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2011 Undergraduate Research Symposium Abstract Book

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The University of Minnesota, Morris

- 2011 -

**UMM Undergraduate Research Symposium
Featuring student research and scholarship from across campus**

Saturday, April 16, 2011

10:00 a.m. – 3:00 p.m.	Registration, Science Atrium and John Q. Imholte Hall
10:00 a.m. – 12:15 p.m.	Poster/Visual Display, Science Atrium
10:30 a.m. – 10:35 a.m.	Opening Welcome-Dr. Jeffrey Ratliff-Crain Assistant Dean
12:15 p.m. – 1:15 p.m.	Lunch, Oyate Hall
12:30 p.m. – 12:40 p.m.	Welcome-Dr. Jacqueline Johnson Chancellor
1:30 p.m.	Introduction of Featured Presentation-Dr. Cheryl Contant Vice Chancellor for Academic Affairs and Dean
1:30 p.m. – 2:00 p.m.	Featured Presentation, John Q. Imholte Hall #109 Elizabeth Grave - Hands On!
2:00 p.m. – 5:00 p.m.	Oral presentations: John Q. Imholte Hall, Room #s: 101, 109, 111, 112
3:45 p.m. – 4:45 p.m.	Performances, HFA #170

The 2011 Eleventh Annual UMM Undergraduate Research Symposium (URS) celebrates student scholarly achievement and creative activities. The URS provides an opportunity for students to inform the campus community and visitors of the quality and variety of research that occurs at UMM. Research projects from all disciplines participate in the URS. Types of presentations include posters, oral presentations, and short or abbreviated theatrical, dance, or musical performances. Presentations are accompanied by discussions and multimedia presentations.

ORAL PRESENTATIONS

John Q. Imholte Hall, Room #s 101 and 109

Room #101

- 2:00 **Peter Hurd** (English): **The Quest Will Go On: Rider Haggard's *She***
(Adviser: Bradley Deane), abstract pg. 11
- 2:25 **Dominic Scheck** (English): **Saying, "I cannot say, I": Spectral Subjectivity in *The Picture of Dorian Gray* and *Dr Jekyll and Mr Hyde*** (Adviser: Bradley Deane),
abstract pg. 16
- 2:50 **Hannah Lindquist** (English): **Infiltrating the Classroom: High-Stakes Essay Tests and High School Writing Instruction** (Adviser: Tisha Turk), abstract pg. 13
- 3:15 **Taylor Lunemann** (Communication, Media, and Rhetoric): **Selling the Droid: An Analysis of Online Advertising Strategies** (Adviser: Barbara Burke), abstract pg. 13
- 3:40 **Zach Ranallo** (Communication, Media, and Rhetoric): **Home Run: An Assessment of Television Commercials from the 2010 Major League Baseball World Series Telecasts** (Adviser: Barbara Burke), abstract pg. 14
- 4:05 **Andreana Saunders** (Communication, Media, and Rhetoric): **Asian Cultures and Contemporary Individualization - Respect, Deference, and Hard Work as Determinants of Self-Worth** (Adviser: Barbara Burke), abstract pg. 15
- 4:30 **Sam Krump-Johnson, Alex Kies, Alek Sievert, Matt Privratsky, Mark Privratsky, and Wyatt Nolan** (Communication, Media, and Rhetoric and English): **A Webseries is Born: Practice in the Collaborative Process of Comedic Productions Intended for Internet Consumption** (Adviser: Barbara Burke), abstract pg. 12

Room #109

- 1:30 **Elizabeth Grave** (Art History): **Hands On! : Creating a Virtual Exhibit of Hands as Represented in the History of Art** (Adviser: Julia Dabbs), abstract pg. 7
- 2:00 **David Schilmoeller** (Art History): **Roman Treasure, Greek Science**
(Adviser: James G. Schryver), abstract pg. 17
- 2:25 **Joshua Smith** (Art History): **Petah Coyne: A Catholic Interpretation**
(Adviser: Joel Eisinger), abstract pg. 17
- 2:50 **Kayla Hagen** (Art History): **Douglas Chandor's Incomplete Portrait of Franklin Delano Roosevelt: an Analysis** (Adviser: Julia Dabbs), abstract pg. 10
- 3:15 **Mandi Riley** (Art History): **The Many Faces of Michelangelo in the *Last Judgment***
(Adviser: Julia Dabbs), abstract pg. 14
- 3:40 **Susan Robertson** (Art History): **The Iconic Mrs. Jack: A Portrait of a Lady by John Singer Sargent** (Adviser: Julia Dabbs), abstract pg. 15

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ORAL PRESENTATIONS

John Q. Imholte Hall Room #s 111 and 112

Room #111

- 2:00 **Austin Kelsey** (Environmental Studies): **The Minnesota Statewide Health Improvement Program-Evaluating Outcomes at Community Gardens** (Advisers: Jessica Beyer and Karen Mumford), abstract pg. 12
- 2:25 **Alicia Johnson** (Biology and Sociology): **Convenience, Culture, and Support: Why Some Women Choose to Use Formula to Feed their Infants** (Advisers: Karen Mumford and Jennifer Rothchild), abstract pg. 11
- 2:50 **Dugan Flanders** (Economics): **Economic Viability of Hydrostatic Transmissions in Wind Turbines** (Adviser: Arne Kildegaard), abstract pg. 9
- 3:15 **Colin Scheck** (Political Science): **Defending Sovereignty in the Midst of Giants: Mongolian Foreign Policy in the New Millennium** (Adviser: Seung-Ho Joo), abstract pg. 16

Room #112

- 2:00 **Josephine Corley** (Communication, Media, and Rhetoric): **First Amendment Controversies and Communication** (Adviser: Mary Elizabeth Bezanson), abstract pg. 8
- 2:25 **Oliver Goulet** (Communication, Media, and Rhetoric): **First Amendment Controversies and Communication** (Adviser: Mary Elizabeth Bezanson), abstract pg. 9
- 2:50 **Morgan Turner** (Communication, Media, and Rhetoric): **First Amendment Controversies and Communication** (Adviser: Mary Elizabeth Bezanson), abstract pg. 18
- 3:15 **Michael Ward** (Communication, Media, and Rhetoric): **First Amendment Controversies and Communication** (Adviser: Mary Elizabeth Bezanson), abstract pg. 18
- 3:40 **Kathryn Barron** (Spanish): **The First Republic: Political and Literary Foundations of Modern Spanish Liberalism** (Adviser: James Wojtaszek), abstract pg. 8
- 4:05 **Abram Henry** (Spanish and Political Science): **Multilateral Diplomacy, Multilateral Roles: The Many Understandings of the "Role" of International Organizations in Modern International Relations** (Advisers: Stacey Parker Aronson and Paula O'Loughlin), abstract pg. 10

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PERFORMANCE PRESENTATIONS 3:45 p.m. – 4:45 p.m.
HFA Choral Room #170

- 3:45 **Anthony Bannach** (Music): **Studies of Electronic Instrumentation within a Standard Orchestra Score** (Adviser: Joseph Carucci), abstract pg. 19
- 4:10 **Sarah Mensen** (Music): **Music as Historical and Political Commentary: Frederic Rzewski's *Winnsboro Cotton Mill Blues*** (Adviser: Ann DuHamel), abstract pg. 19
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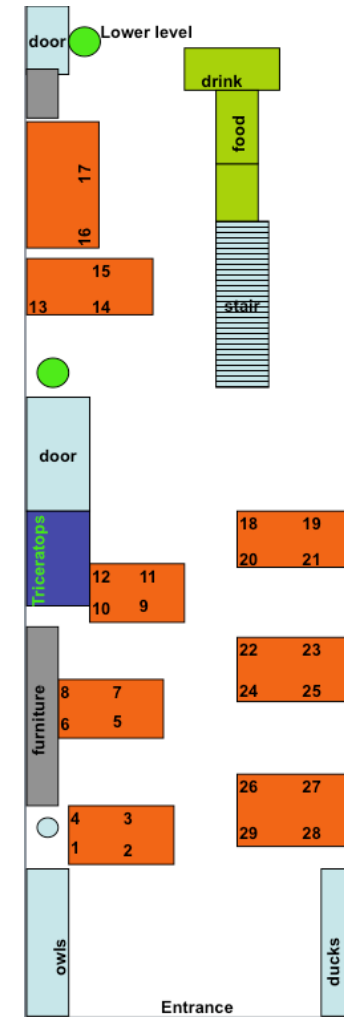
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POSTER PRESENTATIONS 10:00 a.m. – 12:15 p.m.
Science Atrium

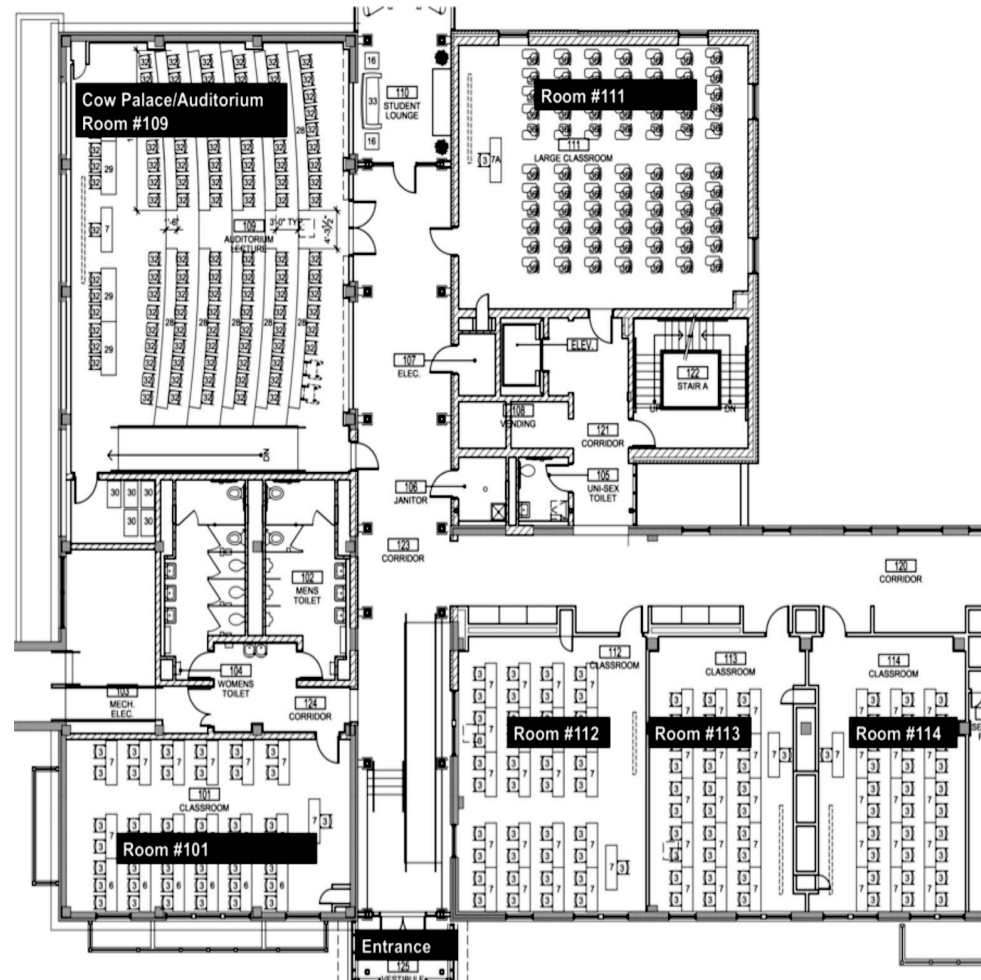
- #1 **Elise Porcher** (Biology): **Developing an Optimum Method for Harvesting Seeds of *Cuphea wrightii*** (Adviser: Chris Cole), abstract pg. 29
- #2 **Alicia Johnson** (Biology): **Light to Dim Oscillatory Response in *Neurospora crassa* Circadian Rhythms** (Adviser: Van Gooch), abstract pg. 25
- #3 **Kele Cable** (Biology): **Variation in Limb Structure of Salamanders** (Adviser: Paul Myers), abstract pg. 21
- #4 **Ashleigh Thompson and Ember Phillips** (Biology): **Cottonwoods: Trade-offs between Biomass Production and Chemical Defense** (Adviser: Chris Cole), abstract pg. 32
- #5 **Andrea Lund** (Biology): **Effects of Machismo and Acculturation on HPV Vaccination Status and Willingness among White and Latina Women** (Adviser: Karen Mumford), abstract pg. 27
- #6 **Lisa Larson, Bailey Stanard, Hannah Schubloom, and A. Hunter Baldry** (Biology): **Pollinator Constancy in the Foraging Behavior of Syrphid and Tachinid Flies Toward *Solidago canadensis* and *Symphyotrichum laeve* in Pomme de Terre Park** (Adviser: Margaret Kuchenreuther), abstract pg. 26
- #7 **Guinevere P.E. Bitker** (Chemistry): **Isoergic Hydrogen Bonding in Substituted Acetic Acid Dimers** (Adviser: James B. Togeas), abstract pg. 20
- #8 **Alex Madsen** (Chemistry): **Teaching Electrochemistry: Addressing Misconceptions by the Development of Educational Materials that Promote Conceptual Understanding** (Adviser: Jernnifer Goodnough), abstract pg. 28
- #9 **Jennifer Schmidt and Ryan Koehn** (Chemistry): **PBC-DFT: An Efficient Method to Calculate Energy Band Gaps for Conducting Polymers used in Solar Cells** (Adviser: Ted Pappenfus), abstract pg. 30
- #10 **Deborah Schneiderman and Matthew Lovander** (Chemistry): **Oligothiophene tetracyanobutadienes as Alternative Donor-Acceptor Materials** (Adviser: Ted Pappenfus), abstract pg. 31
- #11 **Jerome John Kessler** (Physics): **Weather Trends Spanning a Hundred Years from the Morris Region** (Adviser: Sylke Boyd), abstract pg. 25
- #12 **Jeffrey Lind** (Physics): **Skylight Polarization from a Balloon Flight** (Adviser: Gordon McIntosh), abstract pg. 27
- #13 **Matthew Kroonblawd** (Physics): **Computational Study of Shock Energy Distribution in the Vicinity of a Void in Crystalline RDX** (Adviser: Sylke Boyd), abstract pg. 26
- #14 **Brian Goslinga and Eugene Butler** (Computer Science): **Improving Error Messages in the Programming Language Clojure** (Adviser: Elena Machkasova), abstract pg. 22

