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# 10th Annual Research in the Capitol [Program], March 24, 2015

University of Northern Iowa. University Honors Program.

Iowa State University. Honors Program.

*See next page for additional authors*

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Iowa Regent Universities present the

# 10th Annual Research in the Capitol

Tuesday, March 24, 2015

11:30am – 1:30pm

Iowa State House, Rotunda

Des Moines, Iowa

# Schedule

## 11:30am Opening Remarks

- Bob Kirby
- Director, Iowa Center for Research by Undergraduates
  
- Blake Findley
- Student Speaker—University of Northern Iowa

## 11:45am-1:30pm

- Student Poster Presentations





## Welcome

Welcome to our **tenth annual** Research in the Capitol. In the last decade, over 500 undergraduates from our three Regent's Universities have come to the Iowa Statehouse to present their work to legislators, members of the Board of Regents, and the public. These students have gone on to contribute to our state as doctors, educators, engineers, lawyers, nurses, and professionals in various disciplines. The opportunity for our students to share their knowledge and exuberance with legislators, Regents, and guests in the Iowa Capitol is a special honor that has stayed with them across the years.

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—Iowa Center for Research by Undergraduates



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# Student Presenters

1. **Elizabeth Agey** - University of Northern Iowa
2. **Reem Alkhalil** - Iowa State University
3. **Maya Amjadi** - University of Iowa
4. **Preston Anderson** - University of Iowa
5. **Rebecca Barrett** - University of Iowa
6. **Nate Beyerink** - University of Northern Iowa
7. **Morgan Bobb** - Iowa State University
8. **Celia Bravard** - Iowa State University
9. **Maddie Bro** - University of Iowa
10. **Lauran Chambers** - Iowa State University
11. **Kendra Clark** - Iowa State University  
**Megan Trautmiller** – Iowa State University
12. **Trevor Draisey** - University of Northern Iowa
13. **Allison Dreyer** - University of Northern Iowa
14. **Blake Findley** - University of Northern Iowa

15. **Natani Gallagher** - University of Iowa
16. **Hayley Graham** - University of Northern Iowa
17. **Kenneth Heitritter** - University of Iowa
18. **Hannah Hinkel** - University of Iowa
19. **Ann Huet** - Iowa State University
20. **Victoria Hurst** - University of Northern Iowa
21. **Peter Ickes** - University of Northern Iowa
22. **Christopher Isely** - Iowa State University
23. **Megan Kingery** - University of Northern Iowa
24. **Zachary Kockler** - University of Northern Iowa
25. **Jordan Koos** - University of Northern Iowa
26. **Natalie LaLuzerne** - Iowa State University
27. **Catherine Le Denmat** - Iowa State University
28. **Abigail Lee** - University of Northern Iowa
29. **Rianka Macwan** - Iowa State University



**30. Michael Madsen** - University of Northern Iowa

**31. Nicholas McCarty** - University of Iowa

**32. Margaret McGinity** - Iowa State University

**33. Catherine Meis** - Iowa State University

**34. Tyler Meseke** - Iowa State University

**35. Christian Miller** - Iowa State University

**36. Giselle Narvaez Rivera** - Iowa State University

**37. Hieu Nguyen** - Iowa State University

**38. Nathaniel Otjen** - University of Iowa

**39. Stephanie Paape** - University of Northern Iowa

**40. Dzavid Pandzic** - University of Iowa

**41. Tyler Pecora** - University of Iowa

**42. Adiceson Peppels** - University of Iowa

**Rachel Vasquez** – University of Iowa

**43. Hannah Philgreen** - University of Iowa

**44. Lucas Pietan** - University of Northern Iowa

45. **Kevin Quinteros** - Iowa State University
46. **Anna Rogers** - Iowa State University
47. **Sara Roth** - University of Northern Iowa
48. **Chelsea Ryan** - University of Iowa
49. **Brett Schneider** - University of Iowa
50. **Haley Stevens** - University of Northern Iowa
51. **Celeste Underriner** - University of Northern Iowa
52. **Natalie Veldhouse** - University of Iowa  
**Wonchul (Daniel) Chung** – University of Iowa
53. **Michelle Voelker** - Iowa State University
54. **Gabrielle Watson** - University of Iowa
55. **Angela Weepie** - University of Northern Iowa
56. **Rachel Winter** - University of Iowa
57. **Christopher Winters** - University of Iowa
58. **Wensday Worth** - University of Iowa  
**Devon Dawson** – University of Iowa

60. Shumao Ye - Iowa State University

59. Zhipeng Ye - University of Northern Iowa



## **1. Elizabeth Agey - University of Northern Iowa**

Story City, IA

Major(s): Anthropology

Mentor(s): Tyler O'Brien

### **Female Mate Selection Criteria: Preferences in Short-Term and Long-Term Mating Strategies**

Townsend & Levy (1990a) researched the effect of socioeconomic status on perceptions of attractiveness and found that unattractive men with high incomes are perceived to be more attractive than attractive men with low incomes. In this study I will explore the effect of undergraduate major, as an indicator of wealth, on men's attractiveness in different types of relationships. Women were asked to rate men's attractiveness level and willingness to participate in different types of relationships in a survey. Women should rate men as more attractive overall when their undergraduate major has a higher earning potential. Women should also be more willing to participate in long-term relationships with men who have higher earning potentials than with men with low earning potential. Short-term relationships should not be affected by earning potential. Sexual relationships should also not be affected by earning potential, but might be affected by attractiveness.

## **2. Reem Alkhalil - Iowa State University**

Ames, IA

Major(s): Chemical Engineering

Mentor(s): Mandela Magnidjem

### **The Biological Role of Water - Teaching Students Through the Metal Blast Game**

"META!BLAST" is a 3D action-adventure game in which players shrink to microscopic size and explore the inner workings of a soybean plant's mesophyll cell. Water is a crucial molecule in all biological systems, and the goal of this work is to incorporate knowledge about water's unique physical and chemical properties into the game. Specific objectives include explaining hydrogen bonding, covalent bonding, polarity, cohesion and adhesion, high surface tension, high heat capacity, density, etc. To achieve this goal, we created a mini-game in Metalblast called "Sugar-Rush." The conducted study consisted of comparing how well students learn, using either the common "reading method" or the "gaming method." The study showed that students who studied with the game enjoyed studying, spent more time studying, and scored better than the students who were reading. In the future, the study can be conducted with more participants to enable statistical significance.

### **3. Maya Amjadi - University of Iowa**

Cedar Falls, IA

Major(s): Biology, Spanish

Mentor(s): William Nauseef

#### **White blood cells that eat staph bacteria secrete particles involved in local inflammation during a staph infection**

Infection by staph bacteria cause symptoms such as swelling and boils and may lead to severe diseases including pneumonia. Specifically, the antibiotic-resistant strains are problematic because they infect otherwise healthy individuals. Staph infections are among the top five most frequent hospital acquired infections; annually 500,000 individuals contract staph infections from hospitals in the United States. Neutrophils, the predominant white blood cells, ingest the staph bacteria and release particles, called ectosomes, from their surfaces. These ectosomes play a role in local inflammation during staph infections. We have found that these ectosomes instigate a pro-inflammatory signal, propagating the pro-inflammatory profile of the staph bacteria. This finding supports the hypothesis that, in this context, these ectosomes contribute to exuberant inflammation.

### **4. Preston Anderson - University of Iowa**

Lakeville, MN

Major(s): Biochemistry and Human Physiology

Mentor(s): John Engelhardt

#### **Over-expression of Lef1 Transcription Factor Leads to Increased Amount of Glandular Density**

Submucosal glands are essential for proper airway function and assist in lung innate immune response. Submucosal glands harbor an array of stem cells and the submucosal glands are considered the "stem cell niche" of the airway. During early development of the glands, induction of a transcription factor called lymphoid enhancer-binding factor 1 (Lef-1) is required. Since Lef-1 is needed in glandular development, we sought to ask two questions: Does the overexpression of Lef-1 increase the size of submucosal glands and does Lef-1 expression change the types of cells in glands? When Lef-1 is overexpressed, we found significantly more cells in the submucosal glands and more proliferating cells. Specifically we found an increase of lysozyme expressing serous cells. Lysozyme is very important for an innate immune response because it lyses gram-positive bacteria. This is very relevant to a number of diseases such as cystic fibrosis, chronic bronchitis and asthma. Each of these disease promote changes in airway gland mass and can also alter the ability of the lung to kill inhaled bacteria (for example as in cystic fibrosis).

