



Iowa Regent Universities present
the 6th Annual

Research in the Capitol

"Research for a Healthy Iowa"

Tuesday, March 22, 2011

11:30am — 1:30pm

Iowa State House, Rotunda

Iowa Regents Universities Contacts

Robert Kirby

Director

Iowa Center for Research by Undergraduates
Associate Director
University of Iowa Honors Program
The University of Iowa
443 Blank Honors Center
Iowa City, Iowa 52242-0454
Phone: 319.335.1684
robert-kirby@uiowa.edu

Jessica Moon

Director

University Honors Program
University of Northern Iowa
2401 College St.
Cedar Falls, Iowa 50614-0355
Phone: 319.273.3175
jessica.moon@uni.edu

Dana Schumacher

Assistant Director

Undergraduate Research and Scholarship
University Honors Program
Iowa State University
2130 Jischke Honors Building
Ames, Iowa 50011-1150
Phone 515.294.0172
dschumac@iastate.edu

Special Thanks

Joe Murphy
Katherine L. Wildman
Brenda Hackenmiller
Katharine Monger
Courtney Anderson
Laurie Fiegel
Jenny Haynes



Welcome

Welcome to the sixth annual Research in the Capitol. 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 are more successful academically, are more developed in their career and professional preparation, and are more satisfied with their college experience. Research engagement provides the conditions for collaborative learning and critical thinking that benefit our students as they move into the workforce or on to graduate or professional training. The presentations before you today 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 these outstanding students, you will learn first hand the impact research involvement has on Iowa's students and the impact those students have on the research conducted at our outstanding Iowa Public Universities.

Robert Kirby
Director

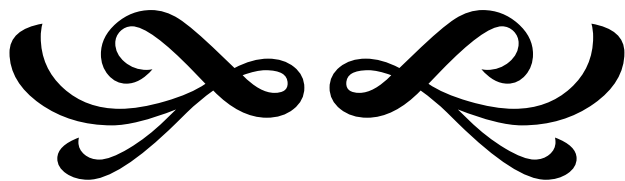
Schedule

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

- 11:35am Terry Branstad
Governor, State of Iowa

Lindsey Knake, Bellevue, IA
Senior, University of Iowa

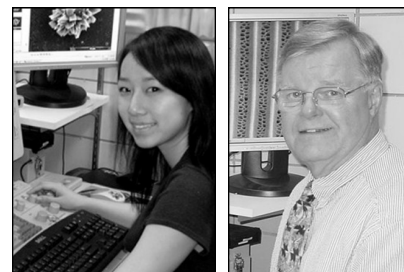
- 11:45am-1:30pm Student Poster Presentations



59. Racism and Antisemitism in America: A Continuing Problem

Amy Windmill, Whittemore, IA
Major: English
Mentor: Lara Trubowitz
The University of Iowa

In the early 1960s, just as the civil rights movement was gaining momentum, another kind of ideology was attracting notice, but for entirely different reasons. The American Nazi Party, headed by the virulently antisemitic and racist George Lincoln Rockwell, staged protests in Nazi regalia and published propaganda espousing hatred for virtually all non-white, non-Christian people. Professor Lara Trubowitz' work on the rhetoric of racism and antisemitism traces these fringe movements and their complicated trajectories. Although Rockwell's pseudo-Nazi discourse might seem a thing of the past in the twenty-first century, my research under the guidance of Professor Trubowitz shows how the hate movements of the past are alive and well today, if wearing slightly different clothes. Here in Iowa, a state with a long history of groundbreaking civil rights progressivism, recognizing the insidiousness of racist and antisemitic hate speech is essential in upholding our traditional values - equality, justice, and freedom.

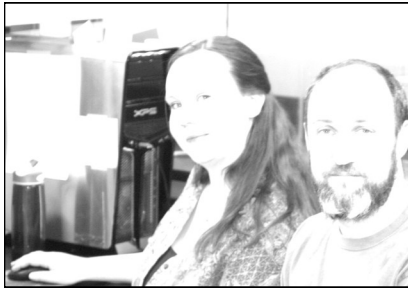


60. Variations in Druse Macropatterns of Two Variegated Peperomia Species

Hana Yoon, Ames, IA
Major: Biology
Mentor: Harry "Jack" Horner
Iowa State University

In my research, I studied the macropatterns of calcium oxalate crystals in plant leaves. These crystals are found in about 75% of all flowering plants and have a variety of functions that depend on the plant, organ, and tissue in which they develop. We focused on a particular type of calcium oxalate crystal called druses. Druses adopt a more spherical shape and are mainly found in the palisade parenchyma, the photosynthetic layer, of leaves. There have been several reports hypothesizing that the light gathering/reflecting properties of druses may enhance photosynthesis in subdued light conditions. In order to test this hypothesis, we studied several peperomia plants species and compared the yellow (non-photosynthetic) and green (photosynthetic) regions of the leaves for differences in the druse size, density, and distribution using various microimaging techniques.

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Anna Wieman, Waterloo, IA
Major: Biology
Mentor: Peter Berendzen
University of Northern Iowa

The population genetic structure of the fiddler crab, *Uca maracoani*, was assessed along the coast of Brazil utilizing sequence data from the mitochondrial cytochrome oxidase subunit 1 (CO1) gene. We hypothesized that the oceanic current bifurcation at the point that separates the northern and southern coasts of Brazil may act as a barrier to gene flow in this species. While within the respective groups, panmixia, or random mating, would be maintained. Our results indicate that the southern group exhibits panmixia and lacks a discernable genetic population structure. This is consistent with an absence of barriers to gene flow. Preliminary analyses incorporating individuals from the northern coast indicate high levels of gene flow between the northern and southern groups, suggesting that the oceanic current bifurcation does not act as a barrier to gene flow between these two groups.



58. Spatial Temporal Analysis of Crop Health in Iowa

Andrew Wille, Monona, IA
Majors: Geography GIS:
Environmental Science, Policy
Mentor: Ramanathan Sugumaran
University of Northern Iowa

Agriculture represents a vast segment of the U.S. national economy and serves the vitally important role of providing a safe and reliable food supply for people and livestock around the world. Timely and reliable crop condition monitoring during the growing season and cumulative seasonal crop yield prediction is important because it provides fundamental information needed to inform wise agricultural management practices. The objective of this research is to use field level data to study spatial temporal variability of different crop's yield as well as to apply spatial temporal methods to analyze variability within a field. Further, it will use ancillary data such as Light Detection and Ranging (LiDAR), precipitation, and temperature to better understand the variability within these fields. This presentation will show some of the results from this analysis.

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55. Identifying Patterns of Alcohol Violations from Police Reports on a Midwestern Campus

Emily Wesely, Toledo, IA
Majors: Psychology, Criminology, Spanish
Mentor: Richard Featherstone
University of Northern Iowa

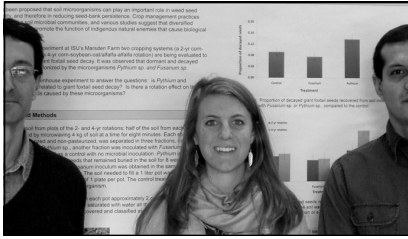
This study analyzes alcohol violations on the University of Northern Iowa's campus from 2005 to 2010 using the UNI Public Safety daily crime log posted on UNI's Public Safety webpage. The data are analyzed across the years of 2005 through 2010 in order to determine whether alcohol violations have been increasing or decreasing at UNI and to explain actual patterns of alcohol violations that are based on time (year, month, day of the week, time of year within academic calendar), location (residence halls, parking lots, on campus and the surrounding area), and offender characteristics (gender, repeat offending and co-offending). This research also identifies concentrated locations of alcohol violations on UNI's campus. The findings provide possible implications for controlling or preventing alcohol violations on campus in the future.