POSTER PRESENTATIONS 10:00 a.m. – 12:15 p.m.
Science Atrium

- #15 **Michael Hoffman** (Mathematics): **A Copula Approach to Modeling of Financial Markets** (Adviser: Peh Ng), abstract pg. 24
- #16 **Michael Rislow** (Mathematics): **Special Structures and Decomposition Patterns of 3-Directed Hypergraphs** (Adviser: Peh Ng), abstract pg. 30
- #17 **Chad Seibert** (Mathematics): **Adaptive GPS Algorithms** (Adviser: Peh Ng), abstract pg. 31
- #18 **Rachel Harstad** (Horticulture, St. Paul campus): **Effects of Cultivar and Initial Plant Spacing on Growth and Development of Primocane-Fruiting Raspberries Grown in High Tunnels** (Advisers: Jon Anderson and Emily Hoover), abstract pg. 22
- #19 **Rachel Harstad** (Chemistry): **Semi-empirical Study of the Effects of Temperature on Hydrogen Bonding Strength and Liquid Salt Water Dynamics** (Adviser: Jennifer Goodnough), abstract pg. 23
- #20 **Liz Vold** (Statistics, Horticulture, West Central Research and Outreach Center): **Raspberry Size and Total Yield in a High Tunnel Compared to Traditionally Managed Fields** (Advisers: Jon Anderson, Emily Hoover, and Steven Poppe), abstract pg. 34
- #21 **Alissa Hawks** (Sociology and Biology): **Breastfeeding in Rural Minnesota** (Advisers: Jennifer Rothchild and Karen Mumford), abstract pg. 23
- #22 **Ayano Jiru and Lea Awoudi** (Statistics and Management): **Workers Compensation Claims: Analysis of Injuries and Costs** (Advisers: Jon Anderson and Stephen Burks), abstract pg. 24
- #23 **Ruth Potter and Manjari Govada** (Economics and Statistics): **Obstructive Sleep Apnea (OSA) and Accident Risk Among Commercial Truck Drivers** (Adviser: Stephen Burks), abstract pg. 29
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- #25 **Ellis Valentiner** (Statistics and Biology): **Seasonal Influenza Vaccination Behavior in Stevens County** (Advisers: Jon Anderson and Karen Mumford), abstract pg. 33
- #26 **Douglas Armstrong** (Wellness and Sport Science): **Skin Preparation for Bursal or Articular Injection** (Adviser: Richard Hardy), abstract pg. 20
- #27 **Alaina Pearce and Ellis Valentiner** (Psychology): **Effects of Lexical Shortenings and Word Errors on Cognitive Processing** (Adviser: Cheryl Stewart), abstract pg. 28
- #28 **Masera Turkson, Austin Kelsey, Joe Dunlavy, and Jon Braegelmann** (Math & Science and Center for Small Towns): **Evaluation of School Physical Activity and Nutrition Initiatives in Western Minnesota** (Advisers: Karen Mumford and Jessica Beyer), abstract pg. 33
- #29 **Kara Thomas** (Sports Management): **The IKDC is the dominant Outcome Measure of ACL Reconstruction** (Adviser: Richard Hardy), abstract pg. 32



Science Atrium
Poster Presentations



Featured Presentation
John Q. Imholte Hall, Room #109
1:30 pm

Presenter: Elizabeth Grave
Project Adviser: Julia K. Dabbs (Art History)
Title: Hands On! : Creating a Virtual Exhibit of Hands as Represented in the History of Art
Type of Presentation: Oral

Abstract:
 Just as hands are an important part of our everyday activities and interactions, it has become obvious to me through the study of art history that hands also play an important role in interpreting art. Through visual analysis and biographical research I have explored the symbolism of hands in selected works of art dating from the Prehistoric period through electronic media of the 1980s. With the knowledge learned from my research, I created a virtual art exhibit bringing to mind the importance of hands and hand gestures in such works as Frida Kahlo's *The Two Fridas* and Alfred Stieglitz's photos of Georgia O'Keeffe. This exhibit, Hands On!, is a unique way to bridge the gap between traditional museum techniques and that of the current media-driven generation, allowing for a broader audience to experience art in new ways. Through examining the works in this exhibit, I will consider the advantages and disadvantages of experiencing art in a virtual exhibit versus a traditional museum visit.

John Q. Imholte Hall, 1st Floor
 Oral Presentations

Oral Presentations
John Q. Imholte Hall
Room #s: 101, 109, 111, 112

Presenter: Kathryn Barron

Project Adviser: James Wojtaszek (Spanish)

Title: The First Republic: Political and Literary Foundations of Modern Spanish Liberalism

Type of Presentation: Oral

John Q. Imholte Hall, Room #112, 3:40 p.m.

Abstract:

The Spanish First Republic was established in 1873 to replace the Spanish monarchy, yet ended eleven months after it began. Even though the First Republic failed, the ideals of liberal government endured in Spanish political life during the rest of the 19th and 20th Century. My research, sponsored by the UROP scholarship, focuses on the importance of the First Republic as the birth of liberalism in modern Spanish politics, how the First Republic influenced political theory during the time it was in place, and how the Constitution of 1873 reflected universal liberal values still seen in Spanish politics today. To make my conclusions, I use the text of the Constitution of 1873 to demonstrate the liberal values behind the First Republic. I also use the text of Benito Pérez Galdós's novel, *La Primera Republica*, as an example of general public sentiment towards the liberal Spanish government. I conclude by showing the First Republic to have played an important part in 19th Century Spanish political tradition and how it made an important contribution to Spanish politics through the literature and policy of its time.

Presenter: Josephine Corley

Project Adviser: Mary Elizabeth Bezanson (Communication, Media, and Rhetoric)

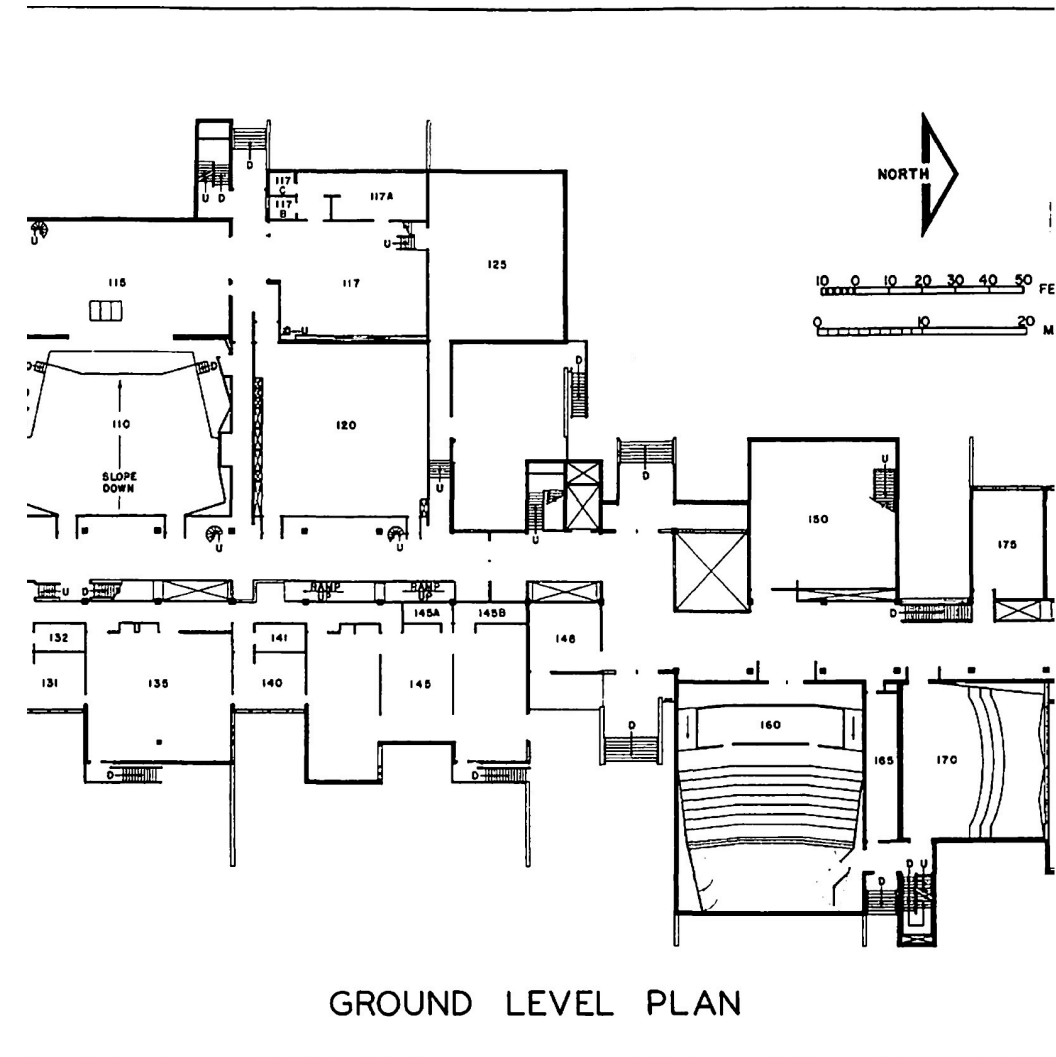
Title: First Amendment Controversies and Communication

Type of Presentation: Oral

John Q. Imholte Hall, Room #112, 2:00 p.m.

