

3-9-2009

## 4th Annual Research in the Capitol [Program], March 9, 2009

University of Northern Iowa. University Honors Program.

Iowa State University. Honors Program.

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**Authors**

University of Northern Iowa. University Honors Program., Iowa State University. Honors Program., and University of Iowa. Honors Program.

Iowa Regent Universities present  
the 4th Annual

Research  
in the  
Capitol

Monday, March 9, 2009

11:30am – 1:30pm

Iowa State House, Rotunda  
Des Moines, Iowa



## Welcome

On behalf of undergraduates at our three Regent Universities, welcome to the fourth annual Research in the Capitol. Research is about learning and that learning comes to fruition when it is shared with others. The opportunity for our students to share their knowledge and exuberance with legislators, Regents, and guests in the Iowa State House is a privilege and a special honor.

Research involvement plays a central role in undergraduate education. Students who take part in research with faculty are more successful academically, are more developed in their career and professional preparation, and are more satisfied with their college experience. Research engagement provides conditions for collaborative learning and critical thinking that benefit students as they move into the workforce or on to graduate or professional training. These presentations required countless hours of effort on the part of the students and their mentors outside of the classroom and represent the shared commitment our students, staff, and faculty place on the undergraduate experience.

As you speak with the outstanding students that are here today, you will learn firsthand the impact research involvement has on Iowa's students and the impact those students have on the research conducted at our outstanding Regent Universities.

Robert Kirby  
Director

## Schedule

**11:15-11:30** Iowa State University Flute Quintet  
Ski Symphonie pour quatre flutes  
Faustin Jean-Jean (1900-1979)

**11:30** Opening Remarks  
Bob Kirby  
Director, Iowa Center for Research by  
Undergraduates

David Miles  
President, Iowa Board of Regents

Josh Mahoney  
Senior, University of Northern Iowa

**11:45-1:30** Student Poster Presentations

**12:00-12:15** Iowa State University Flute Quintet  
Jeux d'Enfants Suite  
Georges Bizet (1838-1875) (arr. T. Wye)  
I. La Toupie  
II. La Poupée – Berceuse  
III. Trompette et Tambour – March  
IV. Le Bal Galop

Toccata in G Major  
Theodore Dubois (1837-1924) (arr. T. Wye)

Iowa State University Department of Music

Flute Quintet

Sonja Giles, bass flute, Director



Lisa Wehr, flute  
Sigourney, IA

Rebecca Hildebrand, piccolo  
Cedar Rapids, IA

Megan Maves, flute  
Boone, IA

Karina Snider, alto flute  
Huxley, IA

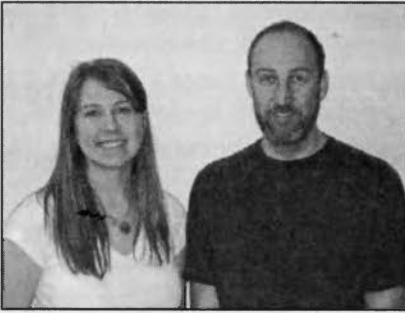
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## **1. Genetic Variation of the Straightfin Barb within Ethiopia**

**Katie Berge, Iowa City, IA**  
**Major: Biology**  
**Mentor: Dr. Peter Berezden**  
**University of Northern Iowa**

*Barbus paludinosus*, the straightfin barb, is a small non-game fish distributed in the southern and eastern parts of Africa. Previous research discovered an unusual morphological pattern in this fish within Ethiopia. Barbs living in the lower regions of rivers express a larger, first dorsal fin ray than barbs living in the headwaters. Straightfin barbs found downstream have the same body size as barbs in the headwaters, despite the large difference in the dorsal spine. The morphology of the fin ray is associated with waterfalls and the presence or absence of a predator. Upstream of waterfalls no predator is present and barbs have a thinner, non-serrated dorsal spine. Downstream of waterfalls a predatory large barb is found and *B. paludinosus* has a strongly serrated spine with ragged hooks. The objective of this study is to use molecular data to determine if straightfin barbs with different spines are the same species but exhibit different ecophenotypes or represent different species.



## **2. "Gay Friendly?" Assessing Campus Climate Through Actual and Perceived Attitudes**

**Tyler Bilyeu, Bancroft, IA**  
**Majors: Psychology & Art**  
**Mentor: Dr. Helen Harton**  
**University of Northern Iowa**

Homophobic and heterosexist attitudes and behaviors may make LGBT students feel undersupported (Louderback & Whitley, 1997), keep them from attending classes, and persuade them to hide their sexual orientation (Brown & Gortmaker, 2006). This study measures attitudes and knowledge towards LGBT people through the responses of heterosexual and LGBT students in an attempt to provide a formal assessment of campus climate. I hypothesize that heterosexual participants scoring low in knowledge about LGBT issues are expected to have more negative attitudes than participants scoring higher in knowledge. Further, LGBT students will perceive a more negative climate than heterosexuals, especially if students have had an aversive experience since attending college or if the student feels disconnected from the LGBT group.



### **3. Internet-Scale Event and Attack Generation Environment**

**Benjamin Blakely, Alleman, IA**  
**Major: Computer Engineering**  
**Mentor: Dr. Doug Jacobson**  
**Iowa State University**

The Internet-Scale Event and Attack Generation Environment (ISEAGE) is a 64-node computer and network security testbed. ISEAGE is able to emulate any network topology, and then generate attacks and traffic loading upon it. This is critical to researching security vulnerabilities in real-world computer networks without affecting operations of those networks. The largest events at the ISEAGE lab are the Iowa State, Community College, National, and IT Adventures Cyber Defense Competitions. At these competitions teams of students must set up a secure and reliable computer network which provides services to a team of testing users. While these testers try to use the teams' networks, a team of attackers tries to break-in and take down the systems. These competitions draw students from throughout Iowa, and across the country. ISEAGE represents a critical and new paradigm in network security research: the ability to research large-scale internet phenomena that, in the real world, would cause economic turmoil, political upheavals, and loss of life. ISEAGE allows for this research in a safe and controlled environment



### **4. The Mental Health of Low Socio-Economic Populations**

**Sarah Bumgarner, New Haven, MO**  
**Major: Psychology**  
**Mentors: Dr. Cindy Juby &**  
**Dr. Sunde Nesbit (not pictured)**  
**University of Northern Iowa**

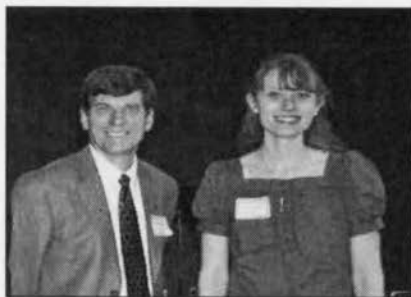
Depression is an illness that has a negative impact on our society. Depression not only lowers the depressed person's quality of life, but it also weighs down the economy. Low socio-economic populations are greatly impacted by depression. In response to this epidemic, this research will explore the relationship between mental health and poverty. Topics explored include factors of a low socio-economic environment that influence the onset of depression as well as the quality of mental health care among depressed people of low socio-economic status. Research will include a review of programs designed to improve mental health care for low income populations, both for the prevention and treatment of depression. The following is the research question to be addressed: What is the relationship between depression, poverty, and community psychology?



## **5. Meeting the Needs of Children of Divorce Through Literature**

**Stephanie Burbridge, Mt Vernon, IA**  
**Major: Elementary Education**  
**Mentor: Dr. Lori Norton-Meier**  
**Iowa State University**

Today, 50-60% of children will live in a single-parent household at some point in their childhood. Teachers have the opportunity to positively impact the lives of these children by providing them with the necessary tools to cope with their parent's divorce. This project explored children's 'funds of knowledge', the needs of children of divorce, and the use of bibliotherapy as a counseling tool. Through a literature review it was determined that children of divorce experience emotional difficulties, often mimicking the stages of grief. The use of literature as a counseling tool, referred to as bibliotherapy, can provide children with strategies for coping. Upon completing the research, a children's book was created to address the needs of children of divorce. The book was written from the perspective of a child experiencing her parent's divorce. She progresses through her emotions, similar to the stages of grief, eventually finding acceptance.