56. Personality and Drug Use on College Campuses: An Examination of Marijuana and Methylphenidate

Jenna Wessels, Waterloo, IA
Major: Psychology
Mentor: Elizabeth Lefler
University of Northern Iowa

Little research has been conducted to study the effects of personality and illicit substance use on college campuses. The purpose of this research is to examine how personality relates to substance use of marijuana and methylphenidate among college students. Seventy students, ages 18-24, from the University of Northern Iowa will participate in this study. It is predicted that the NEO-Five Factor Model of personality traits for marijuana will be similar to empirical findings relating to alcohol use. In contrast, methylphenidate users are predicted to be more conscientious and school orientated. Exploratory predictions hypothesize that marijuana use will be more common among college students on campus, but methylphenidate will be easier to find by the majority of students. This study also hopes to investigate whether perceived normalcy of marijuana or methylphenidate will result in increased use.



53. Soil microorganisms effect on giant foxtail seed decay

Madeline Tomka, Des Moines, IA
Major: Agronomy
Mentor: Matt Liebman & Robin Gómez
Iowa State University

Crop management practices can affect the soil microbial communities, and various studies suggest that diversified cropping systems promote soil health and beneficial ecological interactions. It has also been proposed that soil microorganisms can play an important role in weed seed mortality. In an ongoing field experiment at ISU's Marsden Farm, two cropping systems (a 2-yr corn-soybean rotation and a diversified 4-yr corn-soybean-oat/alfalfa-alfalfa rotation) are being evaluated to test their effects on giant foxtail seed mortality. It was observed that dormant and decayed seeds were mainly colonized by the microorganisms *Pythium* spp. and *Fusarium* spp. We carried out a greenhouse experiment to test the effect of these soil microorganisms on giant foxtail seed mortality in soil from each of the two crop rotations. We determined higher giant foxtail seed mortality when the soil was inoculated with *Pythium* spp., but the rotation effect was not significant.



54. Design/Build: Applied Design as an Ecological Research Methodology

Rebecca Warren, Belvidere, IL
Major: Interior Design
Bethany Luhrs, Knoxville, IA
Major: Interior Design
Mentor: Fred Malven
Iowa State University

This project involved the redesign of an existing ISU graduate studio space based on principles of sustainable design. The hypothesis of this design/build project was that effective design solutions could be reached by a near-complete reliance on surplus materials available in the College of Design. Inspired by LEED (Leadership in Energy and Environmental Design) principles, the concept of "Upcycling" was implemented into the design to create an ecologically responsible design without sacrificing functionality and aesthetic appeal. Students tested this hypothesis by developing innovative reuse design concepts using available inventory and applying these into the interior setting to successfully satisfy user needs and project goals. As noteworthy education theorist Ernest Boyer stated, "New intellectual understanding can arise out of very act of application whether in medical diagnosis, ...creating an architectural design, or working with the public schools." This project provides another contribution to the body of experience translating theory into practice.

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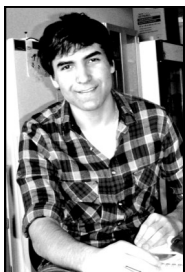
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1. Neurofibromatosis II Protein – Merlin – Inhibiting Glial Tumorigenesis

Nicolas Aguilar, Solon, IA
Major: Integrative Physiology
Mentor: Marlan Hansen
The University of Iowa

NF2 (Neurofibromatosis Type II) is a genetic disorder that gives rise to tumors in the brain and spine. These tumors are a result of an inactive tumor suppressor protein called Merlin. While Merlin's suppression of tumor growth has been well correlated in previous publications, its specific functioning in the body is still poorly understood. The focus of my research is to shed light on the mechanism of the tumor suppressor Merlin by biologically engineering a fluorescent variant of Merlin. This new version of the protein can then be reintroduced into nerve tissue and Merlin's cellular interactions can be directly monitored by fluorescent microscopy.



2. Equivalent Representations of Standard Young Tableaux

Genevieve Becicka, Cedar Falls, IA
Major: Mathematics
Mentor: TJ Hitchman
University of Northern Iowa

Standard Young Tableaux are diagrams used to study symmetric and general linear groups. I investigate an observed possible relation between groups of standard Young tableaux. This has led me to explore various equivalent representations of the tableaux, including the triangulation of polygons and matched parentheses. The most contributive representation in understanding the observed relation between the tableaux has been multidimensional lattice paths.



51. Analysis of available diagnostic tests for optimized detection of Visceral Leishmania infantum infection in canines

Raeann Shimak, Mason City, IA
Majors: Biochemistry, Genetics
Mentor: Christine Petersen
Iowa State University

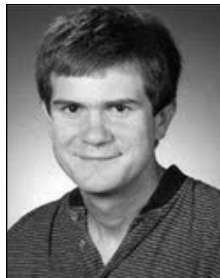
The Leishmania infantum parasite is the causative agent of canine Leishmaniasis. In endemic areas, sand flies are the vector for transmission. Canines are the primary domestic reservoir for human disease. Anecdotal evidence has shown that direct dog-to-dog contact and vertical transmission can also spread Leishmaniasis. This investigation compared four diagnostic tests to determine whether an individual dog had been infected with Leishmaniasis; three tests ascertained the presence of antibodies against the parasite, while the fourth quantified parasitic DNA in whole blood. Foxhounds from hunts across the United States were chosen as controls and test samples. While quantitative Polymerase Chain Reaction has shown the most sensitivity of the tests compared, it requires the most time to obtain results. The DPP Canine Leishmania Rapid Assay shows accuracy and promise as a field test, which would be beneficial in kennel situations by allowing instant feedback to owners on the state of their dogs.



52. In vivo expression and analysis of a novel protein, NIAM, in Drosophila melanogaster

Katie Thies, Shelby, IA
Majors: Biology, Religious Studies
Mentor: Dawn Quelle
The University of Iowa

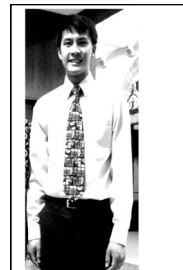
The Arf-Mdm2-p53 is a critical tumor suppressor pathway that is lost in many cancers. A novel protein known as NIAM (Nuclear Interactor of Arf and Mdm2) has functions both dependent and independent of the Arf-Mdm2-p53 pathway. NIAM functions to inhibit chromosomal instability and cell proliferation, both common characteristics of cancers, perhaps indicating a role as a novel tumor suppressor. NIAM contains FYRN/FYRC domains found in many chromatin-associated proteins. The corresponding protein found in *Drosophila*, dNIAM, also retains FYRN/FYRC domains, which we predict associate with chromatin similarly to the mammalian form. Objectives were to investigate whether NIAM is a chromatin associated protein in flies and determine the biological role of dNIAM in *Drosophila melanogaster*. When expressed in flies, dNIAM localized to chromosomes at decondensed regions, consistent with a role in chromatin regulation. Understanding the functions and mechanisms involving the protein, NIAM, may provide future avenues for cancer research and treatment.



49. Structure and Function of Rice Class 3 Hemoglobin

Cynthia Salas, Ventura, CA
Major: Biochemistry
Mentor: Mark Hargrove
Iowa State University

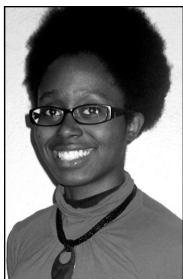
Scientists established that hemoglobin plays a critical role in plants, and it exists in three different forms. This hemoglobin was first discovered in root nodules of plants capable of microbial symbioses, which provide oxygen to Rhizobium that is responsible for nitrogen fixation. Leghemoglobins are the most common example used when describing this type of hemoglobin. Nonsymbiotic hemoglobin is generally "hexacoordinate". Much research needs to be conducted when it comes to truncated plant hemoglobin to better understand why it is so different from nonsymbiotic hemoglobin.