## **5. Rebecca Barrett - University of Iowa**

Iowa City, IA

Major(s): Biomedical Engineering

Mentor(s): Ibrahim Ozbolat

### **3D-Bioprinting of Artificial Blood Vessels for Tissue Engineering**

Tissue engineering has been a promising field of research, offering hope for bridging the gap between organ shortage and transplantation needs. However, building three-dimensional (3D) vascularized organs remains a difficult technological barrier to be overcome. One of the main obstacles in organ fabrication is being able to create an efficient nutrient and waste exchange system that can supply adequate nutrients to interior and exterior tissue. Alginate has been the material of choice for such a nutrient exchange system, because Alginate is not toxic to cells, and is relatively cheap and plentiful. The goal of the experimental project is to create alginate conduits with properties that more closely mimic those of natural human blood vessels by reinforcing them with electrospun collagen and elastin nanofibers. We will study the mechanical properties of these hybrid vasculatures, as well as short and long term cell viability.

## **6. Nate Beyerink - University of Northern Iowa**

Grand Junction, IA

Major(s): WL&C-French:Business/WL&C-German:Liberal Arts

Mentor(s): Ardith Meier

### **Nonverbal Cues in Computer-Mediated Communication**

The purpose of this research is to attempt to attain a better understanding of the ways in which people of different ages interpret text-based computer-mediated communication (texting, instant messaging, email, etc.) that contains certain nonverbal cues. Participants representing different ages, ranging from 18 to 80, participated in a survey which presented various types of nonverbal cues, like emoticons, and asked participants to provide their interpretation of messages that contained these cues. Such studies are becoming increasingly more important as the use of communication technologies becomes more frequent in both workplace communication and in people's daily lives. Identifying differences in the extent to which such nonverbal cues are comprehended by different age groups can contribute to better communication of affect among diverse communicators, which is especially a reality in today's workplace.



## **7. Morgan Bobb - Iowa State University**

Wever, IA

Major(s): Genetics and Global Resource Systems

Mentor(s): Donald Sakaguchi

### **Characterizing Sciatic Nerve Regeneration and Functional Recovery in an in vivo Experiment using a Poly-lactic Acid Micro-patterned Conduit**

Peripheral nerve injury can result in serious functional loss and organ denervation. The current standard treatment is an autologous nerve graft, which results in donor site morbidity. In this study, a biodegradable, artificial conduit was utilized to transcend a nerve gap. Micropatterning in the conduit encourages alignment of cells. The micropatterned, poly-lactic acid (PLA) conduits were implanted in a long nerve gap of a Brown Norway rat. Functional recovery was measured using the Sciatic Functional Index, calculated from footprint parameters of the animals. Sensory reinnervation was analyzed using a reflex test. Immunohistochemical analysis of the fixed tissue collected 12 weeks after implantation was conducted to assess the tissue. The focus of this study was to characterize nerve regeneration inside the PLA conduit and measure functional recovery. Future study is in progress, utilizing transdifferentiated bone marrow-derived mesenchymal adult stem cells expressing Schwann-cell markers seeded on a micro-patterned PLA conduit.

## **8. Celia Bravard - Iowa State University**

Granger, IA

Major(s): Food Science

Mentor(s): Stephanie Clark

### **Development, Acceptability, and Shelf Life of a Gluten-Free Fruit and Whole Grain Snack**

Snacking and food allergies are topics of increasing interest. Many on-the-go snacks do not meet needs of children with food allergies. The goal of this project was to create a bite-sized snack for children under age eleven. Additionally, it could not contain: gluten, soy, dairy, eggs, fish, or peanuts and must provide over half a serving of fruit per serving. Methods included optimal formula development, process flow diagram, acceptability feedback, and shelf-life estimation. A sensory panel conducted with 99 fourth grade students assessed product acceptability. Analytical procedures, including water activity and lipid oxidation quantification (gas chromatography), were performed for shelf-life estimation. Water activity exceeding 0.6 was the failure parameter. The conservative shelf life is 6 weeks (20°C). Fifty-one percent of sample population liked the snack; an additional 33% recorded neutral scores. In conclusion, a nutritious, uniquely flavored snack, free of many food allergens was successfully created for the target market.

## 9. Maddie Bro - University of Iowa

Ames, IA

Major(s): Journalism & Mass Communication; Gender, Women's & Sexuality Studies

Mentor(s): Stephen Berry

### **Daisy Bates: The Maverick of Ninth Street**

This project examines the life and challenges of Daisy Bates, journalist and president of the Arkansas NAACP, who played a major role in the struggle for civil rights in Arkansas during the Little Rock Desegregation Crisis of 1957-59. The confrontation was a pivotal test of the Southern strategy of massive resistance to the landmark Brown vs. Board of Education ruling that outlawed school segregation. Despite additional pushback from Arkansas' conservative black community, Bates fostered support and resources largely from her involvement in the State Press, where she served as writer, editor and co-owner with her husband, L.C. Bates. Harry Ashmore, editor of the Arkansas Gazette, played an important role in Bates' efforts. Ashmore, the winner of the 1958 Pulitzer Prize for his Little Rock editorials, is the central figure of UI Associate Professor Stephen J. Berry's ongoing book project. Harry Scott Ashmore: A Southern Liberal on the Road to Little Rock, Berry's working title, will not only be the first biography about the editor, it will provide new knowledge of the civil rights struggle and a streamlined definition of "southern liberalism." My in-depth study of Bates will contribute to Berry's analysis of the political spectrum of the South.

## 10. Lauran Chambers - Iowa State University

Corwith, IA

Major(s): Biochemistry

Mentor(s): Olga Zobotina

### **Expression of fungal Pectin Methylesterase in Arabidopsis causes a dwarf plant phenotype and increased stress resistance.**

Pectin Methylesterase is an enzyme present in many organisms that plays an important role in plant growth and stress resistance. A previous post-doctoral researcher created a transgenic Arabidopsis plant expressing a fungal pectin methylesterase localized in the cell wall. The transgenic plants exhibit stunted growth and dwarfed features in comparison with wild type, although increased amounts of NaCl (salt) showed little effect on root length of transgenic plants in comparison to wild type. Under osmotic and reactive oxygen species stresses, pectin methylesterase expressing plants exhibited significantly different root lengths in comparison to the plants grown in non-stressed conditions. Future testing of a drought-induced stress will be conducted. Tests that analyze the active form of the enzyme, computational cell wall analysis, and placement in the transgenic plant's genome will be conducted to characterize the gene.

## **11. Kendra Clark - Iowa State University Megan Trautmiller – Iowa State University**

Beeville, TX / Plymouth, MN

Major(s): Biology / Biology

Mentor(s): Julie Kuhlman

### **Identification of glial marker genes in the developing enteric nervous system**

The enteric nervous system (ENS) consists of neurons and glia that control motility, secretions, and blood flow within the gastrointestinal tract. Using the zebrafish (*Danio rerio*) as a model we aim to understand ENS development and how this process might go awry in disorders such as Hirschsprung's, in which children are born lacking neurons in portions of their gastrointestinal tract. The number of markers for enteric glia is relatively small and many of the current immunohistochemical approaches are confounded by the uncertainty of cross-reactivity patterns between species. In preliminary experiments using established glia markers, we obtained unexpected results identifying glia in mutants lacking the ENS, suggesting a lack of glia marker specificity, or the presence of an uncharacterized subpopulation of glia in our mutants. To distinguish between these possibilities, we have cloned other markers to examine glia populations in normal larvae and larvae with defects in ENS development.

## **12. Trevor Draisey - University of Northern Iowa**

Keota, IA

Major(s): Economics:Applied Econ Anal

Mentor(s): Lisa Jepsen

### **Determinants of NFL Player Salaries**

The growing popularity of fantasy football has opened doors for economic studies of NFL player salaries, yet my research is the first to use fantasy football statistics as a measure of performance. In the past, analysis of player performance across positions in the NFL has been extremely difficult as each position is judged on different statistics. Fantasy football statistics provide a uniform method of comparing performance across multiple positions to determine how performance on the field translates to compensation. I study NFL player cap values as a function of performance and other on-the-field measures, as well as the effects of certain variables unrelated to performance, which may affect compensation, such as the race of the player and any history of arrest.