## **6. The Mixed Glass Former Effect in the $\text{Na}_2\text{O}+\text{B}_2\text{O}_3+\text{P}_2\text{O}_5$ Glass System**

**Jennifer Byer, Marshalltown, IA**  
**Major: Materials Engineering**  
**Mentor: Dr. Steve Martin**  
**Iowa State University**

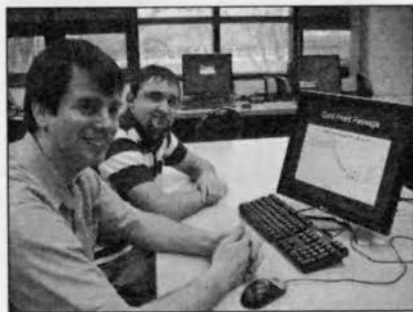
The  $\text{Na}_2\text{O}+\text{B}_2\text{O}_3+\text{P}_2\text{O}_5$  glass system provides the foundation for an international collaboration between the United States and Europe. This collaboration unites different analytical and hands-on research techniques to investigate the Mixed Glass Former Effect (MGFE). The driving force behind studying the MGFE is its strong effect in the ionic conductivity of these. The industrial application of such glasses are solid glassy electrolytes that would provide more stable, smaller and stronger batteries greatly improving present battery technology. This research project will lay the groundwork to understand the MGFE leading to the investigation of other glass systems that are stronger ionic conductors. Iowa State University's contribution to the project shows that the effect is present in the sodium-borophosphate system even in its most basic mechanical and thermal properties; density and glass transition temperature. These changes in properties are supported by further investigation of the glasses' structures through IR Raman, and XRD Spectroscopies.



## **7. Exploration of Nano-layers Grown on Silicon for use in Solar Cells**

**Shanon Davis, West Des Moines, IA**  
**Major: Physics**  
**Mentor: Dr. Tim Kidd**  
**University of Northern Iowa**

The inevitable depletion of fossil fuels in the world forces mankind to look elsewhere for a renewable energy source. One such source comes from the light that comes over the horizon every day. Solar cells currently have only 13% efficiency, so they must have a large surface area to create a significant amount of energy. Nanometer scale features known as quantum dots have the potential to dramatically improve solar cells efficiency. With increased efficiency, production of solar cells would cost less, bringing solar energy to the average household. We created atomically-flat, chemically-inert, optically transparent surfaces on silicon to promote the growth of quantum dots. These layers must be grown inside of an ultra-high vacuum, in which the pressure is less than the pressure in space, to prevent unwanted chemical reactions. The template we created conquers the first hurdle in research on the fundamental properties in solar energy from quantum dots.



## **8. Dew Point Temperature Trends Associated with Synoptic Regime Changes in Iowa**

**Adam Deppe, Maquoketa, IA**  
**Major: Meteorology**  
**Mentor: Dave Flory**  
**Iowa State University**

Dew point temperatures affect many aspects of weather prediction today including minimum temperature and CAPE. Observations of dew point temperature were compiled from June 1998 to August 2008. Dew point data was collected during the summer months (June, July, and August) for five different locations across the state of Iowa: Davenport, Des Moines, Lamoni, Mason City, and Sioux City. To test the accuracy of 24 hour weather forecasts, the NAM and the GFS MOS were compared to observations for three different weather regimes: cold front passage, warm front passage, and dominated by high pressure. Results show that MOS equations predict warm front passage the most accurately followed by a high pressure regime. Cold front passages are predicted with the least accuracy. A warm bias in the NAM MOS was also observed during all three weather regimes.



## **9. The Effects of Sport and Physical Activity on Post-Traumatic Stress Disorder in Youth from Mass Trauma Populations**

**Sydney deVictoria-Michel, Eagan, MN**  
**Major: Physical Education: Sport Psychology**

**Mentor: Dr. Windee Weiss (not pictured)**  
**University of Northern Iowa**

This study will focus on the effects of exercise and sport on Post-Traumatic Stress Disorder (PTSD). PTSD can be debilitating to those who suffer from the disorder, and incredibly confusing when children are involved. Feelings of rage, anger, depression and anxiety can render individuals incapable of normal day to day activities. One way to impact the affects of PTSD is through physical activity and sport. Information will be gathered from completed research to uncover the feelings which are prominent in those suffering from PTSD and to find current treatment options. Research on the impact of exercise on symptom found in sufferers of PTSD will follow. After determining the best path for early intervention, the thesis will conclude with a program created by the student which could be used in a theoretical setting of mass trauma.



## **10. Studying Medical Decision Aids**

**Melissa Dilling, Rochester, MN**

**Major: Graphic Design**

**Gina Assmann, Omaha, NE**

**Major: Interior Design**

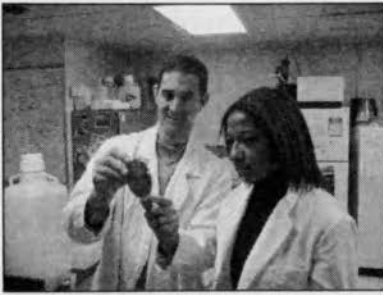
**Becky Murphy, Central City, IA**

**Major: Graphic Design**

**Mentor: Debra Satterfield**

**Iowa State University**

Currently, the Design Information Research Group's (DIRG) objective is to learn more about the opinions and perceptions of medical decision aids. We plan to use this information to design a better experience for patients making decisions about their health care. DIRG is working with the Mayo Clinic to design an evaluation tool for their diabetes decision aids. We are exploring design variables such as: texture, color, typeface, size, and iconography. DIRG has been meeting with focus groups and is currently surveying individual participants. Our questions are based on the Kansei Methodology, a technique that measures social and emotional responses. Participants respond to comparative adjectives and open-ended questions. From these responses, we expect to discover the most effective and trustworthy methods of designing this medical information. In the long run, the goal of this study is to facilitate better patient-doctor experiences, and empower patients to make improved health care decisions.



## 11. Identification of Inhibitors of a Salmonella Gene that Regulates Attachment

**Kalyani Eko, Coralville, IA**  
**Major: Microbiology**  
**Mentor: Dr. Bradley Jones**  
**University of Iowa**

*Salmonella* is a significant health concern worldwide. *Salmonella* infections are contracted by ingestion of contaminated food or water. *Salmonella* can also cause devastation within agriculture, destroying over 10 million dollars worth of American produce in 2007 alone. Economically, this caused major problems for farmers and the agricultural market. An alarming occurrence of *Salmonella* infections takes place in the intestines of poultry, which can then be passed on to humans, causing mild to life-threatening food poisoning. *Salmonella* utilizes a specific gene to regulate its attachment to the intestines of these birds. Based upon this information, we are working on a project to identify small cyclic peptides that inhibit this specific gene. Eventually we hope to use these peptides to reduce or hinder the carriage of *Salmonella* in chickens so that cases of human salmonellosis resulting from poultry consumption will be significantly reduced.



## 12. Teacher-Student Similarity: The Role Model Gap in Education

**Mary Esdorn, Franklin Park, IL**  
**Major: Psychology**  
**Mentor: Dr. Peter Hlebowitsh**  
**University of Iowa**

The achievement gap between minority students and white students is number one for many education researchers. What causes this gap? What can we do to mend it? Although many of these questions are left unanswered, we are certain that affluent, white students are academically excelling more than their minority peers. This gap may be influenced by the lack of role models for minority students in schools called "the role model gap." This is especially obvious in American schools; white teachers hold 86% of teaching jobs. Some evidence suggests that minority teachers interact differently with minority students. I present new support on the idea of same-race/other-race education and student-teacher relationships. I also evaluated whether school location influences discipline. I recorded teachers' responses to an electronic survey measuring harshness of punishment. I found the race of the student was more influential in determining the punishment than the race of the teacher.