3. New sodium-ion conducting solid electrolytes for sodium batteries

Seth Berbano, Ames, IA
Major: Materials Engineering
Mentor: Steve W. Martin
Iowa State University

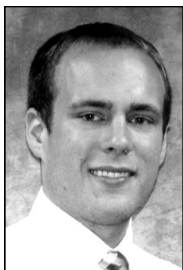
Advancements in renewable energy are crucial to our nation's energy independence and security. The State of Iowa is the second largest producer of wind energy in the United States. Due to the intermittent process of harnessing energy and managing energy usage, researching load-leveling battery systems is a priority. Lithium batteries have proven successful for mobile technologies. However, limitations of lithium supply and costs motivate the development of alternative battery chemistries. Sodium batteries are an attractive alternative to lithium batteries for large scale energy storage. Three issues with sodium cells must be addressed: (1) safety, (2) performance, and (3) lower-cost manufacturing. At Iowa State University, research is being conducted on sodium-ion conducting solid electrolytes using the novel processing technique of mechanical milling. By synthesizing high-purity solid electrolytes through mechanical milling and melt-quenching and comparing these electrolytes, we conclude that full chemical reaction can occur at room temperature for milled electrolytes.



50. The Effects of Afrocentrism, Racial Socialization and Discrimination on Psychological Distress among African American College Students

Mechelle Salley, San Bernardino, CA
Major: Psychology
Mentor: Meifen Wei
Iowa State University

The purpose of this study is to identify the protective factor (e.g., Afrocentrism and racial socialization) in buffering the negative impact of discrimination on psychological distress African American college students at predominately White institutions (PWIs) in the Midwest. It is hypothesized (1) high Afrocentrism will decrease the negative impact of discrimination on psychological distress, and low Afrocentrism will increase the negative impact; and (2) high racial socialization will decrease the negative impact of discrimination on psychological distress, and low racial socialization will increase the negative impact of discrimination on psychological distress. For exploratory purposes, moderation will be examined whether there is a difference between African American male and female students. African American college students will be administered several stress scales and inventories. A regression analysis will be used for examining the hypotheses.



4. Rational Decision-Making in the Face of Uncertainty: An Experiment in Jeopardy!

Trevor Boeckmann, Vinton, IA
Major: Economics: General Economics
Mentor: David Surdam
University of Northern Iowa

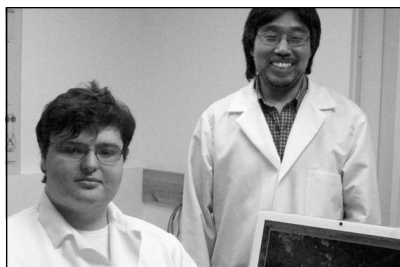
My project examines the quiz show "Jeopardy!". In the game, players accumulate points then wager them in a final round on a single question. My study finds an optimal wagering system for these players, based on empirical evidence, then calculates the benefit of using this system through additional games that would be won with the correct bet. My regression model then finds the determinants of optimal betters. The results show players tend to act too aggressively. Half of non-first place players wager incorrectly and nearly 90% of those non-optimal wagers are too large. The regression shows players are most likely to act optimally when the correct wager is predictable, simple, and large.



5. Harnessing Advanced Computing for Assessment of Trends in Iowa's Vegetation Cover

Stephen Bonett, Ames, IA
Majors: Mathematics, Statistics, Pre-Medicine
Mentor: Kate Cowles
The University of Iowa

We are all familiar with the graphics cards that control the monitor displays on our desktops and laptops. Since 2006, methods have been developed to use these devices for scientific computing. Even moderately priced graphical processing units (GPUs) are capable of executing dozens or even hundreds of calculations simultaneously, thus cutting computer run times by orders of magnitude. We have developed software that uses GPUs' capabilities to model data that is measured in space and time. We apply our software to the analysis of satellite images in order to assess changes in Iowa's vegetative patterns between the years 1981 and 2006.



6. Characterization of a novel model to study human Retinoblastoma

Pavel Brodskiy, Clive, IA
Majors: Chemical Engineering, Biology
Mentor: Donald S. Sakaguchi
Iowa State University

Retinoblastoma is a developing cancer in the retina, the part of the eye that detects light. The use of animal models to study human cancers is essential for developing novel experimental therapies. Recently, we have identified a zebrafish eye tumor model that appears to be similar to human retinoblastoma where retinal tumors develop in mature animals. The purpose of this study was to characterize the progression of the retinal tumors that develop in these zebrafish in order to identify mechanisms involved in cancer progression. Eye tissues were sectioned and immunostained using cell-type specific markers to characterize these tumors. When compared to normal eyes, eyes with retinal tumors displayed over-proliferation of cell layers and disorganized synaptic layers. Moreover, rosettes containing primitive photoreceptor-like cells arranged around a central lumen were also observed, a characteristic of human retinoblastoma. These results support the use of the zebrafish as a new model for studying retinoblastoma.



47. Choreographed Culture: Mexican Folk Forms in American Modern Dance, 1935-1955.

Jennifer Pray, Johnston, IA
Majors: International Studies, Dance
Mentor: Rebekah Kowal
The University of Iowa

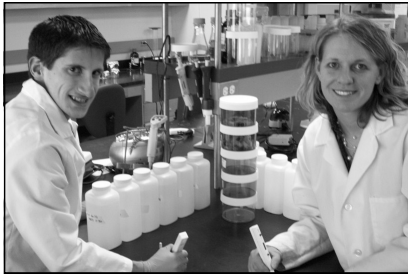
American modern dancers have turned to Mexican folk themes to inspire and inform their choreography since the turn of the century. Works have been performed for a broad range of audiences in venues including museums, schools, large theaters, and international stages. My research examines the correlations and differences between the interpretations of Mexican folk forms by American modern dancers. How were Mexican-Americans portrayed in American modern dance? How did this portrayal change over time? Who was interpreting these cultural subjects? By framing dance as a cultural "import" and "export" item, I place the research in the broader context of U.S./Mexico relations from 1935-1955.



48. Synthesis, Characterization, and Reactivity of a Novel Dicyclopentadienyl Ligand

Regina Reinig, Portsmouth, IA
Majors: Chemistry, Biology: Biomedical
Mentor: Martin Chin
University of Northern Iowa

Saturated hydrocarbons are abundant and readily available from petroleum feedstock. However, the usefulness of these molecules is limited due to the inert nature of the C-H bond. C-H bond activation and functionalization, using transition metal catalysts, is one way to introduce functional groups into this class of molecules and thereby overcome this limitation. We have synthesized a new ligand that holds two metal centers in close proximity to each other. The synthesis of the ligand and resulting complexes will be presented within the context of C-H bond activation.



45. A Process to Assess E. coli Concentrations in Streams of an Agricultural Dominant Watershed

Andrew Paxson, Algonquin, IL
Major: Environmental Science
Mentor: Michelle Soupier
Iowa State University

The project I am working on involves collecting water, bank soil, and sediment samples from the Squaw Creek watershed, which is dominated by agricultural land use. I analyze the samples for several parameters, including pH, dissolved oxygen, Total Dissolved Solids, and Total Suspended Solids. Next, I filter the samples to see if they contain E. coli by incubating them in a water bath for 24 hours. The following day I count how many colonies have grown and then try to determine a relationship between the amounts of E. coli colonies in the environmental samples with various factors such as the weather, the pH, etc. The main objective of the project is to develop recommendations for land practices that will prevent E. coli from entering surface waters. Such recommendations include buffer zones along waterways or alternative fertilizers, which would promote good water quality.