Abstract:

The freedoms of religion and speech are protected by the First Amendment under the United States Constitution. However, in U.S. history, the boundaries for religion and speech can conflict and thus create ambiguities when the interactions between the two freedoms are in practice. Such was the case in 2005 when Thomas Van Orden, who identified as an atheist, was offended by a monument with an inscription of the Ten Commandments that was on the grounds of the Texas State Capitol. The U.S. Supreme Court decided in the case of *Van Orden v. Perry* that the placement of the monument was constitutional. This ruling shows that even though the content of the monument's text was religious, it is the context in which the monument was given and erected that proves to hold a higher significance in constitutionality. This higher significance of the context also suggests that more regard should be given to a sender's intention than a receiver's perception of message.



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Presenter: Dugan Flanders**Project Adviser:** Arne Kildegaard (Economics)**Title:** Economic Viability of Hydrostatic Transmissions in Wind Turbines**Type of Presentation:** Oral

John Q. Imholte Hall, Room #111, 2:50 p.m.

Abstract:

In the last twenty years, the development of wind power as a major source of renewable energy has progressed rapidly. However, as turbine sizes and developments have increased, so have premature failure rates. For many turbine subassemblies, technological innovations have allowed premature failure rates to decrease in recent years. However, no such technological innovations or decreasing rates have been found in the data for wind turbine gearboxes. Premature gearbox failure is the top cause of prolonged downtime among turbines in Sweden, Germany, and Denmark, and the extremely high costs associated with gearbox failure have made the issue a priority among both manufacturers and developers. This study uses raw data from the *Windstats* database of German and Danish turbine reports, along with various Swedish and Finnish sources of data to determine annual gearbox failure rates. The failure data are then used in partnership with actual production and cost data to formulate, in present value terms, an accurate representation of the true cost of gearbox failure. The study also addresses one potential solution to the problem: replacing the gearbox with a hydrostatic transmission. A comparative calculation of the costs associated with hydrostatic transmissions then reveals the potential economic viability of the innovation, and whether it is something to expect in future wind turbine development.

Presenter: Oliver Goulet**Project Adviser:** Mary Elizabeth Bezanson (Communication, Media, and Rhetoric)**Title:** First Amendment Controversies and Communication**Type of Presentation:** Oral

John Q. Imholte Hall, Room #112, 2:25 p.m.

Abstract:

One of the most basic rights that we as citizens of the United States have is the freedom of speech. In order to best understand the nature of this basic human right we need to analyze how our courts interpret freedom of speech. The Supreme Court of the United States provides the most definitive guidance in what does and does not fall under the protection of the First Amendment and thus what is considered free speech and what is not. In analyzing the opinions of the Supreme Court we can gain a better understanding of the nature of our laws and the general direction of our country. Through the case *Christian Legal Society vs. Martinez* 130 S. Ct. 2971 2010, the application of the First Amendment can be better understood as well as the rights of students to free speech. Critical analysis of the rhetorical nature of this opinion offers insight into the reasoning behind the decisions which shape our country. Through rhetorical exploration and close analysis of the case *Christian Legal Society vs. Martinez*, I seek to gain a better understanding of the message conveyed by the Supreme Court in regards to this free speech issue.

Presenter: Kayla Hagen

Project Adviser: Julia Dabbs (Art History)

Title: Douglas Chandor's Incomplete Portrait of Franklin Delano Roosevelt: an Analysis

Type of Presentation: Oral

John Q. Imholte Hall, Room #109, 2:50 p.m.

Abstract:

Every American president has a painted portrait commissioned at the end of their presidency, even in the present day. The way in which they are depicted reflects how they want to be etched into history. For example, Richard Nixon chose to be portrayed in a relaxed, intimate setting with the hopes that people would remember him as a human being in a more positive light rather than for the mistakes he made during his presidency. On the other hand, Franklin Delano Roosevelt was popular and his portrait portrays him in a position of authority to recall his time in office. Interestingly, the portrait for Franklin Delano Roosevelt by Douglas Chandor never reached completion but is currently housed and accepted as an official portrait in the National Portrait Gallery in Washington. The painting includes a portrait of Roosevelt, various studies of his hands, and a sketch of what the final work would have been. In my presentation, I will visually analyze Chandor's study of FDR, compare the painting to the way other presidents were portrayed and interpret the portrait in the context of Roosevelt's time in office. I will also discuss the reasons as to why the work, although incomplete, is still powerful and explore how the painting is able to capture the character of FDR.

Presenter: Abram Henry

Project Advisers: Stacey Parker Aronson and Paula O'Loughlin (Spanish and Political Science)

Title: Multilateral Diplomacy, Multilateral Roles: The Many Understandings of the "Role" of International Organizations in Modern International Relations

Type of Presentation: Oral

John Q. Imholte Hall, Room #112, 4:05 p.m.

Abstract:

In the academic field of international relations (IR), the utility of international governmental organizations (such as the UN) is highly disputed. In their work, most academics studying IR propose unilateral understandings of the utility of international governmental organizations (IOs). Thus, this work strives to refute the unilateral understanding of the role of IOs and instead proposes multilateral understandings or various roles that IOs fulfill. The methodology of this paper employs constructivist theory, while realist theory and liberalist theory are examined and refuted for their unilateral understandings of the roles of IOs. This paper proposes as its central thesis that IOs play multiple and unquantifiable roles in IR. The thesis is supported by an organized examination of the definitions and understandings of IOs by governments, non-government actors, and IOs themselves. Through first examining current literature on IOs, this work begins to set the base for the counter proposal against the unilateral understanding of the organizations. It then examines the multilateral relations between IOs and their member countries, specifically focusing on the Organization of American States. It then examines the relations between IOs and non-governmental actors and the role IOs play in international development. The thesis is supported by the work in that a clear vision of the extremely complex multilateral roles of IOs is given. This work legitimizes itself in that it shows the multifaceted reality of globalization. In a world with such distinct cultures, languages, and understandings, a multilateral understanding of IR is crucial to proper diplomacy and global interactions.

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* denotes co-presenter(s)

Presenter: Liz Vold
Project Adviser: Jon Anderson, Emily Hoover, and Steven Poppe (Statistics, Horticulture, West Central Research and Outreach Center)
Title: Raspberry Size and Total Yield in a High Tunnel Compared to Traditionally Managed Fields
Type of Presentation: Poster #20

Abstract:

A high tunnel is a large hoop house covered by a single layer of greenhouse grade plastic, which can be left on or removed seasonally. High tunnels are used to extend the growing season of a variety of fruits and vegetables. Primocane or fall-fruiting raspberries are becoming common to high tunnels, especially in colder climates as the fruits' growing season is often cut short by cold weather. While it is known that the growing season can be extended by high tunnels, this UROP funded research determines if high tunnels have comparable yields and berry size to conventional growing methods. This study compares the yields and berry sizes in the field trial and the high tunnel, in two locations. The first is at the University of Minnesota West Central Research and Outreach Center (WCROC) in Morris, MN, the second of which is on the University of Minnesota, St. Paul Campus. Both sites have the same cultivars and initial plant spacing. For the analysis a free statistical computing program called "R" was used. R software has a variety of capabilities, for our purposes the lme function was used because it allows for random error between the plots and within the plots. Data analysis showed that berry size and yield were enhanced by the high tunnel. The results of this study could persuade more growers to build high tunnels because of the benefits they provide in berry size and yield, an important bit of knowledge in the competitive agricultural industry of today's world.

Presenter: Peter Hurd
Project Adviser: Bradley Deane (English)
Title: The Quest Will Go On: Rider Haggard's *She*
Type of Presentation: Oral
 John Q. Imholte Hall, Room #101, 2:00 p.m.

Abstract:

H. Rider Haggard's 1887 popular adventure novel *She* is often examined as a powerful exemplar of late Victorian social views. One of the most common modern interpretations of the novel is that it represents Haggard's misogynistic reaction to contemporary women's movements. My paper examines important feminist analyses of Haggard's novel over the last thirty years to highlight weaknesses with this interpretation and to offer an alternative analysis of late Victorian gender ideology: rather than concerns about contemporary women's movements, I argue, Haggard's novel is primarily driven by anxieties over contemporary meanings of masculinity. In particular, I argue that the colonizing of much of the world by the British empire left imperialists like Haggard with the feeling that the type of rugged, "frontier" masculinity that they cherished would soon disappear, and that the meaning of the masculine had come to depend on the preservation of wild frontiers in which it could be proven and developed.

Presenter: Alicia Johnson
Project Advisers: Karen Mumford and Jennifer Rothchild (Biology and Sociology)
Title: Convenience, Culture, and Support: Why Some Women Choose to Use Formula to Feed their Infants
Type of Presentation: Oral
 John Q. Imholte Hall, Room #111, 2:25 p.m.

Abstract:

Although breast milk provides health benefits to infants, many mothers choose to use formula. A number of studies suggest that women choose formula because of work-related challenges, body image, and lack of support from friends, family, spouses, and health care professionals. Few studies have been conducted to examine the decision to use formula among rural women. To address this limitation, women from Ottertail County, MN who used formula to feed their infants participated in a focus group. This qualitative study was conducted to examine the degree to which lifestyle, cultural, and support-related factors influenced women's decisions to use formula. Preliminary analysis of the focus group transcript suggests that women's experiences in the first few weeks after leaving the hospital were crucial to influencing their feeding choices. Many women wanted to breastfeed when their infants were born but switched to formula because of difficulties breastfeeding (e.g. problems with milk production or latching) and lack of support from health practitioners and family members. Other factors that influenced women to use formula were their unexpected post-birth emotions and energy levels. Future steps to assist women in their feeding choices should include comprehensive discussions between health practitioners and women to assess both the options for feeding infants as well as the challenges that these decisions create. New mothers may successfully breastfeed if additional support were available from nurses and lactation consultants for at least two weeks after birth.

2011 Undergraduate Research Symposium

Presenter: Austin Kelsey

Project Advisers: Jessica Beyer and Karen Mumford (Environmental Studies)

Title: The Minnesota Statewide Health Improvement Program-Evaluating Outcomes at Community Gardens

Type of Presentation: Oral

John Q. Imholte Hall, Room #111, 2:00 p.m.

Abstract:

The Minnesota Statewide Health Improvement Program (SHIP) provides funds to Minnesota counties to implement policy or environmental interventions to promote healthy behaviors and reduce the burden of chronic disease. Counties can use SHIP funds to address nutrition, physical activity, and smoking cessation. Morrison, Todd, and Wadena counties in central Minnesota used SHIP funds to support several community garden projects in these counties. Evaluation of the impacts of these gardening projects was conducted by UMM staff and student research assistants. This presentation focuses on findings from the evaluation of three community garden projects. Qualitative interviews of participants were conducted during the summer and fall of 2010. Interview instruments were drafted and finalized by team members. Student research assistants traveled to project sites to conduct in-person interviews. Interview responses were recorded manually and with digital recording equipment. Preliminary review of interview data indicated a rich array of garden participants and users, including food shelves, school children, educators, religious leaders, family and neighbors of gardeners, and community organizations. Participants stated that the quantity and diversity of local fruits and vegetables increased due to the SHIP-funded gardens. In terms of key successes, most participants indicated the increase of nutritious foods, exercise associated with gardening, and socializing with community members. However, concerns were raised about the need for local leadership and resources to sustain these initiatives into the future. These findings suggest that while community garden projects are viable, public health practitioners need to assist communities in building the capacity to sustain these initiatives.

