympatric with *T. latifolia* across most of the northern part of its range and is considered an invasive species in North America. The ultimate goal was to prepare samples of both cattail species for sequencing in order to compare the gene expression at the genomic-wide level. The preparation of samples to be sequenced had multiple steps which needed positive verification before proceeding to the next, thus the amplification of control genes are a vital component to the procedure. We did a literature search and found phytochelatin synthase and metallothionein-like protein gene sequences that have been discovered in *T. latifolia* and designed primer pairs for the project. To begin this process we planted seedlings of both species in a highly controlled environment and extracted RNA to be used for cDNA synthesis. We successfully isolated both genes from cDNA of *T. latifolia* and *T. angustifolia*. The verified cDNA samples could then be utilized for mass sequencing.

Microvasculature of Transgenic Mouse Hearts Lacking Actin Capping Protein

Leah Michaels (Department of Biological Sciences)

Kyle Sonnabend (Department of Biological Sciences)

(All researchers participated equally)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

Transgenic mice bred to be deficient in actin capping protein have inefficient, abnormally formed muscle groups. The hearts of these transgenic mice are a potential model for the study of heart disease in humans. Because the structure of the cardiac muscle groups in transgenic mice is fundamentally different from normal mice, the structure of the microvasculature supplying those muscle groups may also be measurably different. In order to measure this difference in structure, casts were made of the coronary microvasculature in both transgenic and wild type mice (normal/control). Each mouse was first given an intraperitoneal injection of 0.2 mL heparin to thin the blood. After 10 minutes each mouse was killed using cervical dislocation. The heart was then exposed and a catheter was placed into the apex extending 1 mm into the left ventricle. A saline-heparin mixture (0.1 mL heparin to 10 mL 0.9% saline) of 60 mL was infused at a flow rate of 0.1 mL per minute. The infusion was continued with a polyurethane casting polymer. After roughly 20 minutes infusion was stopped and the polyurethane was allowed to polymerize; forming a solid cast of the coronary microvasculature. The hearts were placed in deionized water and frozen overnight then thawed and placed in a 5% weight by volume potassium hydroxide solution to digest the tissues away from the vascular cast. Upon completion of digestion the casts were freeze dried to preserve their structure and then analyzed using scanning electron microscopy.

The effect of sub-lethal concentrations on *Bacillus cereus*

Adeline Ngum (Department of Biological Sciences)

Dorothy Wrigley, Faculty Mentor (Department of Biological Sciences)

Nisin is a biopreservative that is produced by *Lactococcus lactis*. It can be used to inhibit Gram positive bacteria in foods. Other Gram positive bacteria in foods are not killed by the concentrations used in foods but may be affected by sublethal concentrations. The purpose of the study was to investigate the effects sublethal concentrations of nisin have on *Bacillus cereus* and to determine if stress increases nisin resistance. *B. cereus* was conditioned to nisin by culture in 100 µg/ml nisin in Tryptic Soy broth. Conditioning with sublethal nisin concentration increases tolerance to nisin from 200 µg/ml unconditioned *B. cereus* to 300 µg/ml conditioned *B. cereus*. The percentage of cells surviving in nisin was determined by plating ~500 colony forming units on to tryptic soy agar containing 0, 50, and 100 µg/ml nisin. Control *B. cereus* did not grow on the plates with nisin. However, 83 colonies of the nisin conditioned *B. cereus* grew on the 50 µg/ml plate. No colonies were formed on the 100 µg/ml plate. When removed from maintenance cultures with nisin Conditioned *B. cereus* rapidly reverted to the more sensitive phenotype of the control. Heat shock at 45°C did not increase nisin tolerance instead the heat shock bacteria were more sensitive to nisin. Sublethal concentrations of nisin induce a more resistant phenotype in *B. cereus*. Induction of increased resistance appears to be specific for nisin.

Coelomocyte control of bacteria population by phagocytosis in *Eisenia fetida*

Anna B. Novak (Department of Biological Sciences)

Dorothy Wrigley, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

Earthworm immunity is characterized by coelomocytes, leukocytes housed in the coelomic cavity of earthworms. Coelomic cells are a mixed population that phagocytize and detoxify chemicals. Earthworms also have several symbiotic bacteria that are passed from parent to offspring eggs. The population size of the symbionts must be controlled or they would kill the earthworm. My hypothesis is that coelomic cells aid control of bacterial number by phagocytosis. To test this hypothesis coelomic cells binding of a symbiont from earthworm cocoons was examined. The symbiont used was identified as a *Citrobacter*. Coelomic cells were collected from earthworms, *Eisenia fetida*. Coelomic cells were mixed with freshly cultured symbionts, and examined for their ability to bind the symbionts. Binding was assessed at 30 minutes and at 60 minutes using a gram stain method. In Phosphate Buffered Saline (PBS) 80% of the coelomic cells bound the symbionts. The greatest adherence was after 30 minute incubation. When glucose was added to PBS the cells binding bacteria decreased to 20%. Other sugars, galactose and mannose, had no affect on adherence. The data indicates that coelomic cells recognize and bind to the symbiont, and adherence is mediated by sugar binding. Two populations of coelomic cells exist. One population adheres rapidly to glass. When this rapid adhering coelomic cell population was excluded from the cell/symbiont suspension adherence increased to 93%. Further research is being conducted to examine coelomic cell adherence with live versus dead bacteria.

Implications of Eating Habits, Social Class, and Lifestyle to Make Diabetes Less Prevalent in African American Culture

Julian Phipps (Department of Biological Sciences)

Edward Williams, Faculty Mentor (Department of Biological Sciences)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

In this literature review I focused on the reason Type II Diabetes is more prevalent in African Americans than in any other ethnic population. I reviewed an extensive amount of material such as journals, articles, and textbooks that focused on lifestyle, eating habits, and socioeconomic status within the African American culture. The research found that African Americans consume foods that are high in fat, sugar, and sodium than many other ethnic populations. These types of foods are embedded in the culture and lifestyle, but also give African Americans a greater risk to develop Type II Diabetes. Research has shown that over half of African American woman and men are obese or overweight. These health issues are a product of little education and knowledge of the significance of healthier foods. The environment which most African Americans live in; lower to middle class neighborhoods, are saturated with affordable fast food restaurants that serve fatty foods and sugar-rich drinks. Research also shows that social class is a significant factor because the upper class can regularly buy expensive healthier foods while the lower class can afford cheap processed foods. Genetics is also a significant factor in developing Type II Diabetes. African Americans have a greater chance to develop Type II Diabetes because of certain genes that determine insulin secretion and insulin resistance. From this research I concluded that African Americans need more education and awareness of health issues in order to prevent Type II Diabetes within their lives.

Effect of Water and Methanol Extracts of Common Buckthorn Berries on the Germination and Growth of Lettuce and Native Grass Seeds

Jordy Veit (Department of Biology Sciences: Environmental Science)

Beth Proctor, Faculty Mentor (Department of Biological Sciences)

The Common Buckthorn (*Rhamnus cathartica*) is an invasive species and a major threat to natural areas in Minnesota. The purpose of this research was to determine if water and methanol extracts of berries of the Common Buckthorn will reduce the germination and growth of lettuce and native grass seeds (Little Blue Steam, Bottlebrush and/or Canada Wild Rye). The berries were collected last fall and refrigerated. The berries were macerated in a blender. Different amounts of the berries were extracted with water by agitating for 5 minutes with a Vortex mixer and then centrifuged for 10 minutes at 2500 rpm. Water extracts (10 mls) were added to Petri dishes lined with filter paper and containing 10 seeds. Then methanol was added to the berries and the processes repeated. All methanol extracts were allowed to evaporate before adding 10 seeds and 10 mls of distilled water. All treatments were done in triplicate. Water and methanol controls were also done in triplicate. The seeds were incubated at 25C under 14 hour light/10 hour dark cycle. Germination of seeds was monitored daily and at the end of incubation period the root length of each seed that germinated was measured. The results of this research will be presented.

Investigation of the Anatomical Role of Schlemm's Canal and Collector Channels in the Eye

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Glaucoma is among the most prevalent causes of blindness, resulting from increase in fluid pressure of the eye which damages the optic nerve. Schlemm's canal (SC) is a circular tube-like structure that encircles the iris of the eye. The canal drains aqueous humor from the anterior chamber of the eye into collector channels (CC's), which ultimately converge with the outer-most episcleral veins. SC plays a significant role in transferring several micro liters of aqueous humor per minute. In glaucoma, the fluid passage is retarded resulting in elevated intraocular pressure. In glaucoma, SC and CC have been shown to have an increased extracellular matrix material underlying the endothelial cells. Build-up of the extracellular matrix could cause narrowing of the canal and the CC orifices. The objective of this study was to understand the anatomical role of SC and CC's in the maintenance of the intraocular pressure at its normal level. Tissue samples of the SC region taken from the eyes of human cadavers, were dehydrated, critical point dried and sputter coated for scanning electron microscopy. Raised structural flaps were seen in the inner lumen of the SC and seemed to overlie the opening to the collector channels. The results suggest that the flaps may serve as valves that regulate fluid entry into the CC's. Accumulation of the extracellular matrix within these flaps could contribute to reduced fluid drainage.

Acknowledgement: The human eye tissues were obtained from Cheryl Hann MS and Dr. Michael Fautsch in the department of Ophthalmology, Mayo Clinic.

Effect of Increased Water Temperature on Warm Water Fish Feeding Behavior and Habitat Use

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Global change is a major topic in today's society and a change in global temperature could cause a negative effect on biological species. Stream fish are thought to be significantly affected by climate change because individuals are restricted in their movements by water systems and other physical factors that would keep them from moving to locations that are more thermally suitable. The effect of warmer waters on stream fish could cause a change in behavior that could affect the survival of fish species and the ecosystem. During my experiment I observed the effects of increased water temperature on the feeding behavior and habitat use of two native Minnesota fish species, black crappie (*Pomoxis nigromaculatus*) and black bullhead (*Ameiurus melas*). An average increase of 2.3°C over a period of approximately 4 weeks resulted in a 35% decrease in the number of feeding events by black bullheads and an increase of 22.2% for black crappies. Significant changes in habitat use were observed during the study, with bullheads increasing their use of open areas and plant cover, while decreasing their use of brick cover. Crappies were found to increase their use of open areas, while decreasing their use of the brick exterior for cover. These results may help to give an indicator about the future effects of increased water temperature on the feeding behavior, habitat use, and ecosystems of fish species.

Preparation of some new Aryl Diethyl Phosphate and their use in Metal- Catalyzed Reaction

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Michael Lusch, Faculty Mentor (Department of Chemistry & Geology)

The Characterization of this compound was carried out by proton (¹H) and Carbon -13 NMR (Nuclear magnetic Resonance Spectroscopy), Infrared Spectroscopy, and mass spectroscopy. The overall research experiment was to make a compound that had not being made in the MSU organic Chemistry Department. This experiment was carried out by following the procedure of Kenner and Williams (H.W Kenner & N.R Williams, J. Chem. Soc 1955, PG 522-525.) This procedure instiu preparation of Chloro-diethyl-phosphate reacting with phenol under basic conditions to make corresponding aryl-diethyl-phosphate. The compound was purified by using flash chromatography. It structure was confirmed by NMRIR mass spectrometry. Once prepared these compound were subjected to middle catalyzed reaction.

Exploration of the Interaction between Benzaldehyde in Almonds and Our DNA

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Benzaldehyde is the primary component of almond oil, and it is also found in other foods such as apricots and apples. The focus of this project was to demonstrate that benzaldehyde has the ability to bind to the nucleotides of our DNA and change the DNA in our cells. Through thin layer chromatography we have shown that benzaldehyde does react with the nitrogenous purine bases of DNA, adenosine and guanosine. These products have been explored using nuclear magnetic resonance. In addition, DNA has been treated with benzaldehyde. By using information obtained from the synthesized products and the DNA reaction, conclusions regarding the ability of benzaldehyde to form interactions with DNA were made.

Exploring Potential Chemopreventive Properties of the Natural Food Derivative Curcumin

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Curcumin, a derivative of the spice turmeric, has been shown to display several beneficial health properties, including a potential to serve as a chemopreventive agent. It is an ideal research subject for investigating chemopreventive potential because it can be implemented into the diet. This study examined the products of reactions between curcumin and both 2'-deoxyguanosine (dG) and 2'-deoxyadenosine (dA). Curcumin was reacted with dG and dA (in separate reaction vessels) in the presence of a phosphate buffer containing L-arginine, as well as in a Tris-HCl buffer. TLC was used to determine which reactions formed products. Those reaction products were then analyzed using NMR to determine chemical structural features. In addition, calf-thymus DNA (CT-DNA) was reacted with curcumin in a Tris-HCl buffer. After isolation, the treated CT-DNA was digested with various enzymes; the products were isolated with SPE. The dG and dA products and the treated CT-DNA digest were analyzed in sequence using LCMS. The comparison of CT-DNA reaction products and the dG and dA reaction allowed for conclusions to be determined about the ability of curcumin to bind to DNA.

The Effect of Lowered Aldosterone on the Expression of Mineralocorticoid Receptor Isoforms α , β and γ

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Aldosterone is a hormone secreted by the adrenal gland that binds to cytoplasmic mineralocorticoid receptors (MR). The binding of this hormone to its receptor increases the synthesis of the epithelial sodium channel (ENaC) and Na⁺/K⁺ATPase proteins which control the passage of sodium and potassium ions, Mineralocorticoid receptors exist in three isoform structures called alpha, beta, and gamma. Lowering of aldosterone levels can affect blood pressure and hypertension. The objective of this research was to develop three qPCR (quantitative polymerase chain) methods to measure the expression of the three MR isoforms in rat kidneys. The second objective was to test whether lowered aldosterone levels changed the expression of these MR isoforms in the kidneys of treated rats or their male offspring. Total RNA was isolated and reverse transcription was used to make the copy DNAs. Software was used to design TaqMan primers and probes over exon junctions with unique sequences for each isoform, It was found that that the expression of the alpha isoform may be slightly lower in normotensive rat kidneys and in the offspring of spontaneously hypertensive rat kidneys of mothers who had been treated to lower aldosterone levels. More samples need to be run to verify this trend and to establish significance. MR γ displayed no differences among the kidney samples and the MR β assay was not efficient enough to pursue expression analyses.

Cycloaddition of an isomuchnone compound and stilbene

Patrick Hovda (Department of Chemistry & Geology)

Michael J. Lusch, Faculty Mentor (Department of Chemistry & Geology)

The focus of this experiment was the exploration of an inter-ring cycloaddition of an isomuchnone compound (which is derived from a Biginelli compound) and stilbene. The purpose of this reaction was to produce a new class of compounds to be studied in the future for their pharmaceutical potential or other uses. To develop the isomuchnone compound, a procedure developed by Oliver Kappe was used. A Biginelli compound was first produced using a cyclic aldehyde, β -dicarbonyl, and urea. From the Biginelli compound, a diazo intermediate was produced and isolated. In order to get the reaction to proceed as desired and avoid an unwanted rearrangement of the isomuchnone, a protecting group was placed onto the diazo compound. The diazo compound with protecting group was isolated and characterized to ensure that the compound was synthesized correctly. Once complete, the protected diazo compound was introduced to a catalytic amount of Rhodium acetate. This process produces the isomuchnone intermediate. After 30min, stilbene was introduced in to the reaction vessel. The compound was isolated and characterized by using proton and carbon NMR, mass spectroscopy, IR spectroscopy, and thin layer chromatography.