46. Reasons for 'Liking' Companies on Facebook and the Effect on Customer-Firm Relationships

Ciara Pearce, West Des Moines, IA
Major: Marketing: Advertising
Mentor: Matthew Bunker & Kadiampatti Rajendran
University of Northern Iowa

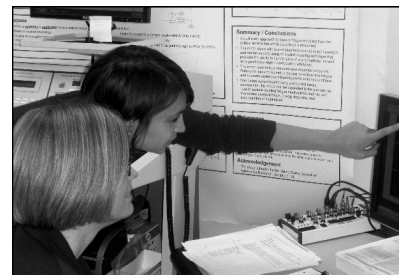
The purpose of this research is to determine why people 'Like' companies on Facebook. 'Liking' occurs when people choose to 'Like' a company's Facebook page and it appears on their personal profile for all of their friends to see. There are varying reasons why people may decide to 'Like' a company. A pretest indicated that there are four major reasons people 'Like' a company on Facebook: satisfaction, identity, norms, and involvement. Researchers collected 402 online surveys from a national sample and the results established a strong correlation between satisfaction, involvement, and customer-firm relationships. Additionally, the results present satisfaction, identity, and norms as antecedents to involvement. There was no correlation between coupons and customer-firm relationships.



7. Tillage and composting strategies to maximize nitrogen retention in maize-based cropping systems

Kimberly Brown, Oregon, IL
Majors: Agronomy, Kinesiology
Mentor: Michael Castellano
Iowa State University

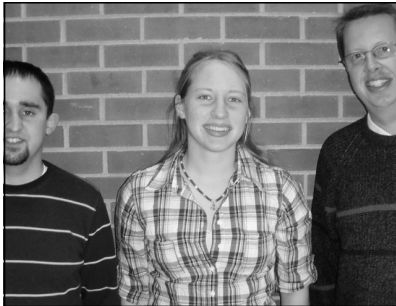
Nitrogen fertilizers are critical to maintain Iowa's agricultural productivity. Significant portions of nitrogen fertilizers, however, are lost from cropping systems to the surrounding environment. These losses represent an economic loss to farmers that can pollute ground and surface waters. Accordingly, agronomic strategies that increase nitrogen retention will benefit farmers and the environment. I evaluated the 12-year impact of tillage and manure compost on potentially mineralizable nitrogen stocks. No-tillage, conventional tillage, no-compost, and compost management strategies were compared in a fully-factorial design with three replicates. The cumulative amount of mineralizable nitrogen was measured during a 28-day laboratory incubation. I hypothesized that no-tillage and compost would increase mineralizable nitrogen. This hypothesis was partially rejected. Although mineralizable nitrogen was not different across compost treatments, no-tillage treatments had significantly more mineralizable N (73.3 kg ha⁻¹) than conventional tillage (36.5 kg ha⁻¹) treatments. These data suggest no-tillage could increase nitrogen stocks on Iowa farmlands.



8. Normative 3D Strength Surfaces in Healthy Subjects at the Ankle Joint: Plantarflexion and Dorsiflexion

Sara Hussain, West Dundee, IL
Major: Integrated Physiology
Mentor: Laura Frey Law
The University of Iowa

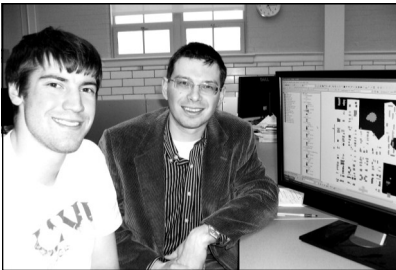
As industry advances, one must predict human capability for industrial design and injury prevention. Santos™ is one model that can predict strength and endurance. The ankle is important for strength/endurance predictions because it is important for locomotion, as well as static and dynamic tasks. The purpose of this study was to establish a database of ankle strength in healthy subjects, and to determine how different muscle properties interact. 56 subjects were tested in maximal static and dynamic paradigms. Torques were gathered at each of five positions/velocities in the pointed toe/flexed toe directions. Data was separated into male/female groups, and plotted in both directions. The resulting 3D graphs indicated that there is a significant interaction between the two major muscle properties; these two properties do not decay at the same rate. Thus, the 3D surfaces are more beneficial than 2D graphs because one can see the interaction between the two properties.



9. Simulation of Nocturnal Low Level Jets with a WRF PBL Scheme Ensemble and Comparison to Observations from the ARM Project

Kristy Carter, Olathe, KS
Major: Meteorology
Mentor: William Gallus & Adam Deppe
Iowa State University

Low Level Jets (LLJs), a common weather phenomenon occurring in the Great Plains, have become increasingly important in the study of wind power. Described as regions of moderately strong winds in the lower atmosphere, LLJs were simulated using the Weather Research and Forecasting (WRF) model with six different Planetary Boundary Layer (PBL) schemes and 10km grid spacing. One location, Lamont, OK, within the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) project was used to validate the ensemble. Thirty cases were selected from June 2008 to May 2010 and compared to model output with cases chosen for inclusion based on the presence of a nocturnal LLJ at the site. Results suggest substantial differences in the simulation of the LLJs depending on which PBL scheme is used. This results in higher wind forecast uncertainty as taller turbines are used for wind power generation.



10. Three-dimensional high-resolution LiDAR-based mapping of urban populations for emergency management and health services delivery in Des Moines, IA

Philip Cavin, Cedar Rapids, IA
Majors: History, Geography: GIS
Mentor: Andrey Petrov
University of Northern Iowa

The accurate mapping of urban populations is an important task due to growth of the urban population around the world. One of the most useful techniques to improve population distribution maps is dasymetric mapping. LiDAR (Light detection and ranging) imagery that provides three-dimensional information on population distribution can become a valuable asset for high-precision population mapping. The purpose of this study is to investigate the utility of LiDAR data in enhancing accuracy and precision of population distribution mapping of Des Moines. The study develops a 3D dasymetric map for central Des Moines to determine whether this new technique is capable of improving precision and accuracy of population mapping. Better population distribution maps will ensure more effective city management and more targeted provision of emergency and health care services. The study concludes that the 3D dasymetric method is successful and can be used for enhancing management and health service delivery strategies in Des Moines and across Iowa.



43. Nanoscale Surface Modification of Layered Materials

Aaron O'Shea, Dubuque, IA
Majors: Physics, Chemistry
Mentor: Tim Kidd
University of Northern Iowa

A scanning electron microscope can magnify a sample many times greater than a standard microscope, down to nanoscale dimensions. It can also be used to form patterns on the surfaces of certain materials, a technique used to create microchips. We have developed a technique that simplifies and expedites this process using an unmodified scanning electron microscope. Using this technique, we are able to alter the surface chemistry in a controlled pattern on a special class of materials called transition metal dichalcogenides. These materials have many useful applications: industrial lubricants; high strength nanocomposites; advanced solar cells; and next generation electronics. Altering the surface chemistry of these materials at the nanoscale results in unusual quantum behavior, which is useful in nanotechnology.



44. Increasing Carbon Sequestration in Maize

Jordon Pace, Dayton, IA
Major: Biology
Alan Moss, Ames, IA
Major: Biology
Mentor: Wei Wu & Patrick Schnable
Iowa State University

Global climate change threatens the productivity and sustainability of agricultural systems. The Intergovernmental Panel on Climate Change (IPCC) has reported the enormous potential of soil-based carbon sequestration. The Carbon Capturing Crops (C2C2) project will test the hypothesis that crops can be engineered to increase their ability to store atmospheric carbon (CO₂) in soil. If successful, the widespread deployment of carbon capturing crops could significantly mitigate global climate change. In addition to mitigating global climate change, the deployment of crops engineering to store carbon in the soil also has the potential to increase soil organic matter content.