### **13. Allison Dreyer - University of Northern Iowa**

Cedar Falls, IA

Major(s): WL&C-French:Business/Biology-Honors:Research

Mentor(s): Carl Thurman

#### **Who's your crawdaddy? Genetic identification of crayfish species of the Cedar River Basin**

The rusty crayfish, *Orconectes rusticus*, poses a threat to native species of crayfish, aquatic plant abundance, and fish populations. It is invading non-native environments, including much of Iowa, Minnesota, Wisconsin, Michigan, and Illinois. Identification of the rusty crayfish is important in documenting the distribution of this species in Iowa, along with possible displacement of native species of crayfish, such as the golden crayfish, *Orconectes luteus*, and the virile crayfish, *Orconectes virilis*. Crayfish are usually identified based on morphological characteristics. However, many crayfish are morphologically similar, making identification difficult and sometimes incorrect. Therefore, identification based on molecular genetic sequences can aid in accurately identifying crayfish species within the state of Iowa, especially the rusty crayfish, which has only recently been documented in Iowa. The results suggest that genetic and morphological identification are mutually supportive and that the 16s-mtDNA gene can be used to accurately identify crayfish.

### **14. Blake Findley - University of Northern Iowa**

New Virginia, IA

Major(s): Psychology/Spanish

Mentor(s): Kim MacLin

#### **Investigating Educational Quality at One Midwestern Comprehensive University**

Higher education is at a crossroads. President Obama has called for increased access to higher education and simultaneously wants greater educational quality from our colleges and universities (Bok, 2013). Comprehensive universities are uniquely positioned to address the demand for greater access to higher education (Schneider & Deane, 2014). However, comprehensive universities, specifically, face an incredible challenge in ensuring educational quality as they are usually devoid of resources and have the greatest spread in student ability (Schneider & Deane, 2014; Bok, 2013). This study will investigate educational quality, according to criteria outlined by Kuh et al. (2005), at one comprehensive university in the Midwest, based on the experiences (i.e., perceptions and behaviors) of faculty and students.

## **15. Natani Gallagher - University of Iowa**

Postville, IA

Major(s): Psychology

Mentor(s): Arianna Rigon

### **Emotion Recognition in the Brain**

Theory of mind (ToM) is known as the ability to infer others' mental states, and it is a necessary component of social interaction. ToM is impaired in several neuropsychiatric conditions (e.g., Autism, Asperger's, Schizophrenia), making understanding this process, even in non-clinical populations, crucial for the development of effective diagnostic tools. / We administered two tasks to a group of female students (N=20): a) the Interpersonal Reactivity Inventory (IRI), which measures self-reported ability to understand other's emotions, and b) the Reading the Mind in the Eyes task, a visual task which assess ToM deficits. Participants then had an fMRI: they would lie still in the MRI scanner and let their mind wander, allowing us to record brain activity at rest. We discovered that participants with higher scores in both tests also displayed more synchronous activity at rest between brain systems important for ToM. Our data is innovative, as it shows that analyzing how different regions activate synchronously at rest could serve as a predictive measure of future social behavior. These findings further our understanding of how regions of the brain interact to produce ToM, and can direct research on disorders characterized by ToM impairment toward new potential assessment methods.

## **16. Hayley Graham - University of Northern Iowa**

Cedar Rapids, IA

Major(s): Communication:PR/Music Performance:Tracka(Inst)

Mentor(s): Danny Galyen

### **The American Symphony Orchestra: Factors Affecting Concert Attendance and Predictions for the Millennial Ticketholder**

This research investigates the perception of live orchestral music performances among members of the American millennial generation, born between 1985 and 1997. Specifically, it describes the most common factors and trends affecting attendance decisions, looking at aspects such as past musical experience, marketing strategies used, and accessibility of performances. Current programming, marketing, and educational trends in several orchestras are also considered. Information for this study was gathered from a survey of University of Northern Iowa students, as well as case studies of orchestras. This thesis provides predictions and recommendations for how to best reach this demographic as orchestras move into the future.



## 17. Kenneth Heitritter - University of Iowa

Peosta, IA

Major(s): Physics, Astronomy

Mentor(s): Randall McEntaffer

### **HFPK 334: An Unusual Supernova Remnant in the Small Magellanic Cloud**

We present new Australia Telescope Compact Array (ATCA) radio-continuum and XMM-Newton/Chandra X-ray Observatory observations of the unusual supernova remnant HFPK 334 in the Small Magellanic Cloud (SMC). The remnant's structure appears as a filled-in shell, where emitting plasma is located inside the shell. HFPK 334 is located in the relatively close Small Magellanic Cloud, a dwarf galaxy. In the center of this Supernova Remnant we can detect a very small source of x-rays that exhibits a spectrum best fit by a powerlaw. Although this x-ray source appears to be associated with the supernova remnant, its association is still somewhat ambiguous. By analyzing the x-ray data from the more spread-out emission, we are about to determine an approximate age of ~1800 years for this supernova remnant.

## 18. Hannah Hinkel - University of Iowa

Rockford, IL

Major(s): Psychology

Mentor(s): Teresa Treat

### **Does the Sexual Relevance of the Social Environment Potentiate Men's Perceptions of Women's Sexual Interest?**

This study evaluates whether the sexual relevance of the background scene influences men's judgments of women's interest in full-body photographs, particularly among men who endorse rape supportive attitudes (eg. women are responsible for or deserve rape). One hundred and seventy three scenes were constructed that were either higher in sexual relevance (n=87; bar or bedroom) or lower in sexual relevance (n=86; office or mall). Full-body photographs of women were inserted into these scenes. The woman varied in nonverbal affective cues (rejecting to sexually interested as communicated via face and body posture), clothing style (conservative to provocative), and normative attractiveness. 150 male undergraduates view each scene and rated how sexually interested each woman felt. We predict that men will focus on nonverbal affective cues, clothing style, and attractiveness when judging how a woman feels "right now" and that the average man will focus not only on women's nonverbal affective cues, but also on clothing style, attractiveness, and the sexual relevance of the social environment when judging how sexually interested a woman feels. We predict that men who endorse more rape-supportive attitudes, relative to men who endorse less such attitudes will focus less on affective cues and more on non-affective cues when determining how sexually interested a woman feels.



## **19. Ann Huet - Iowa State University**

Oak Forest, IL

Major(s): Psychology

Mentor(s): Robert West

### **Keep on the Sunny Side: Effects of Aging on Neural Activity Related to Feedback Processing**

In life we are faced with choices that lead to positive or negative outcomes. Over time we often need to learn which choices predict one or the other type of outcome. This study used event-related brain potentials (ERPs) or brain waves to examine the effects of aging on learning from feedback. Participants performed a task that measures learning from positive or negative feedback. Younger and older adults learned equally well from positive feedback, while older adults failed to learn from negative feedback. The ERP data revealed brain activity that distinguished between positive and negative feedback, and between expected and unexpected positive feedback. Aging was associated with a reduction in brain activity related to positive feedback and changes in brain activity related to negative feedback. This data suggests that the failure of older adults to learn to avoid poor decisions results from a reduced sensitivity to negative feedback.

## **20. Victoria Hurst - University of Northern Iowa**

Cedar Falls, IA

Major(s): Political Science/Public Admin:Comm & Regnl Dev

Mentor(s): Chris Larimer

### **The Impact of Self-Objectification on Political Efficacy: Does Self-Image Affect Feelings of Political Adequacy?**

The phenomenon of self-objectification develops from the internalization of the objectification of the human body by the individual and results in negative psychological effects, including increased body surveillance, interfering with peak motivational states, and body shame. As a result, it is possible that feelings of inadequacy affect other aspects of life, including an individual's self-perceptions of political adequacy. To test this, I conducted an original survey (N=948) to determine if higher rates of self-objectification, using measures for body surveillance and shame, negatively affect internal and external political efficacy. Results suggest increased measures of self-objectification negatively and significantly affect internal political efficacy among both men and women, but the negative effects of self-objectification on the internal political efficacy rates of women are greater than that of men. Further, in analyzing the impact of self-objectification on external political efficacy, body shame negatively affects the external political efficacy of women but not men.

