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Undergraduate Research Forum

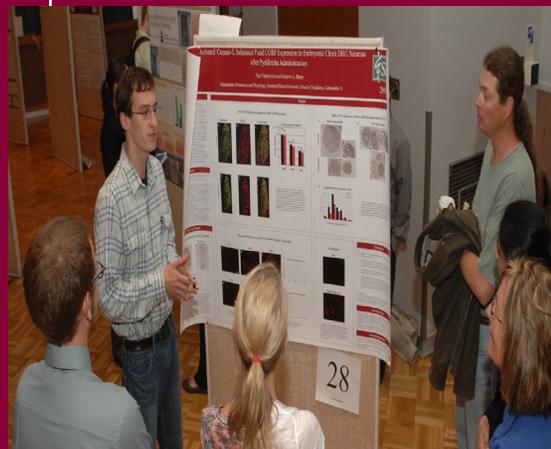
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The Undergraduate Research Forum is part of REACH (Research-Enriched Academic Challenge), a campus-wide program for undergraduates coordinated by the Office of Sponsored Projects Administration at SIU. For more information, see reach.siu.edu.

UNDERGRADUATE RESEARCH FORUM

ABSTRACTS • 2012



SIU
Southern
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University
CARBONDALE

Student Center Ballrooms
April 16, 2012
Southern Illinois University Carbondale

"Engaging in research creates new and exciting learning opportunities beyond the classroom for our undergraduate students. Research is about finding answers, and as students are learning, they also are creating new knowledge. These enriched problem-solving experiences will better prepare them to compete in the global society. The enthusiasm and dedication of our students and their faculty mentors inspire the entire campus community."

—Rita Cheng, Chancellor

"One of the great benefits of attending a research University such as SIUC is that undergraduate students who become involved in research activities work in a professional environment that also involves graduate students and faculty, and gain problem-solving experience that is prized by employers. We are very pleased to offer our students enhanced opportunities of this type through the REACH program."

—John Koropchak, Vice Chancellor for Research and Graduate Dean

"We are extremely proud of our undergraduate research programs at SIU. From first-year students to seniors, students engaged in these programs tend to succeed at a higher rate. The knowledge acquired, collaborations built, and skills developed support a positive supportive learning environment and give students an advantage in pursuit of professional careers and graduate school."

—John W. Nicklow, Provost and Vice Chancellor for Academic Affairs

Undergraduate Research Forum
April 16, 2012
Southern Illinois University Carbondale

Program

Poster Judging Sessions: 8:30 a.m. – 12:30 p.m.

Public Viewing Session: 1:00 – 3:00 p.m.

Award Presentations: 3:00 p.m.

REACH Director

Meg Martin, OSPA

Organizer

Lori Foster, OSPA

Sponsors

Office of the Provost

Office of Sponsored Projects Administration (OSPA)

SPEAR (Students Promoting Educational Advancement and Research)

Poster Judges

Frank Anderson, Zoology
Aldwin Anterola, Plant Biology
Joe Cheatwood, Anatomy
Lizette Chevalier, Civil &
Environmental Engineering
Michael Collard, Physiology
Lisabeth DiLalla,
Psychology/School of Medicine
Buffy Ellsworth, Physiology
Derek Fisher, Microbiology
Jane Geisler-Lee, Plant Biology
Matt Giblin, Criminology &
Criminal Justice
David Gibson, Plant Biology
Pam Gwaltney, University Honors
Michael Hoane, Psychology
Eric Holzmueller, Forestry
Jodi Huggenvik, Physiology
Donald Hughes, McNair Scholars
Agustín Jiménez, Zoology

Kelsy Kretschmer, Sociology
Jim MacLean, Physiology
Derek Martin, Sociology
Gabriela Perez-Alvarado,
Chemistry & Biochemistry
Kyle Plunkett, Chemistry &
Biochemistry
Jared Porter, Kinesiology
Antje Rusch, Microbiology
Rhetta Seymour, McNair
Scholars
Jane Swanson, Psychology
Robert Swenson, Architecture
Haibo Wang, Electrical &
Computer Engineering
Robin Warne, Zoology

Student Participants

Mentors

1.	Suzanne Abell-----	Peter Smith
2.	Elom Amuzu-----	Kathie Chwalisz
3.	Emily Anderson-----	Vjollca Konjufca
4.	*Megan Archer-----	Michael Lydy
5.	*Amanda Baumgartner-----	Eric Jacobs
6.	*Trey Beckerman-----	Jared Porter
7.	Emily Berglin-----	George Burruss
8.	*Alexis Bergman-----	Frank Anderson
9.	*Scott Bradfield-----	Samuel Ma
10.	*Jenny Brown-----	Aldwin Anterola
11.	Marcus Brown-----	Danielle Soto
12.	Blake Cain-----	Andrew A. Sharp
13.	Catherine Carney-----	Gabriela C. Perez-Alvarado
14.	Frank Cavender-----	Pamela Ubaldo
15.	Darlyshia Cherry-----	Rachel Griffin
16.	Karthik Chinni-----	Andrei Kolmakov
17.	Valeria Copello-----	Gabriela C. Perez-Alvarado
18.	Megan Czerniejewski-----	Mary E. Kinsel
19.	Nicholas Defreitas & Kailie Roth-----	Frank E. Anderson
20.	*Steven Ebers-----	Prema Narayan
21.	Benjamin Elliott-----	Scott E. Ishman
22.	Scott Ellis, Anisha Hawkins, Keith Burton, Jr., & Jing Goh--	Meera Komarraju & Dustin Nadler
23.	Ellen Esling-----	Leslie Duram
24.	*Yuri Fedorovich-----	Andrew A. Sharp
25.	David Foutch-----	Matt Geisler
26.	Carly Freiwald-----	Matthew Therrell
27.	*Rachel Frichtl-----	Gary Apgar
28.	Gabriel Garcia-----	Gregory V. Wilkerson
29.	Jacob Gerfen-----	Jane Geisler-Lee
30.	Sabrina Gerzel-----	Cameron Carlson
31.	Lacey Gibson-----	Dale B. Hales
32.	Keenan Gil-McQuillan-----	Lisabeth DiLalla
33.	Jason Gumbel-----	Buffy Ellsworth
34.	*Brogan Gust-----	Boyd Goodson
35.	*Derrick Haan-----	Michael Hoane
36.	An'Drea Hall-----	Danielle Soto

[cont.]

37.	Dustan Heidel-----	Harvey Henson
38.	*Jason Henry-----	Karen Renzaglia
39.	Hollis Johnson-----	Lydia Arbogast
40.	*Brock Kabat-----	Buffy Ellsworth
41.	Allison Kennington-----	Matt Whiles
42.	Austen Knapp-----	Joseph L. Cheatwood
43.	Duane Lickteig-----	Vjollca Konjufca
44.	Zachary Loconsole-----	Stephanie Dollinger
45.	*Loren Luehr-----	Sylvia Smith
46.	Nathan May-----	Clayton Nielson
47.	Christopher Michaels-----	Yu-Wei Wang
48.	Jessica Miller-----	Karen Baertsch
49.	*Caitlin Moliske-----	Jodi Huggenvik
50.	Travis Neal-----	David Gibson
51.	Crystal Newcomb-----	Sarah Buila
52.	Justin Ostrowski-----	Jared Porter
53.	JiHye Park-----	Usha Lakshmanan
54.	Michelle Patzelt-----	Cameron Carlson
55.	Ivan Perez-----	Yanna Liang
56.	*Christopher Peters-----	Matthew Therrell
57.	Madeleine Pfaff-----	Clayton Nielson & Matthew Springer
58.	Stephanie Rich-----	Jane Swanson
59.	Ruby Roknic-----	Yanna Liang
60.	Jillian Rung-----	Michael Young
61.	Carly Schrey-----	Deborah Bruns
62.	*Julie Schroeter-----	Brian Small
63.	*Lindsay Shupert-----	David Gibson
64.	Jonathan Smith-----	Robert Swenson
65.	Keegan Smith-----	Michael Lydy
66.	Nathan Smith-----	Frances Harackiewicz
67.	J. Andrew Spencer-----	Robert Spahr
68.	Anthony Steinmetz-----	John McCall
69.	*Jessica Stout-----	Joseph L. Cheatwood
70.	*Jessica Suchon-----	Judy Jordan
71.	Meghan Treece-----	Yu-Wei Wang
72.	Jacob Walker-----	James Mathias
73.	Esmeralda Zamora-----	Daryl Kroner

*Recipient of a 2011-12 Undergraduate Research/Creative Activity Award from the REACH Program

Suzanne Abell

School of Architecture

Aahana: A Study on the Sustainable House

The objective of this research project was to design a modern, comfortable, efficient and sustainable single-family house, measure its energy usage, efficiency and cost effectiveness, and compare it to that of a house constructed using typical, non-sustainable building materials and methods. Materials have been studied in three specific areas of the dwelling including the building envelope, environmental systems, and interior finishes and furnishings. The highest quality, state-of-the-art and most energy efficient materials were chosen for each aspect including roofing, wall materials, windows, flooring, heating and cooling systems, etc. After the best materials were chosen, I designed a moderately sized home located in Harrisburg, Illinois. I determined the amount of energy being used and saved, overall costs, and the long term financial benefits. A model of the sustainable house has been made for visual reference. This project has helped me to further my understanding of modern advancements in architectural design and system technology with a focus on “Green Engineering” technologies and standards. It has also greatly enhanced my ability to design spaces with specific goals in mind. Overall, this project has boosted my understanding of architecture, my own identity and proclivities as a designer, and which of the many paths my architectural vision may take.

Louis Stokes Alliance for Minority Participation

SIUC is a member of the Illinois Louis Stokes Alliance for Minority Participation, a statewide coalition dedicated to increasing the number of underrepresented minority students in science, mathematics, and engineering. Funded by the National Science Foundation, this program provides paid, mentored research experiences for undergraduates on campus.

More Info: www.ilsamp.siu.edu

Undergraduate Assistantships

The Undergraduate Assistantship program, coordinated through the Financial Aid Office, provides on-campus, paraprofessional employment opportunities for full-time undergraduate students with a cumulative GPA of 2.25 or higher. Students are able to work directly with a faculty member or professional-level staff member in a position related to their academic discipline or prospective career. Students are paid on a salary basis and work 10, 15, or 20 hours per week. **A high percentage of assistantships entail working with faculty on research projects,** so this is an excellent option for students interested in research.

More Info: www.undergraduateassistantship.siu.edu

Elom Amuzu and Kathie Chwalisz

Department of Psychology

The Association of Feminist Orientation and Ethnicity to Women's Perceptions of Sexist Events

Despite developments stimulated by the women's movement, sexist events continue to be pervasive, affecting 99% of American women in at least one form (Landrine & Klonoff, 1997). This study builds upon previous research and continues the examination of women's experiences related to sexist events with a focus on feminist identity styles and ethnicity. A sample of 108 women, 51 African American women and 57 European American women, ages 18 to 62, completed the Schedule of Sexist Events (Klonoff & Landrine, 1995) and the Feminist Identity Developmental Scale (Bagard & Hyde, 1991). Heightening feminist awareness was associated with increased reports of sexist events, although self-labeled feminist and non-feminists did not differ substantially in their endorsement of attitudes reflecting the various stages of feminist identity development, as hypothesized. Concerning ethnicity, African American women and European women did not differ in self-labeling as feminist or in endorsement of feminist identity attitudes. African American women reported experiencing more recent sexist events than European American women. These findings suggest that feminist identity development does not differ across ethnicities, but feminist orientation, and perhaps ethnic identity, will heighten awareness of sexist events.