41. Prevalence of *Staphylococcus aureus* and Methicillin-Resistant *Staphylococcus aureus* (MRSA) in Retail Pork

Ashley O'Brien, Chicago, IL
Major: Biology
Mentor: Tara Smith
The University of Iowa

This research project focused on determining the prevalence of the bacterium *Staphylococcus aureus*, and specifically methicillin-resistant *S. aureus* (MRSA), in retail pork products from Minnesota, New Jersey, and Iowa. With the first food-borne death due to MRSA in 1995, the emergence of MRSA in communities has led to public concern over the mechanisms for transmission of these bacteria, especially among hospital workers and patients. Although the MRSA carriage rate in the general human population is estimated to be only 1%, a recent cause for concern has been the carriage rate of MRSA found in swine (above 50% in some studies). Other studies have also found that high levels of pork products are contaminated with MRSA. This study is important to Iowa, as retail pork products from Iowa were found to be contaminated with MRSA, and it is still unclear whether these food products can act as a vector of transmission of this bacterium from contaminated pork to humans.



42. Reducing deforestation in Rajasthan, India through solar cookers

Brianne O'Loughlin, Independence, IA
Major: Mechanical Engineering
William Davies, Winnetka, IL
Major: Mechanical Engineering
Mentor: R. Rajagopal
The University of Iowa

In order to reduce deforestation in critical biodiversity areas in Rajasthan, India, nine students and one professor from the University of Iowa traveled to India to investigate the possibility of using solar cookers to decrease the need for firewood. This group consisted of a mix of engineering and non-engineering majors, which ensured that the problem would be addressed both technically and culturally. Partnering with Foundation for Ecological Security and Climate Healers, the students traveled to rural villages in order to investigate the current obstacles to the use of solar cookers. Additionally, technical and cultural design constraints were established in order to aid in the development of a new generation solar cooker which is currently being designed by University of Iowa mechanical engineers. As a result of the first-hand research conducted in the rural Indian villages, this new solar cooker will be designed to meet all the technical constraints of the household cooking, without requiring any lifestyle changes.



11. Anti-vWF Immunofluorescence in Mouse Brain

Minjung Choi, Wonju City, South Korea
Major: Biochemistry
Mentor: James McNamara
The University of Iowa

Blood brain barrier (BBB) serves an important protective role for the brain. It also blocks access of most therapeutic reagents and is thus an obstacle for the treatment of many disorders of the nervous system. To determine whether intravenously administered experimental therapeutic reagents are able to cross the BBB in animal models of disease, it is necessary to determine the location of the reagents relative to the vasculature; methods for labeling the vasculature are useful for such studies. Here, we carried out immunofluorescent labeling of the vasculature in mouse brain tissue sections with an antibody specific for von Willebrand Factor, a protein expressed on the surface of brain endothelial cells.



12. Executive Functions in Healthy Young and Middle-Aged Adults

Whitney Cook, Newton, IA
Major: Communicative Disorders
Mentor: Angela Burda
University of Northern Iowa

Executive functions (EF) refer to the high level abilities to plan, initiate, organize, monitor and adapt behavior (Chamberlain, 2003). Impaired EF may cause individuals to have difficulty starting or stopping actions, making or adapting plans, and inhibiting inappropriate behaviors (Pickens, Ostwald, Murphy-Pace, & Bergstrom, 2010). Thus, intact EF allow individuals to function independently (Mitchell & Miller, 2008). Measures of EF may predict changes in functional status resulting from aging or neurological damage (Pickens et al., 2010). This is important for middle-aged adults, since the onset of degenerative diseases (e. g., Parkinson's disease) can begin in middle-age (Yorkston, Miller, & Strand, 2004). Ten young and 10 middle-aged healthy adults completed three executive function tests: Behavioral Assessment of Dysexecutive Strategies, Functional Assessment of Verbal Reasoning and Executive Strategies, and the Behavior Rating Inventory of Executive Function – Adult Version. Middle-aged adults had significantly higher performance on various subtests. Implications will be discussed.



13. The parallel experience of a bilingual child with a communication disorder and a college language immersion program

Kate Elahi, Omaha, NE
Majors: Spanish, Communicative Disorders
Mentor: Ken Bleile
University of Northern Iowa

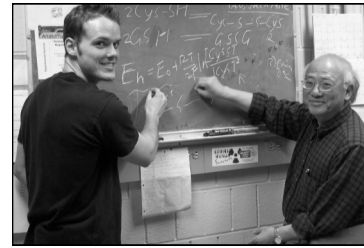
For many speech-language pathologists, it is difficult to truly understand the experience a child goes through when he or she has a communication disorder. This idea is true especially when at the same time a child is learning a new language in an unfamiliar culture. This thesis will attempt to bridge that gap of understanding by comparing the experience of a bilingual child with a language disorder and that of a college student studying abroad in a language immersion program. It will review and compare various literature and studies describing the language characteristics as well as the emotions felt by these two groups. Interviews will also be conducted with college students who have studied abroad and who can share personal reports and reflections. This thesis will encourage empathy and increased awareness so that SLPs will be able to offer quality services that are more sensitive to a bilingual/multicultural client's needs.



14. The Efficiency of the NFL Point Spread Betting Market

Nicholas Fohey, Monona, IA
Major: Economics: General Economics
Mentor: Lisa Jepsen
University of Northern Iowa

The National Football League is the highest revenue-earning sports league in the United States. As a result, the market for betting on NFL games is substantial. The markets for gambling on sporting events are unlike other financial markets. Bookmakers have an incentive to create a line not to match buyers and sellers, but to create large profits for themselves. Like any successful business venture, these profits are essential because without them, bookmakers would not stay in business. In this project I will investigate whether or not the market for betting on NFL games is an efficient market. I will also investigate whether there are any strategies that will allow an individual to win more often than normal. Preliminary research has yielded mixed results on the efficiency of the market.



39. Behavioral correlates of the social-interaction mediated lifespan extension in Cu/Zn SOD mutant Drosophila

Jeffrey Nirschl, Cedar Rapids, IA
Major: Biology
Mentor: Chun-Fang Wu
The University of Iowa

Social behaviors and their benefits have been documented throughout the animal kingdom in a variety of cases. In the fruit fly, *Drosophila melanogaster*, short-lived mutants deficient for the antioxidant enzyme superoxide dismutase (SOD1) show a robust lifespan extension in response to co-housing with active, longer-lived flies. Furthermore, this effect depends upon sensory and motor behavioral cues. Here, we address the behavioral correlates of this social-interaction mediated lifespan extension in SOD1 flies using high-throughput behavioral analysis in a system particularly amenable to genetic and molecular manipulation. Elucidating the behavioral components of this phenomenon may provide insight into the neurobiological mechanisms of ageing or disease, some of which can be extrapolated to humans. Indeed, human mutations in SOD1 have been implicated in ageing and a number of age-dependent neurodegenerative diseases. With many molecular pathways shared between flies and humans it is possible similar networks mediate the beneficial effects of social interactions in humans.



40. The Effect of Childhood Family Structure on Adult Religiosity

Jennifer Nulty, Van Horne, IA
Majors: Political Communication, Sociology
Mentor: Kristin Mack
University of Northern Iowa

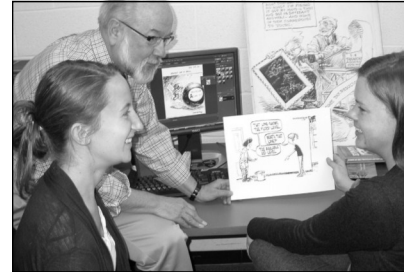
Research has shown that parent's marital happiness and traditional family structure have effects on the transmission of religiosity from parents to children (Myers, 1996). The purpose of this study is to further explore different types of single parent families and family structure effects on adult religiosity. The study builds on existing research by using a different measure of religiosity that incorporates aspects of spirituality rather than only the frequency of religious activity. I statistically analyze variables using data from the General Social Survey. The independent variable is the type of single parent household, and the dependent variable is adult religiosity. A number of control variables are used in this statistical analysis. I expect to find that adults who grew up in a single parent household due to death will experience higher adult religiosity compared to adults who grew up in a single parent household due to divorce.