NMR Study of Hydroxymethylfurfural (HMF) Reactivity toward Nucleosides of DNA

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Danaé Quirk Dorr, Faculty Mentor (Department of Chemistry & Geology)

Hydroxymethylfurfural (HMF) is an α,β -unsaturated aldehyde (enal) derived from the dehydration of sugars, notably fructose. HMF is commonly formed in high-fructose corn syrup—a staple ingredient in modern-day food and beverages, among other things—due to heating during storage. Past research involving other enals, such as crotonaldehyde and acrolein, has shown that their bifunctional character enables them to form covalent bonds with 2 nucleotides within DNA simultaneously, forming a cross-link. In order to investigate the potential reactivity of HMF toward DNA, HMF was allowed to react with isolated samples of adenosine, thymidine, cytidine, and guanosine, the four distinct nucleoside building blocks contained in DNA. The resulting products were then examined using NMR spectroscopy to explore their corresponding chemical structures. The NMR spectra were indicative of whether or not a reaction occurred, bonding HMF to a respective nucleoside to generate a new molecule.

Using Q-PCR To Measure Effects of Nitrogen Supplementation on the Expression of Lipoxygenase Isoenzymes in Soybeans

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Lipoxygenases (LOXs) have been described as a group of enzymes that add oxygen to fatty acids containing a *cis,cis*-1,4-pentadiene bond system. Soybeans have been shown to have four different LOXs in the seed and at least five different vegetative LOXs. Several roles have been proposed for the LOXs including lipid mobilization, nitrogen storage and wound response. The purpose of this project was to investigate the possible role of LOXs as nitrogen storage proteins by monitoring the effect of nitrogen supplementation on the levels of the mRNAs coding for different LOXs. Soybean plants were grown in a controlled environment. Plants were watered with a modified Hoagland's solution containing minimal nitrogen. Control plants received only this basic solution while experimental plants were watered with this minimal solution supplemented with NH_4NO_3 . Leaves and roots were harvested at the bifoliate stage. RNA was isolated from the tissue samples using an RNeasy Plant Minikit from Qiagen. cDNA copies of the mRNAs were made using a High Capacity Reverse Transcription kit from Applied Biosystems. Changes in the relative levels of LOX 5, LOX 7 and LOX 9 mRNAs were measured by the Quantitative Polymerase Chain Reaction (Q-PCR) using a Power SYBR Green mix from Applied Biosystems.

The Effect of Wounding And Methyl Jasmonate on the Expression of Lipoxygenase in Soybean Leaves

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(All researchers participated equally)

James Rife, Faculty Mentor (Department of Chemistry & Geology)

Lipoxygenase enzymes (LOXs) have been shown to catalyze the peroxidation of polyunsaturated fatty acids. Numerous LOX forms have been reported in soybeans. Several roles have been proposed for these enzymes including lipid metabolism, growth and development, senescence, defense, synthesis of regulatory molecules and nitrogen storage. Physical wounding and pathogenic infection have been reported to increase levels of some LOX forms. Previous work in this lab confirmed that physical wounding enhanced expression of LOX 5 and revealed a reduction in LOX 7 expression. In this project, we explored the time course of the effect of wounding on the expression of LOX mRNAs in wounded and systemic leaves. We also tested whether methyl jasmonate, a plant defense signal, affected the expression of LOX isoenzymes in wounded plants to understand the defense mechanism against predators. For time course studies, plants were wounded at the bifoliate stage; one leaf was wounded while the other was used as a systemic leaf. Both leaves were harvest at 3 hours or 24 hours. Leaves were also harvested from a control plant. For the effect of methyl jasmonate, plants at the trifoliate stage were wounded on both bifoliate leaves. Treated plants were exposed to methyl jasmonate in a sealed chamber. After 24 hours both sets of leaves were harvested. RNA was isolated from the tissue samples and cDNA copies were prepared by reverse transcription. Relative levels of LOX cDNAs were measured by the Quantitative Polymerase Chain Reaction using Power SYBR Green from Applied Biosystems.

Exploration of the Mesabi Iron Range

Ryan Rague (Department of Chemistry & Geology)

Steven Losh, Faculty Mentor (Department of Chemistry & Geology)

For over a century, the 1.85-billion year old iron-rich sedimentary rocks of the Mesabi Iron Range in Northern Minnesota have been an important resource of high-grade iron ore to the United States. Due to extensive 20th century mining, the range has been almost entirely depleted of known high-grade deposits.

High-grade iron ore on the Mesabi Range resulted from fluids dissolving soluble minerals from the iron formation at some time in the past, before the rocks became exposed at the Earth's surface by erosion. If these fluids had flowed up from below, there could be more high-grade ore beneath what has already been mined.

To determine the possibility of geothermal fluids responsible for the high-grade iron, fluid inclusion and geochemical analysis was performed on iron range samples, including high-grade iron ore. Fluid inclusions are microscopic bubbles of fluid trapped in minerals as they precipitated from hot water and when heated or frozen under the microscope, indicate the homogenization temperature and salinity of the fluid. Our data showed that fluids in the iron formation had an average temperature of 206° C and average salinities of 9.6% (seawater salinity is 3.5% for comparison), consistent with fluids flowing up from below. Research of rare earth elements in altered rocks show that these fluids flowed through large areas of the iron formation.

An assessment can be made from the data derived from our analysis. From the information gathered, it appears that high-grade iron ore below the shallow mined surface is a distinct possibility.

Quantifying Sedimentary Iron Mineral Abundance with X-Ray Diffraction

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The iron carbonate mineral siderite forms in a restricted geochemical environment and is often associated with hydrocarbons and iron ore deposits. Previous work has detected abundant siderite within the sediments of Otter Lake, Michigan.

Carbonate mineral abundances are commonly quantified using loss-on-ignition (LOI). However, siderite decomposes during LOI, and other methods must be used to determine its abundance. We used x-ray diffraction (XRD) to quantify siderite abundance in Otter Lake sediments. When x-rays encounter a row of atoms in a crystalline structure, the x-rays diffract at an angle that is characteristic of that mineral or element. We calibrated the x-ray diffractometer with a series of powdered siderite samples spiked with an external standard of corundum powder from percentages of 50-90% corundum by mass. We then determined the XRD intensity ratio of siderite and corundum peaks, analyzed the relationship between the percent of siderite to this intensity ratio, and fit this relationship to a quadratic equation. We then employed this equation to quantify siderite abundance in XRD scans of sediments from an Otter Lake sediment core spiked with corundum at 20cm intervals. Following XRD scans, we determined the organic carbon content of the sediments using LOI and performed stoichiometric corrections to account for the decomposition of siderite.

This project enhanced our understanding of this unusual occurrence of siderite by quantifying changes in its abundance in the sediments of Otter Lake, Michigan through time and correlating them with known Holocene climatic changes recorded in other lakes in the region.

Differentiating ABO Genotypes by Using qPCR Genotyping Methods

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Theresa Salerno, Faculty Mentor (Department of Chemistry & Geology)

The objective of this research was to develop a qPCR (quantitative polymerase chain reaction) genotyping assay to identify the common ABO genotypes. The ABO blood system has A, B, and O phenotypes but genotypes include the common variant alleles of A101, A201, B101, O101, O201 and O303. Previously, a qPCR genotyping method was developed that involved the single nucleotide polymorphisms (SNPs) at positions 261 and 297. At nucleotide 261 types A and B have a guanine while O101 and O201 have the guanine deleted from the sequence. At the 297 SNP, type A and O101 have an adenine while type B and O201 have a guanine. Ambiguity was found in identifying some heterozygote genotypes making it necessary to use another SNP to distinguish between A/O201 and B/O101 genotypes and between O303 and B alleles. The SNP 930 was chosen because it allows the identification of the B101 allele; the B allele has unique nucleotide adenine at this position. The DNA samples were obtained using a DNA purification kit, and their concentrations were estimated using a spectrophotometer at a wavelength of 260. The qPCR primers and probes were designed using software from Applied Biosystems. The method was validated with samples of known genotypes. It was tested with samples previously showing ambiguities. By combining all qPCR genotyping methods for the three SNPs most tested variants were distinguished, and the ambiguities were relieved.

Cellulosic Ethanol from Cattail Leaves

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Fuel-grade ethanol can be made from any appropriate source of carbohydrate. Cellulose, an abundant polysaccharide found in plant cell walls, can be converted into the readily fermentable sugar glucose. Previous work in this lab demonstrated that cattails are viable source for the production of cellulosic ethanol allowing the use of cattail leaves rather than food crops to make ethanol. The current project carried cattail biomass through the steps necessary to convert cellulose into ethanol. To improve workability, the leaves were dried and ground to a powder. The resulting powder was pretreated to break open the cell wall lattice and make the cellulose accessible to hydrolytic enzymes. We evaluated pretreatments of cattails using phosphoric acid, sulfuric acid, and water. Pretreated samples were then treated with cellulase and b-glucosidase to hydrolyze the cellulose to glucose. The amounts of these enzymes were varied to optimize the conversion to glucose. The final step involved using *Saccharomyces cerevisiae* to ferment the liberated glucose into ethanol. Fermentation of the glucose obtained from all three pretreatment conditions was compared to see if pretreatment impacted ethanol production. High Performance Liquid Chromatography was used at the different stages to measure glucose and ethanol levels. Final levels of glucose and ethanol were compared against the initial amount of cellulose to compare the efficiencies of the three pretreatment methods.

Expression of Lipoxygenase (LOX) 1 Ps: 5 and LOX G in Pea Leaves after Mechanical Wounding

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Lipoxygenase (LOX) enzymes are a class of catalysts that vitally contribute to plant defenses against environmental and pathogenic stressors. Several LOX isoforms like LOX 1 ps: 1, LOX 1 ps: 5, LOX 2, LOX 3, LOX 4, LOX G, and LOX 7 have been identified at the DNA level in pea tissues. Previous studies have shown an increase in total lipoxygenase activity in wounded pea plants after the plant had been exposed to biotic stressors. Very few studies have shown differences in the relative expression of individual LOX isoenzymes. In this present work, two real time polymerase chain (qPCR) methods were designed to quantitatively monitor LOX ps:5 and LOX G expression in wounded pea leaves. RNA was isolated from pea leaves using the RNeasy Plant Mini Kit (Qiagen). The quantity and quality of the RNA samples were assessed spectrophotometrically. The RNAs were reverse transcribed using random hexamers and a high capacity cDNA reverse transcription kit (Applied Biosystems). Primers and probes were designed using known sequences and Primer Express software (Applied Biosystems). Efficiency curves showed that the qPCR designs were successful. The expression of the LOX isoenzymes were measured in pea leaves at 0, 12 and 24 hours after mechanical wounding. While LOX 3 expression increased significantly compared to the unwounded control, LOX 1 ps:5 did not.

Investigation of the Effects of Cinnamaldehyde and Vanillin on 2'-Deoxyguanosine and 2'-Deoxyadenosine

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Cinnamaldehyde and vanillin are compounds which are present in the common food flavorings cinnamon and vanilla. Cinnamaldehyde and vanillin have been shown to induce the cell's ability to repair mutated DNA specifically at the sites where guanosine has been mutated. However, the precise reaction which cinnamaldehyde and vanillin undergo with guanosine and the mutation induced is poorly understood. Previous research has shown that α,β -unsaturated aldehydes form exocyclic adducts with 2'-deoxyguanosine. The focus of this research was to synthesize possible exocyclic products of cinnamaldehyde and vanillin with 2'-deoxyguanosine and 2'-deoxyadenosine. The results of these synthetic reactions were compared with the results obtained when calf thymus DNA was independently treated with cinnamaldehyde and vanillin.

Identification and stability of fluoroquinolone antibiotic complexes involving heavy metals, ciprofloxacin, and phenolic degradation products: Relevance in ground and waste water systems

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According to Pharmaceutical literature, metal-fluoroquinolone complexes are highly stable and often have increased antimicrobial activity relative to the uncomplexed fluoroquinolone. However, minimal research has been conducted regarding the role metal-fluoroquinolones play in environmental systems. This research aims to characterize novel metal-fluoroquinolones potentially relevant in ground and wastewaters. Stoichiometric analyses of aqueous test solutions showed highly insoluble ternary complex formation between cadmium (Cd; a heavy metal found in animal wastes), ciprofloxacin (a common veterinary fluoroquinolone antibiotic), and 4-nitrophenol (4-NP) or 2-chloro-4-nitrophenol (2C-4NP) at μM concentrations and $\text{pH} = 7.0$.

Experiments with 4-NP at varying pH demonstrated that the nitrophenolate form is required for ternary complexation. Solutions also containing Cd, ciprofloxacin, 2,6-dichloro-4-nitrophenol (2,6C-4NP) or 2-chloro-4,6-dinitrophenol (2C-4,6NP) formed insoluble 1:1 charge transfer complexes between ciprofloxacin and either nitrophenol. Charge transfer complexation may be due to the enhanced electrophilicity of these nitrophenols; steric hindrance may also partially explain the observed difference in complex type. For the eight phenols that were tested in this study, a nitro group in the para position appeared to be necessary for formation of the ternary or charge transfer complexes. Experiments to determine the stabilities of the ternary complexes are ongoing. These results are important because they point to an unaddressed reaction pathway available to heavy metals, powerful antibiotics, and toxic phenolic degradation compounds.

Laboratory exercise demonstrating systematic error in instrumental analyses: Aberrant atomic absorption spectroscopy of cadmium

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Commercial stock solutions are routinely used to prepare calibration standards for atomic absorption spectroscopy (AAS). Unfortunately, these solutions contain high concentrations of acid (e.g., 2-6 % HNO_3) which may cause interferences in the AAS signal. Using calibration standards prepared from commercial stock solutions, 200 μM Cd (as $\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$) test solutions were consistently quantified by air-acetylene flame AAS to contain $\sim 135 \mu\text{M}$ Cd. Three sets of calibration standards, ranging from 0.5 to 1.5 ppm Cd, were prepared from two commercial 1000 ppm Cd solutions and a 1000 ppm Cd solution made from $3\text{CdSO}_4 \cdot 8\text{H}_2\text{O}$. The $3\text{CdSO}_4 \cdot 8\text{H}_2\text{O}$ standards produced a calibration curve with linear slope $\sim 33\%$ lower than the slopes of both sets of commercial standards. Using these results as a framework, a laboratory exercise appropriate for an *Instrumental Analysis* course is prepared. Students will design and perform experiments to identify and eliminate the systematic error in Cd AAS analyses.

Isomorphous substitutions of Calcium by dysprosium in the structure of synthetic vanadate apatite

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Compounds with the apatite structure had the general composition $M_{10}(EO_4)_6(X)_2$, where M was univalent to trivalent cations (Ca, Sr, Ba, Cd, Eu, Y, 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, O. Hydroxyapatite $Ca_{10}(PO_4)_6(OH)_2$ was particularly interesting among them because of its chemical similarity to the principal inorganic constituent of bone tissue. Due to its absolute biocompatibility with living tissues, calcium hydroxyapatite ceramics were widely used as biomaterials in medicine (stomatology, maxillofacial surgery, traumatology, orthopedy). Apatites with the hydroxovanadate structure, $Ca_5(VO_4)_3OH$ was not studied well. These compounds could be used as luminescent substances, laser materials and catalysts.

An important feature of apatite-like compounds was that many different kinds of elements could substitute for the major constituents in their crystal structures. These substitutions, called *isomorphous replacements*, resulted in substances known as *solid solutions*, and presented a very interesting subject matter for investigation in solid state chemistry.