Emily Anderson and Vjollca Konjufca

Department of Microbiology

Capture of blood-borne Salmonella typhimurium by splenic macrophages and its transport to the white pulp for initiation of T cell responses

The spleen is an important immune organ that also functions to filter red blood cells. It has three main regions: red pulp (RP), white pulp (WP) and a bridging marginal zone (MZ). This interface of the circulatory system and immune system provides an ideal environment for elimination of blood-borne pathogens, which are captured by macrophages in the RP and the MZ. Transport of the captured pathogen from the MZ to the WP is critical for initiation of B and T cell-mediated adaptive immune responses. Both *Listeria monocytogenes* (*Listeria*) and *Salmonella typhimurium* (*Salmonella*) are intracellular pathogens and widely used models of bacterial infections. *Listeria* replicates within the host cell cytoplasm, while *Salmonella* resides in a *Salmonella*-containing vacuole (SCV) within infected host cells. Another difference between these two bacterial pathogens is that infection with *Listeria* initiates a strong T cell response, but infection with *Salmonella* does not. Our hypothesis is that the very different immune responses initiated by each pathogen are a result of their intracellular lifestyle. When administered intravenously (i.v.), *Listeria* is initially captured by cells of the MZ and within 2h, it is transported to the WP by CD11c⁺ dendritic cells (DCs). Inhibition of this transport leads to abrogation of T cell responses. We have found that *Salmonella* is not transported efficiently to the WP, even 24h after i.v. infection. However, a mutant strain of *Salmonella* ($\Delta SifA$) which replicates in the cytoplasm of the host cell is transported to the splenic WP as early as 2h post-infection. Our results suggest that host cells must sense bacteria with their cytoplasmic receptors (NLRs) in order to transport the bacteria to the T cell regions in the WP. *Salmonella* has evolved a lifestyle that enables it to “hide” in the SCV, prevent initiation of strong T cell responses, and prolong the infection.

Undergraduate Research Opportunities at SIU

REACH (Research-Enriched Academic Challenge)

This program offers competitive one-year Undergraduate Research/Creative Activity Awards to support original research, creative, or scholarly projects done with the guidance of a faculty mentor. Awards consist of \$1,500 grants combined with undergraduate assistantships of 10 hours per week. Students present project results at the Undergraduate Research Forum. For more information about the program and application materials, visit reach.siu.edu. You may also contact REACH staff in the Office of Sponsored Projects Administration in Woody Hall C-206, at 453-4540 or via email at reach@siu.edu.

Saluki Research Rookies Program

This program offers competitive provides funds on a competitive basis for high-achieving freshmen and sophomores interested in conducting research and learning more about their intended major. Working with a faculty mentor, students plan a research project in fall semester to be carried out the following spring. Students receive an initial \$150 book stipend and earn a \$250 stipend if they successfully complete the program.

More Info: srrp.siu.edu

McNair Scholars Program

This federally funded program offers graduate school preparation to students from diverse backgrounds, including first-generation college students. It provides mentoring, GRE preparation, and academic support. McNair Scholars take part in a summer research institute and present findings at a campus symposium and at conferences in their discipline.

More Info: www.mcnair.siu.edu

Megan C. Archer[†], Amanda D. Harwood[‡], Brittany Hanson[‡], and Michael J. Lydy^{†‡}

Department of Chemistry and Biochemistry[†]
Fisheries and Illinois Aquaculture Center, Department of Zoology[‡]

Applicability of sorbents to predict the bioavailability of polar pesticides

Bioavailability is an important concept in understanding toxicity. Currently, a polymer resin, Tenax TA, has been used to measure the desorption rates, which can subsequently be used to estimate bioavailability and toxicity of certain hydrophobic organic contaminants (HOCs). Although Tenax TA is useful for estimating the bioavailability of HOCs, the applicability for use with more polar compounds is unknown. This study focused on the use of sorbents to estimate the bioavailability of pesticides including some with greater polarity. Five pesticides that varied in polarity and solubility were tested including: tefluthrin, propiconazole, phostebupirim, atrazine, and chlorpyrifos. Two sorbents, Tenax TA and Diaion, were tested to see if they could successfully remove all of the compounds from water. In addition, extracting solvents were varied to see which extracting solvents yielded the best extraction efficiencies. Overall, Diaion has better potential for removing the more polar contaminants from water. Also, various extraction studies showed that the use of acetone:hexane (1:1, v:v) had better extraction efficiency for each compound. Since Diaion extracted pesticides with the largest range of polarity, optimum concentration: sorbent mass relationships were developed for this resin. Many of our streams and other water sources are being contaminated with a variety of polar pesticides, so using Diaion to estimate the bioavailability and toxicity of these compounds could be useful in environmental assessments, and these results provide preliminary information for future research using this resin.

Amanda Baumgartner

Department of Psychology

Rats Foraging in a Rapidly Changing Environment

Animals' foraging is affected by the distribution of food in the environment. Some food distributions are characterized as "patchy"—food resources occur in clumps or patches that are distributed throughout a foraging area. When foraging in a patchy environment, the animal is confronted with two choices—(1) to remain in the current patch, incurring diminishing returns as the patch is depleted, or (2) to leave the current patch and travel to a new, replenished patch, incurring a period of no intake while traveling between patches. Thus, the animal must decide when to leave the current food source to search for a richer food source. According to Charnov's Marginal Value Theorem, the foraging animal should leave the current patch when the rate of return from that patch equals the average rate of return for the environment as a whole. One factor that determines the overall rate of gain for foraging within an area is the distance between patches. When the distance between patches is short, the overall rate of return is relatively rich. When the distance between patches is long, the overall rate of return is relatively lean. Thus according to the marginal value theorem, foraging animals should remain within a patch for longer, further depleting the patch, when the distance between patches is relatively long. In the current study, the predictions of the marginal value theorem are being assessed using a laboratory analog of a patchy environment. Rats make repeated choices between two schedules of food presentation—a progressive schedule and a fixed schedule. The progressive schedule begins with a 0s delay to food, but the delay to the next food delivery arranged by the schedule increases by 4 s with each food presentation delivered by that schedule, simulating the diminishing returns incurred from foraging within a patch. The fixed schedule arranges food delivery after a delay that is held constant within sessions, but varies randomly across sessions over three values (16, 32, or 64 s). In addition to delivering food, completing the fixed schedule also resets the progressive schedule to its minimum delay of 0 s. Thus, selecting the fixed schedule is functionally analogous to leaving the current patch and traveling to a new replenished patch of food. The primary dependent measure is the point at which the subject switches from the progressive to the fixed schedule. According to the marginal value theorem, the switch points should increase as the fixed schedule value increases. That is, as the simulated travel time increases, the animal should remain within the simulated patch for a longer time before leaving for a new patch. The data, however, are still quite variable and additional exposure to the experimental contingencies will be required before the predictions can be assessed quantitatively.

What Students Say about Undergraduate Research:

"It's not somebody else's research, it's my own, which is really nice. You don't have to have somebody tell you what to focus on or what to do. It's a great opportunity to be able to put yourself in your field and get started. It's really helped me starting my career." -- Misty McElyea

"I view this project as part of a bigger effort of trying to find out how all of life is created. There may not necessarily be an immediate or obvious benefit; it's not going to cure a disease or it's not going to make anyone money. It's just one of those questions that I think people are curious about, like how does life all tie together in the end. I feel like this project will contribute to that. And, this has given me a really good opportunity to figure out if this is the major I really want to do, instead of going through four years and not getting any real lab experience and hoping that I would like it. That's really been the main benefit for me—experience and exposure to my field." -- Nicholas Defreitas

"I was a C-average student in high school, but I've blossomed at SIUC," said McNair Scholar Miranda Griffith of her undergraduate research experience.

"This opportunity to do real research as an undergraduate has enforced in me that this is indeed what I want to do with my life." -- Sara Reardon

"I have learned more from doing research than in any class I've taken. Hands-on learning stays with you much better than learning from lectures and books. Research is slow and frustrating but the rewards and excitement of discovering new scientific information are beyond anything I could have imagined. No matter what I do in life, I will always be able to use the tools of research, especially the critical-thinking and problem-solving skills that are essential for success." -- Renee Lopez-Smith

"This experience confirmed my ability to tackle a large project and to meet a deadline, but more importantly I was able to participate in something I enjoyed and also educate the public about a growing problem in our waterways." -- Matt Wegener

Esmeralda Zamora

Department of Criminology and Criminal Justice

Mental Illness in Correctional Institutions: A Look at its Effects on Institutional Behavior

Mental illness can impact how an inmate functions within a correctional facility. This study explores the effects of depression and schizophrenia on nonviolent and violent institutional behavior using data from 3,686 interviewed offenders. An offender's criminal history, as well as the recent history and symptoms of mental disorders, were included as predictors. Correlation and logistic regression analyses were used to test the overall hypothesis of mental health predicting the occurrence of institutional misconducts. Based on the results, several recommendations for practice and for future research are provided.

Trey Beckerman and Dr. Jared Porter

Department of Kinesiology

An investigation into the mechanisms of why contextual interference improves motor skill learning

The purpose of this study was to determine if practicing with gradual increases in contextual interference (CI) also facilitated the learning of a continuous motor skill that required manual tracking. We hypothesized that the group practicing with systematic increases in CI would show performance improvements during practice. We also predicted the group that practiced with increasing amounts of CI would perform significantly better on a retention and transfer test compared to participants that practiced with blocked and random scheduling. A total of 150 participants were randomly assigned to one of three groups (i.e., Blocked, Increasing, Random). Participants in each group followed their respective practice schedules. The level of CI was modified by varying revolutions per minute (RPM) on a rotary pursuit tracker. Participants in each group performed 36 practice trials of the rotary pursuit task using the circle template. After a 24-hour period, each participant returned and completed a 12 trial retention and transfer test. Practice data were analyzed using a 3 (condition) X 12 (trial block) analysis of variance (ANOVA) with repeated measures on the last factor. The results of this analysis indicated that all three groups improved performance during practice. The ANOVA also indicated the Blocked and Increasing groups were significantly better than the Random group during practice. Retention and transfer tests were analyzed with separate univariate ANOVAs. Retention test results revealed the Increasing and Random groups were better than the Blocked group; additionally, the Increasing group was better than the Random group. Similarly, the Increasing group was better than the Random and Blocked groups on the transfer test. The findings of this study are consistent with previous research. Moreover, the results presented here indicate the benefits of practicing with gradual increases in CI generalize to a continuous motor skill that requires manual tracking.

Emily Berglin

Department of Criminology and Criminal Justice

Media Viewership and Opinions of Torture

Terrorism is a salient global phenomenon. Studies have shown that the relationship between the media and terrorism can affect public perceptions (Hoffman and Downes-Le Guin 1993), but none have specifically examined the impact of media portrayals on counter-terrorism. In the past decade, television has become “not just an opinion shaper but a policy driver”, trying to “define the range of options at a government’s disposal or to interpret likely public reaction.” (Hoffman 2006, p. 191)

Deciding which methods of counter-terrorism should be implemented has been extremely controversial. Media’s depiction of counter-terrorism tactics, however non-realistic they may be, may play an important role in how the general population feels toward certain methods and which government policies they are willing to support, or reject. According to Gerbner’s cultivation hypothesis, violence in the media has enormous effects on the value and opinion forming process of an individual. (Gerbner and Gross 2006) These issues are most salient in democratic systems, such as ours, that rely on public support for the maintenance of public policy.