37. Neonatal Negative Emotionality Predicts Childhood Psychopathology

Allison Momany, Amana, IA
Major: Psychology
Mentor: Beth Troutman
The University of Iowa

Many parents have had the experience of raising a baby that gets upset easily, remains upset for a long time, and is hard to soothe. Researchers call the temperament of such a child "difficult". Although the child may outgrow the fussiness in a few months, there is research indicating the child has emotional problems throughout his or her life. Our research concerns the emotional and behavioral outcome of fussy infants. The infants in the study were rated as having a difficult temperament at four weeks of age. Parents provided information regarding emotional or behavioral problems when the children were 8-11 years of age. Results indicate infant temperament is associated with childhood emotional and behavioral problems. These results suggest the possibility of screening infants for early difficult temperament that place them at risk for later emotional and behavioral problems, allowing for better prevention efforts.



15. Half-Century of Cartooning: Iowa Comments on the World

Kayla Garvin, Urbandale, IA
Major: History
Mentor: Sid Huttner
The University of Iowa

In 1906, the *Des Moines Register* hired Jay N. Darling, establishing a tradition that endured for a century. Darling produced a daily political cartoon comment on local, national, or international events that it ran, centered above the fold, on its front page. Syndicated and read in over 150 U.S. newspapers, "Ding" retired in 1949. The University of Iowa Libraries had digitized and analyzed 12,000 Darling cartoons. Tom Carlisle (1949-1953), Frank Miller (1953-1983) and Brian Duffy (1983-2008) followed Darling. The Libraries hold collections representing each of these cartoonists, and under an agreement with the *Register*, the current project establishes 500 cartoon digital collections of each man's most influential cartoons, collections which will grow over time to include every cartoon published by the *Register* 1906-2008, a run of cultural commentary unmatched anywhere in length, quality, insight and humor.



38. When in Rome, Reuse as the Romans Do: Moving Statues Around the Ancient Roman Empire

Lindsay Morecraft, Vermillion, SD
Majors: Ancient Civilization, Museum Studies

Mentor: Brenda Longfellow
The University of Iowa

In Iowa, people tend to buy secondhand goods like household furnishings and clothing for economic reasons. In ancient Rome, emperors and other prominent members of society also acquired secondhand items, including statues, but for reasons other than economic ones. The appeal of this action, especially for emperors, may have been to visually represent Roman dominance over another culture or to legitimize their authority by visually connecting it with an earlier time period and person. Statues were not necessarily reused within their cities of origin, but were sometimes moved to other countries to serve a new purpose. This poster examines a selection of these moved and altered statues in conjunction with their origin and location of discovery in order to better understand the appeal and purpose of this action. By conducting this research, the body of knowledge within this medium is expanded and therefore available to the general public of Iowa and surrounding areas.



16. Neutrophil Activation During Bacterial Sepsis: A Finely Regulated Process

Emily Gross, Indianola, IA
Major: Integrative Physiology, Pre-Medicine
Mentor: Jessica G. Moreland
The University of Iowa

Septicemia, a whole-body infection, is among the top ten leading causes of death in the United States, and thus continues to represent a significant public health burden. Neutrophils are a type of white blood cell, and a critical cellular element of the immune response to bacterial infections. However, full activation of neutrophils may also cause damage to the host. In a process called "priming," neutrophils are altered so that their level of activation may be more appropriate to the severity of the bacterial infection. We studied neutrophil priming responses to the inflammatory cytokine TNF- α , known to be present in the circulation during serious infections. After 24 hour incubation with low concentration TNF- α neutrophils retained their capacity to be reprimed, whereas 24 hour stimulation with high concentration TNF- α blocked capacity to respond to subsequent stimuli. Better understanding of neutrophil priming and activation during bacterial infections may offer improved therapeutic options.



17. The Absorption Rates of Carbohydrates, Proteins and Fats in Glucose Monitoring

Ryan Hall, Elko, MN
Major: Chemical Engineering
Mentor: Derrick Rollins
Iowa State University

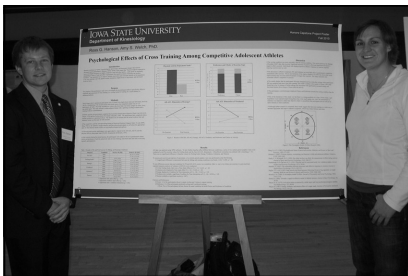
Research is being done to create a statistical model that predicts future blood glucose levels in diabetes victims. In order to come up with an accurate model, the absorption rates of carbohydrates, fats and proteins into the blood stream must be documented. According to the model proposed by Dr. Rollins, the absorption rate for carbohydrates is the highest, followed by fats and then proteins. To verify this model, work of other scientists has been observed and documented. This statistical model will be used in an armband device that allows wearers to see where their glucose levels would be at a variety of times in the future. All the wearers have to do is enter the food they eat into the device. This device will provide a proactive approach to monitoring glucose levels and completely eliminate the traditional finger pricking with current glucose monitors.



35. Raising Good Soviets: Media Depictions of Soviet Life and Upbringing Under Khrushchev

Chelsea Miller, North English, IA
Majors: History, Russian
Mentor: Greg Bruess
University of Northern Iowa

Studies of the Khrushchev Thaw typically concern themselves with political events and the increasing criticism of the Soviet apparatus by the intellectuals. The purpose of my study was to explore criticism and concerns expressed by the common Soviet citizen, particularly in regards to education. I investigated *Pravda*, one of the more popular newspapers of the time, as well as various periodicals covering literature, satire, education, and youth. Throughout my research I discovered that citizens used a variety of Soviet periodicals to criticize the disparities between the educational system as expressed by the party and the reality they saw every day. More so, while these individuals were willing to criticize these contradictions, in the end they remained true subscribers to the principles of the party's policies on raising good Soviet citizens to continue along the path to communism.



18. Psychological Effects of Cross Training Among Competitive Adolescent Athletes

Ross Hanson, Decorah, IA
Major: Kinesiology
Mentor: Amy Welch
Iowa State University

Burnout is rapidly becoming a problem in youth and adolescent sport. One potential way to overcome burnout in this population is by cross training to provide higher levels of enjoyment and improved affect. Fifteen participants from a central Iowa high school track team completed a cycling and a running workout on separate days. Before and after the exercise bout, the AD-ACL (Thayer, 1970) and FS (Hardy & Rejeski, 1989) were completed. After exercise, the PACES (Kendzierski & DeCarlo, 1991) and a survey measuring choice and preference of activity were completed. Cycling was found significantly ($p < .05$) more enjoyable, more energizing, and less tiring than running. Twelve participants chose and preferred the cycling condition while three choose and preferred the running condition. Although further research is warranted, these results suggest that that cross training is a viable way to increase enjoyment and improve affect, which may decrease levels of stress and burnout.