In this work we studied the isomorphic substitution of trivalent dysprosium for calcium in hydroxovanadate with apatite structure under the scheme: $Ca^{2+} + OH^- \rightarrow Dy^{3+} + O^{2-}$.

Isomorphic substitutions in system $Ca_{5-x}Dy_x(VO_4)_3(OH)_{1-x}O_x$, were studied by X-ray powder diffraction analysis. Samples were prepared by nitric-tartaric solutions method and calcined at final temperature of 820°C. Solid solutions formed in the systems $Ca_{5-x}Dy_x(VO_4)_3(OH)_{1-x}O_x$ had substitutional limits $0 < x < 0.20$. The apatite solid solutions coexisted with calcium orthovanadate phase $Ca_3(VO_4)_2$ and unknown X phase in heterogeneous regions of the system. The unit cell parameters were decreased monotonically within homogeneous region of the system corresponding to calcium – rare earth element ionic radii difference.

Production of ^{13}N for Radiotracer Synthesis

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^{13}N has been produced using a 400KeV Van de Graaff particle accelerator housed in MSU-Mankato's Applied Nuclear Science Lab. A custom target system, designed and built in this lab, contains a graphite target connected to an external power supply via insulated feed-throughs. Once ^{13}N has been produced in the $^{12}C(d,n)^{13}N$ reaction the target is ohmically heated, under an atmosphere of hydrogen or carbon dioxide, with a large supplied current releasing the radioisotope from the carbon matrix. The ensuing reaction with either hydrogen or carbon dioxide forms $^{13}NH_3$ or $HC^{13}N$ and $^{13}NO_2$ respectively. Radiolabeled ^{13}N compounds are used for physiological imaging, in both plants and animals, via a technique known as Positron Emission Tomography (PET). While the energies attainable with our accelerator are slightly above threshold resulting in a low yield of ^{13}N , the techniques and procedures developed during this research can be implemented on higher energy accelerator systems.

Psychology

Student Attitudes Towards Online Testing and Preparedness in Relation to Exam Performance

Kayla Genelin (Department of Psychology)

Kristie Campana, Faculty Mentor (Department of Psychology)

Most People Use Only 10% of Their Brain Power: Misconception Identification & Revision in Psychology Students

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Samuel Erickson (Department of Psychology)

(All researchers participated equally)

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Surveying College Students About Their Perceptions of Test Accommodations

Amber L. Sanz (Department of Psychology)

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Does Gender Affect How Participants Perceive a Professional's Intelligence?

Katie Schwartz (Department of Psychology)

Kristie Campana, Faculty Mentor (Department of Psychology)

Recovery from Work-Related Strain: The Influence of Technology Use and Proactive Personality

Kate Wilson (Department of Psychology)

Lisa Perez, Faculty Mentor (Department of Psychology)

Student Attitudes Towards Online Testing and Preparedness in Relation to Exam Performance

Kayla Genelin (Department of Psychology)

Kristie Campana, Faculty Mentor (Department of Psychology)

In this research attitudes towards an online exam were assessed. Elvers Polsella and Graetz (2003) note that procrastination was negatively related with exam scores and with attitudes towards the class for online students. But it is also known from previous studies that online learning can be a beneficial and successful way of learning, and can be as effective as a traditional lecture course (Poirier & Feldman, 2005).

Participants were students enrolled in an online psychology course, with the majority being upper-level students and female. Attitudes and preparedness were measured using Likert scaled items. Attitude items assessed the difficulty level of the material and the interest in the material. Preparedness items assessed how many of the assigned chapters were read and how many hours the student spent studying. Performance was based on exam grade and the overall grade received in the course.

Most People Use Only 10% of Their Brain Power: Misconception Identification & Revision in Psychology Students

Sarah Gilbert-Schwarck (Department of Psychology)

Samuel Erickson (Department of Psychology)

(All researchers participated equally)

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Not surprising, information conveyed to the public as “psychology” is not always grounded in scientific research and many times consists of thoughts of human behavior that have become “rules of thumb.” We cannot fault the public for falling sway to popular psychological myths (e.g., Humans only use 10% of their brain power/subliminal messages persuade people to purchase products) but what about students studying psychology? Past research has indicated that these misconceptions are difficult to overcome, but it is possible through experience and learning in the field of psychology. Lilienfeld, Lynn, Ruscio, and Beyerstein (2010) recently identified common myths in the book, *50 Great Myths of Popular Psychology*. The current study is the first in series dedicated to investigating the underlying cognitive processes that support misconception revision in psychology students. A questionnaire was developed and administered to 75 students taking psychology courses to validate the 50 myths identified by Lilienfeld et al. Results on the questionnaire indicated that the majority of students believed these myths to be true. Scores on the questionnaire differed as a function of number of classes taken, whether the participant was a major or non major, and year of study in the major. These results as well as plans for future research will be discussed.

Surveying College Students About Their Perceptions of Test Accommodations

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*Recipient of Undergraduate Research Conference Small Grant

Test accommodations are commonly defined as a change in the way that a test is administered or responded to by the person tested and are intended to offset or "correct" for distortions in scores caused by a disability (McDonnell, McLaughlin, & Morison, 1997). Under the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973, individuals with disabilities are guaranteed certain protections and rights to equal access to programs and services. Since test accommodations have been available teachers, parents, and students with or without disabilities have formed several perceptions. For example, some people believe test accommodations are too difficult for students to utilize. Others believe some students take advantage of test accommodation which could lead to a "differential boost effect" (Fuchs & Fuchs, 2001). Unfortunately, there has not been any research about the perceptions of college students on test accommodation. Therefore, the objective of this study was to determine if there are similarities or differences in perceptions between students with or without test accommodations. Current undergraduate students enrolled in psychology courses at MSU, Mankato were surveyed about their knowledge of test accommodations and their perceptions regarding test accommodations. Descriptive analyses were conducted on all completed surveys. Results regarding the perceptions of test accommodations for students with and without learning disabilities will be discussed.

Does Gender Affect How Participants Perceive a Professional's Intelligence?

Katie Schwartz (Department of Psychology)

Kristie Campana, Faculty Mentor (Department of Psychology)

The purpose of this research was to examine how attitudes about job performance changes based on gender, profession, and quality of job performance. Previous research has suggested that women tend to be rated lower when performing equally well as men and this difference is especially noticeable when women make mistakes. Furthermore, men and women are rated differently depending upon whether a job is seen as masculine or feminine. We created 8 scenarios that manipulated gender, profession and quality of performance.

It is predicted that men will be rated higher than women in both hard and soft sciences, but men will be rated even higher in the hard science. In the soft science, men will still be rated higher than females, but the gap will not be as large, because it is seen as a more feminine field. Both genders' intelligence rating will be higher for the hard science because it is seen as more prestigious. The female actor may also be rated harsher for a mistake because they *should* know how to do their job whereas men made an honest mistake; both will be rated harsher for making a mistake in the hard science because it appears to be more life threatening.

In conclusion, this study may show the current views of sexism and how women are held to a different standard, especially when it comes to job skills.

Recovery from Work-Related Strain: The Influence of Technology Use and Proactive Personality

Kate Wilson (Department of Psychology)

Lisa Perez, Faculty Mentor (Department of Psychology)

The widespread use of technology has enabled people to engage in work related behaviors outside of the workplace more than ever before. When emails and phone calls outside of the workplace interfere with recovery practices such as psychological detachment, relaxation and mastery experiences; individuals are prone to increased levels of strain. Individuals with proactive personality traits tend to take more initiative than those without and subsequently may take on more work projects. The relationship between proactive personality and recovery will be explored to determine whether proactive individuals are likely to carry more strain because of the amount of work they take on or if they carry less strain because they proactively engage in recovery experiences. We will also examine the relationship between being connected to work technologically while not at work and the ability to effectively detach at the end of the workday. Participants completed an online survey assessing demographics, proactive personality, recovery experiences, strain and technology in the workplace. The implications for personal well-being and work performance will be discussed.

Automotive Engineering Technology

Maximizing the Efficiency of an E-85 Fueled Single Cylinder Engine

Bill Foley (Department of Automotive Engineering Technology)

Colter Marcks (Department of Automotive Engineering Technology)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering Technology)

*Recipient of Undergraduate Research Conference Small Grant

E85 Ethanol Efficiency in an Automotive Engine. Utilization of Direct Injection using General Motors EcoTec Engine.

Justin Kunz (Department of Automotive Engineering Technology)

Courtney Roberts (Department of Automotive Engineering Technology)

Jonathan Kay (Department of Automotive Engineering Technology)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering Technology)

Small Engines Ethanol Research

Kyle Swensen (Department of Automotive Engineering Technology)

Kevin Shutrop (Department of Automotive Engineering Technology)

Gary Mead, Faculty Mentor (Department of Automotive Engineering Technology)

*Recipient of Minnesota State University, Mankato Foundation Grant

Research and Testing of a CNG-Diesel Dual Fueled Engine

Matt Taylor (Department of Automotive Engineering Technology)

Satish Nakarmi (Department of Automotive Engineering Technology)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering Technology)

Research and Testing of Emissions Reductions and Fuel Economy for a Small On-Road Diesel Engine in a Hybrid Vehicle

Zach Zurbey (Department of Automotive Engineering Technology)

Steve Loewen (Department of Automotive Engineering Technology)

Timothy Werts (Department of Automotive Engineering Technology)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering Technology)

Maximizing the Efficiency of an E-85 Fueled Single Cylinder Engine

Bill Foley (Department of Automotive Engineering Technology)

Colter Marcks (Department of Automotive Engineering Technology)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering Technology)

*Recipient of Undergraduate Research Conference Small Grant

The focus of this research is to study the effects of raising the volumetric efficiency of an E-85 fueled, 4-stroke, single cylinder engine via means of turbocharging. With the increasing demand for efficient engines, this study coincides with what all major auto manufacturers are doing. Small displacement, turbocharged engines are becoming more and more prevalent in today's automotive world because of their excellent power output-to-displacement ratio and we were able to study and verify the reasons why these kinds of engines are becoming more popular. Pro/Engineer 3D modeling software was used to model parts of a turbo system to be installed on a 510cc single cylinder engine. The 3D models were then imported into CFDdesign software to analyze airflow characteristics through various parts of the turbo system. After the pieces were modeled and analyzed using computer software, the system was implemented on the 510cc engine and tested on a Superflow SF-902 engine dynamometer. To better control the combustion process, electronic fuel injection and ignition systems were used to allow precise adjustments to the amount of fuel entering the engine and when it is ignited.

E85 Ethanol Efficiency in an Automotive Engine. Utilization of Direct Injection using General Motors EcoTec Engine.

Justin Kunz (Department of Automotive Engineering Technology)

Courtney Roberts (Department of Automotive Engineering Technology)

Jonathan Kay (Department of Automotive Engineering Technology)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering Technology)

Team Ecotec consists of 3 undergraduate Automotive Engineer Technology students researching efficiency gains of E85 ethanol. It was found that at substantial similar engine conditions, increasing the ethanol content of the fuel results in higher engine efficiency as well as higher engine power. It was also found that a higher engine compression ratio can increase the efficiency of the ethanol fuel and counter act the reduced amount of energy per gallon of ethanol. The engine of choice for this project was a 2009 LNF 2.0L 4 cylinder, turbo charged GM motor. Research included taking baseline recordings and numbers including power and fuel economy. The engine was modified and recalibrated to benefit the changes for ethanol and was then retested and compared to the original results showing the losses and gains.

Small Engines Ethanol Research

Kyle Swensen (Department of Automotive Engineering Technology)

Kevin Shutrop (Department of Automotive Engineering Technology)

Gary Mead, Faculty Mentor (Department of Automotive Engineering Technology)

*Recipient of Minnesota State University, Mankato Foundation Grant

Ethanol is an alternative renewable fuel which is currently blended with gasoline in Minnesota and many other states to create a fuel with a 10% ethanol content (E10). Current Minnesota legislation states that by August 30, 2013 gasoline sold in Minnesota must contain at least 20% ethanol. Before a new fuel such as E20 can be used, the Environmental Protection Agency (EPA) must conclude that the fuel will not negatively affect engines and their systems. Small engines are the most susceptible to increased ethanol concentration in gasoline because of their inability to electronically adapt to the changes in the fuel. They also make up a large percentage of all engines sold and are used in a variety of ways all over the world. The study consisted of running four different fuels in four different engines of the same model for their full useful life. The four fuels tested were E0 (0% ethanol), E10, E15, and E20. Through emissions testing, performance testing, and aging the effect that ethanol had on these engines was determined.

Research and Testing of a CNG-Diesel Dual Fueled Engine

Matt Taylor (Department of Automotive Engineering Technology)

Satish Nakarmi (Department of Automotive Engineering Technology)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering Technology)

Finding alternatives to gasoline and diesel fuels has been prominent as long as there have been engines to run on them. In recent years, the purpose is to find clean, efficient, and even renewable alternatives. As technology advances, there has been more work and development with feasible alternative fuels. Compressed natural gas (CNG), primarily comprised of methane (CH₄), is an alternative fuel that is the recipient of such research. However, now it is not only just alternative, but also a prominently emerging renewable biogas. The biogas can be produced on cow, and more associated to our research, hog farms. For this project we are working in conjunction with Environmental Technologies, who utilize this process and have revolutionized it to work efficiently, on a mass scale. Utilizing a silo-like digester, a fermentation reaction takes place inside, yielding the biogas. It then undergoes their unique purification process to remove the Sulfur and CO₂, and the product is natural gas as clean as what is piped into homes. The use of natural gas in engines has shown to lower NO_x, CO₂, CO, and in diesels, particulate emissions. The primary goal of the project is to understand the actual affects of running a turbo diesel on CNG-Diesel bi-fuel; doing so by utilizing the EPA standard for emissions testing for over the road diesel engines. Continuing research will then optimize the mixture to keep a constant stoichiometric air:fuel mixture to obtain the most fuel efficiency, and net power, with the largest decrease of emissions, throughout the entire operation of the engine.

Research and Testing of Emissions Reductions and Fuel Economy for a Small On-Road Diesel Engine in a Hybrid Vehicle

Zach Zurbey (Department of Automotive Engineering Technology)

Steve Loewen (Department of Automotive Engineering Technology)

Timothy Werts (Department of Automotive Engineering Technology)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering Technology)

The Environmental Protection Agency has been reducing the allowable emissions of on-road diesels engines significantly over the past decade causing the production of small diesel economy vehicles to be cost prohibitive. The Smart ForTwo with a small diesel engine is one of the vehicles not permitted for use in the United States because it is unable to, or not cost effective to meet the current emissions standards. The Department of Automotive Engineering Technology at Minnesota State, Mankato has installed a Smart ForTwo diesel engine in a student designed and constructed three wheeled hybrid vehicle identified as Tribid. One primary goal of the project was to meet diesel emission standards, and achieve a fuel economy rating greater than 100 mpg. Baseline emissions testing of a Smart ForTwo was conducted by a senior design group in 2008. To fully understand the effects of vehicle weight reduction and installation of a catalytic converter in the exhaust system, several emissions tests were completed by the Tribid senior design group. Emission testing primarily consisted of two parts; testing the vehicle at its final estimated curb weight with a driver, and then again with the addition of a catalyst in the exhaust. Both parts were measured driving an Environmental Protection Agency standard city drive cycle and highway drive cycle. Results of fuel economy and emissions showed reductions of emissions while increasing fuel economy.