Presenters: Sam Krump-Johnson, Alex Kies, Alek Sievert, Matt Privratsky, Mark Privratsky, and Wyatt Nolan

Project Adviser: Barbara Burke (Communication, Media, and Rhetoric and English)

Title: A Webseries is Born: Practice in the Collaborative Process of Comedic Productions Intended for Internet Consumption

Type of Presentation: Oral

John Q. Imholte Hall, Room #101, 4:30 p.m.

Abstract:

In order to further their understanding of and ability in video production, creative writing, acting and directing, six students created the comedic webseries *Sketch 90*. A Webseries is a media term for a video series created solely for use streaming entertainment on the web, divided into segments called "webisodes." *Sketch 90*, the webseries, chronicles the lives of three young men who time travel to the present day from the 1990's, as well as the new inhabitants of what used to be their house using 8-10 minute webisodes. This presentation will be about the creative processes used to accomplish a finished product, and all of the trials and errors that the group faced in the name of entertainment. Topics discussed will include formation of creative ideas, director's process as inspired by John Jory's *Tips for Directors*, transformation from script to video, and differences between editing for web based versus for DVD. The presentation will also contain a portion of video from one of the webisodes in the series.

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Presenter: Masera Turkson, Austin Kelsey, Joe Dunlavy, and Jon Braegelmann

Project Adviser: Karen Mumford and Jessica Beyer (Math & Science and Center for Small Towns)

Title: Evaluation of School Physical Activity and Nutrition Initiatives in Western Minnesota

Type of Presentation: Poster #28

Abstract:

Morrison, Todd, and Wadena counties in central Minnesota are using funds from the Statewide Health Improvement Program (SHIP) to support school-based K-12 projects that encourage healthy behaviors among students. Twenty-two projects are underway across elementary, middle, and high schools within these counties. These initiatives include various nutrition projects (e.g. school gardens, local foods curricula) and physical activity projects (e.g. winter snow shoeing, classroom balance balls). The purpose of this study was to evaluate the degree to which six school nutrition projects met their intended objectives and the types of challenges they faced during project planning and implementation. To assess each school project, qualitative interviews were conducted with project leaders and project-related staff. Interviews included questions about project implementation, goals, and capacity challenges. UMM faculty, staff, and students traveled to school sites to conduct in-person interviews. Responses were transcribed for analysis. Preliminary review of transcripts indicated that major challenges in implementation were due to underestimation of preparation and start-up time. Despite these challenges, respondents also observed increased interest among other teachers and administrators to expand these initiatives to other classrooms in the future. Respondents also voiced concerns about capacity challenges associated with the availability of outside resources or staff to help in project planning and implementation. Results from this evaluation will help statewide health planners understand the successes and difficulties schools face when implementing nutrition programs to encourage healthy eating.

Presenter: Ellis Valentiner

Project Advisers: Jon Anderson and Karen Mumford (Statistics and Biology)

Title: Seasonal Influenza Vaccination Behavior in Stevens County

Type of Presentation: Poster #25

Abstract:

Vaccination is a proven method of prevention against seasonal influenza that provides little risk of side effects. However, many individuals choose not to vaccinate themselves against the illness. The present research compared the attitudes, beliefs, and behaviors of those who received the seasonal influenza vaccine and those who did not to identify opportunities to improve compliance. Participants were selected from households in Stevens County, Minnesota using a two-stage cluster selection process. U.S. Census data were used to calculate the number of households necessary to achieve a representative sample using probability proportional to size of each census block. Interview surveys were conducted between June, 2010 and October, 2010 using an online survey tool, UMSurvey. Participants consisted of 86 adult volunteers living in Stevens County who consented to participate in the survey. Survey questions were designed to gather specific information concerning current attitudes, motivations, and subjective norms toward seasonal influenza vaccinations. Results from the study show approximately 70% of respondents reported receiving the seasonal flu vaccine within the last 12 months while 30% had not. About 24% had never received a seasonal flu vaccine. Furthermore, 24% were unsure of whether seasonal flu vaccines could cause influenza. Information about local vaccination attitudes, beliefs, and behaviors is useful information for local public health officials and allows for message-framing interventions for population subgroups with known vulnerabilities. Findings will be used to assist development of strategies to increase vaccination compliance. This study was supported by the Center for Small Towns at the University of Minnesota, Morris and Bremer Foundation Fellows Program.

Presenter: Kara Thomas

Project Adviser: Rich Hardy (Sports Management)

Title: The IKDC is the dominant Outcome Measure of ACL Reconstruction

Type of Presentation: Poster #29

Abstract:

More clinicians and academic practitioners use outcome measures or scales to evaluate patient response to Anterior Cruciate Ligament reconstruction. The purpose of this study was to determine which scale was the most frequently used and whether it varied by continent. In order to determine which tests were used fifty studies were chosen from pubmed.com. The studies focused on the outcome after an Anterior Cruciate Ligament reconstructive surgery. The continent and scale(s) used for each publication were documented. Of the fifty studies each were broken down by continent and type of score. It was determined that the IKDC score was the most commonly used score across the world with the exception of Asia which preferred the Lysholm score. These results show that there is a preferred score across the world, and it would be easy for everyone to perform this test for consistency.

Presenters: Ashleigh Thompson and Ember Phillips

Project Adviser: Chris Cole (Biology)

Title: Cottonwoods: Trade-offs between Biomass Production and Chemical Defense

Type of Presentation: Poster #4

Abstract:

Cottonwoods, poplars, and aspens (*Populus* species and hybrids) have the broadest range of all North American trees and are the main trees grown for biomass fuel production, principally in Europe but increasingly in North America. Recent research shows that, in aspens (*P. tremuloides*), there is a metabolic trade-off between growth and defense. Cottonwoods are notable for extremely high growth rates, and our work sought to discover whether this species (*P. deltoides*) also shows a trade-off between growth and chemical defense. We quantified growth by measuring annual growth rings of cores from cottonwood trees in the Morris area, and quantified defense by measuring the concentrations of condensed tannins in leaf tissue from the same trees. Annual rings were huge, sometimes exceeding 1 cm, but often had very indistinct boundaries, and there was a high level of variation even within individual rings in a single tree. Growth rates (measured as ring widths) increased rapidly in young trees, then declined when the trees reached maturity. Condensed tannin levels were extremely low. Because the growth rates were so high, and so highly variable, and the tannin levels were so low, we found no evidence of a trade-off between growth and defense within this species. In comparing *P. tremuloides* and *P. deltoides*, the trade-off between growth and defense is very strong in *P. tremuloides*. Whereas aspens have more chemical defense, cottonwoods grow fast instead. Funding from the National Science foundation STEP (Science, Technology, and Engineering Program) and the UMM MMP (Multicultural Mentorship Program) programs.

Presenter: Hannah Lindquist

Project Adviser: Tisha Turk (English)

Title: Infiltrating the Classroom: High-Stakes Essay Tests and High School Writing Instruction

Type of Presentation: Oral

John Q. Imholte Hall, Room #101, 2:50 p.m.

Abstract:

Educators and scholars of composition studies acknowledge a gap that often exists between high school and college writing instruction. Many students enter college underprepared for the academic writing and critical thinking that is expected of them. Though freshman composition courses are designed to ease this transition, some students still feel the inadequacy of their high school writing instruction. However, it is important to consider that high school teachers must balance their writing instruction to meet a variety of purposes, not solely college preparation. In my research I explore the role of high-stakes essay tests in influencing high school teachers' instruction of writing and students' perceptions of writing. The tests I look at are the standardized BST and GRAD tests, required in Minnesota for high school graduation; essay questions on AP exams; and the ACT and SAT essay portions. High-stakes essay tests do not claim to comprehensively assess students' writing ability and educators agree on the limited applicability of these tests. I argue that the pressure teachers feel to "teach to the test" can unintentionally unbalance their other, though not necessarily conflicting, goal of preparing students for college. From a student perspective, I explore how classroom preparation for high-stakes essay tests and the testing contexts themselves can limit students' understanding of writing as a process that facilitates thinking and communicates knowledge. In order to narrow this writing gap, I argue for the current conversation to expand, more fully including students and exploring the problem at the level of individual high schools.

Presenter: Taylor Lunemann

Project Adviser: Barbara Burke (Communication, Media, and Rhetoric)

Title: Selling the Droid: An Analysis of Online Advertising Strategies

Type of Presentation: Oral

John Q. Imholte Hall, Room #101, 3:15 p.m.

Abstract:

To keep up, the advertising world is changing as different sources of media are forming or evolving with the technology advances in the world. Therefore, companies choose to use various new tactics to persuade their targeted consumers to purchase their product. This study explores the ways a collection of online video ads created by advertising agency McGarryBowen from 2009-10 crafted persuasive messages for the Droid smartphone. One research method applied to this analysis was Gutman's means-end model. This model suggests consumers buy products that bring them benefits that get them closer to valued end-states. Research using this model often offers marketers a way to position products by associating means—the features of the product—with advertising that seeks to tie the use of products to the achievement of desired ends—valued states. By using this model, I was able to analyze which visual elements in the advertisements were used to appeal to the consumer's personal values. Another research method applied to this research study of ads was Rank's intensification/downplay model. In this model, persuaders choose from four strategies of action: intensify their own good points, intensify the weak points of the opposition, downplay their own weak points, and/or downplay the good points of the opposition. Using this model, I was able to determine what qualities the Droid was intensifying and downplaying about itself and its competitors. Findings from this study may be used to help scholars better understand the unique features of the world of online advertising.

Presenter: Zach Ranallo

Project Adviser: Barbara Burke (Communication, Media, and Rhetoric)

Title: Home Run: An Assessment of Television Commercials from the 2010 Major League Baseball World Series Telecasts

Type of Presentation: Oral

John Q. Imholte Hall, Room #101, 3:40 p.m.

Abstract:

The Major League Baseball World Series is one of the most-watched sporting events on American television, with over 14 million viewers tuned in to each game of the World Series in 2010 (MLB.com). The Super Bowl, World Cup, and other major sporting event commercials have been studied frequently in the past, yet the World Series commercials have little research data to date. For the collection of 2010 commercials, this project asked: What were the most frequently advertised products? What were the most common persuasive techniques used by advertisers during commercials? What were the most common themes presented in World Series commercials and how were they related to the target audience? To answer these questions, this project used systematic content analysis to generate descriptive quantitative data, and used Rank's "model of persuasion" to create an interpretative analysis of ad characteristics and content. Each game's commercial content sets were unique, the assortment varied from game to game, and persuasive strategies within product ads varied as well. Using communication theories and analysis to learn about the placement and message strategies of commercials shown during popular sporting events can lead to better understanding about how companies use these practices to increase sales, and how they try to influence sports fans to be advertising viewers and product consumers.

Presenter: Mandi Riley

Project Adviser: Julia Dabbs (Art History)

Title: The Many Faces of Michelangelo in the *Last Judgment*

Type of Presentation: Oral

John Q. Imholte Hall, Room #109, 3:15 p.m.

Abstract:

The *Last Judgment* in the Sistine Chapel by Michelangelo Buonarroti has been a source of controversy since the time of its creation in 1541. More recently the arguments regarding the evidence of Michelangelo's self-portraits within this fresco have been scrutinized and criticized by many scholars, with the result that only one of the four potential self-portraits is widely accepted as an image of the artist. My research digs deeper into this problem by examining the reasons Michelangelo would have had to portray himself in his works, in general through iconography. The presentation will also suggest that by broadening the focus to Michelangelo's use of self-portraits in all of his works, it is possible to move beyond the controversies currently surrounding the self-portraits in the *Last Judgment*. Through visual analysis I will examine the possible reasons behind Michelangelo's choice to portray himself in his works and his choice to do so in unflattering and unusual ways. I argue that these self-portraits tell us vital personal information about this Renaissance artist.