36. In Search of the Ideal Lead Time: an Empirical Analysis and Social Perspective of the Correlation Between Tornado Warning Lead Times and Casualties

JoBeth Minniear, Huntington, IN
Major: Meteorology
Mentor: William Gallus
Iowa State University

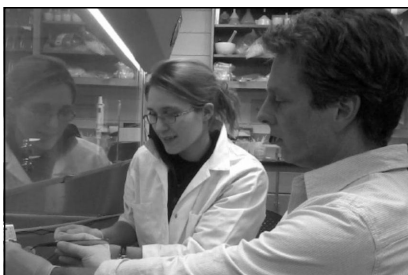
As technology continually becomes more advanced and more is learned about tornadogenesis, tornado warnings have become more accurate and can be issued earlier than ever before. Is this longer lead time better for our society? Does an earlier warning for a tornado translate to more saved lives and property? This study focuses on two main topics: past tornadic events and the public's opinion of tornado lead times. The warned tornadic events within the last three years have been analyzed to find if there was any correlation between storm's parameters and casualties. Over a thousand people across the United States participated in a survey about his or her preference involving tornado lead times, along with other information relating to a person's behavior during a tornado warning.



33. Formation of intercellular junctions during secondary neurulation in the tail bud region of developing chick embryos

Selena Losee, Hanlontown, IA
Major: Biology
Mentor: Darrell Wiens
University of Northern Iowa

This study aimed to locate specific cell junction molecules in the tail end of developing chick embryos. Particularly, we studied when and where these molecules appear during secondary neurulation, the process by which the neural tube forms in the tail bud. This occurs when a small region of unorganized cells begin to group together, forming multiple cavities. The cavities eventually coalesce into the final lumen of the neural tube. We found that the cavities appear to arrange asymmetrically and the location of their formation within the tail bud is variable. Further, the tight junction molecule PAR-3 was observed via immunolocalization techniques in the tail bud during the early stages of secondary neurulation, suggesting that tight junctions may play a role in the organization of cells during this process.



34. Biolistic Transformation of Hop (*Humulus lupulus* L.)

Megan Merner, Cedar Falls, IA
Major: Biology
Mentor: Axel Schwekendiek
University of Northern Iowa

Humulus lupulus, or hops, a plant used mostly as a flavoring in beer, produces minute amounts of the anti-cancer compound Xanthohumol in secretory glands located on the flower cones of the female hops. In producing transgenic hops plants with increased amounts of Xanthohumol, the hop could be grown to produce a low-cost cancer treatment. My research, therefore, focuses on altering the metabolic pathway of hops to produce more Xanthohumol by over-expressing the transcription factor and structural genes. I will do this through biolistic transformation, injecting hops in the highly regenerative callus stage with predetermined genes by using a gene gun. The genes will contain a fluorescent marker that will allow me to immediately check for successful insertion. Successfully transformed tissues will then be regenerated to whole plants (using previously established protocols) and analyzed for increased amount of Xanthohumol.



19. Matlab-based Nanoscale Device Characterization

Paul Haugen, Mason City, IA
Major: Computer Engineering
Mentor: Hassan Raza
The University of Iowa

Compact size is important in modern electronics. Nanoscale electronic devices are electronic components on the scale so small that a million of them end to end would only be a millimeter wide. They are essential in many modern technologies, including energy harvesting and nanoelectronics. These are devices such as carbon nanotubes or graphene-based transistors or capacitors. These materials are on the cutting edge of material science today. Research in graphene was awarded the Nobel Prize in 2010. Graphene is basically a sheet of carbon that is only one atom thick. An essential process in development of these devices is their accurate current and voltage analysis (characterization). Automation of this process is very important for accuracy and consistency. Our project uses commonly available academic software to automate the process of analyzing these devices and present its analysis in an affordable package that is perfect for research grade laboratories.



20. Triple Auxotroph

Jay Hoch, Dallas, IA
Major: Genetics
Mentor: Paul Scott
Iowa State University

The nutritional value of grain is determined partly by the amino acid balance. Current methods of determining the amino acid balance of grains are expensive and time consuming. A method enabling low-cost quantitative measurement of amino acid balance would allow researchers to develop crop varieties with higher nutritional value. We developed an *E. coli* strain with amino acid requirements similar to humans and non-ruminant animals. The strain is a triple auxotroph because it requires the essential amino acids lysine, methionine, and tryptophan to grow. We identified optimal conditions for using this bacterial strain to evaluate nutritional quality. This triple auxotrophic bacterial strain can be used to differentiate among corn varieties known to contain different amino acid levels. This work provides researchers who focus on improving nutritional quality a new analytical tool. Eventually, the food industry and consumers will benefit from this work as improved food and feed products are developed.



21. Butterfly response to floral resources at a prairie biofuel research site

Ben Hoksch, Johnston, IA
Major: Biology: Ecology & Systematics
Mentor: Mark Myers
University of Northern Iowa

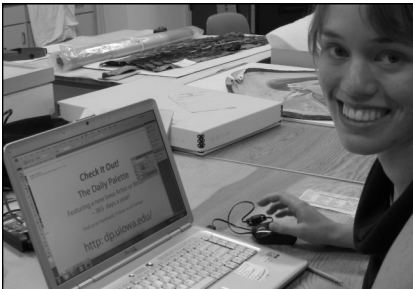
Current biofuel production relies on high input monoculture crops that do little to support native biodiversity. Growing demand for sustainable and ecologically beneficial biofuels has triggered UNI's Tallgrass Prairie Center to develop methods for cultivating diverse mixes of native vegetation as a biofuel feedstock. In 2009, 48 research plots were seeded with 1, 5, 16 or 32 species of native prairie vegetation. I monitored floral resources and butterfly communities in the plots during early establishment and explored the hypothesis that treatments with greater floral resources would support greater abundance and diversity of butterflies. I recorded 31 species of butterflies and 54 species of forbs in bloom at the site. Butterflies were approximately six times more abundant and butterfly communities contained twice as many species in treatments containing 16 or 32 species compared to low diversity plots.



31. Improving Golf Course Turfgrass Health With Organic Products

Quincy Law, Clear Lake, IA
Major: Horticulture
Mentor: Nick Christians
Iowa State University

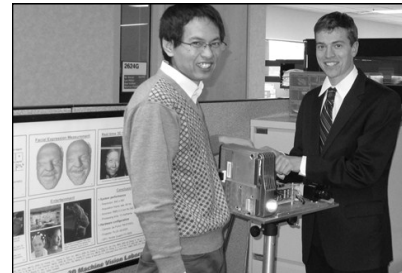
The revenue generated per acre by Iowa golf facilities in 2006 was nearly 13 times more than corn and 21 times more than soybeans in that same year. Golf courses with putting greens composed of older bentgrass varieties face a tough decision: close the golf course and lose a year's revenue by renovating the putting greens to better-performing turf variety or find an alternative. This research compared three organic fertilizers and their effect on an old bentgrass variety. The treatments were applied to plots in a randomized block design every two weeks during the summer and fall of 2010. Data was taken on disease resistance, grass plant density, color, growth, and nutrient uptake for the plots of each treatment. Results indicated that one organic fertilizer from an Iowa company had a biostimulant effect that promoted turf health. Golf courses may have a viable and organic option for healthy putting greens.



22. The Daily Palette: promoting public awareness and engagement with the arts in Iowa

Kallie Holt, Iowa City, IA
Major: Art History
Mentor: Jon Winet
The University of Iowa

The Daily Palette is a multifaceted project to promote engagement with the arts in Iowa. The website has promoted a daily artist or writer associated with Iowa continuously since its inception in 2004. We showcase the work of arts programs across Iowa such as Poetry in Public, the UI Graduate Archive, Live from Prairie Lights, Women in Exile, and University Press. Related projects include social media development and public poster promotions, bilingual writing submissions, and new video art media. The Daily Palette also collaborates with the Virtual Writing University to promote activities related to the UNESCO designation of Iowa City.