## **21. Peter Ickes - University of Northern Iowa**

Marion, IA

Major(s): Biology-Honors Research

Mentor(s): Kenneth Elgersma

### **Best Management Methods to Combat the Spread of *Typha x glauca*, an Invasive Hybrid Cattail Species**

*Typha x glauca*, a cattail formed through hybridization of a North American and a European species, is a superior competitor for nitrogen compared to *Typha angustifolia*, the North American native. The hybrid often dominates nutrient-enriched wetlands, leading to extremely dense stands and a significant reduction in overall biodiversity. We investigated the most effective means to control *T. x glauca*, either by burning, mowing, or herbicide application. Over the summer, we grew potted plants in a greenhouse along a nitrogen gradient. On three separate dates, plants were either burned, sprayed with herbicide, or cut. Results show that herbicide application to be most effective in controlling growth, followed next by burning. Additionally, out of the plants that survived, the means of aboveground biomass 4 weeks after treatment from burning or cutting were 0.9 g, and 1.9 g, respectively, compared to 8.0 g for untreated control plants.

## **22. Christopher Isely - Iowa State University**

Cottage Grove, MN

Major(s): Chemical Engineering

Mentor(s): Kaitlin Bratlie

### **pNIPAm particles for protein-based reprogramming of tumor-associated macrophages to anti-tumor macrophages**

Macrophages are immune cells that engulf debris in the body, but are also known to be associated with tumor growth. They work with tumor cells to develop blood vessels to allow delivery of nutrients. These tumor-associated macrophages can be reprogrammed to destroy the tumor instead of aid it. Polymer nanoparticle based delivery of a protein to macrophages can be used to locally destroy the tumor. Our goal was to develop a polymer drug delivery vehicle that would be biocompatible and degrade within tumor associated macrophages to release the protein. PEGDA cross-linked pNIPAm microgel particles were synthesized and were found to not be cytotoxic and were internalized by macrophages. These particles slowly release their contents over a time frame of two weeks. This delivery system has promise in eliminating cancer cells, and improving cancer patient prognosis.

## **23. Megan Kingery - University of Northern Iowa**

Jefferson, IA

Major(s): Music Education:Instrumental/WL&C-Dual:Spanish/German

Mentor(s): Angeleita Floyd

### **Things Ain't What They Used To Be: A Look At The Emergence Of Female Flutists Into The Jazz World**

Jazz holds a unique and important position in the American culture because it is the only original American music genre. The flute as a jazz instrument and women instrumentalists in jazz are both relatively new practices that still do not receive equal treatment in the jazz world. The purpose of my thesis is to increase the understanding and awareness of the flute as a jazz instrument. To achieve this, first I provide a historical overview of jazz and when the flute was first used as a jazz instrument. Next, I discuss the role of important female jazz flutists, highlighting four prominent flutists that I interviewed and providing their reactions to current trends and acceptance in jazz. Lastly, I describe the process that went into choosing and arranging the jazz standard "Things Ain't What They Used to Be" for jazz flute big band for performance with the Northern Iowa Flute Choir.

## **24. Zachary Kockler - University of Northern Iowa**

Altoona, IA

Major(s): Biology-Honors Research

Mentor(s): Jim Jurgenson

### **Aligning Fungal Genomic Sequences with Genetic Maps of the Genomic Sequence of the Corn Pathogen *Fusarium verticillioides***

The goal of the project is to find and map AFLPs, Amplified fragment length polymorphisms, within the *Fusarium verticillioides*, a corn pathogenic fungus, genome with an emphasis on the twelfth chromosome. An amplified fragment length polymorphism is a way to detect a difference in the sequence of DNA in different individuals of the same species without prior knowledge of the DNA sequence. Previous literature (Jurgenson, 2002) indicates AFLPs found already within the genome, but there is a distinct decrease in number in the twelfth chromosome relative to the other eleven chromosomes. With this project the knowledge of the genome will be improved in which it will enable *Fusarium verticillioides* to be a model organism for population genetics and genetic studies linked to plant pathogenic fungi (Jurgenson, 2002).

## **25. Jordan Koos - University of Northern Iowa**

Davenport, IA

Major(s): Biology

Mentor(s): Mark Sherrard

### **Nitrogen Use in Bioenergy Feedstocks**

Increasing global energy demand and decreasing fossil fuel reserves have created the need for renewable energy sources. Diverse native prairie vegetation could be an ideal biomass crop in Iowa. Prairies are highly productive, resistant to weed invasion, and have low fertilizer requirements. In this study, we tested whether switchgrass plants in low-diversity mixtures show evidence of nitrogen depletion relative to switchgrass plants in high-diversity mixtures at a biomass energy production site. We sampled 200 plants in four diversity treatments. We measured 4 traits associated with plant nitrogen content: chlorophyll concentration, leaf florescence, photosynthetic rate, and leaf tissue nitrogen and one trait associated with growth rate. Plants had higher chlorophyll concentration, FvFm, and photosynthetic rate in the high-diversity mixtures than the 5 warm season grass mix, but less than the switchgrass monocultures. Our results suggest that nitrogen depletion is greater in the 5 warm season grass mix than the other three treatments.

## **26. Natalie LaLuzerne - Iowa State University**

Savage, MN

Major(s): Meteorology

Mentor(s): William Gutowski

### **Contemporary and Future Extreme Winter Precipitation in the Upper Mississippi River Basin**

We analyzed 28-year output from regional climate simulations of daily extreme precipitation events in the contemporary and future-scenario climates. We examined the Upper Mississippi River Basin in the winter months (December-February) for daily precipitation totals in the top 0.5% of all precipitation amounts that simultaneously occurred on several grid points in the simulations. All extreme events occurred when there was a low-pressure center east of the Rocky Mountains that produced strong moisture flow from the Gulf of Mexico. Intensity and spatial distribution of extreme precipitation events increases from the contemporary climate to the future-scenario climate, mainly due to a net increase in temperature and humidity, rather than a change in the atmospheric circulation patterns.



## **27. Catherine Le Denmat - Iowa State University**

Racine, WI

Major(s): Chemical Engineering

Mentor(s): Kaitlin Bratlie

### **Using Biomaterials to Reduce Fibrous Encapsulation of Implanted Devices**

Fibrous encapsulation, commonly referred to as scar formation, can cause failure in many biomedical implants, such as in the artificial pancreas for type I diabetes treatment. Scar tissue prevents wastes and nutrients from being exchanged in the implant, ultimately rendering the treatment painful or ineffective. For example, one potential therapeutic for type I diabetes involves using a polymer to protect insulin-producing cells. This artificial pancreas provides diabetics with their much needed insulin on-demand. If scar tissue forms around this artificial pancreas, the device loses the ability to deliver insulin and becomes useless. Our goal is to reduce the fibrous encapsulation of implants using biomaterials and improve the understanding of how cells involved in scar formation respond to biomaterials. We show that our materials can reduce fibrous capsule formation by inhibiting certain physiological pathways. This research will not only improve the success of the artificial pancreas, but other biomaterials.

## **28. Abigail Lee - University of Northern Iowa**

Iowa City, IA

Major(s): Music:General Studies in Music/Spanish/Biology-Honors Research

Mentor(s): Julie Kang

### **Analysis of Ipomoea (morning glory) Leaf Mutants**

Ipomoea (morning glory) is the largest family in the Convolvulaceae. Cultivation of morning glory plants began in the late Edo period in Japan and this horticultural success resulted in thousands of plants with varying floral displays. In addition to the different flower morphologies, leaf shape is highly variable within this family making it an ideal group in which to study leaf development. We selected four mutants that vary in lobe number and lobe depth: 1) Tokyo Standard (TKS 1065; wild-type) (3 lobes), yellow maple (ym 1018) (5 lobes), delicate maple (dlm 620) (5 deep lobes), and maple willow (mw 646) (simple leaf). These leaf mutants represent the range of leaf shapes found in this family. By using qualitative (microscopy) and quantitative (morphometric) techniques, the specific purpose of this study was to investigate leaf shape and vein homology among leaf mutants in the morning glory family.