### **13. Statistical Analysis of Toolmark Striations**

**Charles Fisher, Mount Auburn, IA**  
**Major: Materials Engineering**  
**Mentor: Dr. Scott Chumbley**  
**Iowa State University**

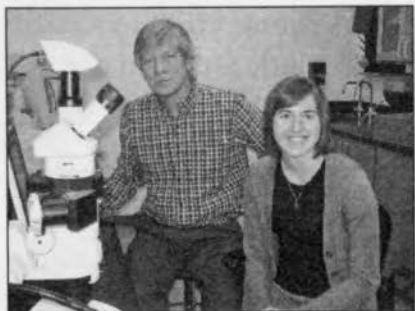
Toolmark examiners employ an optical comparison method to match suspect marks from a known source with the assumption that the marks are unique to a single tool. Lately, this method has come under scrutiny from the Supreme Court. This project seeks to provide scientific evidence for the validity of this basic assumption. This will be completed by 1) developing an objective (automated) methodology for comparing two toolmarks which will give a statistical analysis of the quality of the match and 2) by providing a quantifiable link between a tool and marking plus describe the validity of that link. A computer-based search/match algorithm has been created to deliver a numerical number describing the quality of a comparison and is being compared to data that was compiled in the field. So far, it was confirmed that the comparison of toolmarks has scientific and statistical validation.



### **14. Public Water Fluoridation**

**Jessica Fohey, Monona, IA**  
**Majors: Management: Business**  
**Administration & Biology**  
**Mentor: Dr. Darrell Wiens**  
**University of Northern Iowa**

There is some debate as to whether or not public water systems should be fluoridated. This project seeks to deduce a conclusion on this question. I have compiled an extensive literature review of scientific research dealing with the effects of fluoride on the body, which strongly supports water fluoridation. However, since public opinion has such a strong influence on legislative decisions, science is not the only factor involved. The first part of my methodology analyzes pseudo-scientific literature which may be negatively impacting public opinion toward water fluoridation and points out inappropriate reasoning leading to unsound arguments. The second phase of my methodology features a case study of Prairie du Chien, WI, the largest city in Wisconsin without a fluoridated water supply. Considering all information, I have come to a conclusion about whether or not cities should fluoridate their water supplies and have offered recommendations that coincide with that conclusion.



## **15. The Effect of Homocysteine on Development of Contractions and $\beta$ -Catenin Expression in Chick Embryo Precardiac Mesoderm**

**Michelle Formanek, Cedar Falls, IA**  
**Major: Biology: Biomedical**  
**Mentor: Dr. Darrell Wiens**  
**University of Northern Iowa**

In the chick embryo, homocysteine (Hcys) is teratogenic at elevated levels, causing neural tube defects and cardiac malformations. There is evidence for several Hcys mechanisms of action, including interference in the critical Wnt signaling pathway. By responding to FGF and BMP signals and activation of the Wnt pathway, the precardiac mesoderm rapidly differentiates into contracting heart tissue.  $\beta$ -catenin is a transcription factor involved in the Wnt pathway. We are testing the precardiac mesoderm's ability to develop contractions and its expression of  $\beta$ -catenin when cultured in elevated levels of Hcys. Disruption of contractions in treated explants would indicate that elevated levels of Hcys may affect early heart development. Immunohistochemistry will be performed and sections quantitatively analyzed by color thresholding for intensity of  $\beta$ -catenin expression. If the expression of  $\beta$ -catenin is affected by Hcys, this would provide evidence that the Wnt signaling pathway may be altered by high levels of Hcys during early heart development.

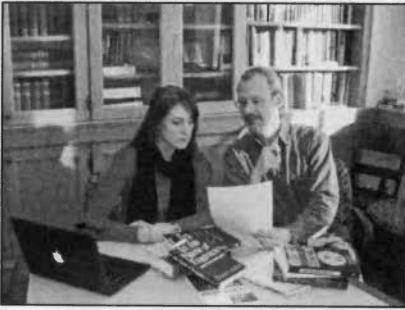


## **16. Problem Solving Behaviors in College Relationships**

**Bethanie Frattini-Scott, Rhodes, IA**  
**Majors: Family Services & Psychology**  
**Mentor: Dr. Helen Harton**  
**University of Northern Iowa**

This study evaluates problem-solving behaviors, particularly support seeking, in college relationships. 130 college students currently in romantic relationships completed measures of attachment, relationship efficacy, partner attribution, and relationship satisfaction and responded to hypothetical scenarios to assess their problem-solving behaviors. Securely attached participants and those reporting high relationship efficacy are expected to utilize more social support resources when problem-solving than insecurely attached participants and those reporting low relationship efficacy. Positive partner attributions are expected to result in cooperative conflict resolution behaviors and high relationship satisfaction. Results may contribute to our understanding of how college students handle problems within intimate relationships and the extent to which they seek help and social support from others during times of distress.





## **17. The Eugenic Effort to Retain "Good Genetic Stock" in the Rural Midwest**

**Kathryn Gaskill, Lake Mills, IA**  
**Major: History**  
**Mentor: Dr. Douglas Baynton**  
**University of Iowa**

The early years of the 20<sup>th</sup> century saw massive urban growth caused by immigration and industrialization. As living conditions in American cities worsened, eugenics—the pseudo-science of improving humanity through selective reproduction—gained momentum. Eugenecists, relying on faulty science and nationalist bigotry, blamed the genetic make-up of immigrants and persons with disabilities for the crime and disease plaguing large cities. However, inhabitants of the rural, ethnically homogenous Midwest did not experience these urban vices. Eugenic advocates declared the countryside as the "reservoir from which the town draws its best citizenship." The eugenics movement to preserve the Midwest's "good stock" manifested in two manners: retention of genetic "superiors" and restraint of genetic "inferiors". Midwestern states, including Iowa, acted to limit reproduction of their population's "degenerate" elements by legislating involuntary sexual sterilization of the "feeble-minded" and habitual criminals. It has long been the goal of societies to learn from history, in hopes that yesterday's mistakes will not be repeated. To do this, the study of history must be comprehensive, examining all elements—even the discomforting—to gain perspective on the past and to provide insight for the present.



## **18. Continuous Productive Urban Landscapes: A Sustainable Design Option to Growing Urban Communities in Iowa**

**Jason Grimm, North English, IA**  
**Majors: Landscape Architecture & Environmental Studies**  
**Mentor: Mimi Wagner (not pictured)**  
**Iowa State University**

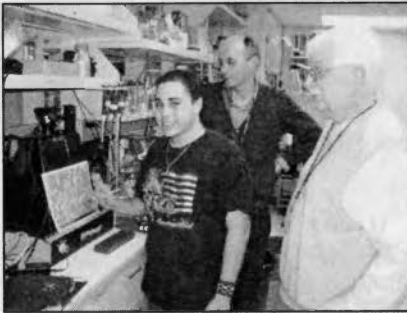
As a designer and planner of urban landscapes, landscape architects hold a vital tool in the growth of any Iowa community. Both locally and globally food has become a common theme in many discussions. Motivations include the lack of productive urban land, lack of societal knowledge of food growing and preparation, urban/rural conflict at the urban fringe, lack of stable urban markets and uncontrolled urban growth. The goal is to research and design continuous productive landscapes as a tool and or mechanism to sustainable growth in Ames, IA. As infrastructure in a city or town, continuous urban agriculture (UA) has the potential of being a thread that is sewn through a community creating a rigid and ecological backbone to growth that connects neighborhoods, open spaces, and urban markets. Research is based on case studies, interviews of producers and city officials, and studies of UA in London and Toronto.



## **19. Bananas are Becoming Extinct: Emotion and Credibility in Rumor Spreading**

**James Harms, Allison, IA**  
**Major: Psychology**  
**Amanda Harms, Waverly, IA**  
**Major: Psychology**  
**Mentor: Dr. Helen Harton**  
**University of Northern Iowa**

The study examined the role of emotion and credibility in the likelihood of a rumor spreading. Participants rated how credible and relevant various rumors we gathered from internet sources were, as well as the emotions they elicited and whether they had heard them before. A separate sample read several rumors and then recalled them after a distraction. Rumors that were sad and believed to be true were more likely to be remembered. Participants also reported that they would be more likely to share the rumors that elicited the most anger, disgust, sadness, fear, and threat. These results suggest that people are better at remembering information that is sad and believable, and if they believe they will share that information with others, they are more likely to retain it as well.