Gender & Women's Studies and Sociology & Corrections

The United States' Food System From an "Outsider's" Perspective: International Residents of the United States' Accounts of the Intersection of Food and Gender

Maggie Freeman (Department of Gender & Women's Studies)

Maria Bevacqua, Faculty Mentor (Department of Gender & Women's Studies)

The Cultural Acceptance of Male Contraception and its Implications in Reproductive Justice

Sarah Gilbert (Department of Psychology)

Cybill Okitikpi (Department of Biological Sciences and Gender & Women's Studies)

(All researchers participated equally)

Dawn Rae Davis, Faculty Mentor (Department of Gender & Women's Studies)

Increasing Awareness of LGBT Rights in the Workplace in Minnesota

Sydney Piras (Department of Psychology)

Jennifer Stenzel (Department of Management)

Dawn Rae Davis, Faculty Mentor (Department of Gender and Women's Studies)

Employment Opportunities for Ex-offenders: An Employers' Perspective on Hiring and Retaining Exoffenders

Sahara Leonard (Department of Sociology & Corrections)

Sherrise Truesdale-Moore, Faculty Mentor (Department of Sociology & Corrections)

Finding Success and Stability in Long Lasting Marriages

Lacey Theodorson (Department of Sociology & Corrections)

Emily Boyd, Faculty Mentor (Department of Sociology & Corrections)

The United States' Food System From an "Outsider's" Perspective: International Residents of the United States' Accounts of the Intersection of Food and Gender

Maggie Freeman (Department of Gender & Women's Studies)

Maria Bevacqua, Faculty Mentor (Department of Gender & Women's Studies)

In this paper, feminist food studies research was used to analyze the food-centered life histories of international residents of the United States. I argue that international residents of the United States have a greater ability to observe intersections of food with gender, race, and class since they are forced into the role of outsider within the United States' society. Through semi-structured interviews with international residents of the United States and feminist content analysis, new insight is shed on the United States' food system.

The Cultural Acceptance of Male Contraception and its Implications in Reproductive Justice

Sarah Gilbert (Department of Psychology)

Cybill Okitikpi (Department of Biological Sciences and Gender & Women's Studies)

(All researchers participated equally)

Dawn Rae Davis, Faculty Mentor (Department of Gender & Women's Studies)

There are more methods of contraception available for women than men and increasing the availability of contraception for women alone increases the expectation that contraception is solely the responsibility of women and not equally shared by men. Improved access to contraception has had positive impacts on women by increasing their reproductive control. However, in order to attain reproductive justice the choice and use of contraception needs to be equally available for men and women. This project studied published research, promotion of male contraception and how it is used and perceived. The outcome of this study points to the importance of social and cultural acceptance of male contraception in order to increase males' use of contraception. Our analysis of the acceptance survey and published literature on male contraception demonstrated the need for an increased effort in research into methods of contraception for men besides condoms, abstinence and vasectomy and the need for the promotion of male use of reliable contraception in order to increase its acceptance.

Increasing Awareness of LGBT Rights in the Workplace in Minnesota

Sydney Piras (Department of Psychology)

Jennifer Stenzel (Department of Management)

Dawn Rae Davis, Faculty Mentor (Department of Gender and Women's Studies)

Contrary to the state of Minnesota's laws prohibiting discrimination based on sexual orientation and gender identity, discrimination against people who identify as lesbian, gay, bisexual, or transgender occurs in the workplace regularly. In fact, at least 16% of people who identify as LGBT reported experiencing discrimination in the workplace in 2007 according to Badgett et al (2007). Their study revealed that LGBT discrimination in the workplace occurs at the same rates as discrimination against ethnic minorities and women. According to the Human Rights Campaign, Minnesota is one of only twelve states which prohibits discrimination in the workplace based on sexual orientation and gender identity; however, awareness and knowledge of LGBT rights in the workplace is scarce. Our research examined individuals' awareness of LGBT rights in the workplace within Minnesota. We have compiled recommendations on how to improve knowledge of these basic employee rights. Knowledge of LGBT rights in the workplace can empower individuals to stand up to discrimination and can challenge companies to adapt their policies to better prohibit discrimination based on sexual orientation.

Employment Opportunities for Ex-offenders: An Employers' Perspective on Hiring and Retaining Exoffenders

Sahara Leonard (Department of Sociology & Corrections)

Sherrise Truesdale-Moore, Faculty Mentor (Department of Sociology & Corrections)

Research has shown that there is a correlation between low employment rates and very high recidivism rates observed among inmates released from prison (Martin, Hernandez Hernandez-Fernaund, Hernandez, 2010). Strategies for improving employability of ex-offenders include providing ex-offenders with basic education and job-specific training, assisting in identifying potential employment opportunities, and eliminating *de jure* and *de facto* employment discrimination against ex-offenders. Further, if reentry employment programs work, it will benefit not only ex-offenders but society at large--a smart societal investment (Martin, Hernandez & Hernandez-Fernaund, Hernandez, 2010). For this study, a convenient sample of fourteen employment agencies was surveyed in Minneapolis, Minnesota to examine several issues: 1) characteristics and demographics of exoffenders, 2) barriers to locating employment for exoffenders, 3) hiring practices and policies of employers, and 4) job performance and retention of exoffenders. The respondents in this study were employment agencies who assist exoffenders in locating employment. These agencies were solicited and selected from a directory provided by the Minnesota Department of Corrections and the Minnesota Department of Labor.

Finding Success and Stability in Long Lasting Marriages

Lacey Theodorson (Department of Sociology & Corrections)

Emily Boyd, Faculty Mentor (Department of Sociology & Corrections)

Many people worry about the divorce rate in America, according to the National Vital Statistics Reports of Births, Marriages, Divorces, and Deaths on July, 29, 2009 over 1 million people got divorced in 2008. Given such high divorce rates, what can we do to make marriage stronger? In order to investigate the properties of long lasting marriage, I interviewed 10 couples who have been married thirty or more years. The subjects were asked several questions about the beliefs and values that are important in their relationship. My results focus on two key findings that couples suggested contributed to their happiness and marital success: a) having a stay at home mother within the family, and b) their perspectives on raising children. Additionally, I discuss their current views on divorce and marriage today. If these findings are correct the fate of marriage today may be in more trouble than we once thought. This means that families today face more difficult obstacles in creating and keeping the marriage and family situation healthy and successful.

Biological Sciences, Computer Science, Electrical & Computer Engineering & Technology, Iron Range Engineering, Mathematics & Statistics, and Mechanical & Civil Engineering

1 - Morphological Characterization of Transgenic Mice Hearts

Derek Anderst (Department of Biological Sciences)

Jennifer Heibel (Department of Biological Sciences)

(All researchers participated equally)

Marilyn Hart, Faculty Mentor (Department of Biological Sciences)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

*Recipient of Minnesota State University, Mankato Foundation Grant

2 - Evaluation of Specimen Preparation Methods for Characterization of *Mycobacterium avium* subsp. *paratuberculosis* Biofilms

Jose A. Barriga (Department of Biological Sciences)

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

3 - The Novel Polyglutamine Protein KIAA1946 Localizes to Cytoplasmic Vesicles

Anita K. Becker (Department of Biological Sciences)

Geoffrey M. Goellner, Faculty Mentor (Department of Biological Sciences)

*Recipient of Minnesota State University, Mankato Foundation Grant

4 - Determination of the Localization Patterns of the Alpha 1 and Alpha 2 Subunits of Actin Capping Protein

Samantha A. Buss (Department of Biological Sciences)

Raeann L. Kragenbring (Department of Biological Sciences)

Marilyn C. Hart, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

5 - Creation of a Reporter Gene Fusion Vector for the Localism of Mycobacteria Proteins

Adam Edwinston (Department of Biological Sciences)

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

6 - Effectiveness of disinfectants on dormant *Mycobacterium avium* subspecies *paratuberculosis*

Jessica M. Jurovich (Department of Biological Sciences)

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

*Recipient of Minnesota State University, Mankato Foundation Grant

7 - The Effect of Renal Perfusion Pressure on the Baroreflex Response to High Blood Pressure

Tyler Kabes (Department of Biological Science)

Meredith Lovaas (Department of Biological Science)

(All researchers participated equally)

Penny Knoblich, Faculty Mentor (Department of Biological Sciences)

8 - Localization of the Novel Polyglutamine Protein KIAA1946- Using A Multi Tissue Western Blot

Toni M. Kopachek (Department of Biological Sciences)

Geoffrey M. Goellner, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

9 - A Possible Screening for the Development of Uterine Cancer in Obesity

Jennifer L. Lamoreux (Department of Biological Sciences)

Steven D. Mercurio, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

10 - Analysis of Polyglutamine Tract Length Polymorphism within the Novel Protein KIAA1946

Han Lee (Department of Biological Sciences)

Geoffrey M. Goellner, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

11 - The Effect of Reduced Aldosterone and Voluntary Exercise on High Blood Pressure in Spontaneously Hypertensive Female Rats

Yusuf Opakunle (Department of Biological Sciences)

Kristen Oldenburg (Department of Biological Sciences)

(All researchers participated equally)

Penny Knoblich, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

12 - Evaluation of Dormancy Modeling Systems for Consistent Viability of Dormant *Mycobacterium avium* subsp. *paratuberculosis*

Nicholas Ramberg (Department of Biological Sciences)

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

13 - Effects of an Anticancer Agent on Brain Development of Mice on Regular and High Fat Diets

Moriamo Sulaiman-Ifelodun (Department of Biological Sciences)

Steven D. Mercurio Faculty Mentor (Department of Biological Sciences)

*Recipient of NorthStar STEM Alliance Award

14 - Effects of reduced aldosterone secretion on hypertension development in the Spontaneously Hypertensive Rat (SHR) as measured by remote monitoring.

Crystal Taylor (Department of Biological Sciences)

Susan Gerbensky (Department of Biological Sciences)

(All researchers participated equally)

Penny Knoblich, Faculty Mentor (Department of Biological Sciences)

*Recipient of Minnesota State University, Mankato Foundation Grant

15 - Effects of Extracts of Alternative Chinese Herbal Pain Medicines on Nerve Conduction

Daniel C. Widman (Department of Biological Sciences)

Steven D. Mercurio, Faculty Mentor (Department of Biological Sciences)

16 - Smart User Interfaces: Building Easier to Use Software through Dynamic User Interfaces

Tyler Chester (Department of Computer Science)

Rebecca Bates, Faculty Mentor (Department of Computer Science)

17 - The Use of Information Retrieval for a Searchable Database of Audio Teachings

Adedayo E. Ologunde (Department of Computer Science)

Rebecca A. Bates, Faculty Mentor (Department of Computer Science)

*Recipient of NorthStar STEM Alliance Award

18 - Analysis of Learning Styles of Undergraduate Science, Engineering, and Technology Students

Sarah M. Painter (Department of Mathematics and Statistics)

Rebecca A. Bates, Faculty Mentor (Department of Computer Science)

19 - Construction Of Autonomous Vehicle for the SparkFun Competition

Kokouvi S. Ketika (Department of Electrical & Computer Engineering & Technology)

Vincent Winstead, Faculty Mentor (Department of Electrical & Computer Engineering & Technology)

*Recipient of Undergraduate Research Conference Small Grant

20 - Assessment of Pattern Recognition Using Lasers with CMOS Imaging Arrays

Erik Morness (Department of Electrical & Computer Engineering & Technology)

Dexter Jenson (Department of Electrical & Computer Engineering & Technology)

William Hudson, Faculty Mentor (Department of Electrical & Computer Engineering & Technology)

*Recipient of Minnesota State University, Mankato Foundation Grant

21 - Differentiation of Sidewalk and Other Image Features via Multiple Image Processing Methods

Nadia Sultana (Department of Electrical & Computer Engineering & Technology)

Vincent Winstead, Faculty Mentor (Department of Electrical & Computer Engineering & Technology)

22 - Experiment and analysis of a combustion fueled Tesla turbine

Matthew Hudson (Iron Range Engineering – MNSU)

Nicholas Esler (Iron Range Engineering – MNSU)

Tom Happy (Iron Range Engineering – MNSU)

Eric Schaupp (Iron Range Engineering – MNSU)

Dan Ewert, Faculty Mentor (Iron Range Engineering – MNSU)

Ron Ulseth, Faculty Mentor (Iron Range Engineering – MNSU)

Andy Lillesve, Faculty Mentor (Iron Range Engineering – MNSU)

23 - Coexistence of Multi-allelic Polymorphism with Migration and Selection

Andrew J. Flick (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

24 - Using Logistic Regression Model to Analyze Student Satisfaction Data

Amanuel Tsegaye (Department of Mathematics & Statistics)

Deepak Sanjel, Faculty Mentor (Department of Mathematics & Statistics)

25 - Antibiotics and disinfectants effect on septic treatment

Ryan Birdsall (Department of Mechanical & Civil Engineering)

Nripendra Bastola (Department of Mechanical & Civil Engineering)

Adimoraegbu Frances Ngozi (Department of Mechanical & Civil Engineering)

Hyunjung Lee (Department of Mechanical & Civil Engineering)

Jerry Schimmel (Department of Mechanical & Civil Engineering)

Stephen Druschel, Faculty Mentor (Department of Mechanical & Civil Engineering)

*Recipient of Undergraduate Research Conference Small Grant

26 - Combating Fecal Coliform Growth with a Diluted Chlorine Bleach Solution

Steven Muir (Department of Mechanical & Civil Engineering)

Shaun Bulfer (Department of Mechanical & Civil Engineering)

Cassandra Orcutt (Department of Mechanical & Civil Engineering)

Maria Tiegs (Department of Mechanical & Civil Engineering)

Ashley M. Veldkamp (Department of Mechanical & Civil Engineering)

Stephen Druschel, Faculty Mentor (Department of Mechanical & Civil Engineering)

*Recipient of Minnesota State University, Mankato Foundation Grant

27 - Algal Filtration for Excess Nutrient Removal

Mark Origer (Department of Mechanical & Civil Engineering)

Anthony Adams (Department of Mechanical & Civil Engineering)

Kyle Bruender (Department of Mechanical & Civil Engineering)

Sriya Panta (Department of Mechanical & Civil Engineering)

Kristopher Roppe (Department of Mechanical & Civil Engineering)

Stephen J. Druschel, Faculty Mentor (Department of Mechanical & Civil Engineering)

Morphological Characterization of Transgenic Mice Hearts

Derek Anderst (Department of Biological Sciences)

Jennifer Heibel (Department of Biological Sciences)

(All researchers participated equally)

Marilyn Hart, Faculty Mentor (Department of Biological Sciences)

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

*Recipient of Minnesota State University, Mankato Foundation Grant

The heart is a specialized muscle found in all animals with a circulatory system that is responsible for pumping blood throughout blood vessels by rhythmic contractions. The vertebrate heart is composed of myofibrils which maintain a precise alignment of two major components, actin and myosin. The ends of actin filaments are attached to a structural anchor, the Z line, that maintains the alignment of the thin filament. Biochemical and cell biological studies suggest that actin capping (CP) attaches one end of the actin filament to the Z line. In previous studies, mice with reduced expression of CP had major structural defects in muscle unit organization, leading to an enlarged heart and ensuing lethality. To determine the basis of the myofibril defect, we examined the hearts of transgenic and wildtype mice using scanning electron microscopy. The myocardium in both transgenic and wildtype mice were removed and fixed in 2.5% glutaraldehyde. The hearts were cut down the septum, and the right and left ventricles were treated with 1% elastase, 1% collagenase, or both 1% elastase/1% collagenase. The prepared tissue was freeze dried, sputter coated with gold, and visualized using a scanning electron microscope. Digital images were captured and analyzed for alterations in myofibril organization. The genetically altered myocardium displayed disarray relative to their wild type counterparts.