## **29. Rianka Macwan - Iowa State University**

Naperville, IL

Major(s): Animal Science

Mentor(s): Craig Chase

### **Comparative Analysis and Case Study of Local Meats Procurement in Cresco, IA Schools**

Through case studies and comparative analyses, national best management practices for the procurement of local meats by K-12 institutions have been developed. Further, in-depth semi-structured interviews of key informants involved in farm to school initiatives within and around Cresco, IA have led to recommendations for the continued development of local meats procurement in Cresco's local school system.

## **30. Michael Madsen - University of Northern Iowa**

Council Bluffs, IA

Major(s): Geog-GIS:Env Sci & Policy

Mentor(s): Andrey Petrov

### **Monitoring Reindeer Migration Using Mobile Satellite Systems**

The Russian government announced that in the summer of 2014 it would fund an aerial survey of wild reindeer (*Rangifer tarandus*) in Taimyr, Russia. This year I was hired by the GeoInformatics Training Research Education and Extension, or GeoTREE, as a spatial analysis of aerial survey and imagery data for the Rangifer data gathered through Argos satellite systems. Using GPS trackers on thirteen different reindeer, we tracked their movements for a ten-month period to better understand their migration patterns, sleeping cycles, movement speed, and other factors. The data was also organized to track each individual reindeer to see how long they lasted in the environments and what factors could have led to their inevitable death. The purpose of this research is to show how GPS tracking can be used to better understand migrating animal species, and to show the results of the data gathered.



## **31. Nicholas McCarty - University of Iowa**

Geneva, IL

Major(s): Microbiology

Mentor(s): E. Dale Abel

### **Role of Essential Insulin Pathway Proteins in the Preservation of Cardiac Function and Structure**

Type 2 diabetes is characterized by insulin resistance. Insulin is produced within specialized cells in the pancreas called beta-cells. Insulin then circulates throughout the bloodstream, binding to Insulin Receptor (IR) and Insulin-like Growth Factor 1 (IGF1). The Abel lab seeks to understand essential proteins within the insulin-signaling pathway, which is very important for the maintenance of the heart under conditions of diabetes. The present study utilized a genetically modified mouse in which IRS1 and 2, essential proteins that are activated immediately after IR in this pathway, were deleted. We then ran a series of tests to find out what happened to the mice after this deletion. The mice ended up having heart failure after only ten weeks, which is 60% of all diabetes-related deaths in humans. Therefore, we have increasing evidence to support the fact that normal insulin signaling is essential to maintain healthy cardiovascular function in the adult heart. We were able to trace this progression of heart failure with echocardiography (similar to ultrasound) and by looking at the disarray of the heart cells (cardiomyocytes) under a microscope. Additional molecular tests were also performed to isolate potential mechanisms of the eventual heart failure.

## **32. Margaret McGinity - Iowa State University**

Ottumwa, IA

Major(s): Music (Flute Performance); Journalism & Mass Communication

Mentor(s): Jeff Ames

### **Short Film: Nonverbal Communication**

This creative project is a short silent movie titled "Meet Me at Seven." The script is based on a literature review of forms of nonverbal communication (including acting, written language, visual communication, music, and body language) and their effectiveness, as well as the art of cinema and silent film. Upon completion of the script, the movie was cast with individuals who could express ideas and emotions in a convincing, yet overdramatic manner, as the genre of silent film requires. The filming was completed on an iPhone, in locations near and on the Iowa State University campus. Once filming was completed, the film was edited to its final version in iMovie by cutting extra footage, writing inter titles (characters' dialogue on screen), and adding in an original piano score to supplement and advance the message of the film.

### **33. Catherine Meis - Iowa State University**

Le Mars, IA

Major(s): Materials Engineering

Mentor(s): Nastaran Hashemi, Dr. Reza Montazami

#### **Ionic Electroactive Polymer Actuators for Microfluidic Mixing**

On-chip automated sample processing is necessary to allow small biological analysis devices, such as lab-on-a-chip devices, to be commercially practical. Additionally, low power devices are necessary to allow lab-on-a-chip technologies to be used for portable applications like diagnostic devices. A low-power-consumption integrated microfluidic chip employing an ionic electroactive polymer actuator (IEAPA) as an active micromixer was developed and fabricated. Visible changes in the laminar flow pattern were observed when electrical stimulus was applied to the actuator, indicating that these actuators could be viable active microfluidic mixers. In addition, the performance of IEAPAs with varied electrode materials was investigated. Actuators with silver microparticle electrodes applied via spray deposition were compared to identical IEAPAs with conventional gold electrodes; the silver microparticle electrode IEAPAs were shown to perform comparably and even favorably for some operating conditions. IEAPAs have many applications including microrobotics, artificial muscles, and sensors.

### **34. Tyler Meseke - Iowa State University**

Bettendorf, IA

Major(s): Biology & Anthropology

Mentor(s): Pooja Gupta-Saraf

#### **Mammalian Orthoreovirus Proteins $\mu 1$ AND $\mu 2$ Induce Infection Independent Downregulation of HIF-1 $\alpha$**

Tumor outgrowth from the blood supply leads to low oxygen condition, or hypoxia in microregions of solid tumors. Hypoxia Inducible Factor-1 (HIF-1), regulates these hypoxic cells, and is formed when one of its components, HIF-1 $\alpha$ , is stabilized. We previously found that Mammalian Orthoreovirus (MRV), a potent oncolytic virus, causes the downregulation of HIF-1 $\alpha$  in infected hypoxic cells. Here we report that MRV proteins,  $\mu 1$  and  $\mu 2$  induce the downregulation of HIF-1 $\alpha$  independent of viral infection. The ability of  $\mu 2$  to downregulate HIF-1 $\alpha$  was attributed to strain specific differences, where the T1L and T3DC strains induced more downregulation than the T3DF strain. By examining single amino-acid and deletion mutants, the region containing aa 188-380, and specifically amino-acid 208 of  $\mu 2$ , and  $\phi$  domain of  $\mu 1$  were determined to be necessary for HIF-1 $\alpha$  downregulation. These observations provide new insights into the effects of specific MRV proteins on HIF-1 $\alpha$  when expressed in hypoxic cells.

## **35. Christian Miller - Iowa State University**

Atlanta, GA

Major(s): Biological Systems Engineering

Mentor(s): Thomas Brumm

### **Oxygen Demand of Red Flour Beetles in Sorghum**

Sorghum is the third most internationally traded cereal grain in the world and is Nigeria's highest produced cereal grain. Full return storage is pivotal to maintaining edible feed in this region. Hermetic storage, which is a non-chemical storage method that utilizes the capability of oxygen seals for possible aerobic asphyxiation of pest, has been evaluated for the control of the red flour beetle (*Tribolium castaneum*), which causes large storage losses. Using hermetically sealed containers and a fixed ratio of beetles to sorghum mass at different temperatures (22°C and 34°C) and grain moisture (8% and 16%), the oxygen requirement of the red flour beetle was determined. Time to 100% beetle mortality in hermetic storage, as a function of infestation level, storage volume, temperature and grain moisture content, can be estimated by using these oxygen requirements results. These estimates can be utilized to design effective hermetic storage systems for sorghum.

## **36. Giselle Narvaez Rivera - Iowa State University**

San Juan, Puerto Rico

Major(s): Animal Ecology

Mentor(s): Amy Toth, Dr. Adam Dolezal

### **The effects of nutritional stress and viruses on honey bee survival and foraging behavior.**

Honey bees (*Apis mellifera*) are extremely important worldwide pollinators, but have been in decline in recent years. Researchers have tied these losses to several environmental stressors, including landscape use (lack of forage), pests and pathogens, and pesticide exposure. Two of the most problematic issues are viral pathogens and pollen nutrition. Pollen is the primary nutritional source for bees and monoculture crop systems have led to a substandard diversity of pollen which can negatively affect bee health. Despite studies on these factors individually, the interaction of honey bee nutritional stress and viruses is poorly understood. This interaction was studied using a semi-field experiment in which we manipulated small "nucleus" bee hives by experimentally controlling their diet and infecting them with viruses to learn how these factors affect their survival and foraging activity. The findings will provide a better understanding on how these stressors affect honey bee health and foraging behavior.