## **20. Measuring Infectivity of the Chicken Pox Virus using Newer Imaging Methods**

**Ernesto Henderson, Ft. Washington, MD**  
**Majors: Psychology & French**  
**Mentors: Dr. Charles Grose &**  
**Dr. John Carpenter**  
**University of Iowa**

When the Chicken Pox Virus or the Varicella-Zoster Virus (VZV) is made in cell culture, its known for not being very infectious. VZV looks like a sphere with a protein envelope outside and a capsid, another little sphere with DNA, inside. When a virus infects a cell, it tries to make more of itself. However, when VZV tries to make more of itself in cell culture, it makes many virus particles without capsids making those particles noninfectious. So, this project involved looking at how infectious VZV really is. Myself and other members of Dr. Grose's lab in the University of Iowa's Children's Hospital did this by using an electron microscope to take over 300 hundred pictures of the surface of cells infected with VZV. After we averaged all the images, we found that only 15.2 % of the particles were complete implying that it takes a large number of virus particles to be infectious when we make it cell culture. It is important to know how VZV acts outside the body because that is how the vaccine is made.



## **21. The Agricultural Workers' Role in Pandemic Avian Influenza Spread**

**Amanda Irish, Cedar Rapids, IA**  
**Major: International Studies**  
**Mentor: Dr. Gregory Gray**  
**University of Iowa**

Animal workers sometimes spread human viruses to animals and animal viruses to humans. In particular, modern swine herds have suffered much illness from human-like influenza virus infection. Similarly, swine and poultry workers have had evidence of swine or poultry influenza virus infections. Assuming such viruses move freely between man and domestic animals, mathematical modeling has shown that such workers could accelerate a world-wide epidemic of influenza but his acceleration could easily be stopped if the workers were included in surveillance and pandemic influenza vaccination programs. I evaluated national pandemic influenza plans for 15 countries with confirmed human detections of H5N1 avian influenza. I searched for key words to learn if the countries had any special plans for agriculture workers. I found no substantial mention of agricultural workers in the 15 national pandemic influenza control plans. I then gathered agriculture production statistics and estimated the number of swine and poultry agriculture workers in each country. These data were then used to calculate the number of doses of pandemic influenza vaccine necessary for each country to protect its workers and the workers' rural communities from an increase in spread of pandemic influenza.



## **22. A Comparison of the Partial Thickness Technique and the Bourgouin Technique through Bufkit Output**

**Logan Karsten, Des Moines, IA**  
**Major: Meteorology**  
**Mentors: Dr. William Gallus & Chris Karstens**  
**Iowa State University**

Precipitation type issues constantly plague forecasters during the winter time across the country. However, there are several approaches to this issue, including algorithms based on methods during the past 50 years. This study looked at two methods in particular; the partial thickness method, and the Bourgouin method. Bufkit software was used to produce model output using these two methods. Output was compared using statistical analysis. Results were inconclusive, demonstrating the work that still needs to take place before a complete understanding of precipitation type forecasting occurs. Further work is taking place spring 2009 to digest results further and address areas of the study that need improving.



### **23. Developing a Vaccine for a Deadly Parasitic Disease**

**Alexandra Keenan, Urbandale, IA**  
**Majors: Biomedical Engineering, Biochemistry, & International Studies**

**Mentors: Dr. Mary Wilson (not pictured) & Dr. Sruti Debroy**  
**University of Iowa**

Visceral leishmaniasis (VL) affects 500,000 new individuals each year, primarily in less developed countries. It is caused by a protozoan parasite that is transmitted to humans through the bite of a sandfly. The disease is difficult to diagnose and prevent, and disease foci often exist in remote areas that are not easily accessible or have limited health care facilities. Drug-based treatment is difficult to administer, expensive, and becoming ineffective due to increasing parasite resistance. When left untreated, this insidious infection is fatal, with 57,000 deaths attributed annually. Spontaneous or drug-induced recovery from VL leads to immunity, providing the rationale for vaccine development. Despite numerous efforts, there is no safe vaccine against VL. Vaccination of mice with *L. infantum* culture filtrates confers strong immunity, suggesting that proteins secreted by the parasite are attractive targets for protein vaccine development.



### **24. Diurnal Resting Habitat Selection of the White-tailed Jackrabbit in an Intensive Agricultural Setting**

**Eric Kilburg, Maquoketa, IA**  
**Major: Animal Ecology**  
**Mentor: Dr. W. Sue Fairbanks**  
**Iowa State University**

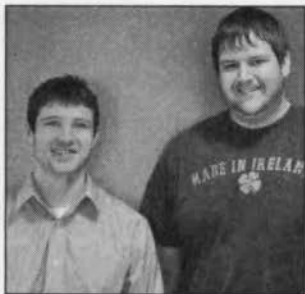
Declines in the population of white-tailed jackrabbits in Iowa since the mid 1900s, have highlighted the need to collect data on this largely unstudied Species of Greatest Conservation Need. White-tailed jackrabbits require large, open areas to avoid predation. Continuous expansion of large-scale agriculture potentially limits the availability of that required niche. I am conducting a study of jackrabbit preferences for daytime resting habitat in relation to seasonal and agricultural changes on an intensively farmed landscape. To date, we have fitted radio-collars on 8 jackrabbits on an ISU Research Farm. I track each radio-collared animal to resting locations at random times during the day to compare vegetation and visibility at the resting site to 2 reference sites. This allows comparison between habitat used by jackrabbits versus habitat available. Knowledge of jackrabbit preferences for resting sites will provide information needed to develop a management plan for this declining species.



## 25. Distinguishing Species of Fossilized Western Caribbean Coral by Shape Analysis

**Myra Laird, Nevada, IA**  
**Majors: Anthropology & Geoscience**  
**Mentor: Dr. Ann F. Budd**  
**University of Iowa**

This study used morphometrics, geometric shape analysis; to distinguish species in the *Montastraea cavemosa* complex, a Caribbean coral, based on a collection of 112 colonies. Fossil specimens, dating from the late Miocene to early Pleistocene, were collected from Panama and Costa Rica and analyzed in addition to modern samples from Belize. Results were analyzed by locality and geologic age which showed two long ranging (greater than 10Ma) species and two extant. Results were also compared with two other studies which support a decrease in complex diversity through time, but an increase during the Neogene. Species complexes formed by Caribbean reef coral accentuate regional and local diversity at particular time units which can be indicative of large-scale environmental events caused by the closure of the Central American isthmus, northern hemisphere glaciation, and climate change. Iowans may relate to this study because species complexes can directly reflect human-initiated global warming thereby showing both historical climate events and those affecting the world today.



## 26. Spontaneous Calcium Activity in Differentiating Adult Rat Hippocampal Progenitor Cells

**William Law, Marion, IA**  
**Major: Genetics**  
**John Callahan, Dubuque, IA**  
**Major: Biology**  
**Mentor: Dr. Don Sakaguchi**  
**Iowa State University**

The use of neural stem cells is an exciting therapeutic strategy for treating neurodegenerative diseases and injuries to the nervous system. A fundamental issue is to understand the biology of these cells in an effort to direct their differentiation, behavior, and activity. Our studies focus on multipotent neural stem cells isolated from the adult rat hippocampus. These neural stem cells have the ability to differentiate into neurons and glial cells. Recently we have identified spontaneous calcium activity in these cells that correlates with their differentiation into neurons and glia. We see dramatic changes in the waveform of this activity as the neural stem cells differentiate. This activity may play a critical role in the differentiation of these adult neural stem cells, and may provide a means in which to control their differentiation into specific cell types.



## **27. Transcutaneous Electrical Nerve Stimulation (TENS) Does Not Alter Cold Sensory Detection Threshold**

**Alicia Liebe, Washington, IA**  
**Major: Athletic Training**  
**Mentor: Kelli Snyder, M.S.**  
**University of Northern Iowa**

The purpose of this study was to examine the impact of therapeutic electrical nerve stimulation (TENS) on thermal sensory detection threshold. Seventeen participants volunteered for this study in accordance with IRB protocol. The independent variables were a control treatment and a twenty-minute TENS application to the dorsum of the hand. Cold sensory threshold represented the dependent variable and was assessed using the Case IV Computer Aided Quantitative Sensory Evaluator. Cold sensory threshold was not significantly reduced during or following the TENS treatment ( $\chi^2 = 0.68$ ,  $p = 0.71$ ). Mean change values for the control, during-, and post-treatments were  $-0.85^\circ\text{C} + 1.36$ ,  $-0.05^\circ\text{C} + 1.61$ , and  $-0.01^\circ\text{C} + 1.59$ , respectively. Our results indicate that a TENS does not alter the thermal sensory threshold. Because TENS is most commonly used for pain control, future research should examine the impact of TENS on the perception of painful thermal stimuli.