Evaluation of Specimen Preparation Methods for Characterization of *Mycobacterium avium* subsp. *paratuberculosis* Biofilms

Jose A. Barriga (Department of Biological Sciences)

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

Mycobacterium avium subspecies *paratuberculosis* (Mpt) is the causative agent of Johne's disease, a deadly gastrointestinal disease of ruminants. This disease results in large economic losses for American dairy farmers. Mpt is believed to utilize biofilms to survive in the environment. An understanding of how Mpt biofilms form is needed to prevent the spread of Johne's disease. But to understand the formation of Mpt biofilms, it is first necessary to determine the conditions that allow us to best examine Mpt biofilms. Lipids have been identified as the primary component of the extracellular matrix that holds cells together in biofilms formed by other mycobacteria. We will compare cellular and biofilm morphologies in samples prepared for scanning electron microscopy by ethanol dehydration and by lyophilization. It is expected that the lyophilization will yield clearer results regarding the structure of biofilms, including the extracellular matrix, and will limit stress on the biofilm morphology without harming the composition or location of the biofilm cells. We will qualitatively evaluate cell surface integrity, cellular morphology, and extracellular matrix connections between Mpt cells in biofilms. Extracellular matrix composition will be determined using Energy Dispersive Spectroscopy. This will allow us to better characterize biofilm formation by Mpt, which ultimately, will help to limit the impact of Johne's disease.

The Novel Polyglutamine Protein KIAA1946 Localizes to Cytoplasmic Vesicles

Anita K. Becker (Department of Biological Sciences)

Geoffrey M. Goellner, Faculty Mentor (Department of Biological Sciences)

*Recipient of Minnesota State University, Mankato Foundation Grant

Kiaa1946 is a novel protein that contains a polyglutamine (polyQ) stretch within its primary amino acid sequence; polyQ tract proteins are particularly interesting because expansion mutation within them has been shown to underlie a growing list of severe neurodegenerative disorders such as Huntington's Disease and Spinocerebellar Ataxia. Using a bioinformatics approach, we have found that Kiaa1946 is likely expressed in the nervous system, and contains a putative signal sequence and transmembrane domain- suggesting that it likely plays a functional role in some aspect of the neuronal endomembrane system. As an initial attempt to ascertain which subcellular compartment Kiaa1946 functions in- we have cloned it into both pEGFPN1 and pFLAG-CMV vectors, and assayed its intracellular localization in tissue culture cells using fluorescence microscopy. We find that both epitope tagged versions of KIAA1946 display a punctate/vesicular staining pattern in the cytoplasm of COS-7 and HELA cell- as predicted by the bioinformatics data. These data represent a first step in characterizing the cellular function of this novel polyQ protein, and serve as a starting point for further investigations including: verification of KIAA1946's subcellular localization using specific antibodies, and colocalization studies using organelle specific markers.

Determination of the Localization Patterns of the Alpha 1 and Alpha 2 Subunits of Actin Capping Protein

Samantha A. Buss (Department of Biological Sciences)

Raeann L. Kragebring (Department of Biological Sciences)

Marilyn C. Hart, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

Actin is an abundant protein of eukaryotic cells that contributes to a variety of cellular processes including cell division, maintaining cell structure, mobility and muscle contraction. Monomeric actin can polymerize and depolymerize to form long filaments and branched structures. Actin dynamics are largely regulated by accessory proteins, including actin Capping Protein (CP). Capping Protein is a heterodimer composed of an alpha (α) and a beta (β) subunit. In higher organisms, there are three alpha isoforms ($\alpha 1$, $\alpha 2$, $\alpha 3$) and three beta isoforms ($\beta 1$, $\beta 2$, $\beta 3$). In vertebrates, the $\alpha 1$ and $\alpha 2$ proteins are highly conserved, differing by approximately 20 amino acids. In previous Western Blot analysis using an antibody that recognizes α subunits equally, both $\alpha 1$ and $\alpha 2$ proteins accumulated in all mouse tissues examined; however, the relative amounts of the proteins varied among different tissues. The presence of multiple isoforms of the subunits of CP and their different expression levels in tissues raises the possibility of isoform specific functions. We have recently generated $\alpha 1$ and $\alpha 2$ polyclonal antibodies and confirmed their specificity. We are using the antibodies to define similarities and differences in the protein patterns of α isoforms using immunofluorescence studies. Both $\alpha 1$ and $\alpha 2$ had similar localization patterns in murine myocardium, localizing to the Z-line. In other tissues, preliminary studies suggest novel localization.

Creation of a Reporter Gene Fusion Vector for the Localism of Mycobacteria Proteins

Adam Edwinston (Department of Biological Sciences)

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

*Recipient of Undergraduate Research Conference Small Grant

Transmission of *Mycobacterium avium* subsp. *paratuberculosis* (Mpt) within cattle has become an economic issue for dairy farmers. Mpt is the causative agent of Johne's disease, a chronic, fatal intestinal disease of ruminants. Intracellular multiplication of Mpt causes the release of virulence factors and enteritis, inevitably killing the host. As Mpt grows it is excreted, subsequently infecting other livestock. Infected cattle fail to show symptoms initially and often go undiagnosed. Since these cattle are not removed from the herd immediately it allows for the uncontrolled spread of disease. Understanding how Mpt responds to its environment may lead to more efficient methods of disease control. Our primary goal was to construct a plasmid that would allow determination of when, where, and under what conditions various proteins concentrate in Mpt. Plasmid pMV261, a mycobacterial shuttle vector was cut with enzymes *HindIII* and *HpaI*. A plasmid, pEGFP-N1 containing a coding region for enhanced green fluorescent protein (eGFP) was cut with the enzymes *HindIII* and *NsiI* to release a 1709bp fragment of DNA containing the entire coding sequence of eGFP and multiple restriction sites. A ligation reaction was conducted to fuse the eGFP coding region into pMV261. A total of 6 new restriction sites were added to the plasmid pMV261 as a result of this addition. This newly constructed plasmid was inserted into *Mycobacterium smegmatis* for analysis and determining the success of transformation. Subsequent findings from transformations can provide a greater understanding of Mpt and the proteins employed when responding to stressors within the host.

Effectiveness of disinfectants on dormant *Mycobacterium avium* subspecies *paratuberculosis*

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Mycobacterium avium subspecies *paratuberculosis* (Mpt) is a gram positive, acid-fast organism that triggers Johne's disease, which is a severe gastroenteritis found in ruminants, such as dairy cattle. The accidental ingestion of Mpt from contaminated surfaces is one of the most common means by which ruminants become infected. Mpt has a greater resistance to disinfectants than many other bacteria, so it is important to determine the concentrations at which Mpt cells are eradicated. The purpose of this investigation was to compare the susceptibility of actively growing and dormant Mpt cells in different disinfectants at varying concentrations. The Mpt cells were treated with selected disinfectants, such as benzalkonium chloride and chlorhexidine, at ten-fold concentrations. Viability was measured at regular intervals with flow cytometry. The viability of actively growing Mpt diminished to less than ten percent initially when treated with benzalkonium chloride at the manufacturer's recommended concentration. When treated with a ten-fold dilution, the viability of active Mpt was only slightly diminished initially, but over thirty minutes diminished to about twenty percent. The viability of dormant Mpt diminished to less than ten percent initially when treated with benzalkonium chloride at the manufacturer's recommended concentration as well. When treated with a ten-fold dilution, the viability of dormant Mpt diminished slightly initially, but within ten minutes diminished to less than ten percent. Treatment of both active and dormant Mpt cells with one hundred and one thousand fold dilutions did not lead to diminished viability. The results of testing with other disinfectants are pending.

The Effect of Renal Perfusion Pressure on the Baroreflex Response to High Blood Pressure

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(All researchers participated equally)

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Hypertension, or high blood pressure, affects 28.6% of the United States population, and results in an increased susceptibility to heart attacks, strokes, and aneurysms. Blood pressure is controlled by two mechanisms, a short term mechanism (baroreflex) and a long term mechanism (kidneys). The baroreflex acutely lowers high blood pressure down to the set point (regulation point) by reducing heart rate and blood vessel resistance. The kidneys regulate blood volume. Hypertension develops as a result of a malfunction of both mechanisms. Although both systems malfunction in all forms of hypertension, traditional thinking is that the two systems function completely independently. However, recent research suggests the two may interact. To test for evidence of this interaction, the current study used anesthetized female SHR (hypertensive) and WKY (normal) rats that were given bolus injections of phenylephrine to generate acute hypertensive episodes. With catheters in the brachial artery, femoral artery, and femoral vein, data was collected on heart rate and blood pressure with the administration of each phenylephrine injection. In order to investigate the possibility that the kidneys have a neurological input to the baroreflex, the descending aorta was alternated between restricted and unrestricted states, therefore preventing or allowing renal (kidney) exposure to acutely induced hypertension. If the kidneys interact with baroreflex responses, induced hypertension should be associated with altered magnitudes of heart rate reduction when comparing results during restricted and unrestricted states. Understanding kidney and baroreflex interactions may contribute to a more lucid understanding of hypertension and the development of more effective treatments.

Localization of the Novel Polyglutamine Protein KIAA1946- Using A Multi Tissue Western Blot

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Of the many proteins expressed in the human body, nearly 20% contain a repeat component in their primary amino acid sequence. The novel protein KIAA1946 contains one such polyglutamine (polyQ) stretch- which interestingly may also be polymorphic. Repeat polymorphisms are significant because mutations in these sequences well beyond their normal range underlie a number of severe neurodegenerative diseases such as Huntington's Disease. As KIAA1946 is completely uncharacterized, we would like to know which tissues in the body express this protein. In a preliminary attempt to determine the tissue location of KIAA1946, we transfected a GFP-tagged version of the protein into COS-7 cells in order to test a newly available commercial KIAA1946 antibody via western blotting. We found that although an antibody against the GFP moiety does indeed recognize the fusion protein, the KIAA1946 antibody detected very little. Thus, the new KIAA1946 antibody is likely very weak- and it is too early to tell if COS-7 cells (or any other tissues) express this novel protein. This data indicates an initial attempt in distinguishing the tissue localization of the novel protein, and provides the groundwork for further investigations including: verification of KIAA1946 tissue localization using the new commercially-available KIAA1946 antibody, and intracellular localization using fluorescent tags and fluorescence microscopy.

A Possible Screening for the Development of Uterine Cancer in Obesity

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Constant growth and shedding of the uterine lining in women has made them prone to mutations and cancer, especially in obesity. Obese women and animals have also shown increased sensitivity of their estrogen receptors. To test the hypothesis that obese female mice challenged with estrogen would have increased cancer gene expression and reduced risk in the presence of a medication that reduced blood vessel formation, female mice were fed a normal diet compared to others fed a high fat diet for 15 weeks, given that medication (Avastin[®]) for the first 10 days, and challenged with a dose of estrogen 6 hours prior to sampling. The uterus of each mouse was examined at the end of the treatment period and frozen under liquid nitrogen. It was already noticed the whole mouse and uterine weights of Avastin[®]-treated mice were lower than their untreated controls, whether high fat or low fat. Some uteri appeared necrotic. Using these uterus samples, I looked for development of the c-MYC gene to find the effect of obesity versus Avastin[®]. Mice were analyzed by a gene kit using a real-time PCR machine. A kit was used to examine m-RNA sequences indicating c-MYC expression. Their development was seen by fluorescence labeling of the new gene transcripts. It already appeared that the medication had profound effects, especially on animals that were not obese and that pretreatment for cancer was unwarranted. However, development of this gene assay may have proven to be a good marker for developing reproductive cancer in women.

Analysis of Polyglutamine Tract Length Polymorphism within the Novel Protein KIAA1946

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The purpose of this research project was to determine whether the polyglutamine (polyQ) tract within the novel protein KIAA1946 was polymorphic in humans. Nine hereditary neurodegenerative diseases, such as Huntington's disease (HD), Kennedy's disease, Dentatorubralpallidolusian atrophy (DRPLA), and six forms of Spinocerebellar ataxia (SCA), are called polyQ diseases because their etiology is characterized by an abnormal expansion of a polyQ repeat. For example, HD manifests when the polyQ tract in HD protein includes more than 35 consecutive glutamines. More interestingly, the polyQ tract length is polymorphic (different) even in the general population, showing that high mutation rates and genetic variations are common in polyQ tracts. We were specifically interested in KIAA1946; as it is a completely uncharacterized protein that contains a polyQ tract of approximately 16 glutamines, and is likely expressed in various tissues including the nervous system. The project investigated the length of polyQ tract in KIAA1946 by analyzing participants' DNA samples collected from their cheek cells (MSU IRB#5668). The DNA samples were amplified by PCR (polymerized chain reaction), run on PAGE (polyacrylamide gel electrophoresis), and analyzed by a DNA sequencer. By studying polyQ tract length in KIAA1946, this research could provide insight in understanding polyQ disease polymorphism and the relationship between KIAA1946 and polyQ diseases.

The Effect of Reduced Aldosterone and Voluntary Exercise on High Blood Pressure in Spontaneously Hypertensive Female Rats

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While approximately half of the population suffering from hypertension is women, few studies have investigated its contributing factors in women, and research conducted on male populations cannot be applied to females as hormone regulation varies between the two. Aldosterone, which is secreted from the outermost layer of the adrenal gland, is one of the main hormones known to influence blood pressure regulation, with an increase in aldosterone resulting in increased blood pressure. In addition, lifestyle and exercise play major roles in the development of hypertension; once established, regular exercise may be used as a means of reducing and maintaining healthy blood pressure levels. The link between aldosterone levels, exercise, and blood pressure remains unclear.

The current study aimed to investigate the relationship between surgically reduced aldosterone levels in spontaneously hypertensive female rats (SHR) and their willingness to voluntarily exercise. An adrenal freezing procedure that has previously been shown to reduce aldosterone levels to approximately 30% of normal was performed on female SHR rats at the age of six weeks; a control group of female SHR groups underwent a sham surgery. The rats were allowed to voluntarily exercise for 16-17 weeks with exercise time and distance being recorded as a weekly average. At the end of the exercise period, blood samples were collected to evaluate aldosterone and corticosterone levels to examine the relationship between these hormones involved in blood pressure regulation and willingness to exercise.

Evaluation of Dormancy Modeling Systems for Consistent Viability of Dormant *Mycobacterium avium* subsp. *paratuberculosis*

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Mycobacterium avium subsp. *paratuberculosis* (Mpt) causes Johne's disease, a fatal gastrointestinal disease that infects ruminant animals such as cows. This particularly affects the dairy industry because cows infected with the disease end up starving to death due to the result of highly inflamed gastrointestinal tissue inhibiting absorption of nutrients from the intestinal lumen. Evidence also suggests a link between Johne's disease and Crohn's disease, the human form of Johne's disease, which increases the importance of Mpt research. The ability of Mpt to enter a dormant state poses problems for detecting asymptomatic infections with Mpt, as these organisms cannot be reliably detected by diagnostic culture. Previous research in our laboratory has demonstrated that dormant cultures can differ widely in viability, indicating that the physiologic state of the organisms also varies widely. The development of a standardized system for investigating dormancy would improve the reliability of detecting Mpt infections. We cultured Mpt in sealed vials to restrict oxygen availability. In addition, culture medium was supplemented with different concentrations of Oxyrase, a biological reducing agent, to increase the rate of oxygen loss from cultures. Culture viability was measured by differential staining with fluorescent DNA stains that allow the enumeration of live and dead cells when measured by flow cytometry. Our preliminary results indicate no variation in the viability among the treatments used. This indicates that entry into a dormant state for laboratory investigations can be accomplished much more quickly than previously believed. The results of final testing are currently in progress.