## **37. Hieu Nguyen - Iowa State University**

Ames, IA

Major(s): Finance, Economics, and Math

Mentor(s): Peter Orazem

### **Marginal Tax Rates and its Implications on Housing Prices**

This study examines the extent to which state tax rates are capitalized into housing prices. To the extent that high marginal tax rates add expense to residing in an area relative to neighboring jurisdictions, populations will move to the lower tax jurisdictions and land prices in the higher taxed jurisdictions will decline. In the end, the housing prices net of taxes will equalize across jurisdictions with the higher housing prices in the locations with lower tax rates. The effect of tax rates on housing prices will be greatest at state borders where the cost of moving to a different area is the lowest. It is much more costly to move from properties located in the middle of the state to a lesser taxed jurisdictions. As a result, the capitalization of tax rates into land prices is likely to be more moderated as distance from the state border increases.

## **38. Nathaniel Otjen - University of Iowa**

Alexandria, PA

Major(s): English and Anthropology

Mentor(s): Barbara Eckstein

### **The Peoples' Weather Map**

The Peoples' Weather Map is a county-searchable, digital map of Iowa that displays both past and recent severe weather events that have occurred in all 99 counties across the state. The project aims to present stories that have affected Iowans in order to encourage conversations about ways to live together in these changing times while also inviting curiosity about the ways local weather fits into larger climate patterns and other peoples' stories about severe weather elsewhere in the world. Under the guidance of Professor Barbara Eckstein, much of my research has involved identifying and reaching out to people across Iowa to partner with the Peoples' Weather Map. I identified over 220 museums across the state that might be able to help with the project and mailed each of them individually and a number of interested people contacted us to help with the project. We have met with partners from across the state with skills and interests ranging from meteorology to storm chasing. Most recently, I have been working on constructing and designing stories for the Harrison County map, which has involved conducting research at the State Historical Society and also reaching out to groups/individuals within the county for assistance.

## **39. Stephanie Paape - University of Northern Iowa**

Sobieski, WI

Major(s): Biology

Mentor(s): Mark Myers

### **Ground Arthropod Abundance in Switchgrass and Diverse Prairie Agroenergy Crops**

The University of Northern Iowa's Tallgrass Prairie Center converted corn and soybean fields in the Cedar River Natural Resource Area to four mixes of perennial tallgrass prairie species. Research plots were randomly seeded with one of four treatments of native prairie vegetation including a switchgrass monoculture and a 32-species prairie mix. We studied ground arthropod abundance in Switchgrass and the 32-species prairie mix at various distances from the nearest woody edge using pitfall traps. We hypothesized that a 32-species Prairie mix would support greater numbers of ground arthropods than a Switchgrass monoculture and that ground arthropod abundance would be greater in traps set closer to a woody edge. Our results indicated little difference in arthropod abundance between the Switchgrass and Prairie plots. Arachnid captures were greater nearer to a woody edge, but catch rates of other arthropods studied did not vary with distance from a woody edge.

## **40. Dzavid Pandzic - University of Iowa**

Elkhart, IA

Major(s): Biology, Human Physiology

Mentor(s): Bryant McAllister

### **Impact of Temperature on Maintaining Alternate Chromosome Forms within *Drosophila Americana***

Change in chromosome structure is common throughout plants and animals, yet the factors that influence these changes remain mostly unknown. The McAllister lab is currently investigating the forces acting on two different chromosomal arrangements within the fruit fly *Drosophila Americana*. One of the arrangements consists of entirely unfused (isolated) chromosomes and the other form contains two chromosomes that have been fused together. Previous data has shown that the fused arrangement is predominant in the northern United States while the unfused form is more prevalent in the southern United States. One of the main differences between these regions is average seasonal temperature. Consequently, a possible explanation for the observed division throughout the United States is that warmer temperatures promote the survival of the unfused arrangement. To evaluate this claim, identical laboratory populations containing both chromosome forms were introduced into two different incubators reflecting a normal summer day for either northern or southern latitudes. These populations will be monitored for one year during which monthly samples will be collected to approximate the distribution of the arrangements within each temperature treatment. At the end of the study, we will determine the impact of summer temperature on the different chromosomal arrangements within *D. americana*.

## **41. Tyler Pecora - University of Iowa**

Long Grove, IL

Major(s): Genetics and Biotechnology

Mentor(s): Daniel Eberl

### **Hearing Colors**

Looking at structure know to cause deafness inside flies antenna can be difficult. We plan to make it easier by incorporating gene instructions to make these structures glow. This will help us see when and how the flies are going deaf.

## **42. Adiceson Peppels - University of Iowa Rachel Vasquez – University of Iowa**

Des Moines, IA / Hampshire, IL

Major(s): Psychology / Psychology

Mentor(s): Ryan LaLumiere

### **Addiction**

Abstract / / Addiction has enormous societal costs and treatment options are limited. The posterior region of the insular cortex (IC) is associated with nicotine craving and relapse in both humans and rodents. Current studies aim to determine whether the IC and the surrounding subregions regulate cocaine-seeking behavior. Rats self-administered cocaine by pressing a lever to receive liquid cocaine infusions. Extinction training followed, in which they were removed from all cocaine. After at least 8 days of extinction, relapse was modeled using a reinstatement process, in which cocaine-seeking was induced by cues, cocaine primes or cues + cocaine primes. The posterior insular cortex (PIc) and the anterior dorsal agranular insular cortex (AId) were inactivated to determine their role in reinstatement to cocaine-seeking. Inactivation of the AId potentiated cocaine prime reinstatement and reduced cued reinstatement, while inactivation of the PIc had no effect. Corticotropin-releasing factor (CRF) in the IC plays a role in drug craving and relapse and was examined in the present study. CRF1 receptor blockade in the AId reduced cued reinstatement and potentiated the cocaine-prime reinstatement. These results indicate the AId and CRF1 receptors in this region regulate cocaine-seeking and are a potential therapeutic target for cocaine addiction.



### **43. Hannah Philgreen - University of Iowa**

Cedar Rapids, IA

Major(s): International Relations, French

Mentor(s): Brian Lai

#### **Examining the Politics of US Drug Certification Policy, 1987-2011**

The goal of our research was to examine the factors that influence US drug certification policy. In order to help fight the war on drugs, this policy looks at countries that have been named as major producers and transit states for illegal drugs, giving certification to those that are seen as cooperating with US expectations and cutting off US aid to those that are not. Drawing on the literature on the role of US foreign policy interests, we suggest that countries important to US security interests and those with similar preferences as the United States are more likely to be labeled as "certified". Certification allows American allies and nations with similar preferences as the United States to avoid punishments that could otherwise be costly. Looking at all nations identified by the United States as a major producer or transit state for illegal drugs from 1987-2011, we test the effects of military aid and preference similarity on the probability of de-certification. The results of our analysis support our theoretical argument.

### **44. Lucas Pietan - University of Northern Iowa**

Waterloo, IA

Major(s): Biology-Honors Research/Pre-Prof:Medicine

Mentor(s): Jim Demastes

#### **Multiple mitochondrial genomes in a parasitic insect**

Mitochondrial DNA (mtDNA) is DNA present within the mitochondria of the cell and is passed on strictly from mother to offspring in most animals. Likewise, in most animals the mtDNA is present as a single circular molecule. There are exceptions to this and our research has demonstrated that the mtDNA in a species of chewing louse has fragmented into many smaller mini-circles of DNA. Elizabeth Rasing, a previous undergraduate researcher in our lab, demonstrated the presence of one of these smaller circles using DNA techniques. My research has focused on characterizing the structure of this mini-circle of mtDNA using standard DNA techniques such as PCR in conjunction with bacterial cloning. My research has uncovered the presence of multiple, different, copies of this mini-circle. This means that this species of insect actually has at least 4 different versions of its mtDNA genome.