## **28. Inflation and the Composition on Unemployment and Output**

**Jack Luze, Cedar Falls, IA**  
**Majors: Economics & Management Information Systems**  
**Mentor: Dr. Bryce Kanago**  
**University of Northern Iowa**

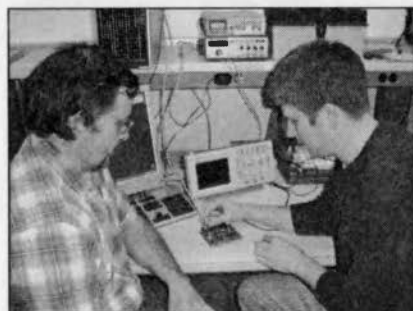
Since Phillips published his paper on the relationship between wage growth and unemployment decades ago, economists have been studying the relationship between inflation and unemployment. The relationship is illustrated in a model dubbed the Phillips Curve. The Phillips curve implies that current unemployment rates should help predict inflation. However, some studies find little or no value from including current unemployment in a forecasting equation that includes lags of inflation. This paper explores forecasting models that explore the implications of breaking up unemployment by industrial sector or by certain demographic characteristics in forecasting. Better inflation forecasts would have implications for central bank policy decisions.



## **29. What is the Marginal Revenue Product of an FCS College Football Player?**

**Josh Mahoney, Sioux Falls, SD**  
**Majors: Economics: General Economics & English**  
**Mentor: Dr. Lisa Jepsen**  
**University of Northern Iowa**

Recent media attention has focused on the growing disparity between team revenues, coaches' compensation, and the relatively small value of students' athletic scholarships. I investigate the value of an FCS (1-AA) football player to his team. Previous studies indicate that the value of a FBS (1-A) football player to his team exceeds \$500,000. My preliminary results suggest that an All American FCS football player generates revenues to his team that are less than an FBS player.



## **30. A Robust, Microwave Rain Gauge**

**Timothy Mansheim, Burlington, IA**  
**Major: Electrical Engineering**  
**Mentor: Dr. Anton Kruger**  
**University of Iowa**

This research investigated the ability of a new, innovative rain gauge to accurately measure rainfall by comparing its results to a standard method. The microwave rain gauge is essentially made up of a radar gun that determines rainfall by measuring the speed of individual rain drops and using a set of assumptions relating rain drop velocity to the average rain rate. The biggest advantages of this rain gauge are that it is relatively inexpensive, it requires almost no maintenance, it cannot become clogged like a conventional rain gauge, and it gives a detailed picture of how much rain fell and at what time. An inexpensive rain gauge would allow a farmer to know how much rain fell on his or her land rather than relying on measurements provided by the local weather since the amount of rainfall can vary widely over a region. Additionally, knowing the amount of rainfall is necessary for people concerned with local river levels, golf course maintenance personnel, and anyone else who grows plants for living or as a hobby.



### **31. Contribution of the Hsv operon to Leaf Colonization in Pseudomonas Syringae**

**Rina Mbofung, Ames, IA**  
**Major: Microbiology**  
**Mentor: Dr. Gwyn Beattie**  
**Iowa State University**

The plant pathogen *Pseudomonas syringae* pv. tomato (Pst) causes lesions on the leaves and fruits of tomato as well as on the leaves of the model plant species *Arabidopsis thaliana*. The ability to cause disease results, in part, from its ability to transfer proteins into plant cells and suppress the plant's defenses. The virulence of a strain can be additionally influenced by the production of toxins that affect plant metabolism, called phytotoxins. Recent studies with the Pst strain DC3000 identified genes, named the hsv operon, that are similar to genes that contribute to the virulence of the fireblight pathogen *Erwinia amylovora*. The hsv operon putatively encodes enzymes involved in the synthesis of a phytotoxin. The purpose of this study was to evaluate if the hsv operon and an adjacent gene encoding a putative efflux pump, which may enable export of the phytotoxin, contribute to the virulence of DC3000.



### **32. Reading is for Girls: Examining Gender Differences in Reading Attitude**

**Molly McAllister, Cascade, IA**  
**Major: English**  
**Mentor: Dr. Kurt Meredith**  
**University of Northern Iowa**

This study examines two Eastern Iowa high schools in order to evaluate whether recent national research suggesting that males view reading more negatively than females holds true in Iowa schools. To evaluate such attitudes, the researcher designed a reading attitudes survey in which ninth grade students at the participating high schools read a variety of statements about reading, responding to each with their own beliefs on a scale ranging from "Strongly Disagree" to "Strongly Agree." When taking the survey, students also had to designate whether male or female in order for gender trends and correlations to be observed and analyzed. Final results of the study are anticipated to reflect that of national research and will be shared with the participating schools in the hopes of reversing such tendencies.





**33. 2008 Iowa  
Flooding:  
Disaster  
Mitigation, An  
Integrated  
System  
Approach**

**Keihly Moore, Two Harbors, MN**

**Majors: Architecture & Environmental Studies**

**Mentors: Nadia Anderson & Clare Cardinal-Pett**

**Iowa State University**

The flooding events in Iowa and the Midwest in the summer of 2008 had a large impact on many from the environmental, economic, government, and social perspectives. How do communities adapt and react to such "natural" disasters? How is policy tied to land development, and how does the history of the place set it for environmental "failure?" I narrowed my research to existing mitigation efforts and environmental engineering practices, comparing those with other ecological approaches emphasizing wetland renewal. I also participated in a design charrette for the town of Oakville, IA, helping redesign their flooded town, learning alongside FEMA employees. This project is an effort to document the complex relationships that are affected by these events; it provides a journalistic approach to findings that slowly piece together a story of the reaction and recovery.



**34. An Evaluation of the  
Effectiveness of the Senior Year  
Plus Program in Iowa**

**Andrew Morse, Akron, IA**

**Major: Psychology**

**Mentor: Dr. Jan Hanish**

**University of Northern Iowa**

Since Iowa's public universities graduate students with the highest student loan debt in the country, the proposed research will focus on the Senior Year Plus Program in Iowa and whether it prepares students for their careers and whether it helps to partially alleviate the debts that students incur while obtaining a college degree (The Project on Student Debt, 2006). Interviews are being conducted with currently enrolled University of Northern Iowa students to provide a comparison between students who have and have not enrolled in the Senior Year Plus program in regards to career preparation and loan debt alleviation.



### **35. Maternal Post Adoption Well-Being and Adjustment**

**Sarah Mott, Mount Pleasant, IA**

**Major: Psychology**

**Mentor: Dr. Mike O'Hara**

**University of Iowa**

Postpartum depression (PPD) is a serious mental health concern that affects 1 out of every 8 women following delivery, and depression is a source of significant public health care costs. If PPD is caused by increased stress associated with having a new baby, then women who adopt children may also be at-risk for developing depression. However, depression among adoptive mothers has never been studied. The purpose of the Maternal Post Adoption Well-Being and Adjustment Study is to compare symptoms of depression among mothers who have recently adopted and mothers who have recently given birth. This research may lead to improved identification of post-adoptive women at-risk for developing depression. Given that Iowa has the highest adoption rate in the country, advances in identifying at-risk mothers may lead to improved prevention and treatment of maternal depression and improved outcomes for children in the state.



### **36. Flaked Stone Artifacts at the Scott County Pueblo, Western Kansas**

**Veronica Mraz, Urbandale, IA**

**Major: Anthropology**

**Mentor: Dr. Margaret Beck**

**University of Iowa**

I am studying flaked stone artifacts from the Scott County Pueblo, an archaeological site in Kansas that is the most northeastern pueblo in the United States. This unusual site dates to about 1700 and is documented in historical accounts as a place where Puebloan Indians from New Mexico took refuge from Spanish colonial abuses in New Spain. Artifacts have been recovered from both in and around the pueblo and areas farther away, where traces of Apache camps have been recovered. Research questions include: (1) what types of flaked stone tools were made, (2) what types of stone were used for the tools, and (3) did the Puebloan Indians at the site use different tools and stone than the Apache people living nearby? This project addresses how the immigrant Pueblo group adapted to a new environment, how the newcomers interacted with people already living in the area, and to what extent they could continue their traditional way of life. The migrations and interactions of Native American groups, here and elsewhere in the Midwest/Plains region, form an important part of our national history.