Presenters: Deborah Schneiderman and Matthew Lovander

Project Adviser: Ted Pappenfus (Chemistry)

Title: Oligothiophene tetracyanobutadienes as Alternative Donor-Acceptor Materials

Type of Presentation: Poster #10

Abstract:

Donor acceptor molecules contain an electron rich donor group and an electron poor acceptor group. Molecules and polymers exhibiting this motif are an important class of materials for use in organic electronics; their interesting physical and electronic properties make them ideal for use in organic light emitting diodes, transistors, and photovoltaic devices. The properties of these molecules can be tuned by altering the identity of either the donor or the acceptor group. Thiophene based donor acceptor materials have previously been synthesized with many different types of electron withdrawing groups (EWG) including cyano-based groups. Here we report the synthesis of novel oligothiophene donor acceptor molecules bearing tetracyanobutadiene acceptor groups. These novel molecules were prepared by the [2+2] cycloaddition of tetracyanoethylene (TCNE) to various oligothiophene alkynes. We compare the electronic and optical properties of the TCBD functionalized thiophene molecules to thiophene molecules bearing other cyano-based electron acceptors. Also discussed are our current and future work in this area. This work was supported by the University of Minnesota Morris Academic Partnership program, Faculty Research Enhancement Funds from the University of Minnesota, Morris division of Science and Mathematics and by seed funding from the University of Minnesota Initiative for Renewable Energy and the Environment.

Presenter: Chad Seibert

Project Adviser: Peh Ng (Mathematics)

Title: Adaptive GPS Algorithms

Type of Presentation: Poster #17

Abstract:

The GPS system is one of the most sophisticated pieces of technology ever devised, but most systems are not intelligent about the directions they give. We designed an algorithm that incorporates domain knowledge to optimize travel time. To make the most flexible system possible, we combine two existing systems for traffic routing. The first system dynamically computes the shortest expected path between source and destination based on the traffic levels it has already perceived. Using the current traffic conditions, it determines whether to take a shorter route or a longer route, based on the expected traffic levels. The problem with this system is that it is generally unforgiving when measuring traffic levels. Our research entailed introducing another system designed to handle rapidly changing traffic conditions? We started by implementing both systems and determining their weaknesses. We concluded the first system did not produce optimal routes under changing traffic conditions. The second system over compensated and took too many detours. Based on these observations, we decided to explore a hybrid approach. With UROP funds, we were able to take the classifier of the second system and integrate it into the first. We also created a simulation, where we tested the robustness of our approach. We concluded it performed significantly better than travelling the shortest distance and easily allowed for changing road conditions, including construction zones and accidents.

Presenter: Michael Rislow

Project Adviser: Peh Ng (Mathematics)

Title: Special Structures and Decomposition Patterns of 3-Directed Hypergraphs

Type of Presentation: Poster #16

Abstract:

Consider a network of locations that are connected in some fashion such that items can flow amongst the locations. Suppose that one connecting element of this network can link at least two, but at most three locations. Such a situation can be modeled by a graphical structure known as a *3-directed hypergraph*. A *3-directed hypergraph* is defined as $G = (V, H)$, where V is a set of vertices, modeling the network's locations, and H is a set of hyperarcs, where each hyperarc defines a subset of two or three vertices that are directly connected to one another. This characteristic of 3-directed hypergraphs is of interest because it allows us to model networks in which the items being sent are split and sent to different locations or multiplied in a way such that one location receives items from multiple other locations. A hyperarc then represents how "information" flows from vertices to vertices. Through our research, we have analyzed special structures of 3-directed hypergraphs called *pseudocycles* and *doublecycles* in order to better characterize the behavior of these networks. In addition, we have investigated the behavior of these structures when they are summed together in a manner consistent with conventional graphical structures by studying both the graphs and their underlying vertex-hyperarc incidence matrices. This study is significant since it enables us to solve the optimization problem $\{\max \mathbf{c}\mathbf{x} : \mathbf{A}\mathbf{x} = \mathbf{b}, \mathbf{x} \geq \mathbf{0}\}$, where \mathbf{A} is the underlying matrix of the 3-directed hypergraph. This work was funded by the Morris Academic Partnership (MAP) program.

Presenters: Jennifer Schmidt and Ryan Koehn

Project Adviser: Ted Pappenfus (Chemistry)

Title: PBC-DFT: An Efficient Method to Calculate Energy Band Gaps for Conducting Polymers used in Solar Cells

Type of Presentation: Poster #9

Abstract:

In recent years, conducting polymers have gained attention for their promising application in solar cells due to their potential low cost, lightweight, and flexibility. Polymers are molecules which have repeating units and are used in everything from plastics to paint. A variety of copolymers with alternating repeating units were calculated using the theoretical chemistry software Gaussian03. Theoretical calculations were used to calculate electronic properties of the polymers and resulting band gap energies. The band gap energy can be defined as the potential stored energy in the polymer which is important when polymers are being considered as energy sources for solar cells. Methods of finding this band gap exist using density functional theory (DFT) by calculating the energy gaps of increasing oligomer lengths (n), and plotting the energy gap (in eV) as a function of the reciprocal polymer length ($1/n$). This method, however, proves time consuming and computationally costly. An alternative, less time-consuming method using periodic boundary conditions (PBC) exists within the Gaussian03 program. In our research, we studied existing donor-acceptor polymers from the literature and used PBC to calculate their band gaps for comparison with experimental data. The PBC method yields results consistent with experimental values for fused ring systems and can be useful in determining theoretical band gaps prior to synthesis which can aid in saving valuable lab time. Our research was sponsored by a grant from the University of Minnesota Initiative for Renewable Energy and the Environment (IREE).

Presenter: Susan Robertson

Project Adviser: Julia Dabbs (Art History)

Title: The Iconic Mrs. Jack: A Portrait of a Lady by John Singer Sargent

Type of Presentation: Oral

John Q. Imholte Hall, Room #109, 3:40 p.m.

Abstract:

Women in the late 19th century were subjected to the strict rules of society during the Victorian era, but Isabella Stewart Gardner (Mrs. Jack, as she was called by friends) was a woman who defied convention. She was extravagant, indulgent, and a great patron of the arts who was notorious in Boston society. She chose the controversial artist John Singer Sargent to paint her portrait because of the scandal he caused with his painting *Madame X*. The portrait was only displayed once during her lifetime, in 1888, and remained behind locked doors until her death because of the uneasiness it caused her husband. The style and background referencing Byzantine icons, her provocative attire and unusual pose were seen as curious at best and shameful at worst. The portrait has been on display in the Isabella Stewart Gardner Museum since its opening, but has not been the subject of an in depth interpretation. I will be analyzing the portrait in relation to Gardner's life as well as her choice of artist. By using visual analysis as well as a socio-historical methodology to interpret her portrait it will become clear just how fascinating this portrait is. The icon imagery (that of Byzantine religious art) and choice of pose and dress that Sargent used is representative of Gardner's lifestyle because of her eccentricity, extensive travel and penchant for collecting all kinds of art from around the world. All of this demonstrates how a portrait can give us insight into this fascinating woman and how an artist who depicts women in such a provocative manner was integral to the portrait's success.

Presenter: Andreana Saunders

Project Adviser: Barbara Burke (Communication, Media, and Rhetoric)

Title: Asian Cultures and Contemporary Individualization - Respect, Deference, and Hard Work as Determinants of Self-Worth

Type of Presentation: Oral

John Q. Imholte Hall, Room #101, 4:05 p.m.

Abstract:

This project examined the formation and conceptualization of individual identity in Chinese and European American US culture to illuminate four key differentiating characteristics of contemporary Chinese culture. Cultural differences were observed through planned conversations and deliberate analysis of interactions with two international exchange students over four meetings, which informed the creation of a cultural profile describing key cultural characteristics. From this profile the four most fundamental differentiating characteristics of Chinese culture were selected: Respect, Collectivism, Performance Orientation, and Future Orientation. The concept of gaining and losing "face" is instrumental in defining these central values. The terms were used as defined by the GLOBE Cultural Taxonomy, a system of criteria built upon Hofstede's Cultural Taxonomy and Kluckhohn and Strodbeck's Values Orientation Theory. The DIE (Describe, Interpret, Evaluate) process was used to structure the analysis. Through contextual, behavioral, and linguistic analysis, it was revealed that Chinese culture, while now more future-oriented in its values than previously demonstrated, still holds very strict and traditional ideas of who deserves and receives respect. These values persist due to Chinese culture's positive valence of collectivism, rather than past orientation. Chinese culture was also revealed to hold more central performance orientation values than the US. These discoveries regarding future orientation and performance orientation contradict the original data generated by the GLOBE Taxonomy.

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Presenter: Colin Scheck

Project Adviser: Seung-Ho Joo (Political Science)

Title: Defending Sovereignty in the Midst of Giants: Mongolian Foreign Policy in the New Millennium

Type of Presentation: Oral

John Q. Imholte Hall, Room #111, 3:15 p.m.

Abstract:

The primary goal of this paper is to ascertain and analyze Mongolian foreign policy objectives regarding China, Russia, and the United States as well as the great powers' interests in the landlocked third world nation. In essence, a key objective in this case study is to address how a small weak state deals with safeguarding its sovereignty in the face of its adverse geo-political position between two great powers. Research was conducted via foreign policy journals and news articles from Mongolian, British, American, Russian, and Chinese sources. The paper examines Mongolia's relations with its two immense and powerful neighbors, China and Russia, and how its "third neighbor policy" seeks to offset the influence of aforementioned states by strengthening relations with the United States. Mongolia's neutrality and growing desire to demonstrate its value to Northeast Asian security is analyzed and critiqued in the context to its reinforcement and defense of Mongolian non-alignment. I argue that Mongolian foreign policy in the past decade is idealistic in nature and ineffective in practice, despite the progress of US-Mongol relations under the Bush administration to offset the growing imbalance of influence within the small state. Chinese influence is found to be growing stronger as well as a decreasing American presence triggered by the 2008 economic crisis and Obama's Northeast Asian policy. With little alternative, Mongolia will look to Russia in order to prevent Chinese dominance, a sharp change from their previous policy of distancing away from Moscow.

Presenter: Dominic Scheck

Project Adviser: Bradley Deane (English)

Title: Saying, "I cannot say, I": Spectral Subjectivity in *The Picture of Dorian Gray* and *Dr Jekyll and Mr Hyde*

Type of Presentation: Oral

John Q. Imholte Hall, Room #101, 2:25 p.m.

Abstract:

Animated by the rigorous close reading methods and binary-subverting spirit of Derridean deconstruction, my project reveals how two short novels of the British fin de siècle, *The Picture of Dorian Gray* and *Strange Case of Dr Jekyll and Mr Hyde* signed by Oscar Wilde and Robert Louis Stevenson respectively, destabilize their images of a unified subjectivity, the position of being a subject ontologically, phenomenologically, and grammatically. I argue that the titular terms of the two texts, Dorian/picture and Jekyll/Hyde, are insufficient for bounding the identities they intimate and that the texts suggest but finally evince the inadequacy of two modes of organizing self: body and narrative. Body fails to circumscribe either of the dually-but-singularly somatic subjects, and narrative, whether textual or memorative, fails to thread together past iterations of the self and a present one. While the critical discourse on these texts has predominantly identified Jekyll and Hyde, and Dorian and his portrait, as gothic doubles or split selves, my project thus demonstrates how neither term in either pair contains in itself a subjectivity; rather, the Jekyll/Hyde and Dorian/picture dichotomies overturn themselves to show that Hyde and Jekyll are always already present in each other, in himself, and that the interplay between Dorian the portrait and Dorian the person produces Dorian's necessarily slippery subjectivity. The implication here is that identity is, in my words (which are not actually mine) and Jekyll's (which are not actually his), an auto-destabilizing "polity of multifarious, incongruous, and independent denizens."