## **45. Kevin Quinteros - Iowa State University**

Des Moines, IA

Major(s): Animal Ecology and Biology

Mentor(s): Fredric Janzen

### **A novel modification of the tetrapod scapula during development of turtles with shell closing systems**

The general evolutionary trend of the shoulder girdle in four-legged backboned animals (i.e. tetrapods) is characterized by the reduction of bones. The turtle's shell is perhaps the most recognizable exception to this trend. Examination of the development of two bones (episcapula and suprascapula) in the shoulder girdle among turtles of the Emydidae family that feature shell-closing systems (i.e. shell kinesis) and those that do not. Development and morphology of extant turtle species were compared to phylogenetic representative of extant tetrapod lineages. Scapula structures were analyzed for changes in cartilage and ossification composition. Our observations suggest that turtles with shell-closing systems regain the capacity to develop additional skeletal elements derived from the scapula. The suprascapula becomes a separate component of the shoulder girdle and is characterized by de novo formation of a synovial joint. We hypothesize that plasticity in bone development promotes the evolution of novel skeletal arrangements in tetrapods.

## **46. Anna Rogers - Iowa State University**

Lake Mills, IA

Major(s): Genetics and Statistics

Mentor(s): Michael Muszynski

### **Analysis of the maize cytokinin receptor *Zea mays* Histidine Kinase 1 function using *Saccharomyces cerevisiae***

Cytokinins (CK) regulate a diverse assortment of processes in plants. Response to CK is regulated through a two-component signal transduction system consisting of a receptor and a response regulator. Our analysis of the semi-dominant, leaf patterning maize mutant Hairy Sheath Frayed1 (Hsf1) identified the maize CK receptor *Zea mays* Histidine Kinase1 (ZmHK1) as the underlying gene. Missense mutations in the CK binding domain of ZmHK1 increase ligand binding affinity, resulting in CK hypersignaling. We are using a two-component signaling assay in *Saccharomyces cerevisiae* to understand the relationship between these amino acid changes and altered ZmHK1 activity. We have assayed the three independent Hsf1 alleles (Hsf1-1595, Hsf1-1603, and Hsf1-AEWL) using the yeast system and found some signal in the absence of added CK. We are making additional targeted amino acid changes near the CK binding domain in ZmHK1 to determine which residues are critical for ligand recognition, binding and signaling.

## **47. Sara Roth - University of Northern Iowa**

Cedar Falls, IA

Major(s): Composition-Theory

Mentor(s): Jay Edelnant

### **Mashing it up: Original and Semi-original Music for Love and Information**

In the fall of 2014, I conducted research to compose and arrange music for the University of Northern Iowa's theatre production of Love and Information by Caryl Churchill. After participating in a workshop led by the director, Jay Edelnant, I began to analyze the script to create a musical theme as a foundation for the rest of the music. I then began to work with the director to decide which pieces would be performed live or on video. After weeks of research and rehearsal, twenty different pieces were composed for the production. They were included either as scores under dialogue or as production numbers. A few pieces were arranged to include popular radio hits as well as the originally composed musical theme.

## **48. Chelsea Ryan - University of Iowa**

Naperville, IL

Major(s): Psychology

Mentor(s): Ryan LaLumiere

### **Brain Regions Involved in Memory Processes**

Brain-based disorders like post-traumatic stress disorder (PTSD) and certain phobias are important to the area of research on emotionally influenced memory consolidation. Because these processes are thought to rely on the involvement of multiple different brain regions, they require investigations into multiple points of the underlying systems. However, there is little known about what specific neural pathways are involved with various processes of memory. The present study aimed to formulate a better understanding of one pathway and its involvement in different components of a memory task (contextual fear conditioning). Investigation of these memory processes may provide a greater perspective on ways to develop treatments for various brain-based disorders as well as injuries that can affect memory.

## **49. Brett Schneider - University of Iowa**

Spring Grove, IL

Major(s): Biology and Psychology

Mentor(s): Daniel Tranel

### **Brain Regions Associated With Retrieving Conceptual Knowledge**

Producing the names of famous people, landmarks, and melodies from seeing or hearing the associated item has been associated with specific brain regions, particularly in the left temporal pole in the left temporal lobe. However, the reverse action of producing knowledge from seeing the name of the item has not been explored for unique entities. In this study, the lesion method is used to determine whether lesions (damaged areas of the brain caused by strokes, head injuries, etc.) in the left temporal pole cause deficits in this task. Participants with a wide array of lesion locations were recruited, along with a normal comparison group of healthy adults with similar demographics. The task involved producing conceptual knowledge from seeing only the name of a variety of unique items in the categories of faces and landmarks. Participants were asked to sing, hum, or tap each melody. Data collection has only just begun, and therefore no preliminary data exists to state any initial conclusions. However, we expect to find a deficit in task performance in all three categories in left temporal pole groups when compared to the other lesion participants and the normal comparison group.

## **50. Haley Stevens - University of Northern Iowa**

Denver, IA

Major(s): Biology-Honors Research

Mentor(s): Carl Thurman

### **Do Crayfish from the Same Location have Identical Patterns of Daily Activity?**

Circadian rhythms are essential for survival and existence. All aspects of life are regulated by biological clocks and the rhythms that they produce. In any habitat, resources are partitioned among species in a community based on the available spatial and temporal spectrum. Locomotor rhythms were studied in two sympatric species of crayfish, *Orconectes immunis* and *Orconectes luteus*, to compare the properties of their biological clocks. The crayfish were individually isolated under either constant illumination (LL) or 24-hr light-dark cycles (LD) where their movements were recorded over several days. As in nature, both species were nocturnal in the laboratory with peaks of activity during the dark. However, *O. luteus* expressed greater activity levels than *O. immunis* during the light phase. Both displayed a free running circadian rhythm under constant illumination. Consequently, patterns of daily locomotor activity in the crayfish are regulated by an underlying biological clock. In conclusion, the two species of *Orconectes* appear to partition the same habitat, in part, based on their different patterns of daily activity.

## **51. Celeste Underriner - University of Northern Iowa**

Saint Ansgar, IA

Major(s): Biology/Biochemistry

Mentor(s): Darrell Wiens

### **Graded Response of Dorsal Root Ganglion Neurons to Increasing Concentrations of Folic Acid**

Folic acid (FA, vitamin B9) is essential for DNA synthesis, repair, and methylation. Although needed for neural development, studies suggest linkage between excess maternal FA intake and incidence of autism spectrum disorder (ASD). This, together with brain imaging studies led to a hypothesis of developmental underconnectivity contributing to ASD. Insufficient FA early in brain development can impede neural tube closure, however, consequences of excess FA require further investigation. We studied effects of FA on developing neurons. Spinal ganglia (SG) excised from chick embryos (about to extend nerve processes, neurites) were cultured and stained to reveal synaptic vesicles. We found significant inhibitory effects of FA. It reduced neurite length and synaptic area surrounding each SG with increasing concentrations. A coenzyme form, folinic acid, was tested to determine possible bypass of the inhibition. Folinic acid didn't reduce neurite length, but if combined with FA it did. These results support the underconnectivity hypothesis.

## **52. Natalie Veldhouse - University of Iowa Wonchul (Daniel) Chung – University of Iowa**

Palo Alto, CA / Seongnam-si, South Korea

Major(s): Ethics and Public Policy

Mentor(s): Steven Hitlin

### **Who Is Important to Me (and Who Isn't)?**

We explored how people responded to the following question: "In general, who is most important to you in describing who you are?" A large sample collected from Iowa reveals most people choose work, family and religion as the most important groups in describing their identity. We were then interested in what social factors of the respondents account for the groups they chose. Correlation analysis showed that political orientation and educational attainment seem to influence what kind of groups respondents indicate are important to them.



## **53. Michelle Voelker - Iowa State University**

Ryan, IA

Major(s): Industrial and Manufacturing Systems Engineering

Mentor(s): Charles Kostelnick

### **Variations in Resume Design**

Employers and applicants have been debating the topic of resumes for years. Infographic and online resumes have been the new trend in resume design and submission, but should you go out of your way to give your resume eye-catching pizzazz? Should you clutter your resume with keywords to make it through the screening process? The objective of this study was to explore writing variation in applications for employment, specifically resumes, to identify best practices for students at Iowa State University. Three phases were used to identify best practices using three unique sample resumes including a user-based survey, usability study, and screening software review. From these three phases, the best practices were identified for resume design and content, which can be used to improve resumes for recruiting purposes.