Effects of an Anticancer Agent on Brain Development of Mice on Regular and High Fat Diets

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Obesity may lead to cancer as well as heart disease in young people. Mice were used to test the effect of an anticancer agent to stem the obesity caused by a high fat diet (11% fat) compared with control (4% fat) mice. This anticancer medication, Avastin[®], works by preventing new blood vessel formation (antibody to vascular endothelial growth factor). The concern in developing animals and humans is that brain development may be compromised. Mice were injected i.p. for 10 days at 0.1 mg/mouse/day with Avastin[®] at the beginning of the 15 week feeding study to evaluate these concerns. Brain weight and brain region measurements were taken to evaluate the hypothesis that decreasing blood vessel formation would retard brain growth and development in the process of preventing new blood vessel development. Results supported this hypothesis indicating that Avastin[®] decreased brain weights more than it decreased weight gain in either low or high fat diet. Other brain region development also appeared affected similarly. A brain molecular marker for blood vessel development will also be brought to bear on this study. It appears that care must be taken in using this medication in children as indicated by the manufacturer to prevent the worst problems of obesity due to possible brain development deficits unless they have a life-threatening cancer.

Effects of reduced aldosterone secretion on hypertension development in the Spontaneously Hypertensive Rat (SHR) as measured by remote monitoring.

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Hypertension, also known as high blood pressure, is a well known cause of cardiovascular disease, the leading cause of death in the United States. The cause of hypertension is poorly understood, but an increase in sodium retention by the kidneys, causing expansion in blood volume and a rise in blood pressure, is a contributing factor. The hormone aldosterone is produced in the outermost layer of the adrenal gland and increases the amount of sodium retained by the kidneys and may be a contributing factor to hypertension development. Eliminating aldosterone by removing both adrenal glands results in death of the animal. However, the effect of surgically reducing aldosterone in young hypertensive rats has not been investigated as a means to prevent development, or reduce the severity of hypertension. This study used an adrenal freezing procedure that reduced the amount of aldosterone secreted to approximately 30% of normal. The rats were studied using a remote monitoring device that was implanted in the femoral artery (in the hind leg). This system allowed the recording of blood pressure and heart rate while the rat was freely moving in its cage. The development of high blood pressure was compared between the adrenal frozen rats and the control rats. We expected a reduction in blood pressure in the adrenal frozen rats, indicating that aldosterone has a significant role in the development of hypertension. This information may lead to new measures to prevent hypertension in genetically predisposed individuals.

Effects of Extracts of Alternative Chinese Herbal Pain Medicines on Nerve Conduction

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Chinese herbal medicines may be sources of pain relief that many are using as alternative therapies. The problem with pain research is that the animal models used by American pharmaceutical companies show variable results and do not get at the true nature of pain relief agents. The purpose of this study was to use a frog sciatic nerve preparation to study the direct effects of claimed herbal remedies on nerve conduction compared to the known sodium channel blocker as a first measure of pain relief and possible neurotoxicity. The sciatic nerve was removed from a frog and placed in a nerve chamber containing Ringer's solution that illustrated the action potential. The first control experiment involved repeated exposure to Ringer's solution to make sure that the exposures were not a condition for nerve degeneration and less performance. Lidocaine was used to show the loss of impulse activity in frog nerve action potential in Ringer's solution. The osthol, corydalis, aconitine, and lidocaine were each dissolved in Ringer's solution and the frog sciatic nerve was placed in the prepared solution. The nerve activity of the osthol, corydalis, and aconitine was recorded and compared to the activity recorded from the nerve in lidocaine. It was expected that the more toxic aconitine compounds that block the sodium channel would be the most effective in preventing nerve conduction while the other agents would not be as potent. This would indicate a more rapid way of testing what are known as lead compounds in pharmaceutical pain research.

Smart User Interfaces: Building Easier to Use Software through Dynamic User Interfaces

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Every computer user has installed a new piece of software and found that they had to spend an extensive amount of time learning not only the new features of the new software, but also the new menus of the user interface (UI). This can make buying any future software less appealing for many consumers. Unfortunately, software that is very easy to use is generally limited in its power and functionality. The use of a smart UI can decrease this learning curve, while not diminishing any power or functionality. A prototype of a smart UI was developed for a simple drawing program that collects user usage data. Given this data, it makes more commonly used buttons and menu items more obvious to increase ease of use. This program was then evaluated through a series of usability tests with a range of users from different age groups and different skill levels. Their impressions of ease of use and their productivity were assessed through a four question survey using a 5 point Likert Scale. This smart user interface system could be adapted to many forms of software interfaces, making new software more productive to new users.

The Use of Information Retrieval for a Searchable Database of Audio Teachings

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Traditional search engines match key words or phrases based on word frequency, location, similarity, and update-time. The ranking of the results based on these criteria does not necessarily reflect the trends of a user's interest. Latent semantic indexing assigns each word contained in a series of documents a column in a matrix corresponding to rows organized by document. Based upon the frequencies represented in the matrix, search results can then be ranked to more accurately match the user's query. In this work, a database of audio recordings was created for a small, non-profit organization and augmented with a simple tagging and search engine in order to provide a framework for semantic indexing and problem domain specific search. Many of the audio files had brief summaries of the audio with some keywords, while others did not. The goal was more accurate search results using semantic indexing. This approach, implemented on a desktop system to ensure data privacy, provides better relatedness and faster retrieval of the desired files and demonstrates how a small organization can benefit from easy search and indexing of their large audio library. Several open-source APIs and packages were used to implement the project. A Java-based implementation of Lucene was used as a search engine. Apache Derby was the database used to contain the words extracted from the files and Apache POI was used to extract relevant words from keyword files. Usability testing was performed. Future work includes comparison with other search techniques to evaluate performance.

Analysis of Learning Styles of Undergraduate Science, Engineering, and Technology Students

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The Felder-Silverman Learning Style Model maps individuals' learning preferences on five tiers: sensory versus intuitive perceptions, visual versus verbal input, inductive versus deductive organization, active versus reflective processing, and sequential versus global understanding. The Index of Learning Styles assessment tool provides online feedback about these tiers (excluding inductive versus deductive organization). The tool has been validated for use in engineering education and allows students to better understand how to get the most out of their classes. Existing data collected from over 250 students in multiple majors over the course of three years has been collected and analyzed to show relationships between learning styles and demographic factors. The majors include automotive engineering technology, electrical engineering, computer science, civil engineering, and mechanical engineering. The analysis performed shows correlation information between learning style results and major programs, parental education levels, ethnicities, and grade point averages. There are substantial differences on the active versus reflexive and sensing versus intuitive axes across different majors. Information about aggregate learning styles for class and major groups can be distributed to faculty in the studied majors in order to provide information about the breadth of learning styles in their classes. Faculty could then make adjustments to their style of teaching to better match the variety of student needs in their classrooms.

Construction Of Autonomous Vehicle for the SparkFun Competition

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In order to construct a completely autonomous robot vehicle, a combination of C programming, GPS orientation data measurement and hardware-software coordination is applied to construct an experimental robot. The robot is intended to be used as an entrant in SparkFun's autonomous vehicle navigation competition. C-programming software will be developed to direct the on-board mini-computer (SheevaPlug) to record the GPS and navigation sensors data and to communicate with the acceleration and steering components of the robot through the Arduino board to control the movement of the robot. The robot's performance will be repeatedly tested before its presentation at the SparkFun Autonomous Vehicle Competition in 2011. This robot's abilities will be optimized to move fast enough and avoid obstacles in its path. A major emphasis will be put on ensuring that the robot robustly completes the course at the SparkFun Autonomous Vehicle Competition. It is expected that the holistic approach followed in the construction of this robot, i.e. combining GPS with hardware-software synchronization and C programming, will result in a winning competition vehicle.

Assessment of Pattern Recognition Using Lasers with CMOS Imaging Arrays

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Using CMOS camera arrays and multiple colors of lasers we determined the ability of CMOS imaging arrays to collect images and the feasibility of accurately determining the laser beam strike point through software pattern recognition. The laser and sensor arrays were tested in varying scenarios with variability of distance, angle of incidence, background color, and target regularity used as variables. Initial testing occurred with three different colored lasers on a black and white gridline target to identify the accuracy of the pattern recognition. Once baseline accuracy had been established under near perfect conditions the variables listed above were systematically added and evaluated as to their impact on the ability to accurately locate the laser "dot" on the target. It was anticipated that targets with non-perpendicular angles of incidence would cause the most difficulty with their resulting laser "splash" that had to be factored into the pattern recognition.

Differentiation of Sidewalk and Other Image Features via Multiple Image Processing Methods

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In this study we considered multiple techniques for post processing of images containing sidewalks in an effort to differentiate the sidewalk feature from other features in the image. The goal of the study was to determine the superior methodology for differentiation of image features for application on an autonomous robot intended for self navigation outdoors around campus. Experimental results were presented for two methodologies. One utilizing pixel color space characteristics and the other considering an approximation of image texture.

Experiment and analysis of a combustion fueled Tesla turbine

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In this article, the implementation of a combustion chamber to power a Tesla turbine is discussed. To date, almost all experiments conducted on the Tesla turbine have used compressed air or steam as in input fluid. The results have shown that the Tesla turbine has a high theoretical efficiency (around 90%) and a max experimental efficiency of 40%. The average consumer's car combustion engine has an efficiency nearing 24-26% which begs the question, "Can something better be created?" The Tesla turbine, with its experimental efficiency being almost double that of the combustion engine, may be the answer. First, there is a difference between a Tesla turbine and a conventional turbine (i.e. wind turbine). Conventional turbines are prone to damage if struck by dust in the air, water droplets in steam or particulates from the combustion process. The Tesla turbine, due to the nature of its design, does not have the same problem as the conventional turbine: This means that combustion gases could be used in the Tesla turbine to generate power. In order to determine feasibility of the Tesla turbine outside of the lab, experiments have been conducted to determine the efficiency when using combustion gases as the working fluid. Research has been conducted to determine the optimal combustion chamber as well as design of the Tesla turbine to optimize inlet gases.

Coexistence of Multi-allelic Polymorphism with Migration and Selection

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Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

Population ecology is concerned with the growth patterns of populations. This field has many applications, ranging from survival at the environmental level, to the spread of infectious diseases at the cellular level. Mathematical modeling and computer simulation can be powerful tools in researching this area. I will be investigating the spatial patterns in populations (or gene frequencies) due to migration and selection. My research conditions are for the maintenance of polymorphism under a variety of migration schemes in discrete-space and continuous-time mathematical models. The results will be applicable from the ecological level to the molecular level. Some species are better at adapting to a certain environment and evolve more quickly to fill a niche (*specialists*). Other species are less capable of adapting to their environment (*generalists*). Generalists survive when immigration between two distinct populations of similar species occurs. For example, species A, B, and C all coexist on two distinct islands. Species A is better adapted to shade and species C is better adapted to light; species B is in-between. If island 1 has shade, and island 2 does not, then we would expect only species A to survive on island 1, and only species C on island 2. However, under immigration all species could survive and coexist. This could be a major factor in helping maintain and manage diverse species. We will use our understanding of populations to create mathematical models and computer simulations that will demonstrate this phenomenon and help us to gain an understanding of the principles behind the concepts.

Using Logistic Regression Model to Analyze Student Satisfaction Data

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Measuring and analyzing customer's satisfaction has been an important element in the quality improvement of businesses and organizations. At colleges and universities, researchers have attempted to gain a better understanding of what sort of factors influence college student's satisfactions through surveys. In literature, several methods have been used to measure and analyze student's satisfaction data. Most often chi-square test has been used but there are limitations on using this test. In this research, student satisfaction survey data have been analyzed using logistic regression model. Variables considered are Gender, Age Category, and Attendance, to measure the satisfaction of six categories. Model adequacy test shows the data are appropriate for logistic regression.

Antibiotics and disinfectants effect on septic treatment

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The adverse effect of the residual antibiotics and disinfectants on the population of helpful bacteria to avoid the septic failure is receiving considerable attention in the United States as 30 % of the residents live in rural areas and rely on septic system. Three treatments of amoxicillin only, bleach only and a combination of bleach and amoxicillin applied to the modeling of static flow system along with a daily load of nutrient broth will identify the right chemical and antibiotic concentration amount that would cause a significant reduction in the bacterial activity. The Most Probable Number (MPN) and Biochemical Oxygen Demand (BOD) tests carried out on initial and final conditions to enumerate the bacterial population is used to determine the organic content representing the population of bacteria. In particular, among three treatments, the combination of chemical and antibiotic dose is seen more efficient treatment than just pure chemical or antibiotic.

Combating Fecal Coliform Growth with a Diluted Chlorine Bleach Solution

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Escherichia coli bacteria resides in the lower intestines of warm and cold blooded animals, in which high levels in a lake environment show contamination by fecal material of some kind. The presence of this bacterium on a beach can cause infection of humans, as well as affect the environment, leading to the reduction of oxygen levels in lakes. For the past fifteen years the city of Bloomington, MN, has been dealing with high levels of fecal coliform at Bush Lake Beach which has led to beach closures. Recently, the city combated this bacterium by spraying the waterfront with a diluted chlorine bleach solution and collecting data on its impact. The purpose of this project was to replicate this approach in a lab setting to better understand the effectiveness of this type of treatment. Experimental units consisting of gutters with sand taken from Bush Lake Beach were constructed and inoculated with coliform bacteria, and sand samples were taken at subsequent times as well as before and after bleach treatments at 200 ppm for 60 minutes. Samples were assessed using the Most Probable Number Method, and data was compared with previous data, ultimately determining effectiveness of the treatment. Many strains of *E. coli* and other fecal coliforms are typically non-pathogenic to humans, but it is important to defer any pathogenic strains from occurring. By showing in a controlled environment that bleaching *E. coli* is successful, other cities can confidently use this treatment method.

Algal Filtration for Excess Nutrient Removal

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The purpose of this research is to determine the effects of filtration procedures on algal blooms and excess phosphorus in Minnesotan Lakes. The use of algal filtration could benefit lakes by removing excess nutrients that contribute to algal blooms. This project is directed at the Lake Elysian Community; however the results can be used for other communities. Fertilizers containing phosphorus and nitrogen are used in the fields surrounding Lake Elysian to enhance the growth of crops. During rainfall, excess fertilizers are washed into the lake creating more nutrients for algal bacteria to grow.

Three sterile plastic tubs were used to create an aquarium version of a lake by using water and silt from Lake Elysian. These tubs were used to grow algae and replicate lakes with algal blooms. Three different filters were used in this experiment. Two methods were used by acknowledging the American Society for Testing and Materials Standards. These included procedures of using sieved sand to capture the algae and phosphorous. The third method was a membrane filtration process aimed singly at catching the algal bacteria. Tests were done before and after each filtration testing phosphorous levels, total suspended solids, turbidity, and a microscopic test of what bacteria still remained.

It is expected that the filtering of the water will reduce the amount of algae and phosphorous in the water. After we have finished this experiment, we hope that our ideas in filtering can help communities throughout Minnesota in lake management.