This project used an experimental design to assess people’s opinions about specific counter-terrorism practices using media portrayals of simulated counter-terrorism as the experimental treatments. Other factors, including gender, political views, age, and media viewership, were also taken into account for separate analysis.

Jacob Walker

Department of Electrical and Computer Engineering

Solar Solutions for University Housing

Solar energy is a form of alternative energy that has been utilized in recent decades to help meet the increasingly larger global demands for energy. Aden Meinel, a notable astronomer, once said solar energy is being recognized as a most promising renewable energy source with the potential to meet a significant portion of future world energy demands. Currently, solar energy is changing to make it more affordable and useful on a national level. Companies are making steady progress in energy transforming technologies that both advance the human race as well as preserve the planet. Recently homes across the world are starting to use solar panels to help decrease utility costs; however, these systems are expensive and can only be used when the weather permits.

My project involves determining the viability of such a system being put into place for university housing on campus, specifically Thompson Point. My reason for choosing this project is because I feel that my life as an engineer will be dedicated towards advancing alternative energy solutions, specifically solar energy. I will, of course, have to use research to find the many different variables associated with working with a photovoltaic system. Researching into the different types of systems, weather patterns, and other statistics will help me learn the certain roadblocks that are inherent in solar systems. This project will help me develop a deeper understanding of the research process as well as what engineering is as a profession.

Meghan Treece, Yu-Wei Wang, Christopher Michaels, & Danielle Fetty

Department of Psychology

Impact of Military Sexual Assault, Coping, and Self-Concealment on Student Veterans' Adjustment

Many veterans are returning to school, but relatively little is known about what supports they need to succeed and complete their education (Black, Westwood, & Sorsdal, 2007). A number of veterans experience symptoms of Post Traumatic Stress Disorder (PTSD) and military sexual trauma (Yaeger, Himmelfarb, Cammack, & Mintz, 2006), but the association between the two has yet to be studied in the student veteran population. Also, little is known about how the student veterans' coping styles and self-concealment tendency may affect their levels of PTSD, suicidal ideation, and satisfaction with life. Therefore, this study aims to investigate how military sexual trauma, coping styles, self-concealment tendency may affect student veterans' psychosocial adjustment levels.

Participants consisted of 181 student veterans from 18 states (74.6% males, 25.4% females; age mean = 30.86 years). The majority of participants identified as White Americans (76.2%), undergraduate students (75.7%), and students attending a state university (55.8%). About 69.6% of participants were deployed to a combat zone, and 60.2% were stationed in Afghanistan or Iraq. The online survey consists of the following measures: Demographics Questionnaire, Koss Sexual Experience Survey: Revised (Koss et al., 2007), the Problem Solving subscale from the Trauma Resilience Scale (Madsen & Abell, 2010), Self-Concealment Scale (Larson & Chastain, 1990), Post-traumatic Stress Disorder Checklist (Weathers et al., 1993), Suicidal Ideation Scale (Rudd, 1989), and the Satisfaction with Life Scale (Diener et al., 1985).

Three hierarchical regression analyses were performed to examine our hypotheses. Results indicated that PTSD symptoms and life satisfaction were significantly predicted by problem-solving and self-concealment, but not by military sexual assault. Suicidal ideation is significantly predicted by military sexual assault, problem solving, and self-concealment. Based on these results, university personnel, psychologists, and counselors should consider implementing programs to help student veterans adopt positive coping strategies to address their unique concerns.

Alexis Bergman and Frank Anderson

Department of Zoology

*Phylogeography of *Sepioteuthis lessoniana* (the bigfin reef squid) and *Uroteuthis duvauceli* (the Indian squid)*

Sepioteuthis lessoniana (the bigfin reef squid) and *Uroteuthis duvauceli* (the Indian squid) are two squid species found in largely overlapping regions in the Indian and Pacific Oceans. While both squids are important to fisheries throughout their ranges, very little taxonomic work has been done on either of them. Previous studies have led scientists to believe that *S. lessoniana* is actually a species complex (for example, there appear to be three species of “*S. lessoniana*” in Japanese waters alone). The similarly broad geographic range of *U. duvauceli* suggests that this species could also harbor substantial cryptic genetic diversity. In order to evaluate genetic variation within these two species, regions of two mitochondrial genes—the large subunit ribosomal RNA gene (16S) and the cytochrome oxidase I gene (COI)—from specimens caught in regions throughout the northern Indian and western Pacific Oceans were sequenced and compared. Sequences were obtained by extracting the DNA from tissue samples of both species, amplifying the DNA using the polymerase chain reaction (PCR), determining the sequences of both DNA strands using an automated DNA sequencer, and comparing sequences to one another to establish similarities and differences between geographic locations. To expand the significance of this study, we compared our sequences to data contributed by a collaborator and data downloaded from GenBank (an online genetic database). Phylogeographic analyses showed that *Sepioteuthis lessoniana* from southern India represent two very distinct genetic lineages, suggesting that “*S. lessoniana*” comprises at least two cryptic species in south Indian waters. For *Uroteuthis duvauceli*, specimens from Iran are genetically distinct from those in Thailand and Japan, which may support the hypothesis of several undescribed species within “*Uroteuthis duvauceli*.” This study is the first attempt to assess genetic diversity across the ranges of these two species; future work will require additional genetic markers and (most importantly) additional sampling from other geographic regions.

Scott Bradfield², Samuel Ma¹, Stephen Ebbs²

Department of Civil and Environmental Engineering¹; Department of Plant Biology²

Chronic Effects of Engineered Silver Nanoparticles on Glycine max

The usage of engineered silver nanoparticles has greatly increased recently. They are currently being used in over 250 products for their antimicrobial activity such as shampoo, soap, toothpaste, and clothing. Through the use of these products, silver nanoparticles are being released into the environment. Research has already shown that plants are able to uptake silver nanoparticles, and high concentrations of nanoparticles have a negative effect on plants. This is extremely concerning because plants are an essential base of all ecosystems, not to mention a staple of the human diet. However, the chronic effect of silver nanoparticles at environmentally relevant concentrations has not been explored. This experiment exposed soybeans to silver nanoparticles with two coating materials at 200µg/L to determine if nanoparticles at this low concentration may have a negative long term effect on plants. Soybeans were chosen for this experiment because of their agricultural importance due to their high protein. The plants were tested for physical effects by analyzing transpiration rates and relative chlorophyll levels, but there was no effects seen in these areas. More analysis, including the biomass, number of root nodules per plant, silver content within the plants, and seed composition, will be conducted. Since soybeans are largely grown for their high protein content, any effects of silver nanoparticles on the composition of the seed's protein and lipid content will provide valuable information.

Jessica Lynn Suchon

Department of English

Damp Beneath My Tongue - A Poetic Study of Domestic Violence

Statistically, one out of every four women in the United States will be physically, sexually, or emotionally abused. My goal with this project was to breathe life into that statistic and give people something to help them realize the impact that domestic violence has on a human being, while also educating myself about the publishing process.

I began this process by reading nearly one hundred published collections of poetry, as well as speaking with victims of abusive relationships. I learned a great deal about the publishing process through my work as Junior Co-Editor of Grassroots Magazine, with the help of English Department faculty members John Tribble and Allison Joseph, as well as from the Grassroots Editor in Chief, Crystal McDaniels.

For this project, I had to focus more intently on my writing than ever before, spending up to twenty hours on an individual poem in an attempt to really capture the psychological complexities of surviving domestic violence. I experimented greatly with trying to bring a character to life so that a reader would be able to see, or even experience through the writing, the emotional conflicts of being involved in an abusive relationship. My mentor, Judy Jordan was a huge influence on my writing, always pushing me to find the right words. Her advice as a poet was completely invaluable to me this past year.

I have designed a chapbook of approximately 45 pages, containing about twenty poems centered on a story of domestic abuse. Three of my poems: "What Did or Did Not Happen," "Eulogy for the Southbound Monarchs," and "Lament for Chicago for December" have been accepted for publication in Bowling Green State University's literary magazine *Prairie Margins*. My poem "When you glimpse his hand, the heel of his shoe" won first prize in the Roxana Rivera Memorial Poetry Competition" and my poem "The Anatomy of Guilt" took third prize.

J.M. Stout^{1,2}, D.G. Wallace³, and J.L. Cheatwood^{1,2}

Southern Illinois University School of Medicine, Department of Anatomy¹ and CIR-CNS²; Northern Illinois University, Department of Psychology³

Effects of daidzein on post-stroke injury and recovery of function in the rat

Treatments to reduce negative behavioral outcomes associated with stroke and/or to improve functional recovery after injury are needed. A recent study from our laboratory demonstrated the ability of a soy protein-based diet to decrease the severity of post-stroke behavioral deficits when provided before the onset of stroke. One potential contributor to the observed effects is daidzein, a bioactive isoflavone found in soy foods. In the current study, we aimed to determine the effectiveness of daidzein as a post-stroke treatment and its ability to produce protective effects in the brain which may lead to enhanced behavioral recovery after stroke. To test this hypothesis, young adult male rats underwent a middle cerebral artery occlusion (MCAO) to produce a stroke lesion. Immediately after the MCAO procedure, rats were treated with either daidzein or vehicle via subcutaneous osmotic minipumps. Forelimb function was assessed using the skilled ladder rung walking task to determine post-stroke behavioral effects and to gauge functional recovery in all groups. In addition, gross locomotor performance was analyzed using the accelerating rotarod walking task. No significant difference was detected in rotarod performance between groups, although a possible trend was noted. Analyses of stroke lesion volume and skilled ladder rung walking data are ongoing.

Jenny Brown and Dr. Anterola

Department of Plant Biology

Cloning of Genes Involved in Biosynthesis of Anticancer Compounds in Woad

The goal of this research is to clone four cytochrome P450 genes and express them in *E. coli* to see if any of these genes encode the enzyme required to oxygenate indole into indoxyl, which is a precursor to indirubin. Indirubin is an anti-cancer agent found in woad (*Isatis tinctoria*), a component of Chinese herbal remedies. A plant enzyme capable of adding oxygen to indole is found in corn, although the product of the enzyme is indolin-2-one instead of indoxyl. This corn gene encodes a cytochrome P450 dependent monooxygenase, which is an enzyme known to catalyze oxygenation reactions. Using unpublished expressed sequence tag (EST) data, we found four genes in woad which are similar to the corn gene. These genes were amplified by reverse transcriptase polymerase chain reaction (RT-PCR) and the products cloned into an expression vector (pET101). For functional heterologous expression in bacteria, plant P450s usually require an N-terminal tag to ensure that they are targeted to the membrane, so the first gene was modified at the N-terminal region, and coexpressed in *E. coli* with a P450 reductase gene, which is also required for P450s to function. The P450 gene that oxygenates indole into indoxyl is expected to turn *E. coli* blue, since indoxyl spontaneously forms indigo. However, no color change in *E. coli* was observed, indicating that this gene does not encode the enzyme responsible for the oxygenation of indole into indoxyl. The other three genes have not been successfully modified at the N-terminal region, so an alternative approach to its expression is being pursued.