## **54. Gabrielle Watson - University of Iowa**

Danville, IL

Major(s): Speech and Hearing Sciences

Mentor(s): Lenore Holte, Owen Van Horne

### **Determining Demographic Factors That Cause Lost to Follow-up After Newborn Hearing Screenings**

The purpose of this study is to determine demographic variables that may contribute to an increase of children lost to follow-up after a newborn hearing screening. To evaluate the performance of Iowa hospitals at screening for hearing loss and entering child into early intervention. We were able to identify the relationship between distance from residence to pediatric diagnostic audiology clinic, urban or rural residence, and maternal education level and whether a child was lost to follow-up. The hospitals evaluation was achieved counting the number of children who were lost to follow-up and who received follow-up at each hospital after being referred from a newborn hearing screening. Recording whether the child received any diagnosis of hearing loss, normal hearing, or lost contact after hearing screening gave us information on whether the child was lost to follow-up or received follow-up. Of the variables tested, distance away from pediatric diagnostic audiology clinic and lower maternal education level were significantly associated with children who were lost to follow-up. Results suggests more targeted training for audiologists/health and more caregiver information materials written at a level appropriate for all education levels as possible solutions for decreasing the amount of children lost to follow-up.



## **55. Angela Weepie - University of Northern Iowa**

Fairbank, IA

Major(s): Chemistry

Mentor(s): Joshua Sebree

### **Exploring Titan's Atmospheric Chemistry Through Laboratory Simulations**

Saturn's moon Titan has a unique atmosphere that is rich in organic chemistry. Chemically, this deep freeze world resembles a pre-biotic Earth. Laboratory simulations of Titan's atmosphere have the potential to provide insight on the chemical processes occurring in Titan's present-day atmosphere and that of early Earth. Various mixtures of gases present in Titan's atmosphere were exposed to ultraviolet light in a laboratory chamber. The resulting aerosols were collected on a filter for further processing. The presence of polycyclic aromatic hydrocarbons was indicated in laboratory chamber generated Titan analog aerosols by near infrared spectroscopy. Near and mid-infrared spectra of aerosol analog samples were compared to in situ data from the Cassini space craft Visual and Infrared Mapping Spectrometer (VIMS) and Composite Infrared Spectrometer (CIRS).

## **56. Rachel Winter - University of Iowa**

Naperville, IL

Major(s): Art History

Mentor(s): Julie Hochstrasser

### **Tea for Iowa: An Exhibition for All**

During this summer and fall, I have been working with Professor Julie Berger Hochstrasser doing research for the exhibition at the University of Iowa Museum of Art, "Tea Time: Going Dutch." I focused on compiling the bibliography, and then students in Professor Hochstrasser's class collaborated to write the wall texts and curate the objects. The exhibition is focused on a group of objects loaned by an alumna of the University of Iowa School of Medicine. The centerpiece is a seventeenth-century Dutch still-life painting entitled *Blue and White Teacups and a Bowl with Yixing Stoneware Teapot, a Teaspoon, and Lumps of Sugar on a Ledge* by Pieter van Roestraten. In addition, the lender shared a tea caddy and creamer featured in *Mary Cassat's Lady at the Tea Table*, and *Grant Wood's Daughters of Revolution*. The exhibition illustrates their historical context, including research on tea, the cultural and ritualistic practices involving tea and sugar, the Opium Wars, Dutch trade, Chinese Porcelain, Yixing Teapots, and the lives of the artists. All of this information will supply visitors from all across the state of Iowa with a comprehensive understanding of global tea culture through related works of art.

## **57. Christopher Winters - University of Iowa**

Oelwein, IA

Major(s): Biomedical Engineering

Mentor(s): Isabella Grumbach

### **CaMKII is Essential for the Development of Pulmonary Fibrosis**

Pulmonary fibrosis is a progressive, terminal disease for which very few treatment options exist. In pulmonary fibrosis, the programmed cell death, called apoptosis, of cells called type II alveolar pneumocytes is known to happen early on in the development in the disease. Our laboratory studies the calcium and calmodulin-dependent kinase II (CaMKII) in various disease states. Because CaMKII is known to induce programmed cell death, in this study, we investigated whether the inhibition of CaMKII would diminish apoptosis and the development of pulmonary fibrosis. To do this, we first developed a transgenic mouse which exclusively expressed an inhibitor of CaMKII in type II pneumocytes. After inducing fibrosis in these mice, and their wild-type littermates, we found that CaMKII inhibition reduced the development of pulmonary fibrosis. Next, we grew a special line of mouse type II alveolar pneumocytes (MLE-12 cells) in culture, and selectively expressed a CaMKII inhibitor using a virus. By treating normal cells with Bleomycin we were able to induce apoptosis in normal cells, while in MLE-12 cells treated with Bleomycin where CaMKII was inhibited, apoptosis was reduced. These data suggest that the inhibition of CaMKII may be a promising approach to prevent the progression of pulmonary fibrosis.

## **58. Wensday Worth - University of Iowa Devon Dawson – University of Iowa**

Ottumwa, IA / Pella, IA

Major(s): Psychology / Psychology

Mentor(s): Ryan LaLumiere, Gutman Schwager

### **Potential therapeutic target for cocaine-associated behaviors examined**

Drug-seeking and drug-taking causes problems to both individuals and society, and these behaviors can become a primary focus for addicted individuals, even at the expense of health and relationships. Understanding the neurobiological processes related to addictive-behaviors may help inform new treatments for addiction. ASIC1a are acid-sensing ion channels (ASICs) that are highly expressed in the nucleus accumbens (NAc), a brain region known to be involved in addictive behaviors. Two tasks were used to examine the role of ASIC1a in cocaine-related learning and memory: cocaine conditioned place preference (CPP) and cocaine self-administration. First, genetic manipulations were used to knockout ASIC1a in the NAc of mice, and preference for a cocaine-paired context was examined using CPP. Mice lacking ASIC1a in the NAc had a stronger preference for a cocaine-associated context, suggesting a role for ASIC1a in the NAc in cocaine-associated memory. Second, rats were trained to press a lever to self-administer cocaine into their jugular veins. Rats overexpressing ASIC1a self-administered less cocaine than control rats, suggesting a role for ASIC1a in regulating the reinforcing properties of cocaine. These results suggest that ASIC1a in the NAc is involved in the reinforcing properties of cocaine and may be a therapeutic target for cocaine addiction.

## **59. Zhipeng Ye - University of Northern Iowa**

Guangdong Shenzhen Shenzhen, China

Major(s): Physics

Mentor(s): Rui He

### **Temperature-activated layer-breathing vibrations in few-layer graphene**

In this research, we investigated the low-frequency Raman spectra of freestanding few-layer graphene (1–8 layers) at varying temperatures (400–900 K) controlled by laser heating. At high temperatures, we observed for the first time the lowest frequency Raman mode for the layer-breathing vibration. The frequency of this mode redshifts dramatically from 81  $\text{cm}^{-1}$  for bilayer to 23  $\text{cm}^{-1}$  for 8-layer. Notably, the layer-breathing mode Raman response is unobservable at room temperature, and it is turned on at higher temperature ( $>600$  K) with a steep increase of Raman intensity. The observation suggests that the layer-breathing vibration is strongly suppressed by molecules adsorbed on the graphene surface, but is activated as desorption occurs at high temperature. It also suggests that layer-breathing vibrations may be used to fabricate nano-mechanical oscillators and novel mass detectors that complement the existing gas sensors using electrical detection methods.[1]

## **60. Shumao Ye - Iowa State University**

Ames, IA

Major(s): Dietetics

Mentor(s): Manju Reddy

### **Calcein's Quenching In Vitro Method for Assessing Dietary Iron Bioavailability**

Low iron bioavailability (IBA) is a major contributor of iron deficiency anemia, a most prevalent nutritional deficiency around the world. Traditionally, IBA is measured by ferritin responses in caco-2 cells, which is cumbersome since it takes more than 24 hours and is an expensive test. Hence, our objective was to develop a high throughput method to assess food IBA. In this new method, the quenching of calcein fluorescence in caco-2 cells by food iron uptake was used as an index of IBA. Similar to human absorption, IBA was enhanced by ascorbic acid, and was reduced by bran, phytate, and tea. A high correlation was found between human absorption and the IBA we tested ( $r=0.90$ ;  $p=0.04$ ). In conclusion, our method reliably predicts human iron absorption in a more cost effective and faster manner compared to the ferritin method. However, future studies are needed for more comparisons with human studies.



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