### **37. The Daily Palette**

**Ellis Mumford, Indianapolis, IN**

**Major: Art History**

**Mentor: Dr. Jon Winet**

**University of Iowa**

The Daily Palette's goal is to heighten interest, awareness and appreciation of the visual arts and writing through recognizing the efforts of Iowa-identified artists and communities. The project has for over two years provided a means for the public to view a diverse range of artwork produced by artists and writers with ties to the state of Iowa through the display of images, texts, and streaming video. The Daily Palette features works in many series including the Graduate Archive, displaying work from University of Iowa graduate students, the Iowa Women's Oral History Project, Flood Tales in response to June 2008's record flooding, and several more. The project began in conjunction with the Year of the Arts & Humanities in 2004-2005, when a team from the College of Liberal Arts & Sciences School of Art & Art History Intermedia Area developed The Daily Palette to combine Intermedia's art & technology research with a broad public information effort. Since its inception in 2005, the Daily Palette, which was only intended to be maintained for a year, has featured nearly 1700 artists and writers.



### **38. Correction of Detector Dead Pixels in 3D Imaging for Cancer Radiation Therapy**

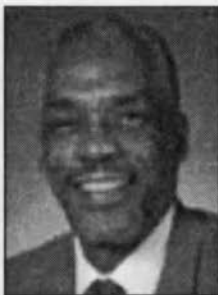
**David Nelms, Urbandale, IA**

**Majors: Applied Physics & Biochemistry**

**Mentor: Dr. Ryan Flynn**

**University of Iowa**

In the Department of Radiation Oncology at the University of Iowa Hospitals and Clinics, cancerous tumors are often treated by focused radiation delivery from high precision external beams. Since missing the target by only a few millimeters can adversely affect the treatment outcome and harm normal tissue, pre-treatment imaging is necessary to ensure proper patient positioning. Dead x-ray detector pixels can occur in the flat panel devices used to acquire the 2D projection images due to manufacturing defects, mechanical, or radiation damage. These dead detectors degrade the final image quality and affect locations throughout the final image because one projection pixel affects multiple locations in the final reconstructed image. The purpose of this study was to determine the maximum percentage of dead pixels at which each correction method fails. Clinical use of the dead pixel correction methods tested in this study could result in less expensive and more efficient patient positioning systems.



### **39. Comparing the Cultural Competence of African American and Caucasian Foster Mothers Caring for African American Foster Children**

**Brittany Overstreet, Des Moines, IA**  
**Major: Communication Studies**  
**Mentors: Dr. Thomas Hill & Dr. Sedahlia Jasper Crase**  
**Iowa State University**

The purpose of this study is to compare the cultural competence of two African American foster mothers and two Caucasian foster mothers caring for African American foster children, in order to begin to understand how cultural competence is taught/passed on to children, and thus to help improve the foster care system. After all the interviews are completed, I will analyze and transcribe qualitative responses and look for themes and subject areas to see how the two racial groups of mothers (African American and Caucasian) respond to the questions relative to teaching cultural competence to their African American foster children.



### **40. Impact of Skin Color on Noninvasive Measurements with Near Infrared Spectroscopy**

**Rebecca Paszkiewicz, Johnston, IA**  
**Majors: Chemistry & Theatre Arts**  
**Mentor: Dr. Mark A. Arnold**  
**University of Iowa**

People with diabetes must measure their blood glucose levels daily in order to reduce the medical complications associated with this disease. Conventional testing of blood glucose levels requires a drop of blood that is normally obtained by pricking a finger tip. For many, the pain and inconvenience of the conventional testing procedure discourages frequent testing. The result is poor glucose management and early onset of diabetes complications, such as heart disease, stroke, and blindness. Our research group is exploring the feasibility of measuring blood glucose levels without the need to collect a sample of blood. The idea is to pass a harmless beam of light through a fold of skin and then determine the concentration of glucose from an analysis of the collected light. Clearly, successful development of this noninvasive sensing technology will greatly benefit the 17 million Americans with diabetes. This poster will explain the concept of noninvasive glucose measurements and examine the impact of skin color on noninvasive spectra collected from human volunteers.



## 41. Risk Attitudes in Two Big Ten Student Populations

**Bethany Patten, Coralville, IA**  
**Majors: International Studies & Economics**  
**Mentor: Dr. Gabriele Camera**  
**University of Iowa**

This research involves analysis of survey data taken from a questionnaire given to undergraduate students at Purdue University and the University of Iowa during the fall of 2008. The questionnaire was filled out by the students after they participated in an experiment involving team building, game theory, and risk aversion. It is designed to elicit information on student attitudes toward risk. With the data from such surveys, it is possible to sort different levels of risk aversion based on demographics such as gender, school, and major. Results could provide insight into whether males or females take more risks or if students studying a specific major are willing to take more risks than other students. Also, these results could lead to better knowledge of how different people invest their money, why they choose to invest a certain amount, and perhaps which types of people know best how to invest their money in a way that will earn them more money.



## 42. Upper-air Flow Pattern of Floods in the Central Plains

**Matthew Perry, Chillicothe, MO**  
**Major: Meteorology**  
**Mentor: Ross Hays, Jr. (not pictured)**  
**Iowa State University**

The following will discuss two major floods that have occurred in the Midwest in recent years. The upper-air flow pattern with the flood of 1993 is significant as to the cause of the floods. Many separate and yet different atmospheric events came together to allow a setup that had not been seen before this specific flooding event that occurred in 1993. Individually these separate events would never have caused such a strong and dangerous event to take place. The flood of 2008 that occurred in the same region of the United States was very similar to the flood of 1993 with a few differences including the onset time and pre-flood environment. Also the overall placement of the heaviest areas of rainfall and the development of crops from the planting stage to the maturing stage. Overall, the separate events share many similarities.



### **43. Assessing Effects of Fire and Grazing on Prairie Insect Biodiversity**

**Michael Rausch, Ionia, IA**  
**Major: Biology**  
**Mentor: Dr. Diane Debinski**  
**Iowa State University**

Much debate has ensued over managing prairies for biodiversity, particularly with respect to insect communities. Fire and grazing are coupled processes that historically defined prairie ecosystems. However, re-establishing these coupled disturbances can be restricted by land use legacies imposed by cultivation and other disturbance regimes. Burning is important for control of woody and exotic plant invasion, but it can also cause insect mortality. Grazing can enhance structural heterogeneity of vegetation, but high grazing intensity leaves insufficient herbaceous vegetation to carry fire or to provide habitat for invertebrates. We established an experiment to 1) test the differential effects of homogeneity management (burning every 3 years/no grazing vs. burning every 3 years/ moderate grazing), and heterogeneity management (patch-burn grazing—burning spatially distinct patches with free access by moderately stocked cattle) on insects and 2) examine how these responses are mediated by prior land use.



### **44. Kinematic Comparison of Two Base Stealing Strategies in Division I Baseball Players**

**Jacob Reed, Muscatine, IA**  
**Major: Physical Education**  
**Bradley Brons, Lake Park, IA (not pictured)**  
**Major: Movement & Exercise Science**  
**Mentor: Dr. Robin Lund**  
**University of Northern Iowa**

The baseball steal is an important factor in that upon successful completion it allows the runner to advance toward home plate without giving up an out. Coaches teach two styles of steps to initiate the steal, the jab step and the cross over step. It is the purpose of this study is to compare the stride length, stride frequency, hip displacement, velocity, and total time between the jab step and the cross over step. Collegiate Division I baseball players that have experience with these steps participated in this study. All testing was done in one session with the players performing each step three times while being recorded with a high speed camera.