Marcus Brown

School of Social Work

Attitudes and Ethical Concerns regarding E-Therapy

The purpose of this study was to examine attitudes and ethical concerns among counseling practitioners and students in the social work graduate program regarding e-therapy, a new service delivery method. This study addressed four major ethical concerns that current or future practitioners have about e-therapy: informed consent, privacy, confidentiality, and their views about the perceived limitations of e-therapy. The study included surveying 70 practitioners and students. Of those surveyed, 45 participated by returning the completed survey (64%). Analysis further distinguished between those who self-reported as competent and those who self-reported as not competent to conduct e-therapy. The study findings were a comparison of attitudes and concerns regarding conducting e-therapy using Email, Real Time Video, and Live Chat which fills the gap in the current literature. Recommendations include training current and future practitioners to conduct e-therapy.

Anthony Steinmetz

Department of Anthropology

Hydraulic Fracturing: an Anthropological Approach to Understanding Fracking in the United States

Recently, fracking has come under scrutiny by concerned citizens, communities and politicians all over the United States. Fracking, which is short for hydraulic fracturing, is a technique developed in the 1940's, by the Halliburton Corporation, as a way to obtain natural gas and oil deposits deep below the Earth's surface. The cause for recent concern is due to alarming levels of toxic chemicals being discovered in drinking water and in the atmosphere surrounding communities in proximity of fracking sites. Subsequently, citizens believe the fracking technique is causing the rise in pollution within areas close to drilling wells. However, corporations that perform the technique deny any hazardous effects caused by hydraulic fracturing and assert that fracking is safe. Therein lays the anthropological issue. In this research project, the debate over the use of fracking and its possible harm to the environment has opened discourse between the supporting and opposing viewpoints, and this paper intends to explore the discursive gap between the motivations and sentiments that drive each side's perception on the issue of fracking.

Joseph Andrew Spencer

Department of Cinema and Photography

Sand Paintings of the Navajo Indians

In today's world of shifting values in response to globalization, a collapsing world economy, and rampant consumerism, my faculty mentor, Robert Spahr, is investigating the sand painting ceremony of the Navajo Indians and the sand mandalas of Tibetan Buddhism, looking for similarities in their creative practice regarding attitudes towards temporality, permanence, ritual, creativity, and the sacred, as well as looking to discover what spiritually our culture and art has long since lost. He will apply this to his current art practice that consists of writing automated computer programs that harvest images and text from selected online sources, remixing them into collage and short videos. Once Robert Spahr and I collect enough research and information, we will consider the sand paintings as a literal and symbolic act of transformation and apply those ideas to Mr. Spahr's own art practice. We will be taking the negative of the mainstream media, and attempting to transform the profane into the sacred with the goal of producing real and meaningful change.

Blake Cain and Andrew A. Sharp

Department of Anatomy, School of Medicine

Sensorimotor Integration in the Embryonic Chick: A Kinematic and Force Analysis of Movement

Early in embryonic development, the neural circuits utilized for sensorimotor output and motility are established; however, it is not clear when animals start to use this information to modulate their movement. Since embryonic chickens are readily accessible and available for manipulation (being that they develop completely *in ovo* rather than *in utero*), they make perfect candidates for behavioral and neural experimentation. Embryos start to finalize the circuitry needed for movement around embryonic day seven (E7). Around E7.5, the neurons needed for sensory feedback and motor output regulation start making synaptic connections to the spinal cord. While data from our lab indicate that embryos are using some sensory feedback information at E9, it is not clear exactly when chicks start to use sensory information to modulate motor output and control movement. It was hypothesized that the E8 embryo would use sensory feedback to modulate its movement. To test this hypothesis, leg movements of E8 embryos were partially obstructed with a force probe and synchronous video and force measurements were recorded. Kinematic analysis coupled with force analysis is used in the final determination for sensory modulation. We are currently implementing a new two-dimensional force analysis process. An understanding of when sensory feedback begins to modulate motility will inform future mechanistic studies on sensorimotor development. Final data analysis of these data is currently being conducted.

C. A. Carney¹, B. C. Hilburn¹, R. C. Weber¹, P. Van Hoveln¹, K. H. Cho², B. M. Lee¹ and G. C. Pérez-Alvarado¹

Department of Chemistry and Biochemistry¹; Department of Microbiology²

Characterization of the metal-dependent catalytic activity of the HD phosphohydrolase domain in the conserved virulence factor A

Our studies involve the structural characterization of the HD domain present in the conserved virulence factor protein, CvfA, from *Streptococcus pyogenes*. The CvfA protein contains four conserved structural domains: a transmembrane helix, a coiled coil domain, an RNA recognition domain (KH domain) and a hydrolase HD domain. HD domains from other organisms present low sequence homology and conserved global folds with subtle structural differences in the catalytic site associated with their substrate specificity. HD domains utilize different metal-cofactors that control their catalytic function. We are studying proteins that contain the HD domain and both the HD and KH domains to characterize the effects of RNA-recognition on the catalytic activity and vice versa. Previous studies using proteins with N- and C-terminal extensions beyond the HD domain resulted in poor soluble expression in *E. coli* with most of the protein accumulating in inclusion bodies. Also, nuclear magnetic resonance (NMR) spectroscopy data indicated aggregation and improperly folded proteins after refolding trials. These proteins were then expressed with an N-terminal maltose-binding protein (MBP) solubility-tag that improved their soluble expression. A protein containing the KH and HD domains is being purified for kinetics studies to characterize the substrate specificity of CvfA. Preliminary continuous-scan kinetic assays using a protein containing only the conserved core-catalytic region of CvfA revealed fast kinetics, as well as phosphohydrolase and phosphodiesterase activities. These kinetics studies allowed us to optimize the assay conditions to be used for the metal-dependent and substrate specificity characterization of the different HD and KH-HD proteins.

Nathan L. Smith

Department of Electrical and Computer Engineering

Ultra-Wide Band Printed Dipole Antenna

Printed antennas are widely applied in industry today due to the fact that they are usually very small and are essentially two dimensional. This is very beneficial to airplanes and spacecraft as the antenna can be mounted on the exterior and has little to no effect on aerodynamics. Mobile communication devices are another common application of this type of antenna. Here, a unique geometry is applied to create a patch antenna with an Ultra-Wide Bandwidth (>500MHz or 20% of Center Frequency). The theory behind the research is that the curves of the printed poles of the antenna allow more paths for the current to take. In return, this creates a more correct length for more frequencies for the antenna to generate a signal for those frequencies through the air. This is why the antenna is believed to have a wider bandwidth.

Keegan T. Smith[†], Amanda D. Harwood[‡], Warren Hanson[‡], and Michael J. Lydy^{†‡}

Fisheries and Aquaculture Center[†]; Department of Zoology[‡]

Effect of life stage on relative sensitivity of three aquatic invertebrates to bifenthrin

Pyrethroid insecticides have been detected in urban and agricultural systems at levels lethal to *Hyalella azteca* in California, Illinois, and Texas. Previous studies have determined bifenthrin to be highly toxic to several species of aquatic invertebrates. Standard laboratory toxicity tests typically use a single life stage; however, due to the potential influence of life stage on sensitivity, it is important to know the relative sensitivity of other life stages. The objective of this study was to determine the toxicity of bifenthrin to three aquatic invertebrates: *Chironomus dilutus*, *Hyalella azteca* and *Hexagenia limbata* at various life stages. Bifenthrin is a major concern because it is one of the most toxic and prevalent pyrethroids in urban systems in the United States. Acute mortality as well as sub-lethal endpoints including growth and immobilization were evaluated. Standard 10-d sediment toxicity bioassays were used to evaluate the effects of bifenthrin on mortality, immobilization, and growth. Earlier life stages were more sensitive than later life stages and *Hyalella* were the most sensitive species tested followed by *Hexagenia* and *Chironomus*. Therefore, it is important to consider the relative sensitivity of different life stages and species when assessing bifenthrin's toxicity in aquatic systems.

Frank Cavender and Pamela Ubaldo

Department of Chemistry and Biochemistry

Toxicity of Silver Nanoparticles in Human Liver Cells

As technology and engineering of silver nanoparticles increase at a rapid rate, studies about the adverse effects struggle to keep up. Nanoparticles are a flagship of the technology boom, being implemented in several different industries over the past few years including: electronics, optics, medicine, textiles, cosmetics, and water treatment. Silver nanoparticles have long been known for their antibacterial properties, making them useful in biotechnology, bioengineering, and surgical applications, as well as topical ointments and wound dressings, making the presence of nanoparticles more frequent in daily life. However, the rapid increase in use of the particles causes concern, as their toxic effects on human health are not fully understood. Increased contact with silver nanoparticles may cause a health risk for some, and may have severe repercussions if they are not fully investigated. By researching the interactions of 10 nm silver nanoparticles, suspended in a citrate stabilizer, in HepG2 cells, the toxicological effects can be measured. An H2DCFDA Assay normalized by a BCA Protein Assay was used to observe the harmful effects of the silver nanoparticles. Additionally, cell viability tests were run to determine the baseline concentration of cells, as well as harmful effects of the nanoparticles. After the tests were performed, the results showed that cell viability decreased sharply as the concentration of silver nanoparticles increased to 1.5 ppm. The LD50 of the silver nanoparticles was at 3.0 ppm. This information points towards the nanoparticles as a toxic substance, which increases the presence of reactive oxygen species in the HepG2 cells, and should be monitored strictly.

Darlyshia Cherry

Department of Speech Communication

There is No Rainbow for a Colored Girl: A Media Critique on the Misrepresentation of Black Women in For Colored Girls from a Black Feminist Standpoint

Black women have been misrepresented and misunderstood throughout history. From house maids to CEOs of companies, Black women find it difficult to progress with negative stereotypical assumptions following their every move (Littlefield, 2008). The way that media portray Black women affects how they function in society and, because of this, Black women have to fight harder to gain power, status, and privilege (Collins, 2000). This paper will examine the mammy and matriarch caricatures of two Black female characters in the film For Colored Girls (2010) and how even when these characters roles are meant to be positive, they are actually very negative. The way media keeps Black women oppressed with its negative representations and consistently dehumanizing roles is beyond understanding. From my perspective, change is overdue. An analysis of For Colored Girls (2010) will inform a discussion of what can be done to more fully represent Black women in media.

Jonathan Smith

School of Architecture

Recreating the William J. Lewis, a Metropolis Built Steamboat, from Historic Photographs

For the last eight years, Professor Robert Swenson has been researching Metropolis, IL built steamboats. One of the steamboats that he has become particularly fond of is the **William J. Lewis**. This river boat was very successful and made a great deal of profit during its trips along the Missouri River. The objective of my Undergraduate Research work was to determine new techniques to recreate the **William J. Lewis** using a series of 3D modeling and drafting programs. The main difficulty of this endeavor was that the only visual aids I had to work from were two very old photographs of the steamboat.

My research started by attempting to continue developing a previous Undergraduate Assistant unfinished 3D Model of the William J. Lewis. After a great deal of study, I rendered this technique to be insufficiently accurate and decided to start from scratch. This decision required that I learn an entirely new 3D modeling program called Rhino3D. Once I developed rudimentary knowledge of the program, I began drawing the steamboat from the beginning. I used a multitude of techniques and programs in order to extract the necessary raw dimensions and proportions from the only two pictures provided. Some of these steps included a grid overlay system, screen overlay display, precedent comparisons, intuitive recreation, and a great deal of proportioning tools in Rhino3D.

The ultimate goal of my research and drafting is to provide 3-dimensional working drawings of the **William J. Lewis** and to collaborate with Professor Swenson on the text for his book to explain the techniques used for 3-dimensional graphic representation of history objects using historic photographs. This Undergraduate Research Forum poster will explain the process and the status of work to date.