Art History and History

The Art of Being: A Study of the Relationship Between Daoism and Art

Jessica Ortis (Department of Art History)

Alisa Eimen, Faculty Mentor (Department of Art History)

US Intervention in Russia 1918-1920: the Forgotten Mutiny

Austin Lee (Department of History)

Matthew Loayza, Faculty Mentor (Department of History)

African Women in Politics: A Case Study of Liberia Women, 19th century to the Present

Florence Paye (Departments of International Relations and Psychology)

Agnes A. Odinga, Faculty Mentor (Department of History)

Squaw Valley 1960: Sport, Politics, and Nationalism

Joe Schiller (Department of History)

Matthew Loayza, Faculty Mentor (Department of History)

Causes for Child Abandonment in Eighteenth-Century France

Emily Timm (Department of History)

Christopher Corley, Faculty Mentor (Department of History)

The Art of Being: A Study of the Relationship Between Daoism and Art

Jessica Ortis (Department of Art History)

Alisa Eimen, Faculty Mentor (Department of Art History)

Ever since the beginning of time, artists have been inspired by the religion they choose to follow. Sometimes religion was the subject, but more often than not, one had to really dig deeper into a work of art to understand the religious meaning. In my paper, I focused on contemporary Chinese artist Song Dong, who uses his artistic abilities to reflect the ideals of Daoism. Focusing on a couple of more well known works by Song Dong, one can see that he shows how one is able to move down the path to lead a more full life through the Dao. In this paper, I took my discussion along the path of the major themes of Daoism, relating it back to a piece from the Han era of China, and then related all of this to Song Dong's pieces and provided one with the inevitable fact of how religion, whether intentional or not, can influence a work of art.

US Intervention in Russia 1918-1920: the Forgotten Mutiny

Austin Lee (Department of History)

Matthew Loayza, Faculty Mentor (Department of History)

After Russia withdrew from WWI, the Allied nations worried about Germany relocating its eastern front forces to the western front. Britain and France both urged the United States to militarily intervene in Russia to reopen the eastern front. Although President Wilson initially ignored this proposition of the Allied nations, he reconsidered in 1918 and ordered troops to Russia. Many scholars have examined the US intervention in Russia and debated why Wilson decided to use American troops in Russia. The preoccupation among historians as to why these troops were sent to Russia has caused them to overlook why some of these troops mutinied against their commanding officers. The 1919 mutiny forced President Wilson to consider withdrawing troops from Russia, which eventually occurred in 1920. My research on the causes of the mutiny found that the underlying reasons for the mutiny were that soldiers were tired of the ambiguity of the mission in Russia, were indifferent or favorably inclined toward the Bolshevik government, and were generally weary of the war. This mutiny would change the course of American Soviet Relations for the next seventy years.

African Women in Politics: A Case Study of Liberia Women, 19th century to the Present

Florkime Paye (Departments of International Relations and Psychology)

Agnes A. Odinga, Faculty Mentor (Department of History)

In this paper I will examine the role of Liberian women in politics from the late 19th century to the present. The election of Johnson Sirleaf as the first Liberian woman president and the first woman within the African continent to become a president in our times epitomized a long trend of women's involvement in politics. While much of has now been written on this subject, very little has focused on women in Liberia. My research will examine the lives of a few selected women including the current president to delineate their work and contribution in politics, education and the economy. Building on the works of other scholars, I argue that Liberia women have played a significant role in politics and in shaping and defining political public discourse. I will conduct research through primary research, such as interviews, articles and books. My work will make a contribution to the ongoing discussion on politics and gender in Africa.

Squaw Valley 1960: Sport, Politics, and Nationalism

Joe Schiller (Department of History)

Matthew Loayza, Faculty Mentor (Department of History)

My research examined American attitudes towards the Soviet Union and the Eastern Bloc at the 1960, Squaw Valley Winter Olympics. This includes the press' prevailing attitude in its depictions of American and western European athletes, versus those of Eastern European athletes. Parallels between these and the 1980 Lake Placid Winter Games are of especial import; a Cold War era Olympics, on American soil, pitting American capitalism against Soviet communism, where the underdog Americans score an ice hockey victory over the Soviets en route to a gold medal. In 1980 the ice hockey competition was highly politicized, and historians have devoted increasing attention to how nation states have used sport as a means of justifying national ideologies. Yet in 1960, the same result met little fanfare, and no attention from historians. My research also examined the American government's attitudes towards Soviet Russia to help explain this disconnect. This research is based on relevant secondary monographs and articles which explore the rise of international, state-driven sport beginning with the modern Olympics; sport and international politics in the 20th Century, especially as it pertains to competition between and among capitalism, communism, and fascism; the importance of pageantry and glorification to competing and hosting Olympic nations; the 1980 Olympic hockey competition, and nationalistic bias in Olympic figure skating judging. It is also based on examination of government documents, the Final Report of the VIII Winter Olympic Games, and a variety of contemporary newspapers and mass-circulation magazines such as *Sports Illustrated* and *Time*.

Causes for Child Abandonment in Eighteenth-Century France

Emily Timm (Department of History)

Christopher Corley, Faculty Mentor (Department of History)

The rate of the abandonment of children in eighteenth century France was fairly high. The causes of these abandonments are mostly correlated to social problems, such as premarital sexuality, and economic problems, such as a rise in the price of grain. Those who experienced the brunt of these problems may have abandoned their children, in most cases newborn children, at an orphanage or in some cases on the streets for someone else to find and bring to an orphanage. Orphanages provided a crucial safety-net for these children.

I conducted my research to trace patterns in the abandonment of these children. To do so, I have examined orphanage records from the St. Anne's orphanage in Dijon, France between 1775 and 1780. By studying these records I was given an inside look at the main causes of abandonment in eighteenth-century France. These records have consistently shown social and economic problems as the main cause of abandonment with disability as a significant but understudied underlying motive.

These findings will not only help historians solidify their evidence on the main causes of the abandonment in children being socially and economically motivated, but also suggest other important causes that also contribute to the reasons for abandoning a child. With this research we are able to suggest what has changed since the eighteenth-century to significantly decrease the rate of child abandonment today in modern industrialized societies.

English and Human Performance

Dorothy Wordsworth: Lyrical Poet

Nathan Robertson (Department of English)

Mary Susan Johnston, Faculty Mentor (Department of English)

The Horrors of Frankenstein

David Wild (Department of English)

Mary Johnston, Faculty Mentor (Department of English)

The Will to Run: Mental Strategies Used by Recreational Marathon Runners

Amy Harris (Department of Human Performance)

Cindra Kamphoff, Faculty Mentor (Department of Human Performance)

Suzannah Armentrout, Faculty Mentor (Department of Human Performance)

*Recipient of Undergraduate Research Conference Small Grant

Women Coaches in High School Sport: A National Study

Inge E. Milius (Department of Human Performance)

Cindra Kamphoff, Faculty Mentor (Department of Human Performance)

*Recipient of Minnesota State University, Mankato Foundation Grant

Dorothy Wordsworth: Lyrical Poet

Nathan Robertson (Department of English)

Mary Susan Johnston, Faculty Mentor (Department of English)

Dorothy Wordsworth (25 December 1771 – 25 January 1855,) sister to William Wordsworth, one of the great poets of the Romantic Era, played a major role in the production of the *Lyrical Ballads*, the book that inaugurated the Romantic Period. However, she receives little critical attention. Her poetry shows her unique way of perceiving the natural world. Dorothy's unique style of writing, keen eye for natural observation, and curious mind make her a poet equal to her brother. My project examines Dorothy Wordsworth; it is my goal to shed a light on her talents and show her for the Lyrical Poet that she was in her own right.

The Horrors of Frankenstein

David Wild (Department of English)

Mary Johnston, Faculty Mentor (Department of English)

Mary Shelley's literary masterpiece *Frankenstein* illustrates the consequences of creativity unchecked. The reader learns in shock about how these consequences affect Frankenstein's mind, his friends and family, and even the monster he creates. Frankenstein seeks to be worshipped as the creator of a new species. However, once he realizes with revulsion what he had done, it is too late. The monster is gone, and the downward spiral of Frankenstein's existence begins. My project will examine the negative consequences of Victor Frankenstein's creativity. Unlike modern movie adaptations which glorify Frankenstein for his genius, Mary Shelley's novel depicts the horrors that follow the creation of this grotesque being.

The Will to Run: Mental Strategies Used by Recreational Marathon Runners

Amy Harris (Department of Human Performance)

Cindra Kamphoff, Faculty Mentor (Department of Human Performance)

Suzannah Armentrout, Faculty Mentor (Department of Human Performance)

*Recipient of Undergraduate Research Conference Small Grant

The marathon is growing in popularity throughout the U.S. and the world. In fact, Buman, Omli, Giacobbi, and Brewer (2008) reported that over 300,000 more people participated in the 26.2 mile race in the United States in 2004 compared to 1980. Since the marathon takes several hours to complete and a variety of people are now running marathons, it is important to understand mental strategies that are used. Although there is research on the mental strategies of elite marathon runners (Raglin, 2007), there is a lack of research on the mental strategies used by recreational marathon runners and few qualitative research studies to date (Buman, Brewer, Cornelius, Van Raalte, & Petitpas, 2008). Therefore, the purpose of this study was to qualitatively explore how recreational marathon runners use mental strategies to overcome pain and adversity while training and completing the marathon. Twenty-one recreational marathoners (females = 10, males = 11) were interviewed using a semi-structured interview guide. Participants reported a variety of mental strategies used to overcome pain and adversity such as directing attention to themselves and their effort, remaining positive, focusing on the present, chunking the marathon into smaller parts, setting sufficient goals, and distracting themselves. Some strategies differed by the participant's goal (i.e., to finish vs. a specific time). Almost all of the runners experienced mental roadblocks including negative thinking, setting rigid goals, focusing on uncontrollable conditions, and dealing with internal and external pressure. Specific concrete mental strategies will be discussed further and ideas for future research will be shared.

Women Coaches in High School Sport: A National Study

Inge E. Milius (Department of Human Performance)

Cindra Kamphoff, Faculty Mentor (Department of Human Performance)

*Recipient of Minnesota State University, Mankato Foundation Grant

Although the number of female athletes is near an all time high, only 42.6% of female collegiate teams are coached by a female and only 1.5-3% of male collegiate teams are coached by a female (Acosta and Carpenter, 2010). Furthermore, the Women's Sports Foundation (2010) reported a lack of female coaches at the interscholastic level, but the exact percentage is unknown. This research project documented females in coaching positions at the interscholastic level. We used the *Clell Wade National Coaches Directory* to assist our research which included over 450,000 lines of data including name of the coach, gender of the athlete they coach, sport they coach, and U.S. state they are employed. Data was coded, imported, and analyzed in SPSS Version 12.0 and documented. From these findings, we established the percentage of females that occupy coaching positions in U.S. interscholastic sports, if female coaches experience "tokenism" (i.e., where they are less than 15% of all coaches) and marginalization (i.e., where they coach less desirable sports such as "minor" or "Olympic sports"), and what percentage of females occupy different coaching positions (i.e., head coach, assistant coach). Ultimately, we expect that this report will raise national awareness about the lack of females coaches, and result in policy development or changes related to females in coaching positions in U.S. sport.

Computer Science, Mathematics & Statistics, and Mechanical & Civil Engineering

A Dialog System to Supplement Student Advising

Brian McMahan (Department of Computer Science)

Rebecca Bates, Faculty Mentor (Department of Computer Science)

Network Propagation and Related Algorithms

Joe Wagner (Department of Computer Science)

In-Jae Kim, Faculty Mentor (Department of Mathematics & Statistics)

Mathematical Modeling and Optimal Control of Chemotherapy applied to HIV

Daniel R. Branscombe (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

*Recipient of Minnesota State University, Mankato Foundation Grant

Minimum rank, zero forcing number and network propagation

Moyang Chen (Department of Mathematics & Statistics)

In-Jae Kim, Faculty Mentor (Department of Mathematics & Statistics)

Mathematical Modeling of Vehicular Carbon Emissions

Evan Vidden (Department of Mathematics and Statistics)

Jin-ho Yun (Department of Biological Sciences)

Namyong Lee, Faculty Mentor (Department of Mathematics and Statistics)

Impedance Tests to Assess Corrosion in Reinforced Concrete

Tim Setala (Department of Mechanical & Civil Engineering)

Allison Stanek (Department of Mechanical & Civil Engineering)

(All researchers participated equally)

Farhad Reza, Faculty Mentor (Department of Mechanical & Civil Engineering)

*Recipient of Undergraduate Research Conference Small Grant

A Dialog System to Supplement Student Advising

Brian McMahan (Department of Computer Science)

Rebecca Bates, Faculty Mentor (Department of Computer Science)

Dialog systems are an implementation of natural language processing theory which allows use of natural sentences for communication with a computer system. The purpose of this project was to design and implement a dialog system to augment university student advising, which is a relatively narrow domain of possible questions and responses. To further narrow the domain the dialog system focused on prescriptive advising rather than developmental advising. To better understand the domain, a professional advisor was recorded during a mock advising session to model student-advisor interaction. The natural phrases from the mock advising session were transcribed. The session was analyzed to develop the conversation sub-goals to gain data for organizing dialog. Phrases were encoded using Artificial Intelligence Markup Language (AIML). The system included a state manager to facilitate the conversation and AIML interaction. The purpose of the state manager is to control the flow of the conversation and ensure that the sub-goals are satisfied. A rule-based expert system was implemented to process the conversation results and make advising decisions, generating sentences and a visual representation of a proposed schedule to return to the student. The system was evaluated by an advisor for correctness and tested on several students for feedback on ease of use and likelihood of using the system. Future work will include expanding the conversational ability and the knowledge domain so that the system can be useful at other universities.

Network Propagation and Related Algorithms

Joe Wagner (Department of Computer Science)

In-Jae Kim, Faculty Mentor (Department of Mathematics & Statistics)

An idea or infectious disease can propagate through a network of individuals via personal contact. We can set up mathematical models of propagation by specifying governing rules of how an idea or disease spreads. In this presentation we study governing rules of propagation and discuss their related algorithms.

Mathematical Modeling and Optimal Control of Chemotherapy applied to HIV

Daniel R. Branscombe (Department of Mathematics & Statistics)

Namyong Lee, Faculty Mentor (Department of Mathematics & Statistics)

*Recipient of Minnesota State University, Mankato Foundation Grant

Of great concern today is the treatment of patients infected with the human immunodeficiency virus (HIV). In this project, we built a series of mathematical models to understand the dynamics of HIV virus, immune system and chemotherapy interactions. Then we found the best chemotherapy strategy through optimal control theory.

Different chemotherapies are continuously being tested and these are under intense study to find the optimal strategy for administering the treatment. While chemotherapy can be effective at fighting HIV, at the same time it also can cause several negative side effects such as; nausea, diarrhea, anemia, neutropenia, and cytotoxicity. Further, HIV is capable of mutating and gaining drug resistance. Thus it is of vital importance to be able to find an optimal dosage strategy that both minimizes the negative side effects as well as the likelihood of mutation. We first developed a mathematical model for the interaction of chemotherapy with HIV and the immune system as well as the possibility of virus mutation.

Optimal control theory, an extension of the calculus of variations, is a mathematical optimization method for deriving control policies. The method is largely due to the work of Lev Pontryagin and Richard Bellman. The optimal control can be derived using Pontryagin's maximum principle (a necessary condition), or by solving the Hamilton-Jacobi-Bellman equation (a sufficient condition).