## 45. The Effect of Elevated Homocysteine on the Expression of Cadherins 6B, 7, and 11 in Migrating Neural Crest Cells of Chick Embryos

**Chelsea Reinhard, Gladbrook, IA**  
**Major: Biology: Biomedical**  
**Mentor: Dr. Darrell Wiens**  
**University of Northern Iowa**

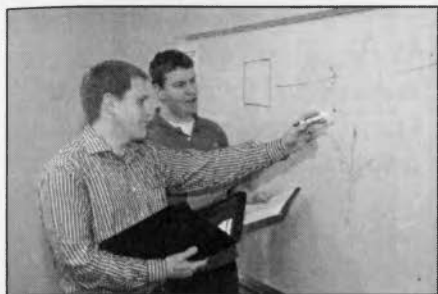
Following neurulation in the chick embryo, the pleuripotent neural crest cell (NCC) population migrates from the neural tube to form a variety of tissues, including craniofacial cartilage, melanocytes, and the adrenal medullae. Type 2 cadherins, calcium-dependent mesenchymal cell adhesion molecules, are upregulated in NCCs during their epithelial-to-mesenchymal transition (EMT), just prior to migration. Among teratogenic substances known to cause congenital malformations, homocysteine (Hcys) is a natural blood amino acid found to disrupt EMT. The purpose of this project is to study the effect of elevated levels of Hcys on the expression of cadherins 6B, 7, and 11, which are all type 2 cadherins, in migrating NCCs and their adhesions. The results of preliminary research show no significant difference in expression of cad-11 and adhesions among NCCs from the different regions, nor between control and Hcys treated. The effect of Hcys on cadherins 6B and 7 is currently being studied.



## 46. Antimicrobial Effects of Common Flavonoids and Plant Extracts

**Erinn Rieser, Stillwater, MN**  
**Major: Nutritional Science**  
**Mentor: Dr. Suzanne Hendrich**  
**Iowa State University**

Flavonoids such as Quercetin, Daidzein, Naringenin, and Rutin are derived from common plant extracts and have been linked with anti-inflammatory responses in human studies. They may exhibit antimicrobial effects on aerobic and anaerobic microbes, namely those associated with periodontal disease. These responses are likely due to the phenolic dissociation of the compounds, which affects cellular membrane proteins and is present in all flavonoids in question. Dose-response assays were performed with these compounds as well as their parent plant extracts, and were shown to limit microbial growth. The microbial assays performed included treatment of aerobic bacteria *E. coli*, *S. aureus*, *S. marcescens*, and *P. aeruginosa* with the pure compounds as well as their respective plant extracts. These antimicrobial results may contribute to increased effectiveness of disease management, and will contribute to current research on oral microbial inhibition by way of flavonoids. These tests could therefore help to lower periodontal disease occurrence.



## **47. Developing Sustainable Seed Supply Chains in Africa: A Sensitivity Analysis of Factor Conditions**

**Joel Rindfleisch, Cedar Rapids, IA**  
**Major: Management Information Systems**

**Mentor: Dr. Bobby Martens**  
**Iowa State University**

In Mozambique and many African countries, improved seed quality has the potential to make an enormous contribution to increased crop productivity and market opportunities. Still, improved crop genetics are not widely available to small African farmers, partly because seed supply chains remain undeveloped. This research identifies conditions necessary for sustainable seed chains in Mozambique. Relevant variables (market penetration and demand, spoilage and theft, and marketing, production, transportation, and conditioning costs) were identified and sensitivity analysis was used to evaluate key variables. The results suggest that viable market driven seed chains can exist only where infrastructure and demand thresholds are met. African seed entrepreneurs can benefit from this research when identifying where to locate their businesses. Policy makers, NGOs, and those working to disseminate improved crop genetics can consult this research to help identify locations where seed projects are most likely to succeed.



## **48. Analysis of the Pesticide Chlordane in Cedar Rapids Sediments Following the 2008 Flood**

**Zachary Rodenburg, Council Bluffs, IA**  
**Major: Chemical Engineering**  
**Mentor: Dr. Keri Hornbuckle**

**University of Iowa**

Do you ever wonder what happens to man-made chemicals that break down very slowly in the environment? Or whether such chemicals might end up in your lawn or nearby lakes after a catastrophic event like the flood in Cedar Rapids last summer? The purpose of this study is to find the answer to such questions. Specifically, the study focuses on the formerly used termite pesticide, chlordane, which is composed of several persistent organic pollutants (POPs) and was banned in the late 1980s due to its potential for human harm. We hypothesize that these compounds were mobilized by flood water and that their residues remained in the soils and sediments of the residential areas of downtown Cedar Rapids. To test our hypothesis, soil samples were collected from roughly 200 residential locations in the city and analyzed for three representative chemicals that composed the industrially-produced pesticide. Samples were extracted from soils using an accelerated solvent extraction system, and analyzed using gas chromatography mass spectrometry (GC/MS). This poster compares the results of the study, including a comparison of data collected both from within and outside the flood zone.





## **49. Temperature and Water-level Evidence for Flood Water Entering the Ames Aquifer**

**Rachel Scheurer, LaFayette, MN**  
**Major: Environmental Engineering**  
**Mentor: Dr. William Simpkins**  
**Iowa State University**

Seven monitoring wells were installed in August 2008 to investigate the interaction of the South Skunk River and the sand and gravel aquifer at River Valley Park in Ames. Integrated pressure transducer/dataloggers were installed near the bottom of each well to record hydraulic head and temperature variations. Data show that this section of the Skunk River is a losing reach to groundwater. Temperature, isotope, and nitrate concentration data suggest that river water penetrates only the upper part of the aquifer. Temperatures of 16 to 20 degrees C down to 42 ft may represent the May 2008 flood event. Data from wells at 69 and 97 ft suggest that groundwater there is not in hydraulic communication with the river. Data from this study will be used to help calibrate a 3-D groundwater model of the Ames aquifer.



## **50. Correlation Between Updraft Strength and Tornado Intensity Using Gibson Ridge Level 2 Analyst Edition Software**

**Justin Schultz, Ollie, IA**  
**Major: Meteorology**  
**Mentor: Dr. Mike Chen & Karl Jungbluth (not pictured)**  
**Iowa State University**

The updraft is the most important determinant of the strength of the severe thunderstorm, and determining its strength is vital to estimate the strength of the storm itself. For this study, Gibson Ridge Level 2 Analyst Edition radar software was used to imply the strength of the updraft in 150 cases of severe weather and tornado activity. Using Gibson Ridge, several parameters were observed, such as 50 dBZ Height, Echo Top Height, Vertically Integrated Liquid, and Vertically Integrated Liquid Density. These parameters were then observed for the six different categories of tornado strength, by the Fujita Scale and were observed to see how much they varied with different tornado intensities to imply the strength of the updraft.



## **51. Our Aliens: How Does a Criminal Become Human?**

**Leah Short, Des Moines, IA**  
**Majors: Spanish & The Study of Religion**  
**Mentor: Dr. Susan Hill**  
**University of Northern Iowa**

My research focuses on the language we use to discuss immigration in this country. I am interested in the ways in which words like "illegal aliens" dehumanizes immigrants. In addition, I explore the ways in which religious groups, particularly Catholics, are using biblical ideas to counter anti-immigration policies. Using Postville, IA as an example of the debates about language and religion, I want to show how real people talk about immigrants and the effects this dialogue has on how we think about and treat immigrants. I suggest that we are taking for granted that language shapes our world, our worldviews. A simple example that portrays the power of language in our lives is how we talk about our food. Instead of eating cow, we say that we eat beef. Language shapes how we think which then determines how we behave. This country was founded on principles of equality and liberty. I suggest this means we give qualified foreigners an equal chance at life, given the real economic need we have for them in our country.



## **52. Patterns in the Diffusion of Policies Across the American States in the 20th Century**

**Paul Skinner, Iowa City/Dubuque, IA**  
**Major: Political Science**  
**Mentor: Dr. Frederick K. Boehmke (not pictured)**  
**University of Iowa**

I am working on research dealing with policy diffusion among the American states. As former Supreme Court Justice Louis Brandeis said, the states serve as the laboratories of democracy by experimenting and innovating new policy programs. If these innovations prove effective, then other states will likely emulate these programs. We are examining over 125 policies that have been adopted by the various states during the past 150 years in an effort to determine which states are likeliest to adopt a specific program first and which are likeliest to follow the trend. This research has implications for the policy process in Iowa. Where do legislators look when their state is one of many that suffers from a national problem? State legislatures do not exist in a vacuum; rather, they see solutions to societal problems that get implemented in other states and learn from them. If we know where Iowa ranks in the patterns of policy adoptions, then not only can we get a clearer understanding about how the dynamics of federalism work, but we will be able to predict what policy trends will affect our citizens.