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Presenter: Elise Porcher

Project Adviser: Chris Cole (Biology)

Title: Developing an Optimum Method for Harvesting Seeds of *Cuphea wrightii*

Type of Presentation: Poster #1

Abstract:

Cuphea is a plant, native to North America. Cuphea oil [Lauric acid] for most purposes is identical to coconut and palm oils, which has peaked the interest of Aveda, a beauty company that concentrates on botanically based products. Lauric acid is an important ingredient in beauty and personal care products. The objective of this experiment was to develop a method to optimize seed harvest of *Cuphea wrightii*, by using a variety of mulches and materials to collect the seeds as they dispersed. The field study was conducted at the Swan Lake Research Farm. The Cuphea seedlings were started in the green house and then transplanted into seven different mulching treatments. The purpose for the mulch was to collect the seed for easier harvest, while providing a beneficial growth environment for the plants. The treatments were also divided into frequency of harvest. Some treatments were harvested periodically on a 10 to 12 day basis, starting July 21st, while other treatments were only harvested midway and at the end of the growing season. The results of this experiment are still being analyzed, but so far these materials show a slight increase in harvest efficiency, but it is unknown how significant. The mulch did benefit in providing easier harvest. However, further research needs to be done to domesticate this crop. In conclusion, *Cuphea wrightii* is a rich source of Lauric acid and could be used to replace imported oils, but further research is needed.

Presenters: Ruth Potter and Manjari Govada

Project Adviser: Stephen Burks (Economics and Statistics)

Title: Obstructive Sleep Apnea (OSA) and Accident Risk Among Commercial Truck Drivers

Type of Presentation: Poster #23

Abstract:

The Institute of Medicine (IOM) has identified chronic sleep disorders, such as obstructive sleep apnea (OSA), as a major public health problem in the United States. OSA is a condition in which the individual's airway repeatedly closes during sleep and the brain is required to open it preventing the sufferer from ever getting fully restful sleep. Among 14 million US commercial driver license (CDL) holders, 2.4-3.9 million (12-28%) are likely to have OSA, making it the most common medical cause of excessive daytime sleepiness in this population. The Truckers and Turnover Project (T&T) has studied drivers from a cooperating trucking firm which has a unique and industry leading program to screen, diagnose, and treat its employee drivers for OSA. We have studied these drivers for over a five year period and examined the risk of crashes associated with OSA. Using data obtained from the firm and its health care service providers, we analyzed the relationship between OSA and accidents using survival analysis to identify the impact of screening, diagnosis, and treatment on the time until the driver experiences an accident. We have controlled for crucial variations in accident risk exposure that accompany variations in working conditions, such as varying weekly miles, numbers of trips and type of work. This analysis is in preparation for future academic journal articles intended to influence the public policy debate on the nature of prospective regulatory requirements for OSA screening in commercial drivers. Sponsors include the Truckers and Turnover Project and Morris Academic Partners.

2011 Undergraduate Research Symposium

Presenter: Alex Madsen

Project Adviser: Jennifer Goodnough (Chemistry)

Title: Teaching Electrochemistry: Addressing Misconceptions by the Development of Educational Materials that Promote Conceptual Understanding

Type of Presentation: Poster #8

Abstract:

Students often have a difficult time comprehending electrochemical concepts due to the level of abstraction involved. Common misconceptions exist regarding the movement of electrons through an electrochemical cell and the relationships between voltage, current, and resistance. Even textbooks contribute to these misconceptions that must be overcome in order for students to understand what is happening on the micro level. The goal of my NSF funded summer research at North Carolina State University was to develop experiments that addressed specific concepts in electrochemistry in order to address common misconceptions. Experiments were developed to help students connect the macro and micro levels of representation in electrochemistry by the unification of physical sciences' concepts. The concepts explored included the relationship between the concentration of electrolyte in the electrochemical cell to the solution resistance, the relationship between the concentration of solution in the cell to the intensity of light from a LED, and the relationship between the resistance and voltage with varying resistors. These experiments were developed to allow students to construct definitions of concepts and qualitatively explain what is taking place in the cell with minimal guidance from the teacher. The results of this research project, the actual educational activities, will be tested in future research to see if these experiments help students to better develop a strong conceptual understanding of electrochemistry.

Presenters: Alaina Pearce and Ellis Valentiner

Project Adviser: Cheryl Stewart (Psychology)

Title: Effects of Lexical Shortenings and Word Errors on Cognitive Processing

Type of Presentation: Poster #27

Abstract:

At present, little research information exists on cognitive processing of text messaging. The present study examined the effect of type of language (lexical shortenings/text language, Standard English, and grammatically incorrect/misspelled wording) and message content (academic versus conversational material) on memory in a 3 x 2 mixed factorial design, with message content as a repeated measures variable. Participants were randomly assigned to one of three language conditions, and received both the casual and academic readings in the same language format, with the order of readings counterbalanced across participants. The main measures of cognitive processing included a free recall task and a multiple-choice exam. Additionally, reading time served as a secondary dependent variable. We expected that if lexical shortenings represent an emerging language then they should be processed as linguistic material, thus producing better memory for the essays than when those essays were written with grammatically incorrect or misspelled words. Whether lexical shortenings lead to poorer memory for material relative to Standard English also was investigated. At present, texting is used primarily for casual conversations; however, texting of academic material is on the horizon. Prior to assuming that content-rich academic material can be communicated using texting, we need to know whether memory for this type of material remains intact. Finally, consistent with Perea et al. (2009), lexical shortenings should take longer to read than the same passage in Standard English; furthermore, we expect a time difference is likely to be true regardless of the content of the passage. This research was supported by UROP.

2011 Undergraduate Research Symposium

Presenter: David Schilmoeller

Project Adviser: James G. Schryver (Art History)

Title: Roman Treasure, Greek Science

Type of Presentation: Oral

John Q. Imholte Hall, Room #109, 2:00 p.m.

Abstract:

One of the earliest shipwrecks to be found, the Antikythera wreck (named after the island it was discovered near) represents an incredible discovery for historians. Largely preserved by layers of sediment, it was likely a treasure-laden ship bound for Imperial Rome. As such it was loaded with precious objects from the near East, covering a wide span of time (5th to 1st century BCE). My research focused on the most significant and well-studied objects, including several pieces of statuary and, most notably, the so-called "Antikythera Mechanism". Previous research has focused on the objects individually, whereas I have also examined their significance as a whole cargo in addition to single finds; by observing the kinds of objects on board, we can learn something of the minds of the people who took them. Much of the presentation will focus on the most interesting object, the Antikythera Mechanism, a device capable of predicting the phases of the moon, positions of constellations, and various other astronomical data, the device was of a mechanical complexity that would not be replicated for approximately 1500 years. By studying the numerous art-historical and archaeological studies submitted over the past 100 years, as well as the continuing studies of the Mechanism, I have prepared a presentation that will offer an overview of the most significant artworks and the Mechanism, as well as their significance to Classical Art and mechanical and engineering history. My work will also address the implications of the finds in the context of the potential of the wider Mediterranean, whose underwater surface remains largely unexplored and contains vast potential for more finds of similar magnitude.

Presenter: Joshua Smith

Project Adviser: Joel Eisinger (Art History)

Title: Petah Coyne: A Catholic Interpretation

Type of Presentation: Oral

John Q. Imholte, Room #109, 2:25 p.m.

Abstract:

In this paper, I analyzed the work of contemporary American sculptor Petah Coyne and the way critics have responded to her, demonstrating that her critics have not paid sufficient attention to the religious themes in Coyne's art and have consequently failed to understand her work as a coherent whole. The increasingly secular art world often ignores religious issues, but Coyne's art requires that they be discussed. Her critics have written about her work in a variety of legitimate ways, such as biographically inspired or through the dichotomy of life and death, but they have largely treated her religious impulses as an afterthought. Art critic Eleanor Heartney is a refreshing exception. She regards Coyne's Catholicism as central to her art and as the basis for understanding it as a coherent body of work. Inspired by Heartney, I argued that Coyne's art comes together when seen as utilizing Christian motifs, particularly of the Virgin Mary, in order to critique gender inequality in the Church and to make a case for reform.

2011 Undergraduate Research Symposium

Presenter: Morgan Turner

Project Adviser: Mary Elizabeth Bezanson (Communication, Media, and Rhetoric)

Title: First Amendment Controversies and Communication

Type of Presentation: Oral

John Q. Imholte Hall, Room #112, 2:50 p.m.

Abstract:

The right to freely communicate in the United States has long been a source of in-depth deliberation. Decisions made by the Supreme Court regarding the extent and limitations of our free speech rights impact each of our lives on a daily basis. The facts regarding the case *Citizens United v Federal Election Commission*, 130 S.Ct. 876 (2010) play an essential role in understanding free speech as it applies to citizenship, justice, and democracy in our society today, specifically in terms of media film content. Through analysis of the justices' concurring and dissenting opinions as well as the facts, prior treatment, and decisions of the case, this research addresses the current state of communication freedom within the film medium. Produced by the Citizens United corporation, *Hillary: The Movie*, was released preceding the 2008 primary elections. Analysis of the case brought in response to the controversial nature of this film illustrates a paradigm shift in the understanding of freedom of speech by the Supreme Court.

Presenter: Michael Ward

Project Adviser: Mary Elizabeth Bezanson (Communication, Media, and Rhetoric)

Title: First Amendment Controversies and Communication

Type of Presentation: Oral

John Q. Imholte Hall, Room #112, 3:15 p.m.

Abstract:

Without question, one of the most powerful liberties that exists in the world today is the freedom to communicate. In the days where books, magazines, and artwork dominated the most popular forms of public forum, a raging debate stewed over the limitation of obscene works in the United States. This deliberation holds steadfast in the culture of more modern times with the frequent use of text messaging, social networking, and the Internet as common means of communication. Using the decision within *United States Attorney General John D. Ashcroft et. al. v. American Civil Liberties Union et. al. (2004)*, a derivative of various past United States Supreme Court obscenity, commercial speech, and balance of interests rulings, I have explored the limits of governmental censorship on specific types of material with the advance of technology. I have also examined the contribution to case law *Ashcroft v. ACLU* provides for future free speech cases. In addition, with an eruption of political turmoil in recent events surrounding the limitations of internet communications in both United States, as well as around the world, I have researched the negative effects and tremendous impact of limiting communication over the internet. With past case law, as well as the decision within *Ashcroft v. ACLU*, I establish that it is a common goal of the court to protect nearly all forms of speech, even as the spectrum of mediums for communication expand with modern technology, as they are a fundamental basis for the functioning as a united republic.

2011 Undergraduate Research Symposium

Presenter: Jeffrey Lind

Project Adviser: Gordon McIntosh (Physics)

Title: Skylight Polarization from a Balloon Flight

Type of Presentation: Poster #12

Abstract:

This research project attempted to measure the polarization of skylight as a function of altitude using a balloon based polarimeter. The hypothesis was that as altitude increases the model of a Rayleigh sky (single scatters from very small particles) improves because the likelihood of multiple scatters and the aerosol density decrease. Aerosols affect the amount of sunlight being reflected or absorbed in our atmosphere and play a role in planetary energy balance. This experiment was a technique to measure the distribution of aerosols as a function of altitude. The polarimeter utilized eight LED light detectors with seven detectors filtered by fixed linear polarizers and one unfiltered detector. The linear polarizers were positioned at fixed increments of ~26 degrees, and the filtered detectors were calibrated by the unfiltered detector. In November 2010, the polarimeter took data during a near space balloon flight to an altitude of approximately 80,000 ft. Results were inconclusive because of the cloudy weather that eliminated the polarization signal at lower altitudes where aerosols are most prominent. The use of the polarimeter during a balloon flight was successful because of the new design with no moving parts. A second flight to occur in March 2011 will improve directional capabilities using an accelerometer and compass measurements to record the detector's viewing vector. With directional information, the measured degree of polarization can be compared directly to the Rayleigh sky model. This experiment was sponsored by a University of Minnesota UROP.