Lindsay Shupert, David Gibson

Department of Plant Biology

Reproductive potential of Achyranthes japonica (Miq.) Nakai
(Japanese Chaff flower)

Achyranthes japonica (Amaranthaceae) is a non-native invasive species that is relatively new to the state of Illinois (2008) that is spreading along bottomland forests adjacent to the Ohio and Mississippi rivers. Prolific seed production and high germination rates make this species a direct threat to southern Illinois natural areas. This study explored the reproductive potential of *A. japonica* in an effort to better control and understand this problematic plant. Seed production, seed rain, seed bank density, seed viability and germination rates, growth rate, population density, and response to water stress were assessed in the field at Chestnut Hills Forest Preserve in Olmsted, IL and through greenhouse experiments. Results showed that *A. japonica* produces approximately 804 seeds per plant (i.e., approximately 9,444 seeds per m²). Number of seeds and spikes was significantly higher in creek side plants vs. upland plants. Seed rain showed an average of 56 seeds per trap. The soil seed bank produced 15 *A. japonica* plants in 8 out of 40 samples. Height and leaf number was significantly higher in plants on a daily watering regime vs. plants watered less often. The germination study showed 100% germination of *A. japonica* seeds within 13 days. The high seed production and seed viability of *A. japonica* makes this plant a formidable management challenge. However, the rapid germination rates and low density seed bank implies that seeds do not persist in soil for an extended period of time. This may allow land managers to control populations of this invasive prior to flowering or seed set without a significant amount of reemergence of the population.

Karthik Chinni

Department of Electrical and Computer Engineering

Single layer graphene multisensor array for gas analysis

We have developed the fabrication protocols and tested the performance of multi-electrode conductometric sensor arrays based on single graphene sheet. The first prototypes have been tested against ethanol, isopropanol and methanol vapors mixed with synthetic air to address the healthcare issue of detection of methanol traces in the food and beverages. The response signals of the multisensor array have been processed using artificial neural network approach showed successful gas recognition.

Valeria Copello

Department of Physiology, School of Medicine

Structural characterization of the interaction of α -actinin to LMO7 at the adherens-junctions

Our main goal is to learn how the cytoskeletal protein α -actinin interacts with the adaptor protein LMO7 and which specific domains are responsible for this interaction. LMO7 has been found to associate with α -actinin and afadin, participating in the stabilization of cell-cell adhesion cytoplasmic protein complexes.[1] LMO7 participates in the control of gene expression important for various cellular processes.[1-3] The minimal region in α -actinin that interacts with LMO7 has not yet been determined but a broader region was previously identified to the C-terminal half of α -actinin.[1] Proteins containing different domains in α -actinin, to be used in our binding-studies to LMO7, were expressed in *E. coli* and are being purified using a combination of liquid chromatographic methods. We will present the results of our characterization of α -actinin spectrin repeats 3-4 and the EF-hand domains 1-4 by gel filtration chromatography and nuclear magnetic resonance (NMR) spectroscopy.

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Julie C. Schroeter¹, Carlin Fenn², and Brian C. Small¹

Department of Animal Science, Food and Nutrition¹; Fisheries and Illinois Aquaculture Center²

Effects of Ghrelin and Gastrin-Releasing Peptide on Food Intake in Channel Catfish

The goal of this project is to determine if neuropeptides secreted from the stomach, specifically ghrelin (GHRL) and gastrin-releasing peptide (GRP), have the same effects (appetite-stimulating and appetite-inhibiting, respectively) in catfish as they do in goldfish, Atlantic cod, and Winter Flounder. This research is important for understanding the evolution of appetite regulation in vertebrates and for improving feed consumption within the catfish aquaculture industry. Twenty-eight juvenile channel catfish were stocked into four 75-L glass aquarium at seven fish per aquarium. In each aquarium, GHRL and GRP were injected intraperitoneally into individual fish at concentrations of 0.05, 0.10, 0.20 mg/kg body weight (BW), respectively. The seventh fish was the control fish for each aquarium and was injected with 1X phosphate buffered saline (PBS). Fish were allowed to recover for 30 minutes, then fed a special feed formulated to contain 0.25% of ballotini leaded-glass beads to satiety. One hour after initiation of feeding, blood was collected and stomachs x-rayed to determine feed intake. Effects of GHRL and GRP on feed intake were determined by counting the number of ballotini glass beads in the stomach and measuring stomach content. Catfish injected with GHRL consumed significantly ($P < 0.05$) less feed at the highest concentration tested, 0.20 mg/kg BW, than control fish. GRP also suppressed ($P < 0.05$) feed intake, but only at the two lower concentrations, 0.05 and 0.10 mg/kg BW, when compared to control fish. Plasma glucose levels and NPY expression in the hypothalamus were also determined.

GHRL suppressed feed intake and, thus, did not have the same effect in channel catfish as in other fish. GRP suppressed feed intake as reported for other fish. Understanding how feed intake is regulated in catfish provides insight into the evolution of appetite regulation in vertebrates and may aid in the development of aquaculture management practices towards enhanced feeding.

Carly Schrey

Department of Educational Psychology and Special Education

Perspectives from Parents with Children with a Rare Trisomy Condition

In the past, few studies have been conducted that address in-home care needs and work responsibilities of parents with a child with a rare trisomy condition such as trisomy 18. Children with rare trisomy conditions are often characterized as “incompatible with life;” however, an increasing number of children are surviving well beyond the immediate postnatal period. Daily care for these children, including bathing, dressing, and feeding, continually extends beyond the early childhood years and requires specialized training. Beyond this, parents’ work responsibilities often alter due to lack of skilled providers to supply both daily and medical care. The purpose of this study was to examine perspectives of parents with a child with a rare trisomy condition on in-home care needs and work responsibilities for themselves and their spouses. The results indicated parents feeling a responsibility to be “on call,” due to their child’s needs, which restricted their ability to meet work responsibilities. Spouses often worked outside the home to provide income for the family, but this limited their participation in caregiving. Parents repeatedly discussed availability of time to complete other in-home housework and time for themselves. The implications of this study show a need for increased awareness of children with rare trisomy conditions and their families’ needs.

Megan Czerniejewski, Stephanie Eastwood, Mary E. Kinsel and Gary R. Kinsel

Department of Chemistry and Biochemistry

Optimization of Method for Quantitation of Methimazole Concentration in Compounded Veterinary Chews

Hyperthyroidism (i.e., an overactive thyroid gland) is a disorder common in older cats. Cats suffering from hyperthyroidism undergo weight loss despite exhibiting increased appetite and food intake. Methimazole (mercaptomethylimidazole) is prescribed for the medical management of this condition. Because of its bitter taste, it is compounded into meat-based chewable tablets to improve palatability. The purpose of this research is to optimize an in-house protocol for the quantitation of the amount of methimazole in the compounded tablets. The extracts are analyzed by High Performance Liquid Chromatography (HPLC) and the isolated methimazole is detected using an ultraviolet-visible detector at 254 nm. The compound p-toluamide (molecular weight 135.16 g/mol) has been identified as an internal standard. The purpose of an internal standard is to reduce the amount of sampling error and to increase the reproducibility of results. To use p-toluamide as an internal standard, several criteria must be met. It must absorb at the same wavelength of the analyte, and must be stable under the experimental conditions. Also, an internal standard must be well resolved from the analyte in the chromatograms. All of these criteria are met for p-toluamide. Optimization of the protocol to include the p-toluamide internal standard has allowed methimazole recovery reproducibility to improve from 91.6 +/- 8.3% (without internal standard) to 95.1 +/- 2.4% (with internal standard).

Nicholas Defreitas, Kailie Roth and Frank E. Anderson

Department of Zoology

Evolutionary relationships within Polygyridae, a group of common North American forest snails

Polygyridae is a diverse group of land snails comprising 24 genera found across North America. Polygyrids are common in many habitats (particularly deciduous forests) and their primary ecological role is to act as detritivores and as prey for other organisms, including salamanders, small mammals and birds. Polygyrids have an intriguing biogeographical distribution, and they also show substantial variation in their reproductive behavior and physiology. Their evolutionary relationships have mainly been examined through a morphological lens and little work has been done from a molecular standpoint. To clarify polygyrid evolution and provide a framework for studies of historical biogeography as well as morphological and behavioral evolution, DNA was extracted from 90+ polygyrid specimens that were either collected by us or mailed from a variety of collaborators from across the U.S., ranging from the West Coast to Florida. Regions of three mitochondrial genes--cytochrome c oxidase subunit I and the large and small ribosomal subunits-- were amplified via PCR and sequenced on an automated sequencer. These sequence data were combined with data generated by our collaborators and data from previous studies. Phylogenetic trees were constructed using maximum likelihood methods for each gene and all genes combined and compared to previously published trees based on morphological characteristics. Evolution of shell shape and reproductive behavioral traits were investigated on the phylogeny for the combined data set. Recovered relationships are strongly at odds with those previously proposed based on morphological data, but suggest that similar shell shapes have evolved in at least two different polygyrid clades. Future work on polygyrid phylogeny will consist of increased taxon sampling (at the genus, species and population level) and addition of data from nuclear genes.

Jillian Rung and Dr. Michael Young

Department of Psychology

Can Video Games Teach Self Control?

Impulsivity can decrease long-term positive outcomes in many aspects of life. While people can learn the consequences of risk taking and impulsive choice through experience, these experiences can expose individuals to the negative outcomes of these risks. The proposed research examines whether an impulsivity task based on escalating interest (EI) can train participants to be self-controlled.

The EI task was first implemented as a video game. Video games are a universal form of entertainment. As such, they hold great promise both as a more engaging assessment task and as a tool for training individuals to show greater self-control. A video game environment in which people can experience less-costly consequences while learning self-control would be beneficial, especially for those who may be more susceptible to developing chronic issues that can arise from poor decision-making.

The present study examined the lasting effects of exposure to reinforcement that increased in magnitude with time in a video game implementation of the EI task. In the video game, players were instructed to eliminate all enemies in a level, and a charge bar indicated the amount of damage that their weapon could produce if fired. When weapon charge grows exponentially, it encourages participants to wait longer between shots because firing quickly decreases the damage rate and thus lengthens game play. When weapon charge increases at a fixed rate over time, there is no penalty for firing quickly. Participants initially trained under exponential growth wait significantly longer to fire their weapons than participants who were initially trained under linear growth. I hypothesized that participants who were initially trained under exponential growth would show lasting effects in the form of greater self-control when later moved to a linear growth condition where the disincentive for impulsive behavior was removed. This hypothesis was confirmed.

Ruby Roknic and Yanna Liang

Department of Civil and Environmental Engineering

Sweet Sorghum Juice for Biofuel Production through Yeast Fermentation

From oil spills in the gulf to melting ice caps to strip mining Appalachia, communities all over are being impacted by modern society's consumption of fossil fuels. The reduction in use of fossil fuels due to its environmental problems caused by groundwater contamination and surging prices for petroleum-based fuels are dramatically increasing the demand for biofuel and the interest in biofuel production in the United States. Biofuel can be produced from carbohydrates such as sugar, starch, and cellulose by fermentation using yeast or other organisms. Biofuel is one alternative to fossil fuels that is very feasible for farming communities in the Midwest where farmland is available for growing appropriate feedstock.