### **53. Fragrance Compounds as Tracers of Sewage Sludge in Cedar Rapids Flood Waters**

**Jess Smith, Iowa City, IA**  
**Majors: Environmental Engineering & Studio Art**  
**Mentor: Dr. Keri Hornbuckle**  
**University of Iowa**

Synthetic musk fragrances are common additives in consumer products such as shampoo, hand soap and laundry detergents. These persistent compounds stay in the environment long after being emptied down the drain. Traces can be detected in nearly all environmental compartments including water, air, sediment, aquatic organisms, and humans. Their pathway into the environment is due almost exclusively to wastewater discharge. After being first detected in 1981, musk concentration levels have only continued to escalate as they tend to bioaccumulate where they are deposited. It is hypothesized that one of the origins of sediment deposited in Cedar Rapids during the flood of 2009 was from wastewater. To determine this, core samples collected around the city. The results will help identify the quality of water that inundated Cedar Rapids, and map the event based on concentration and dispersion of these compounds. Amalgamating these results with other sediment and PCB research will help us determine the potential for pollutant dispersion in the flood that occurred this past summer.



### **54. The Relationship between Employment and Alcohol Consumption among College Students**

**Justin Sprung, Osage, IA**  
**Major: Psychology**  
**Mentor: Dr. Adam Butler**  
**University of Northern Iowa**

This study examines the relationship between employment and alcohol consumption among college students in order to determine whether one variable influences the other. A survey was utilized to investigate this relationship. A total of 687 students from the University of Northern Iowa, 226 males and 461 females, participated in the study. The results indicated no significant relationship between student employment and alcohol consumption. However, it was found that alcohol consumption was significantly correlated to residency and gender. The findings of this study suggest that factors other than employment may play a more important role in determining the level of alcohol consumption among college students.



## **55. Exploration of Superparamagnetic Nanocomposites for Wide Frequency, High Temperature Applications**

**Daniel Stoecklein, Lakeville, MN**

**Major: Physics**

**Mentor: Dr. Ruslan Prozorov**

**Iowa State University**

We obtain superparamagnetic nanocomposites using powerful ultrasound techniques, and can control magnetic properties of the end product. Nanocomposites have many applications in modern technologies. Examples include power generation, engines, radar and microwave applications, military and space technologies, and a plethora of communication devices. Nanocomposites have many advantages over most bulk materials currently in use, such as the absence of electromagnetic losses due to domain wall motion, eddy currents, and negligible coercivity. Our synthesis techniques replace complicated multistage processes typically seen with nanocomposites by utilizing heterogeneous sonochemistry. The process is scalable, and can be implemented in industrial production. Magnetic moment measurements via a SQUID magnetometer provide the first indication of sample quality, while radio-frequency susceptibility measurements test the samples under conditions similar to those found in potential applications. Continued research with these materials will greatly extend their suitability for applications, and possibly lead to new fast and efficient technologies.



## **56. The Hand that Wounds, the Hand that Heals: Science and Mysticism in Stevenson, Stoker, and Wells**

**Zachary Umsted, West Bend, IA**

**Major: English**

**Mentor: Dr. Samuel Gladden**

**University of Northern Iowa**

Britain at the end of the nineteenth century was a time of change and fear of the unknown, accented by the population's growing disillusionment with science as a cure all as well as a return to mysticism and the occult in an attempt to answer the questions science was unable to answer satisfactorily. I will show that this fear infiltrated literature in the form of a theme where science acts as a force of divergence and mysticism acts as an agent of convergence through an examination of Robert Louis Stevenson's *Strange Case of Dr. Jekyll and Mr. Hyde*, Bram Stoker's *Dracula*, and H.G. Wells's *Island of Doctor Moreau*.



## **57. Are Medical Students Learning what Faculty Members are Trying to Teach?**

**Rajiv Verma, Mason City, IA**  
**Major: Integrative Physiology**  
**Mentor: Dr. Susan Hagen**  
**University of Iowa**

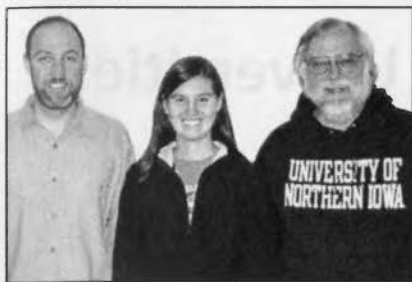
Lectures are common in higher medical education, although faculty are rarely trained in this skill. The purpose of our study was to determine whether the key points retained by third-year medical students in the surgery clerkship at the University of Iowa Hospitals and Clinics correspond to faculty goals and lecture ratings. Faculty submitted 3-6 objectives they wanted students to learn. Immediately following the lecture, students were asked to complete lecture evaluations and list 3-6 concepts they learned. The statements given by the students were analyzed for their specificity and grouped into twelve categories, such as "treatment" and "symptoms." Most statements possessed high specificity in relation to the lecture topic. Faculty objectives that were clear, concise, and clinically relevant emerged strongest in student statements. Current progress is being made on a sequel project examining delayed recall. Preliminary results indicate lecture ratings and specificity of student statements are lower in comparison to immediate recall. It will be interesting to see if this trend continues and, if so, what factors lead to increased or stable retention of information over time.



## **58. U.S.-Funded HIV/AIDS Prevention Programs in Kampala, Uganda: The Gap Between the Theoretical and the Practical**

**Annah Vollstedt, Sioux City, IA**  
**Major: Communication Studies**  
**Mentor: Dr. John D. Peters**  
**University of Iowa**

My research examines the gap between the theoretical policies made in Washington, D.C. and the practical needs of HIV/AIDS prevention programs in Kampala, Uganda, focusing on the United States' funding initiative PEPFAR (President's Emergency Plan for AIDS Relief). My research comes at a vital time, while the numbers of new HIV infections in Uganda have been slowly increasing, despite the nations past initial success. The economic advantages for the U.S. and the conservative moralistic ideology that are disguised as policies embedded into U.S. funding guidelines do not take into consideration the cultural needs of the prevention programs where the policies are implemented. By observing and participating in U.S.-funded programs, interviewing key informants in Kampala who are associated with these programs, collecting HIV/AIDS prevention materials found in Uganda, as well as gaining a U.S. Senator's perspective on the matter, my research critically analyzes the process of policy-making in top-down initiatives and compares it to the much more effective and culturally-sensitive approach of grassroots organizations.



## **59. Comparison of Larval Distribution, Geographic Range, and Genetic Variation of the Red-Jointed Fiddler Crab**

**Alexa Warwick , Ames, IA**

**Majors: Biology & Modern Languages:  
Portuguese & Spanish**

**Mentors: Dr. Peter Berezden &  
Dr. Carl Thurman**

**University of Northern Iowa**

The red-jointed fiddler crab, *Uca minax*, has a disjunct distribution along the Atlantic and Gulf coasts in North America. Previous studies have not found any significant discrepancies in morphology, physiology, or allozymes between the two groups of *U. minax*. The primary objective of this study was to use DNA sequence data to test whether genetic variation is consistent with patterns of morphological, physiological, and allozyme variation of the disjunct populations. Phylogenetic analyses of the haplotypes revealed no genetic differentiation among the Gulf and Atlantic groups, which is consistent with previous studies. Both genes also showed little variation among individuals. Further analyses will be used to estimate the timing of the split of the two groups, as well as to evaluate the influence of historical climatic and geographic factors on the species' range and genetic variation.



## **60. Barriers to Reintegration: An Audit Study of the Impact of Race and Offender Status on Employment Opportunities for Women.**

**Sarah Wittig Galgano, West Branch, IA**

**Majors: Sociology & Psychology  
Mentor: Dr. Mary Campbell**

**University of Iowa**

Recent research in the field of sociology has focused on the impact that a criminal record has for African American and white men, and such research has illustrated that the presence of a criminal history may create additional obstacles for a population most needing gainful employment (Pager, 2003, Uggen, 2000). However, little research has examined the affect of a criminal record on female employment. My study tested employer responses for African American and white women (both with and without a criminal history) to discern whether a criminal history acts as the same negative credential for women as it does for men. Contrary to previous findings which have found that the presence of a criminal record can severely impede job attainment for males, the data from this study indicate that a criminal history has little effect on whether potential employers respond to applications from African American and white females.

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## Special Thanks

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