32. Realtime Surface Capture using Multiple Wavelength Fringe Projection

William Lohry, Sioux City, IA
Major: Chemical Engineering
Mentor: Song Zhang
Iowa State University

Recent use of 3D characters and scenes in movies and video games has increased the demand for capture of objects in 3D. Fringe projection techniques satisfy this demand by allowing for accurate surface reconstruction of objects by using a camera and a projector. The typical 3-fringe technique requires phase unwrapping in order to reconstruct the surface, unlike the multiple-wavelength method, which allows for calculation of the absolute phase directly. Using the multiple-wavelength method, we demonstrate a realtime system capable of recreating the surface of the human face, with further applications in entertainment and medicine.



29. Veterans' Education

Darys Kriegel, Marengo, IA
Major: Sociology
Mentor: Lynnette Hoelter, Michael Lovaglia
The University of Iowa

The United States places an emphasis on equality and mobility to pursue the American Dream. Many Americans believe they have access to resources that give everyone a chance at upward mobility. The current job market places a high emphasis on college-level education, and any potential barrier to it is worth studying. Veterans have received little attention in the research on educational attainment, and face different challenges than their civilian counterparts. Veterans are socialized into a different lifestyle with different norms, than asked to reintegrate after their service. My research compares educational achievement of the male veteran and civilian population.



23. The Chains of Hidden and Invisible Power: An Understanding Imperative for Societal Transformation

Leanne Hotek, Waterloo, IA
Majors: Political Science, Philosophy
Mentor: Alexandra Kogl
University of Northern Iowa

This thesis addresses the hidden or invisible aspects of power in an effort to understand the effects these types of power have on the individuals who are unaware of their presence. It focuses on the research and conceptions of a few political theorists that form the basis for much of the work on power, and then analyzes and critiques these previous works in order to form a new argument and suggestions for the recognition, and possible resistance, of such power. I then apply this analysis to the contemporary issues of beauty and the feminine body as a depiction of invisible power at work. An accurate understanding of power, and the adverse effects power may have on those who are unaware of its presence, is the first step in any movement towards democratization of power relations.



30. Recruitment of the Latino Population: Marketing Campaign for Hawkeye Community College

Shelly Kuboushek, Calmar, IA
Major: Communication: Public Relations
Mentor: Mike Klassen
University of Northern Iowa

Many people of minority races, specifically the Latino population in this study, face major obstacles and become discouraged when it comes time for them to pursue a post-secondary education. For example, less than one-fourth of the Latino population between the ages of 18 and 24 were enrolled in institutions of higher education in 2000. Community colleges provide a number of benefits for Latino students such as flexible class options, shorter programs, and lower tuition. Therefore, I have created a marketing campaign for Hawkeye Community College that is aimed toward the local Latino population. My hope is that Hawkeye will be able to better reach this target audience, and in return, the Latino population will be exposed to this institution of higher education that would greatly benefit them.



24. DeBAFFling Nuclear Organization: A Structure-Function Analysis of a Chromatin Bridging Protein

Bhavatharini Kasinathan, Brandon, SD
Major: Biochemistry
Mentor:
The University of Iowa

My research focuses on proteins that maintain the organization and integrity of the nucleus. A key protein network lies just inside the nucleus, called the nuclear lamina. I investigate interactions between the nuclear lamina and DNA, which is facilitated by Barrier-to-Autointegration Factor (BAF). BAF is important for cell division, gene expression and bridging DNA to the nuclear lamina. Mutations in lamina proteins cause a variety of diseases, collectively called laminopathies. Even though lamina proteins are found in every cell of our bodies, these diseases affect specific tissues that commonly result in muscular dystrophies. The molecular basis for these disease states is still unknown. Through my research, I hope to shed light on the molecular basis in order to facilitate directed treatment.



25. Designing Decision Aids for Reproductive Health Communication

Nathan Kirkman, Wilton, IA
Major: Graphic Design
Brandon Alvarado, Cedar Falls, IA
Major: Graphic Design
Heidi Ylvisaker, Minneapolis, MN
Major: Graphic Design

Katie Ehlert, Minnetonka, MN,
Major: Architecture & Environmental Studies
Mentor: Debra Satterfield, Iowa State University

Building a trusting relationship with your healthcare provider is an important aspect of leading a healthy lifestyle. Unfortunately, reproductive health is a difficult topic for many young women to discuss. This research aims to design an information device, helping college-aged women and their healthcare providers enter into more productive and comfortable conversations regarding reproductive healthcare issues. The design process involved focus group studies of young women and healthcare professionals to determine how each prefers to communicate. Additional data was collected through ethnographic observations of interactions between young women and their healthcare providers. This combined data will inform the iterative information design and evaluation process used to create the final decision aid tool for these young women and their healthcare providers. Focusing on visual aspects of design including color, typography, and layout, we hope to provide women with the informational tools needed to form a trusting relationship with their healthcare providers.



26. Characterization of the Plasmid-borne *cmv-2* Gene from Clinical Isolates of *Salmonella enterica*

Wesley Klejch, Mount Ayr, IA
Major: Microbiology
Mentor: Samina Akbar
Iowa State University

In the U.S., 1.4 million enteric *Salmonella* infections occur each year due mostly to contaminated food. Most healthy individuals resolve the infection on their own, but children and immunocompromised patients are routinely given extended-spectrum cephalosporins (ESCs), such as ceftriaxone, to treat these infections. However, with the rampant usage of antibiotics, strains of *Salmonella* resistant to ampicillin, chloramphenicol, streptomycin, sulfonamide, and tetracycline have increased from <1% in 1979 to 34% in 1996. This increase in resistance has been attributed to horizontal gene transfer of extended-spectrum beta-lactamases (ESBLs), more specifically the *bla*CMY-2 gene a (CMY-2) plasmid-mediated ampC like beta-lactamase that hydrolyzes cephalosporins via the production of a cephamycinase enzyme. Not much is known about sequence variation of the *bla*CMY-2 gene and its correlation to the difference in antimicrobial resistance profiles of plasmids that carry the gene. This study can reveal a possible mechanism for the increase in multiple antibiotic resistance among *Salmonella* spp. and other bacteria which can in turn have implications for controlling *Salmonella* infections in both animals and humans.



27. New Capabilities for Vision-based Posture Prediction

Lindsey Knake, Bellevue, IA
Major: Biomedical Engineering
Mentor: Tim Marler
The University of Iowa

Using Santos™, a digital human developed by Virtual Soldier Research, I developed a new predictive vision model. Digital Human Modeling (DHM) is a growing area of research. DHM is used by many industries to test virtual prototypes such as car, tanks, or motorcycles with a digital human. This allows the company to save time and cost needed for physical prototyping. Santos™ is one of the most advanced digital human models in the world. My work with Santos focuses on incorporating eye movement in the model as well as the capability to look around objects in the virtual environment. Although vision is a commonly used evaluation parameter with other digital human models, minimal research has involved modeling how eye motion affects the posture of a digital human striving to see a particular target. This model predicts realistic human postures while incorporating independent eye movement and the effects of obstacles.



28. Predictors of Language Outcomes in 3- and 6-year-old children with Mild to Severe Hearing Loss: Data from the OCHL Project

Keegan Koehlinger, Palatine, IL
Major: Speech & Hearing Sciences
Mentor: Amanda J. Owen
The University of Iowa

Approximately 10% of the population in the United States has a hearing impairment of some severity. A hearing loss is difficult for any individual, but especially difficult for young children who are in the process of acquiring language. Whether the language of children with a hearing impairment (HI) eventually approximates that of their normal hearing (NH) peers is unclear. Some studies suggest that these children perform similarly to their NH peers while others suggest they lag behind. Conversational language samples from 90 3- and 6-year-old children from Iowa, Nebraska and North Carolina were analyzed. Data on hearing aid use and benefit was also obtained. HI children performed worse than NH peers in average sentence length and use of grammatical features. Regressions showed that language development is affected by severity of the hearing loss and benefit obtained from hearing aid use. Implications for early identification and aural habilitation will be discussed.