Presenter: Andrea Lund

Project Adviser: Karen Mumford (Biology)

Title: Effects of Machismo and Acculturation on HPV Vaccination Status and Willingness among White and Latina Women

Type of Presentation: Poster #5

Abstract:

This study examined cultural factors influencing Latina women's attitudes towards the human papillomavirus (HPV) vaccination. Specifically, the concepts of acculturation and machismo were examined, which evaluate the degree to which participants (a) adapt to host culture and (b) agree with traditional Latino ideals of masculinity. This research is important because HPV is the most common sexually transmitted infection (STI) in the United States and Latina women are at a disproportionate risk of cervical cancer relative to other ethnic groups. Quantitative research that examines such cultural factors in relation to HPV vaccination is limited. A survey of 300 Caucasian and Latina women was conducted. Study participants were recruited from area clinics. Questions addressed measures of acculturation, machismo, social norms, and vaccination status. Logistic and linear regressions were conducted, with age as a covariate predicting vaccination status. Results indicated that increased adherence to the principles of machismo significantly decreased the odds of women (a) being vaccinated against HPV (Odds Ratio = .93, 95% Confidence Interval = .88-.99) and (b) being willing to receive the HPV vaccine (Odds Ratio = .94, 95% Confidence Interval = .91-.98). Acculturation measures on the same responses were not statistically significant. Machismo and acculturation also had significant effects on other factors related to HPV including injunctive and descriptive norms, HPV knowledge, number of lifetime sexual partners and having ever been diagnosed with an STI. These results indicate that cultural factors may contribute to lower rates of HPV vaccination among Latina women and thus increased risk of cervical cancer, compared to Caucasian women. This research was sponsored by the Des Moines University Summer Research Program.

Presenter: Matthew Kroonblawd
Project Adviser: Sylke Boyd (Physics)
Title: **Computational Study of Shock Energy Distribution in the Vicinity of a Void in Crystalline RDX**
Type of Presentation: Poster #13

Abstract:

The primary objective of the project was to study the effects of shockwave propagation in crystalline RDX, a common explosive. An existing computer model of the RDX crystal was used in the study. A program was developed to model the shockwave in a molecular dynamics simulation. In addition, the model itself was adapted to include buffer zones to absorb any repercussions of the shockwave caused by the limited size of the model. Two cases of RDX were studied under shockwave stresses: the ideal crystal and a crystal with a void. Voids are thought to facilitate the transfer of shock energy to intramolecular degrees of freedom. Such an energy transfer is necessary to initiate an explosion. I analyzed the dissipation of the energy of the shockwave into intermolecular and intramolecular degrees of freedom. The crystal with a void favored energy dissipation into the bend and torsion degrees of freedom within the RDX molecule. This indicated that the presence of voids favors molecular excitation during a shockwave. As shockwaves are an integral component of the detonation of RDX, the results of the study fit well into a larger effort to make the handling of RDX safer. The project was funded under the UROP program.

Presenters: Lisa Larson, Bailey Stanard, Hannah Schubloom, and A. Hunter Baldry
Project Adviser: Margaret Kuchenreuther (Biology)
Title: **Pollinator Constancy in the Foraging Behavior of Syrphid and Tachinid Flies Toward *Solidago canadensis* and *Symphyotrichum laeve* in Pomme de Terre Park**
Type of Presentation: Poster #6

Abstract:

This experiment was designed with the goal of testing pollinator constancy (regularly choosing the same flowers to visit) in two different fly families (Syrphidae and Tachinidae) common to Pomme de Terre Park. Pollinator constancy is well documented in bumblebees but is rarely researched in flies. In order to measure constancy, we simultaneously presented two bouquets of flowers, one containing *Solidago canadensis* (Canada goldenrod) and the other containing *Symphyotrichum laeve* (smooth blue aster), to a fly already foraging on one of the two species and recorded the fly's bouquet choice. Statistical testing using a Kappa analysis and 2x2 contingency table showed evidence for pollinator constancy in both fly families and a strong preference towards *S. laeve*. These data and resulting conclusions will further general knowledge of fly pollination and pollinator constancy. Furthermore, the data suggest that these two fly families are important in transferring pollen between wildflowers in the Pomme de Terre Park and fill a significant niche in the reproduction of *S. laeve* and *S. canadensis*.

Performance Presentations

HFA #170

Presenter: Anthony Bannach
Project Adviser: Joseph Carucci (Music)
Title: **Studies of Electronic Instrumentation within a Standard Orchestra Score**
Type of Presentation: Performance
HFA #170, 3:45 p.m.

Abstract:

Studies of Electronic Instrumentation within a Standard Orchestra Score, will present ideas on how the modern electronic instrumentation of pop and rock music fits into the framework of a standard orchestral score. The larger ramification of this project is one of musical exploration and potential innovation. Thus far, the electronic instrumentation has given a new layer of "modern" depth to the standard orchestral framework. The result of combining electronic and orchestral instruments creates music that is intellectually stimulating to a trained musician and pleasing to the ear of a modern music listener. Instrumentation examined will include synthesizers, digital workstations, and electric guitars. Musical recordings and previous works will be studied to observe how musicians have utilized electronics in their standard setting and how they may enhance a standard orchestra. An original composition is being prepared to utilize the findings of this study. This URS presentation will share ideas formalized in this study including how to sonically fit electric guitars and synthesizers with orchestral instruments, part writing for the electronic elements, and extra nuances of the guitars and synthesizers. Additional challenges and successes of the project will be described. Demonstrations and musical performances of excerpts from the newly composed work will illustrate the findings of this study. Expenses for this project were provided by a UROP and used toward the purchase of electronic instrumentation, which will be used in the score. All findings are credited to fundings by the Undergraduate Research Opportunity Program.

Presenter: Sarah Mensen
Project Adviser: Ann DuHamel (Music)
Title: **Music as Historical and Political Commentary: Frederic Rzewski's *Winnsboro Cotton Mill Blues***
Type of Presentation: Performance
HFA #170, 4:10 p.m.

Abstract:

Many people will argue that contemporary music is unrelatable to a general audience. This argument is conceived because contemporary music demands more from an audience as listeners, in terms of tonality, pulse, and rhythm. When pieces are considered a broader context, however, the history and narrative behind them can provide more for the listener to grasp, and thus better understand the music despite the challenges presented to the audience. Twentieth-century composer Frederic Rzewski wrote several important piano pieces inspired by political events. One of the most striking pieces in the piano repertoire, *Winnsboro Cotton Mill Blues* from his group of pieces entitled *North American Ballads* contradicts the argument that modern music is too difficult to listen to. The *Winnsboro Cotton Mill Blues* was originally a protest song about working conditions in the Winnsboro Mills of South Carolina in the 1930s. Through extended twentieth-century techniques as well as quotations from this protest song, Rzewski portrays the constant battle between the workers and the machines. The research presented will contextualize Rzewski's piece in terms of history, culture and politics. By examining how these influences are depicted musically, the workers from the earlier time period are connected to an audience today. This connection will show how something political, like worker's rights, can translate into music to make a forceful statement. This presentation, which will include a live performance of examples from the piece, will demonstrate that Contemporary music, like *Winnsboro Cotton Mill Blues*, can create a powerful impression for a general audience.

Poster Presentations
Science Atrium
10:00 a.m. – 12:15 p.m.

Presenter: Douglas Armstrong
Project Adviser: Richard Hardy (Wellness and Sport Science)
Title: Skin Preparation for Bursal or Articular Injection
Type of Presentation: Poster #26

Abstract:

As skin preparation for either a bursal or articular (joint) injection, Duraprep (3M, St. Paul, MN) is more expensive per use than an Iodine Sepp Applicator (Enturia, Leawood, KS) (\$2.66 Vs. \$0.28 per application). The purpose of this study was to compare irritation and infection rates between the two skin preparation agents after injection. We reviewed the charts of 365 patients (combined 543 injections) who were injected after the skin was prepared with Duraprep (169 patients- 92 males & 77 females) or an Iodine Sepp applicator (196 patients- 86 males & 110 females) at Heartland Orthopedic Specialists between September 2008 and April 2009. Injections of the glenohumeral joint, acromioclavicular joint, subacromial space, and the tibiofemoral joint were analyzed. Using Chi-Square tests, we found no significant difference in adverse reactions between the Duraprep group and the Iodine Sepp applicator group ($p^* = 0.07$). However, males whose skin was prepared with Duraprep were more likely to experience an adverse reaction ($p = 0.014$). Neither group experienced a culture positive infection as a result of the injections. Over 7 months, \$530.88 could have been saved by using Iodine Sepp skin preparation (261 injections @ \$0.84 each (average 3 swabs used)) compared to Duraprep (282 injections @ \$2.66 each). This cost savings may prove significant for medical facilities that inject a high number of patients.

* A p-value (p) is a measure of evidence against a null hypothesis. The null hypothesis is traditionally a “no effects” scenario. The resulting measurement is considered significant when p is < 0.05 .

Presenter: Guinevere P.E. Bitker
Project Adviser: James B. Togeas (Chemistry)
Title: Isoergic Hydrogen Bonding in Substituted Acetic Acid Dimers
Type of Presentation: Poster #7

Abstract:

Two molecules of acetic acid combine by hydrogen bonding to form a dimer. The derivatives of acetic acid form dimers of the same hydrogen bond strength to within chemical accuracy, as found by calculation. The dimers were found to be isoergic, meaning that the dissociation energy of the dimer is the same regardless of the attached substituent. The dissociation energy is the energy required to break the dimer into the two molecules of acetic acid the dimer originated from. The result of isoergicity is unexpected because acetic acid and its derivatives do not have the same acidic strength. Added substituents alter the strength of other types of bonds, such as covalent and ionic bonds, and it was presumed that the same trends would hold for hydrogen bonds as well. This unexpected result means that the dimer molecules are made up of two independent units: the dimer ring and the substituents attached to the ring, thus making the dimers near-invariant. The result of near-invariance is consistent with other calculated measures of stability. Calculations were run on Spartan '08 for Windows, Macintosh and Linux. The sponsoring fund of this research was the Chemistry Undergraduate Research Fund (CURF), an alumni funded chemistry program.

Presenter: Alicia Johnson
Project Adviser: Van Gooch (Biology)
Title: Light to Dim Oscillatory Response in *Neurospora crassa* Circadian Rhythms
Type of Presentation: Poster #2

Abstract:

Neurospora crassa, a fungus, is a model system often used for studying circadian rhythms. These rhythms are influenced by environmental factors such as light, although their regulation at a cellular and molecular level is not well understood. Previous studies have failed to observe circadian rhythms in *Neurospora* under constant light conditions. Through our use of an optimized firefly luciferase reporter gene our novel experiments have shown that *Neurospora* can display circadian rhythms in dim light. These circadian rhythm oscillations are observed only when the cultures receive a light pulse as short as fifteen minutes before going into dim. We refer to this behavior as the “light to dim oscillatory response”. It is important to note that oscillations are absent in cultures that go from dark to dim conditions. We have characterized this response in respect to the length of light pulse, time of light pulse before dim, intensity of dim light, and the unique oscillatory response in dim light. Although we are unclear of the molecular mechanism that drives this light to dim oscillatory response, it is significant that the *Neurospora* are able to “remember” this light pulse given at least thirty hours before they enter dim light conditions. This finding suggests that a long-term memory of bright light exists as part of the circadian molecular components and impacts the circadian timing mechanism. The light to dim oscillatory response shows the importance that light plays in influencing circadian rhythms in an area of study that has not been well explored.