Sweet sorghum juice contains high concentrations of fructose, glucose, and sucrose. These sugars are excellent carbon sources for microbial growth. Among different microbial species, lipid-accumulating yeasts have attracted extensive attention during recent years. Lipids harvested from yeast cultures can be used for producing biodiesel and other advanced biofuels. In this presentation, we will describe our preliminary experimental results of yeast fermentation on concentrated sorghum juice (sorghum syrup). Growth of *Cryptococcus curvatus* on different syrup concentrations and sugar utilization profile will be reported.

Steven D. Ebers and Prema Narayan

Department of Physiology, School of Medicine

Effect of testosterone on Leydig cell development

Leydig cells (LC), specialized cells in the testes, develop during puberty and are responsible for producing testosterone. The hormones, luteinizing hormone (LH) and testosterone, are important for LC development. The secretion of LH during puberty and binding to its receptor (LHR) initiates the production of testosterone. A mutation can occur that causes the LHR to be constitutively active, causing testosterone to be produced before puberty. This mutation can cause a male to reach puberty as early as 3 or 4 years of age. A transgenic mouse, the YHR⁺ mouse, was generated which mimics the constitutively active LHR by fusing the hormone, human chorionic gonadotropin, to the LHR to continually activate the receptor and result in precocious puberty. In this mouse, testosterone levels are high at neonatal ages of 10 days and 2 weeks and have a lower number of LC than the wild type (WT) starting at 5 weeks of age. It is hypothesized that the high level of testosterone at these early ages in the YHR⁺ mice may decrease LC number. The goal of this project is to determine whether blocking the action of testosterone at neonatal ages will increase the LC number present in the YHR⁺ mice. The YHR⁺ mice were injected for 7 days with either the androgen receptor antagonist, flutamide, or vehicle control. Testes were collected, fixed and paraffin embedded. Serial sections were obtained and stained with an antibody against the LC specific marker, 3 β hydroxysteroid dehydrogenase. LCs were counted at 2, 3 and 5 weeks of age. LC numbers were not significantly different between the flutamide and vehicle treated mice at 2 or 3 weeks of age, consistent with previous studies that did not show a significant difference at these ages between the YHR⁺ and WT mice. A greater number of LCs were present in the flutamide treated YHR⁺ mice than the vehicle treated mice at 5 weeks of age, consistent with previous studies where a significant decrease in LC numbers was seen in YHR⁺ mice at this age. These data support our hypothesis that high neonatal testosterone levels affect LC development and cause a decrease in LC numbers.

Benjamin Elliott

Department of Geology

Oceanographic Changes in Barilari Bay, Western Antarctic Peninsula Inferred from Benthic Foraminiferal Records

This project analyzes benthic foraminiferal microfossils within sediments from Kasten core KC-54 to interpret the Holocene glacial history of Barilari Bay on the western margin of the Antarctic Peninsula. Foraminifera construct tests of either calcium carbonate or cemented sediment grains, depending on the species. Relative abundances of these two types of fossils gives important information on the salinity and acidity of ocean water throughout the Holocene. Abundant calcareous species indicates the presence of non-corrosive (e.g. fresh) bottom water. This fresh water comes from the calving and subsequent melting of glacial ice, corresponding to periods of lowered temperature. High abundances of agglutinated species indicate that the bottom water was too corrosive for the calcareous species. The inferred reason for the increased salinity and acidity is that there is little glacier movement, corresponding to increased temperatures.

The ice shelf and coastal glacial systems of the Antarctic Peninsula have undergone significant reductions in recent years (Vaughan et al, 2003). This research sheds light on the changes that have occurred throughout the Holocene, allowing the current reductions to be examined and analyzed with respect to past oceanographic changes. The general trend within the core is abundant agglutinated species within the top 14 cm followed by an abrupt decline, while calcareous species generally increase toward the bottom of the core. This indicates a shift in the oceanography of Barilari Bay from colder, fresher bottom water to warmer, saltier bottom water. The top 14 cm of the core are primarily populated with agglutinated species, with only one calcareous species, *Bulimina aculeate*, being common. Beginning with the 16-18 cm interval, the levels of agglutinated species plummet, and calcareous species begin increasing. *Globocassidulina* species become important components of the species counts from 20 cm downcore, in some intervals comprising half of the total number of fossils.

Stephanie Rich

Department of Psychology

The Effects of Romantic Relationships on Future Career Decision-Making

The influence of romantic relationships on career and future decision-making was examined, as well as differences by sex, current grade level, and romantic relationship status. Participants were 125 undergraduate students (70.4% female) from a large Midwestern university. The survey packet consisted of the Investment Model Scale, Commitment Scale, Career Checklist Scale, Life Role Salience Scale, and the Career Decision Making Self-Efficacy Scale, and was designed to assess the effects of romantic relationships on career and future decision-making. It was hypothesized that romantic relationships would have an influence on career and future decisions, which was supported by individuals currently in a relationship endorsing a question measuring the values, attitudes, and behaviors of the romantic partner regarding appropriate career choices, more than by individual not currently in a relationship ($p < .001$). The second hypothesis was that there would not be a sex difference in the level of influence of the romantic relationship towards career and future decisions, which was supported by finding equivalent means for men and women ($p = .465$) on the question of the values, attitudes, and behaviors of the romantic partner regarding appropriate career choices. Third, there would be a different level of influence of romantic relationships on career and future decisions by level of education, which was not supported by results on the question of the values, attitudes, and behaviors of the romantic partner regarding appropriate career choices ($p = .479$).

Madeleine Pfaff

Department of Zoology

Bait Preference of White-Tailed Deer (Odocoileus virginianus) in Central Illinois

White-tailed deer are a heavily researched species because of their importance as a game species and impact on humans. Deer biologists frequently capture deer for research and commonly use bait to attract deer to capture sites. In order to minimize cost and time, it is important that researchers use the most effective bait. I used motion-triggered cameras to compare 4 types of bait (corn, corn with a commercial attractant, apples, and a salt lick) to determine which is most attractive to deer. From 21 January- 13 March 2012, I placed 1 camera at each bait site to monitor the number of deer using the bait. Bait sites were placed within 200 meters of each other and the 4 cameras were moved to a new habitat each week. We used a two-way ANOVA looking at effects of location and bait on individual deer capture events. We found significant effects from both location ($F_{5,167} = 8.50$, $P < 0.001$) and bait type ($F_{3,167} = 16.11$, $P < 0.001$). We also found an interaction between location and bait ($F_{15, 167} = 6.51$, $P < 0.001$). Corn attracted significantly more deer than both salt and apples ($P < .001$), but did not differ from the corn with a commercial attractant ($P = 0.601$). Corn with a commercial attractant captured significantly more deer than salt ($P = 0.005$). I found no significant preference between apples and salt ($P = 0.601$). The data suggests that deer prefer corn over apples and salt licks and trapping efforts should use corn to maximize bait use by deer.

Scott Ellis, Anisha Hawkins, Keith Burton Jr., Jing Goh, Dustin R. Nadler, Dr. Meera Komarraju

Department of Psychology

Retention Differences between First Generation and Non-First Generation College Students

We tested Tinto's (1973) theory of student retention that suggests that all students need to feel integrated into the university both academically and socially, as well as have high levels of conscientiousness and degree commitment, in order to be retained. In our study, Introductory to Psychology students ($N = 284$) completed a survey regarding their feeling of integration (academic and social), support satisfaction (with faculty, advisors, and other university staff), commitment (university and degree), as well their level of conscientiousness, and demographic information. As suggested by previous research by D'Allegro and Kerns (2010), Davidson, Beck, and Milligan (2009), Ishitani (2006), Lohfink and Paulsen, (2005), and Metz, (2004), we hypothesized that non-first generation college students would report higher university commitment than first generation college students. Additionally, we expected non-first generation students to report higher levels of integration and support satisfaction. Correlation analyses and analyses of variance (ANOVA) indicated social integration, degree commitment and conscientiousness all had significant relationships with university commitment (retention). Interestingly, first generation college students ($N = 116$) reported being more committed to the university, higher levels of advisor support, and higher levels of conscientiousness than non-first generation college students ($N = 168$). Additionally, only first generation college students showed significant positive relationships between support satisfaction and university commitment. However, none of these relationships were significant for non-first generation college students. The results of this study provide strong support for previous research findings which suggest that first generation college students need to receive support from a university in order to succeed and persist.

Ellen Esling

Department of Geography and Environmental Resources

Greening the High School: An Assessment of High School Seniors' Geographic and Environmental Knowledge

The aim of the research has been to investigate Illinois State Board of Education standards for Geography and Environmental Sustainability courses in secondary level education. This was accomplished through conducting a survey to assess the current Geographical and Environmental knowledge of high school seniors. Thus far in the research, it has been found that Illinois only provides mere guidelines for the level of comprehension students should be at for each grade of elementary and secondary school. However, these are not mandated, and many students slip through their Illinois public school education without exposure to key, contemporary geographic issues.

The survey was distributed to all students in their senior year at Carbondale Community High School. The students were asked their gender, parents' level of education, whether they had taken the Advanced Placement Environmental Science class elective offered at the high school, and number of science courses students have taken throughout the course of their high school education. The evaluation was broken into three parts: Social and Environmental Concerns, Mapping, and Behavior. Social and Environmental Concerns target vocabulary, terms and systems that are directly derived from the Illinois State Board of Education guidelines. The mapping portion asks students to locate eight countries on a map. The last segment was developed to gauge student interest in international affairs, environmental concerns and personal beliefs relative to climate change and global perspective. It is anticipated that students will be lacking in their awareness of these important issues, due to the lack of required environmental curriculum.

*At this time the results are not available.

Christopher Peters

Department of Geography and Environmental Resources

*Quantitative Analysis of Annual Growth Ring Vessels in *Quercus macrocarpa* Along the Mississippi River*

A quantitative analysis of *Quercus macrocarpa* (bur oak) was conducted to determine the effects of flood events on the development of vessels present in the annual growth rings of trees. Tree core samples were taken at a site along the Mississippi River in southeastern Missouri, roughly 13 miles east of the New Madrid stream gauge and near Bird's Point Levee. Multiple cores from a variety of tree species were sampled at breast height, dried, mounted, and sanded for viewing under a microscope. From these cores, it was determined qualitatively that *Q. macrocarpa* seemed to be the species best able to record flood events as environmental signals. Using a manual linear measurement system calibrated to a tolerance of 1 μm , 10 vessels within each annual ring in a core were sampled and their widths measured. The annual growth rings chosen spanned from 1900 until 2009, following the temporal growth pattern of the tree. A total of 1087 vessels were measured and analyzed, and vessel diameter was compared to streamflow data. Years with below-mean vessel diameter seem to be related to years for which major flood events have been recorded along this region of the Mississippi River. These findings suggest the need for additional research to be done to more conclusively determine the relationship between annual growth ring vessels and flood events.

Ivan A. Perez

Department of Civil and Environmental Engineering

Optimal condition for releasing sugars from corn fiber through lime pretreatment

Since the inception of the Industrial Revolution, fossil fuels have been driving society. With the transition of the third world into the first, global energy demand has escalated dramatically. This increasing demand is primarily being met by fossil fuels. The problem, that unlimited energy demand is to be satisfied by finite fossil fuel reserves, has people scrambling to find alternative sources. In recent years, biofuels developed from cellulosic feedstocks have been recognized as one of the energy sources that are clean, renewable, and environmentally sustainable. Corn fiber, the remaining product after corn fractionation, is one example of a cellulosic feedstock. Typically, corn fiber is composed of more than 60% carbohydrates in the form of cellulose, hemicellulose, and starch. If these sugar polymers could be effectively degraded, then the released sugars could serve as excellent materials for producing ethanol, biodiesel, and other advanced biofuels depending on different pathways adopted. Thus, this presentation focuses on identifying the best pretreatment condition for breaking down the recalcitrant structure of corn fiber. Among many different pretreatment strategies, lime pretreatment was chosen due to its low cost, simplicity, and effectiveness. Sugar recoveries (mg sugars/g corn fiber) from different pretreatment conditions in terms of different lime doses and water contents will be presented in detail.