Utilizing optimal control theory, we have determined an optimal strategy with dosages of both reverse transcriptase (RT) inhibitors and protease inhibitors (PIs). The optimal strategy is to alternate dosages of RT and PI with a period of no treatment in between. This strategy reduces the amount of virus present while minimizing virus mutation and negative effects on the immune system. We will also present the computer simulation that supports our result.

Minimum rank, zero forcing number and network propagation

Moyang Chen (Department of Mathematics & Statistics)

In-Jae Kim, Faculty Mentor (Department of Mathematics & Statistics)

A graph consists of vertices and edges. An edge connects a pair of vertices. The minimum rank of a graph G is the smallest rank that can be achieved by a symmetric matrix whose graph is G . The computation of the minimum rank of a graph is equivalent to that of the maximum co-rank of the graph. It is known that the zero forcing number of a graph is an upper bound on the maximum co-rank of the graph. In this presentation we introduce the zero forcing number of a graph and its relation to the minimum rank of the graph, and show how we can use the zero forcing number in the study of network propagation.

Mathematical Modeling of Vehicular Carbon Emissions

Evan Vidden (Department of Mathematics and Statistics)

Jin-ho Yun (Department of Biological Sciences)

Namyong Lee, Faculty Mentor (Department of Mathematics and Statistics)

Carbon emissions are contributors to worldwide climate changes, with a large producer of these emissions being automobiles. Modeling emission rates caused by vehicles at certain gas price levels showed that higher gas prices will lead to an increase in the use and number of smaller vehicles (passenger cars) and a decrease in the use and number of larger vehicles (light trucks and SUVs). Using reference data from government agencies for time periods between 1994 and 2008, the effects of gas prices on emissions produced by cars each year are modeled. Various modeling techniques were used to analyze the reference data, adjust model parameters to fit trends observed in the reference data, and predict possible future scenarios. We built mathematical models to simulate the dynamics of the project using various software programs such as pplane, matlab, and mathematica.

Impedance Tests to Assess Corrosion in Reinforced Concrete

Tim Setala (Department of Mechanical & Civil Engineering)

Allison Stanek (Department of Mechanical & Civil Engineering)

(All researchers participated equally)

Farhad Reza, Faculty Mentor (Department of Mechanical & Civil Engineering)

*Recipient of Undergraduate Research Conference Small Grant

The goal of this research was to determine if using impedance tests on concrete cylinders could detect corrosion of steel reinforcing bars (rebars) embedded in the concrete. The impedance tests would provide a convenient alternative nondestructive test method compared to other existing methods. Concrete cylinders with rebar placed inside of them were first constructed. Then salt water baths containing sodium hydroxide and potassium hydroxide that corrodes the rebar inside the concrete were constructed. The concrete cylinders were placed inside of the two baths and connected to a resistor. This was supposed to corrode the rebar inside of the concrete cylinders. Using a voltmeter, the voltage drop was measured each week for 6 weeks and was increasing, which was expected. Also, a reference saturated calomel electrode was used to determine corrosion potential. Then impedance tests were conducted and the data seemed to be inconsistent and hence unreliable as a test method. New concrete cylinders were made with carbon fibers to decrease the electrical resistance and make them easier to monitor. These tests will be compared with the results of the first set of cylinders.

Economics

A Study on the Use of Sex, Violence, and Profanity to Increase Revenue in the Motion Picture Industry

Amanda Helget (Department of Economics)

Christina Lotton (Department of Economics)

(All researchers participated equally)

Ihsuan Li, Faculty Mentor (Department of Economics)

An Analysis of the Impact of Affirmative Action on Gender Wage differential in the United States

Guncha Jumakuliyeva (Department of Economics)

Ihsuan Li, Faculty Mentor (Department of Economics)

*Recipient of Undergraduate Research Conference Small Grant

Does financial aid help reduce crime rate?

Yuyoung Park (Department of Economics)

Ihsuan Li, Faculty Mentor (Department of Economics)

A Study on the Use of Sex, Violence, and Profanity to Increase Revenue in the Motion Picture Industry

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In the past, parental concerns of popular movies were based on the perception of rampant use of sex, violence, and profanity in PG13 and PG rated movies as well. To untangle the effects of other potential factors determining movies revenues, this study examined movies from the years 1993 – 2010 that were shown in over 1000 theaters throughout the United States. Our regression results showed that controlling for critics' review and the season of release, the effects of levels of sex, violence and profanity present in the movies were not statistically significant.

An Analysis of the Impact of Affirmative Action on Gender Wage differential in the United States

Guncha Jumakuliyeva (Department of Economics)

Ihsuan Li, Faculty Mentor (Department of Economics)

*Recipient of Undergraduate Research Conference Small Grant

Using data from the National Education Longitudinal Study of 1988, I examined factors leading to wage differential for college graduates between the ages 22 to 30. Regression analysis showed decreasing wage differential due to increased number of women with higher education, increased enrollment and graduation of women in previously male considered areas such as engineering, science, and technology, increased on-the-job trainings, and increased work experience, as well as increased representation in occupation in more unionized industries. Most importantly, government policy leading to affirmative action hiring of minority women appeared to decrease the wage differential. This study also found that choice of major affected pay penalties for women in the social sciences, humanities, history, and business administration.

Does financial aid help reduce crime rate?

Yuyoung Park (Department of Economics)

Ihsuan Li, Faculty Mentor (Department of Economics)

According to a report released by the Education Department's National Center for Education Statistics, sixty-six percent of undergraduates received some type of student aid during the 2007-8 academic year. Overall fifty-two percent of students received grants, at an average of \$4,900. As widely known, an individual with higher education level tends to have a higher wage rate. Previous work on the effectiveness of financial aid focused on individuals' drop out decision. This paper sought to establish the relationship between federal/state financial aid and the crime rate in each of the 50 states. Using state level data set, I tested if financial aid played a role of positive externality to reduce crime rate as well. Econometric models were developed to analyze the relationship between independent variables including financial aid, the number of police, race, household median income, and unemployment rate and dependent variables, violent, property and white-collar crime rate. Preliminary results showed that financial aid has a moderate significance in reducing the violent crime rate but not on property or the white-collar crime rate.

Anthropology, Elementary & Early Childhood Education, Ethnic Studies, and Scandinavian Studies

Assessment of Hand Hygiene Habits of Employees in an Adult Day Care Center

David P. Wilson (Department of Anthropology)

Kathryn “Jay” Elliott, Faculty Mentor (Department of Anthropology)

Change in Cultural Competency among Students During an Intentional Human Relations Experience (EEC 222W)

Samantha Tupy (Department of Psychology)

Camille McNabb (Department of Psychology)

(All researchers participated equally)

Elizabeth Sandell, Faculty Mentor (Department of Elementary & Early Childhood Education)

*Recipient of Minnesota State University, Mankato Foundation Grant

Social Challenges of African Americans at Minnesota State University, Mankato

Ifedi Obidiegwu (Department of Ethnic Studies)

Kebba Darboe, Faculty Mentor (Department of Ethnic Studies)

Gender and Monarchy: The Case of “King” Christina

Jenna Tatro (Department of Scandinavian Studies)

Suzanne Martin, Faculty Mentor (Department of Scandinavian Studies)

Assessment of Hand Hygiene Habits of Employees in an Adult Day Care Center

David P. Wilson (Department of Anthropology)

Kathryn "Jay" Elliott, Faculty Mentor (Department of Anthropology)

Following hand hygiene protocols is the primary defense in minimizing the transmission of infectious diseases. The adult foster day care facility provides a multitude of services for the local population of vulnerable adults in the Mankato and North Mankato community. The direct care providers provide close personal care to their clients on a daily basis. If hand hygiene protocols are not followed, this type of interaction creates an environment that enables the spread of infectious diseases. Direct care providers were interviewed about how they managed their hand hygiene on a daily basis and about any factors that inhibited their ability to follow hand hygiene protocols. The results of the interviews were compared to proven hand hygiene models to determine how the research participants were in implementing hand hygiene protocols. The data indicated that the direct care providers could not always follow hand hygiene protocols and this resulted in the creation of a new set of hand hygiene protocols that addressed the inhibiting factors.

Change in Cultural Competency among Students During an Intentional Human Relations Experience (EEC 222W)

Samantha Tupy (Department of Psychology)

Camille McNabb (Department of Psychology)

(All researchers participated equally)

Elizabeth Sandell, Faculty Mentor (Department of Elementary & Early Childhood Education)

*Recipient of Minnesota State University, Mankato Foundation Grant

This study measured changes in the intercultural competency of undergraduate students in a course, Human Relations in a Multicultural Society. The National Council for Accreditation of Teacher Education (NCATE) is encouraging teacher preparation programs to foster and measure culturally responsive teaching. The hypothesis for this study was that the intentional, cross-cultural experiences of students will have an impact on the cultural competency of each student. This course is taught each semester at a Midwestern public university. The study included 70 undergraduate students between 18 and 35 years old who voluntarily enrolled in the course and represented students in academic majors such elementary education, sports management, social work, mass communications, journalism, and pre-professional studies (e.g., mortuary science, veterinary medicine, therapy). The theoretical basis of the study was the Developmental Model of Intercultural Sensitivity (DMIS) (Bennett, 1998). For this study, the Intercultural Development Inventory (IDI) (Hammer and Bennett, 1998 and 2001) was used as a measure of cultural competency. The IDI was completed by subjects at the beginning of the semester and at the conclusion of the semester. This provided a process to compare pre-instruction and post-instruction scores. Data were analyzed to compare scores and to identify the cultural orientation of each student among six stages of the DMIS: Denial, Defense, Minimization, Acceptance, Adaption, and Integration. Researchers expect that subjects will show positive gains in overall intercultural sensitivity. Results will be used by the local university to facilitate strategic initiative to educate undergraduate students in multicultural diversity.

Social Challenges of African Americans at Minnesota State University, Mankato

Ifedi Obidiegwu (Department of Ethnic Studies)

Kebba Darboe, Faculty Mentor (Department of Ethnic Studies)

This study examines the social challenges of African American students at Minnesota State University, Mankato. The participants in this research ranged from undergraduate freshman to graduate students. The participants completed self-report surveys asking their perception on their social lives at Minnesota State University, Mankato. The purpose of this research was to identify some of the challenges that African American students face at Minnesota State University, Mankato.

Gender and Monarchy: The Case of “King” Christina

Jenna Tatro (Department of Scandinavian Studies)

Suzanne Martin, Faculty Mentor (Department of Scandinavian Studies)

Queen Christina is to this day among the most intriguing and prominent figures within Swedish history and culture. Easily compared to Queen Elizabeth I of England, Christina was an independent woman who ruled as a king in her own right, and has been subjected to intense speculation about her personal life for having done such. For the phallogocentric world in which she lived dictated that no “woman” should have had passions for the sciences, humanities and politics, as Christina did in fact have. Through feminist views, such as those of Simone de Beauvoir, as well as more traditional views, I have found representations of Christina that focus on masculine and feminine traits, as well as some that fall somewhere between. These traits have been sorted out and interpreted via gender theories. I have examined documentation and paintings beginning in her own time, up through modern portrayals of her in cinema and children’s literature, and have concluded that we no longer need to consider Christina in terms of a binary gender construct, but rather as a powerful ruler and a woman who lived according to her own ideals rather than social customs and expectations.

My resources will include mediums with exemplary representations of Queen Christina as a masculine, feminine, and non-gendered figure.

Government

Recent Health Reforms: in Turkey and Mexico

Abdihakim Abdi (Department of Government)

*Tomasz Inglot, Faculty Mentor (Department of Government)***A Comparative Analysis of Health Care Reforms in France and Germany**

Melissa Do (Department of Government)

*Tomasz Inglot, Faculty Mentor (Department of Government)***Health Policy Reform in Germany and the United States: A Cost Containment Approach**

Derek Eiden (Department of Government)

Tomasz Inglot, Faculty Mentor (Department of Government)

Recent Health Reforms: in Turkey and Mexico

Abdihakim Abdi (Department of Government)

Tomasz Inglot, Faculty Mentor (Department of Government)

This paper will compare and contrast Mexico's *Seguro Popular* health care reform and Turkey's Health Transformation Programme (HTP) respectively. This paper also presents evidence why Mexico's *Seguro Popular* reform has more lasting benefits for the population than Turkey's HTP reform. Quality and efficiency of the health care system are the key ingredients to measure the development of a modern state. A reliable health care system is one of the critical elements that separate the weak states from the strong states. A legitimate health care system unifies the genuine discourse of democracy and economic growth for the particular state. There had been many studies published in the past that dealt with comparative analysis of health care systems. However, previous studies focused on the OCED states. There has been little research that looked at health care systems of states with emerging-market economy. The recent health care reforms in Mexico and Turkey, illustrated the main problems and challenging of two countries in the process of constructing more developed welfare state.

A Comparative Analysis of Health Care Reforms in France and Germany

Melissa Do (Department of Government)

Tomasz Inglot, Faculty Mentor (Department of Government)

This research paper presents a comparison of recent health policies of two European countries, France and Germany. Even though their health care systems are based on the same model, these countries have recently attempted to implement different reforms of their social policies. This paper compares and contrasts specific benefits and health care packages that are provided by each country, with a specific attention to differences in ideological views on how to develop and maintain adequate coverage for citizens of developed capitalist democracies. But first of all, this paper will use an analytical approach to compare and contrast French and German approaches to regulating their health care systems, with one country opting for more centralization and the other for less.

Health Policy Reform in Germany and the United States: A Cost Containment Approach

Derek Eiden (Department of Government)

Tomasz Inglot, Faculty Mentor (Department of Government)

The impacts of resilience thesis, the art of framing, and political characteristics impact the ability of governments to reform health care policy. As the world exits the Golden Age and enters in to a new era of austerity, welfare fundamentals are being challenged in many developed countries. Reforms classified by scholars include first-order, second-order, and third-order types with each corresponding to a greater amount of policy evolution and possible voter consequence. This paper will explain recent reform acts in Germany and the United States, with specific attention to historical factors and outcomes to determine the many influences on the two countries' health insurance policy of the 1990's and 2000's. The key issue is whether politicians can be successful in reforming benefits and still keep their re-election chances high. This paper argues that the answer to this question very much depends on the political strategy chosen by the health care reformers in each country.

Theatre & Dance

***Common Conflict* – Creative Performance Research**

Elizabeth A. Ulseth (Department of Theatre & Dance)

Julie Kerr-Berry, Faculty Mentor (Department of Theatre & Dance)

Common Conflict – Creative Performance Research

Elizabeth A. Ulseth (Department of Theatre & Dance)

Julie Kerr-Berry, Faculty Mentor (Department of Theatre & Dance)

Dance performance research requires the dancer to explore the intent behind movement to gain a deeper understanding of its meaning, and to connect movement to emotion in order to evoke an emotional response from the audience. The collaboration between choreographer and dancer allowed for an exploration of the elements of dance performance, including artistry, musicality, and technique that bridges movement and emotion. The creative process began with the development of the choreography, fueled by the choreographer's intent behind the movement. Intent involves artistic choices in order to convey a specific statement. As the dancer embodied the choreography, the movement and intent shifted from the perspective of the choreographer to that of the performing artist. The choreographer's intent affected movement choices and influenced the dancer's artistic interpretation of the work. This dance explored the many facets of conflict within all types of relationships. The creative research investigated the emotional connection to the movement of this piece through observations of relationships. These observations lead to an awareness of conflict, and the resolution of conflict, within relationships. The results of this creative research project were demonstrated in the performance of the dance piece, *Common Conflict*.

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