Presenter: Jerome John Kessler
Project Adviser: Sylke Boyd (Physics)
Title: Weather Trends Spanning a Hundred Years from the Morris Region
Type of Presentation: Poster #11

Abstract:

My research project has been to investigate climate changes in the Morris region using temperature and precipitation data spanning about 100 years using modern computational means. The data are based on historical records from the West Central Research and Outreach Center (WCROC), from 1920-2000, and the UMM weather station, from 2001-2011, in Morris, MN. The data have been contrasted and coordinated with the weather data taken from the Co-op in Morris, MN. The trends in data show that the mean monthly temperatures have decreased, but the minimum monthly temperature has increased for each month as a function of time. The increase in minimum temperatures may be the result of an increase in precipitation in the area. A 5 year average plot of mean temperatures shows an oscillation around the linear fit transgression with a period of 7-15 years, signifying both a terrestrial and celestial influence on surface temperature. My project is a UROP and Sylke Boyd is my advisor.

Presenter: Michael Hoffman
Project Adviser: Peh Ng (Mathematics)
Title: A Copula Approach to Modeling of Financial Markets
Type of Presentation: Poster #15

Abstract:

In 1959, Sklar first introduced the idea of copulas to model multivariate distributions. Since then, copulas have become extremely important and popular in many different fields including finance, actuarial science and statistics. In finance, copulas are extremely important in determining dependence and correlations over time. A well-known problem in finance is finding good diversification strategies in order to try and limit risk of a portfolio. Copulas are used to solve such a problem because they are able to capture the “tail-end” behaviors of distributions well enough so that small sets of data are not overlooked. The significance of this research project is to get a better understanding of the importance of copulas so that we can use them to predict the probability that a certain portfolio will fail by a certain amount. We accomplish this goal by looking at the lower dependence of a copula. We looked at the stock returns of four stock indexes ideally the S&P 500, NASDAQ, FTSE, and Dow Jones indexes. We also used one-year, five-year, and ten-year bond returns. We examined the different classes of copulas and the properties of each copula class to fit a copula to each pair of stock indexes and bond returns. We then examined the predicted dependence of each pair of stocks and bonds. This finding led us to conclusions about the diversification of a portfolio and the Value-at-Risk (VaR) of each pair of copulas.

Presenters: Ayano Jiru and Lea Awoudi
Project Advisers: Jon Anderson and Stephen Burks (Statistics and Management)
Title: Workers Compensation Claims: Analysis of Injuries and Costs
Type of Presentation: Poster #22

Abstract:

Work related injuries cost trucking companies millions of dollars annually. As a result, companies have set out to find ways to reduce injuries while at work. The Truckers and Turnover Project has been working with cooperating carriers in studying workers injuries and costs. The data used are from a large trucking firm consisting of 3,400 worker’s compensation claims from 1999 to 2004. The objective of our research is to produce statistical analyses of injury types and costs. Particularly, claims frequencies over months, climate seasons, years, the amount of compensation associated with different types of injuries, and attorney involvement in the claims, were analyzed. These variables were studied using STATA statistical analysis package. Claims with zero dollar amounts were examined separately to better understand the factors that predict them. Statistical tests were performed to study the correlations between variables and the multivariate factors that affect the risk of a workers’ compensation claims. These findings will help to better assess the economic impact of work-related injuries and inform decisions on steps to limit on-the-job risk.

Presenter: Kele Cable
Project Adviser: Paul Myers (Biology)
Title: Variation in Limb Structure of Salamanders
Type of Presentation: Poster #3

Abstract:

We examined variation in limb structure, such as number of tarsal bones (in forelimbs and hind limbs), of preserved salamanders bought from Carolina Biological Supply. Modeling work done on California salamanders, we developed and tested methods to dissolve tissues surrounding the bones and staining techniques for analysis. We hypothesized that we would find little variation in limb morphology because these salamanders are farmed animals bred to be similar to one another. This hypothesis was confirmed. Our findings provide a useful null model as future research expands to measuring the variation in limb morphology of local and natural populations of salamanders near Morris, MN.

Presenters: Clara Dux and Ellis Valentiner
Project Adviser: Jeffrey Ratliff-Crain (Psychology)
Title: Effects of Caffeine Consumption on Mood and Physiological Responses to a Speech Task
Type of Presentation: Poster #24

Abstract:

Caffeine is commonly consumed to aid in dealing with stressful situations. This study was designed to examine mood and physiological responses to anxiety-inducing situations when consuming caffeine. We expected greater stress responses with caffeine consumption that would be moderated by caffeine-related expectations. Participants were UMM students who each consumed at least 100mg of caffeine daily. Participants were randomly assigned to one of four conditions in a 2x2 placebo design in which the presence of caffeine and caffeine-related expectations were manipulated. Participants completed a simulated public speaking task to create an anxiety-invoking situation. Mood and physiological measurements of blood pressure and heart rate were taken throughout the study. Nonparametric tests revealed there were no significant differences among participants across conditions at baseline. Univariate analysis of variance confirmed the effect of the caffeine expectancy manipulation. The speaking task was effective in producing anxious mood and physiological responses. There was no drug effect or expectancy effect. Thus neither hypothesis was supported by the data. Further analysis revealed an interrelationship among total caffeine consumption, diastolic blood pressure (DBP) changes, and mood responses. Both DBP and caffeine were predictive of negative mood reactions to the speech task. This combination of mood and physiological response suggests a negative stress reaction when consuming caffeine. The presence of a negative stress reaction as a result of caffeine consumption directly conflicts with the use of caffeine as a coping strategy, one of the many reasons people self report for consuming caffeine. This research was supported by UROP.

2011 Undergraduate Research Symposium

Presenter: Brian Goslinga and Eugene Butler

Project Adviser: Elena Machkasova (Computer Science)

Title: Improving Error Messages in the Programming Language Clojure

Type of Presentation: Poster #14

Abstract:

Clojure is a relatively young programming language, introduced in 2007. Clojure is developed as an Open Source language, which means that the software that translates Clojure programs into executable computer instructions (i.e. the Clojure implementation) is freely available for everyone to use and modify. Clojure has generated a strong interest in the programming community due to its support for easier and safer programming for multiprocessor systems, a traditionally difficult and error-prone task. Clojure is developed under the assumption that the programmers who use it understand the details of its implementation. When a Clojure program encounters an error, the resulting error messages refer to such details. However, now that Clojure has reached a broader programming community, one can no longer assume that all Clojure programmers know about its internal details. These error messages may confuse or mislead new programmers, and often create a frustrating programming experience. Our research aims to solve this problem by decreasing the number of internal details that are exposed in Clojure's error messages. We are modifying the parts of the Clojure implementation that check program correctness to produce more informative error messages. We present a comparison between the new and the old error messages, and show that our style of error messages is easier to work with. As programming for multiprocessor systems becomes increasingly important, our research will help to broaden Clojure's adoption, allowing more programmers to use Clojure's support for reliable multiprocessor programming. This research is sponsored by UMN UROP and LSAMP.

Presenter: Rachel Harstad

Project Advisers: Jon Anderson and Emily Hoover (Horticulture, St. Paul campus)

Title: Effects of Cultivar and Initial Plant Spacing on Growth and Development of Primocane-Fruiting Raspberries Grown in High Tunnels

Type of Presentation: Poster #18

Abstract:

High tunnels are becoming popular with growers to extend the growing season for a variety of fruits and vegetables. Fall-fruiting raspberries are a popular high tunnel crop because their season is often cut short in the Upper Midwest due to early, cold weather events. Research has concluded that berries produced in high tunnels have higher quality, a longer harvest season, and higher yields. Other research has shown that the number of nodes on a primocane-raspberry cane correlates to the yield. The question then arises: does initial plant spacing and cultivar affect yield? Using two cultivars, Caroline and Autumn Britten, planted initially at 45 and 60 cm, data were collected for two years at the University of Minnesota, St. Paul's high tunnel. The number of nodes, yield, and plant height was collected for each treatment. Using a Poisson model, we used node number as the response variable. Preliminary results indicate that there are differences in the number of nodes a plant has based on the cultivar and original plant spacing, while total season yield was not affected by differences in the cultivar. Analysis of data collected at the West Central Research and Outreach Center, Morris, MN, indicates that there is a higher yield of berries grown in the high tunnel over the course of a growing season (as compared to the traditionally grown field trial). These results are important to the current research because the ideal plant spacing for a particular cultivar may differ depending on the growing conditions. This research has been supported by UROP.

2011 Undergraduate Research Symposium

Presenter: Rachel Harstad

Project Adviser: Jennifer Goodnough (Chemistry)

Title: Semi-empirical Study of the Effects of Temperature on Hydrogen Bonding Strength and Liquid Salt Water Dynamics

Type of Presentation: Poster #19

Abstract:

Hydrogen bonding is crucial to the structure of many important molecules and required for critical biological reactions. However, despite more than a century of both theoretical and experimental study, the nature of hydrogen bonding is not completely understood. The liquid phase is particularly unclear and this lack of clarity is largely due to the dynamic state of liquids, in which molecules are constantly moving and changing their hydrogen bond network. The study of hydrogen-bonded liquids is difficult because neither pure experimental nor pure theoretical methods give straight-forward answers. Our research uses a semi-empirical method which combines experimental NMR measurements (chemical shifts and spin lattice relaxation times) and theoretical quantum mechanics calculations. This method is also used to find rotational correlation times, which provides insight into the motion of molecules in the mixtures. The chemical shift provides the relative hydrogen bond strength. NMR data were taken as a function of temperature for aqueous solutions of KCl and NaCl. The addition of salt and changing the temperature of water resulted in a change in hydrogen bond structure. The general trend to our results was that low temperature and low concentrations had the strongest average hydrogen bond strength. This trend is evident in the observed change in chemical shift and rotational correlation time as we move to higher temperature and concentration.

Presenter: Alissa Hawks

Project Advisers: Jennifer Rothchild and Karen Mumford (Sociology and Biology)

Title: Breastfeeding in Rural Minnesota

Type of Presentation: Poster #21

Abstract:

According to the U.S. Surgeon General, breastfeeding provides health-related benefits to infants and mothers. Although many mothers initially breastfeed their newborns, few meet the recommended duration of breastfeeding for six months. To improve the rates and duration of breastfeeding in western Minnesota, Ottertail County implemented the Golden Start initiative. One aspect of this initiative is to understand why some mothers breastfeed while others do not. To better understand this decision three separate focus groups were held that included: (1) health practitioners (n=12); (2) breastfeeding mothers (n=11); and (3) formula-feeding mothers (n=10). Based on literature reviews and input from staff and community members focus group questions were developed and finalized. Focus groups were held in April, 2010 and February, 2011. Each focus group lasted 2.5 hours. Preliminary analysis of focus group transcripts revealed that all three groups shared similar views about the benefits of breastfeeding but differed regarding barriers. While nurses and administrators indicated that some mothers stop breastfeeding so they can socialize, formula-feeding mothers indicated that it was not just socializing but also feeling lonely and isolated that led them to stop breastfeeding. Both formula-feeding and breastfeeding mothers indicated that breastfeeding was more difficult than expected and recommended that better information be available about these challenges. All three groups recommended improving access to lactation and breastfeeding consultants. These preliminary findings indicate differences in perspectives and the importance of acknowledging the challenges of breastfeeding and of improving access to trained staff to help women overcome these challenges.