Y. Fedorovich¹ and A. A. Sharp²

Department of Physiology¹; Department of Anatomy²

Electrophysiological Characterization of Proprioceptive Neuron Loss due to Pyridoxine Overdose

Pyridoxine (vitamin B6) is an essential vitamin that is needed for proper development of the nervous system; however, studies have shown that large doses of pyridoxine cause large fiber neuropathy in adult mammals. Unfortunately, neither the mechanism nor the specificity of this lesion is well understood. The administration of NT-3, the protein growth factor of certain neurons, has been shown to prevent the loss of sensory neurons when co-administered with pyridoxine. This in turn suggests that either pyridoxine targets trkC positive neurons or that NT-3 acts as a neuro-protectant in this case. To further assay the specificity of pyridoxine lesion in chick embryo, this study used an electrophysiological approach. Previous studies done in our lab have shown a significant decrease in the number of large diameter axons in the tibialis nerve; we therefore predict that evoked activity of peripheral nerves should change due to pyridoxine administration. We hypothesized that the Ia proprioceptive neurons response peak should decrease in height or in width. The animals were incubated in a forced-air incubator at 99-100°F with 55% relative humidity. The treated group (3.75 mg/ 100 µl of physiological saline) and control group (physiological saline 100 µl) were injected through an opening made in a shell on embryonic days (E) 7 and E8. Nerves were exposed and recorded on E13. Spinal nerves, as they entered the ischiadic plexus, were stimulated with current pulse via a suction electrode. The resulting action potentials were recorded distally from the ischiadicus nerve, just before its bifurcation, with another suction electrode. The complex wave of responses from different types of neurons was recorded using pCLAMP 10.2 software. Our initial findings showed variability in responses between animals. We are currently designing a normalization process so that the effects of pyridoxine can be properly quantified.

David Foutch¹ and Matt Geisler²

Department of Mathematics¹; Department of Plant Biology²

Differential Gene Expression and the Effects of Soil pH on the Arabidopsis Plant

Bioinformatics is an emerging field that brings together the disciplines—biology, computer science, and mathematics. The goal for bioinformatics is to generate computational models of complex, dynamical biological systems. A model of sufficiently robust predictive capabilities would precisely map the output of a system to the environmental inputs. Gene promoter sequences code for the production of RNA—gene expression—in response to extracellular signaling. Gene expression is a self-regulating system that uses transcription factors, proteins, as signals. Transcription factors selectively bind to promoter regions along any given sequence of genes. However, there is a differential response to the proteins that bind to these promoter regions of genes and are the causative agent of transcription. A transcription factor may either up-regulate or down-regulate the transcription process. Because the binding of proteins to promoter regions of DNA are temporally antecedent to the production of transcription factors, the rise and fall of RNA in the cytoplasm over time can be causally related to a sequence of gene activations. Researchers have discovered that within these dynamic systems complex networks of positive and negative feedback loops emerge. Our research explores differential gene expression of the *Arabidopsis* plant with respect to levels of pH in the soil. Using the data in the Gene Expression Omnibus and provided by Strimmer (2004), we performed a series of mathematical analyses in order to isolate those genes whose differential expression was determined to be significant across a time gradient at two soil pH levels. These genes were then organized into $n \times m$ matrices and entered into R, a specialized statistical software language. An R-based program GeneNet generated directed graphs which indicate the probabilistic “direction” of the causal process and thus predicted the relationship between transcription factor production and downstream target gene relationships for a large group of genes, which is then generalized to the entire genome.

Michelle Patzelt

Department of English

Principal's Usage of Standardized Testing Data and Its Effects on Rural Schools

My research was based on the analysis of standardized test scores and how high school principals interpret the results and make changes in their schools accordingly. Working with Dr. Cameron Carlson, I will assist him in the utilization of data from one rural public high school and one rural Catholic high school. I will interview the principals from the schools to form an overarching idea of how data is used in high schools. Both schools are in rural communities and do not meet AYP standards.

The objective of this study is to gain an understanding of the processes used by principals to interpret data and implement changes in their schools to better the students' learning environment as to spark learning and overall improvement. The study will particularly be looking into the principal-agent theory and principal of decisions made. This will tie into the adaptability of the American education system through studying trends in data and the human reaction to change in a possibly unstable environment.

I hope for the overall outcome to be an understanding of the decisions principals make based on their situations. Personally, this will prepare me as a teacher in a testing based education system. On a broader scale, this could potentially affect how principals are taught at Southern Illinois University and beyond. Positive outcomes of this study could include higher test scores, higher retention rates, and possibly overall school improvement.

The study is not yet complete, and all of my results so far are simply preliminary findings, but they can be useful nonetheless.

JiHye Park and Usha Lakshmanan

Department of Psychology

Understanding the Tip-of-the-tongue phenomenon: Evidence from Korean-English bilinguals

The Tip-of-the-tongue (TOT) phenomenon is a temporary failure to retrieve a word that one is certain one knows. Studies of TOTs in bilinguals have found that bilinguals have more TOTs than monolinguals. One explanation for the bilingual disadvantage, consistent with the Blocking Hypothesis, is that bilinguals experience cross-language interference at the phonological and/or semantic levels. Another explanation, stemming from the Incomplete-Activation Hypothesis and currently gaining support, is that bilinguals use each language less frequently than monolinguals. Research on bilingual speakers of phonologically different languages is necessary for a fuller understanding of bilingual lexical retrieval processes. The current study sought to test the predictions of the reduced-frequency-of-use account by examining the L1 (Korean) TOT states of Korean-English bilinguals. Thirty (L1 dominant) Korean-English bilingual students at a Mid-Western University (age range: 18-30 years) participated in the study. They were assigned to 2 groups based on their length of residence (LOR) in the U.S. The hypothesis was that the group with a longer LOR (> 4 years; M= 6.9) would have more TOTs in their L1 compared to the group with a shorter LOR (< 4 years; M= 1.51). TOT states were experimentally induced through a picture-naming task, consisting of 50 pictures, presented in a fixed random order on a computer screen. The participants responded in Korean. The participants' responses were categorized into 5 different categories (GOT, TRUE TOT, +TOT, -TOT, DON'T KNOW). Participants also completed a language history questionnaire and rated their L1 and L2 proficiency on a 7-point scale. To examine whether the group with the longer LOR had more TOTs than the shorter LOR group, five one-way ANOVAs will be carried out with GOT, TRUE TOT, +TOT, -TOT and DON'T KNOW as the dependent variables and participant group (LOR >4 years, LOR <4 years) as the independent variable. The implications of the findings for theories of lexical retrieval in bilinguals will be discussed.

Carly Freiwald

Department of Accountancy

Revolving Green Loan Funds and Implementation at SIUC

Over the past few years revolving green loan funds have been implemented at about fifty schools all across the country to help fund sustainability projects on their campus. These green revolving funds are used to invest in sustainability projects that lower operating expenses, for example, energy bills. The savings that these projects produce then get sent back to the fund and are reinvested in additional projects. These loan funds have been incredibly helpful in furthering the sustainability goals of colleges, while also helping to save the universities money. My research included looking into how other universities are implementing these revolving loan funds, with a focus on universities in our peer group, to determine how Southern Illinois University can best implement one of these funds on our campus. I also spoke to stakeholders on campus to find out their ideas or opinions on the fund. Finally, I looked at examples of projects other universities have funded to gain insight on the best kinds of projects to fund in the future at SIU, once the loan fund is implemented. The goal of my research is to educate others on campus green loan funds and sustainability projects and to do everything possible to get a loan fund implemented on our campus.

Frichtl, R., A. AbuGhazaleh, T. Rosenthal, R. Atkinson, G. Apgar

Department of Animal Science, Food, and Nutrition

Byproducts in Finishing Pig Diets: Effect on Growth Performance and Carcass Quality

Every year tons of food wastes are disposed of in the U.S. Studies have shown that nutrients in food waste and other by-products, such as dried distiller's grains (DDG), can be effectively used by livestock. Because of the similarities between human and swine digestive tracts, pigs can utilize the nutrients in food waste. Feeding food waste does not negatively affect growth performance or carcass quality. Dried distillers grains (DDG) are used in swine diets throughout the industry. Research shows addition of DDG will not negatively impact growth performance, but will result in increased iodine value and polyunsaturated fatty acid accretion in the pork, therefore decreasing carcass quality. Therefore, studies show removing DDG from the diet at least three weeks before slaughter can reverse some of the negative carcass effects. A study was conducted to determine if supplementing cottage cheese to finisher diets containing DDGS would change the fatty acid composition of carcass fat and growth performance of the pigs. Crossbred pigs (n=48) were randomly assigned to one of four nutritionally equal treatments, corn-soybean meal diet, or CSBM + 30% DDG supplemented with either 0 or 2.22 kg/hd/d cottage cheese. Pigs were housed in a naturally ventilated confinement facility (IACUC protocol #12-003). For carcass quality analysis, two pigs per pen closest to the average pen BW (n= 12 barrows, 12 gilts) were harvested and samples from the 10th rib and jowl obtained. Growth data was analyzed using the PROC GLM procedure, and differences assessed using PDIF statements (SAS, 2011). Average daily gain, feed intake and feed conversion were not different among diet or cheese treatments ($P > 0.417$). Fatty acid composition data is currently being analyzed. Addition of cottage cheese does not impact intake or growth performance; however, it may be a method by which fat quality can be influenced.

Justin Ostrowski, Nicole Wikoff, and Dr. Jared Porter

Department of Kinesiology

Increasing an External Focus of Attention Improves Collegiate Athlete Jumping Performance

Numerous studies have demonstrated that using verbal instructions to direct a performer's attention externally (i.e., towards the effect of the movement) significantly enhances motor skill performance. Limited research has also demonstrated that increasing the distance of an external focus relative to the body magnifies the effect of an external focus of attention. The purpose of this study was to investigate the effect of increasing the distance of an external focus of attention on standing long jump performance in a highly trained population. Using a counterbalanced within-participant design, former and current collegiate male athletes (N=38) performed two standing long jumps following three different sets of verbal instructions (totaling 6 jumps; each separated by 1 minute of seated rest). One set of instructions was designed to focus attention externally near the body (EXN); another set of instructions directed attention externally to a target farther from the body (EXF); the last set of instructions served as a control condition (CON) and did not encourage a specific focus of attention. Participants were verbally instructed to focus on jumping as far past the start line as possible in the EXN condition. Participants in the EXF condition were instructed to jump as close to a distant cone as possible. In the CON condition, participants were asked to jump as far as possible. Results indicated that the EXN and EXF conditions elicited jump distances that were significantly greater than the CON condition; in addition, the EXF condition jumped significantly farther than the EXN condition. These findings suggest that increasing the distance of an external focus of attention, relative to the body, immediately improved standing long jump performance in a highly trained population.

Crystal Newcomb

School of Social Work

Substance Abuse Budget Cuts and Its Impact on Clients and Practitioners in Illinois

Funding for Substance Abuse Programs has been on a continual decline in many states across the nation, including Illinois. Treatment for substance abuse has proved to be effective and cost efficient. Non-treatment for substance abusers relates to many negative issues for the individual, their families, and the community in which they reside. This project addresses the impact diminished funding for substance abuse programs has on clients and practitioners. A conceptual evaluation of this topic involves a review of the literature, along with the participation by directors of substance abuse agencies in Southern Illinois in an online survey. Despite a low response rate from the survey, the findings of the survey reiterate what the literature portrays regarding the treatment of substance abuse. Although the survey and the literature are consistent, further research regarding this issue is necessary.

Garcia, G., GV Wilkerson, EA Scholl, AK Kennington

Department of Civil and Environmental Engineering

The Influence of Enhanced Flow on Duckweed Cover

The aim of this study is to understand the conditions by which duckweed translates downstream. Through the method of a laboratory study, we examined the mechanics of dispersing duckweed by increased flow. We conducted tests on two different structures of duckweed, isolated duckweed patches and channel spanning mats. The isolated duckweed patches react very different than channel spanning mats. Isolated duckweed patches traveled downstream at the same velocity as surface water in the channel. Channel spanning mats ~4.5 cm thick remained intact until a threshold velocity of ~0.07 m/s. At this velocity, the mats traveled downstream at approximately the same velocity as the surface water. Additional research needs to be done on Channel spanning mats.

Jacob Gerfen¹, Christin Fortis¹, Dennis Wang², Xingma Ma², Jane Geisler-Lee³

Department of Plant, Soil Science and Agricultural Systems¹;
Department of Civil and Environmental Engineering²; Department of
Plant Biology³

Chronic Effects of Gold Nanoparticles in Plants: From Seed to Seed

Gold nanoparticles (AuNPs) are a relatively new particle that has not been well-studied. The applications for these nanoparticles, on the other hand, are exponential. AuNPs have been used in a variety of scientific applications such as electron microscopy and sensors for detecting things that bind to gold. In medicine, AgNPs have been applied for things such as treatment of rheumatoid arthritis, and for localized cancer treatments. Since little research is done on AuNPs, more research is needed to determine what they do to our environment. The previous research in our laboratory showed that, in addition to toxicity due to released Ag⁺ (silver ions), silver nanoparticles (AgNPs) possibly blocked intercellular transport in plants (Geisler-Lee et al 2012). So we completed a comparative analysis that examined the effects AgNPs and AuNPs had on *Arabidopsis thaliana*. Also, chronic exposure of AgNPs still allowed plants to complete their life cycle, from seed germination to seed harvest. Thus, the hypothesis is that AuNPs of the same size would have the similar effect as AgNPs. If so, then chronic exposure of AuNPs would allow plants to grow from seed to seed. We found that on the leaves there is larger growth on the control plants than the ones that had AuNPs in them. The conclusion is that the AuNPs have a negative effect on the growth patterns. The application to this finding is that we need to watch out what we put AuNPs into.

Travis Neal

Department of Plant Biology

*Competition Study of *Achyranthes japonica* (Miq.) Nakai and *Microstegium vimineum* (Trin.) A. Camus*

Non-native invasives are species that are introduced to a new environment and they frequently cause ecological problems within otherwise functional ecosystems. One aspect of the ecology of non-native invasive that requires study is competition with other species. Through studying the competition between two co-occurring invasives, better management prescriptions can be implemented. This research examined interspecific competition between a new non-native invasive, Japanese Chaff flower (*Achyranthes japonica*), and a well-known invasive, Japanese Stiltgrass (*Microstegium vimineum*) that was undertaken in the field at Chestnut Hills Nature Preserve and experimentally in the SIUC Plant Biology greenhouse. Performance of both species was recorded in 41m² plots in the field. Plant height, seed production, slope, overhead canopy cover, and species density within each plot was recorded in fall 2011. Subsequently, a greenhouse experiment was conducted to study performance of each species when grown together or alone. Pots were established with either monocultures of five individuals of each species or mixtures with varying ratios of each species under high and low water regimes. Leaf number, height, branch number, as well as relative yield totals (per plot and per species) within three replicates of each experimental condition. Chaff flower tends to overyield when in mixed plots containing stiltgrass. Stiltgrass was shown to have reduced leaf number when compared to the stiltgrass monocultures. Overall, relative yield results suggest that chaff flower does better than stiltgrass in mixed plots regardless of soil water treatment. The field study showed that chaff produces a higher biomass in mixed plots, yet the stiltgrass monocultures are similar in biomass to the mixed plots. Further, this describes a relationship that when chaff flower is mixed with stiltgrass in the plots, chaff flower overyields in terms of biomass and number of inflorescences. Studying these species is important for several reasons. Competition in the experiment has shown that presence of stiltgrass promotes chaff flower growth. These characteristics promote success as a competitor, proving that chaff flower is an eminent threat towards biodiversity and plant populations of Southern Illinois, as well as the Ohio and Mississippi River Valleys.

Caitlin C. Moliske, Michael W. Collard, and Jodi I. Huggenvik

Department of Physiology, School of Medicine

Investigating DEAF1's Role in Apoptosis

Deformed Epidermal Autoregulatory Factor-1 (DEAF1) is a gene that has been found mutated in a variety of human tumors. Decreased DEAF1 protein levels have been correlated with poor patient outcome in cancers of the prostate and colon. DEAF1 protein displays various properties of a tumor suppressor, including enhancing BAX-mediated apoptosis. DEAF1 functions in the nucleus as a transcription factor and may have other activities in the cytoplasm. DEAF1 protein is maintained at low levels by autorepression of its own transcription in most cells, but has shown to be increased in cells exposed to genotoxic agents and in some cancer cells.

The Collard/Huggenvik lab has found that DEAF1 interacts with Ku70 and overexpression of DEAF1 enhances BAX-mediated apoptosis. Mutations in DEAF1 may affect its interaction with DEAF1 and Ku70, which, in turn, may influence the ability of Ku70 to initiate DNA repair and cell survival or enhance apoptosis. The goal of this project was to use human prostate cancer cell line (PC3), some of which overexpress wild type DEAF1 or mutated versions of DEAF1 and analyze gene expression of DEAF1, Ku70, and apoptosis-related genes p53, BAX, and p21. All data was normalized to the housekeeping gene, glyceraldehyde 3-phosphate dehydrogenase (GAPDH). Real time-quantitative polymerase chain reaction was used to quantify mRNA levels after treatment with cycloheximide, a drug that inhibits protein synthesis. Current data suggests there is significant increase in DEAF1 mRNA levels relative to the other genes. This confirms that DEAF-1 mRNA transcription is upregulated in response to reduced DEAF1 protein translation. We hypothesize that reduced DEAF1 protein levels in cancer cells are likely due to mutations that negate this autoregulation, interfere with Ku70 interaction, and/or fail to enhance apoptosis.

Sabrina Gerzel

Department of History

Character and Student Leadership

The Character and Student Leadership Project examines students in a high school setting and their views towards their role in education and extracurricular activities. The students are interviewed about how they feel about the amount of responsibility they have, their roles as leaders, their ability to be leaders, and how being a leader can influence their futures. Students in the study participated in a leadership training camp and subsequent activities that prepared them to become leaders of their school. The anticipated findings include students' perceptions of power in school decisions that affect their futures, perceptions of leadership opportunities within their school, perceptions of adult-to-student communication, and perceptions of desired responsibility. I hope to collect this data by interviewing a small sample of students and analyzing the data to relate findings that seem to be common amongst the students. I also will compare findings with studies similar to this project. The purpose will be to discover how students can become involved as leaders within their school. Conclusions from this study might provide insight into how student leadership training can assist high school students to become leaders.

Lacey Gibson and Dr. Buck Hales

Department of Physiology

Diet, Liver Health, and Ovarian Cancer

This experiment was designed to study the relationship between diet, liver health, and ovarian cancer. The primary source of data used in this experiment was the results of liver panel tests of hen serum samples tested by University of Illinois Veterinarian Diagnostic Lab. These serum samples were taken from hens of four successive age groups that were fed a control or a flaxseed-based diet, rich in omega-3 fatty acids. Results from the liver panel analysis indicate that without regard to the age of the hen, all average levels except for gamma-glutamyltransferase (GGT) pointed to higher overall liver health for flax-fed birds than for control-fed hens. On average, aspartate aminotransferase (AST), glutamate dehydrogenase (GLDH), cholesterol, and triglyceride levels were lower and albumin was slightly higher for flax-fed hens than for control-fed hens, which is indicative of a lower likelihood of liver disease. Moreover, images of liver cells of flax-fed hens stained by hematoxylin and eosin appear to have fewer liposomes than liver cells of control-fed hens, also pointing to a lower likelihood of liver disease. The results of the experiment do not show a direct link between ovarian cancer and results of liver panel tests. Hens with ovarian cancer did not necessarily have an increased likelihood of liver disease, indicated by their liver panels. Liver panel levels were more closely related to diet and age than absence or presence of cancer. However, the absence or presence of ovarian cancer is closely related to diet. Therefore, liver health is an indirect indication of cancer because liver health is a component of overall health, which is caused in large part by diet.

Jessica Miller

Department of Linguistics

Vocalic Effects on Lateral Velarization

In American English, /l/ is often described as having two allophones, light (clear) and dark (velarized,) with no gradient between the two. This paper presents a 30 speaker case study analyzing words with a syllable coda /l/, preceded by differing vowel qualities. The study analyzes the formants of /l/ in order to demonstrate a gradient of /l/, as well as an enhancement of the differences found between genders when producing this particular sound, and what consequences may develop as a result of these observations.

Christopher Michaels & Yu-Wei Wang, Ph.D.

Department of Psychology

Do Meaning-Making Processes Mediate the Relations between Religious/Spiritual Beliefs and Posttraumatic Growth in Domestic Violence Survivors?

The goal of the current study was to investigate whether meaning-making processes explained the positive association between individual religious/spiritual beliefs and posttraumatic growth in a sample of college, community, and international survivors of domestic violence. Although some studies addressed the role of meaning-making in posttraumatic growth (Park, 2005, 2010), few studies directly examined the possibility of positive growth following domestic violence (Cobb, Tedeschi, Calhoun, & Cann 2006). Seeking to expand on the existing posttraumatic growth research, we hypothesized that meaning-making processes would mediate the relations between religious/spiritual beliefs and posttraumatic growth in domestic violence survivors.

Participants were 54 domestic violence survivors from the United States (59.3% from Illinois) and Canada (3.7%), with a mean age of 30.98 years and the majority identifying as White Americans (72.2%). Most of the participants indicated a Christian religious preference (53.7%), while 38.9% of participants reported themselves as not religious, and 29.6% participants indicated that they were very spiritual. Approximately 24.1% of the participants reported moderate satisfaction with the resolution of their trauma, whereas 20.4% indicated moderate dissatisfaction with the trauma's resolution. The data were collected via an online survey, which consisted of a demographic questionnaire, the Posttraumatic Growth Inventory (Tedeschi & Calhoun, 1996), Trauma Resilience Scale (Madsen & Abell, 2010), and Meanings in Life Questionnaire (Steger et al., 2006).

A path analysis with the bootstrap approach was conducted to test the hypothesis. The hypothesis was partially supported by the study's analyses: meaning-making mediated the relation between spiritual beliefs (but not religious beliefs) and posttraumatic growth. Results indicate that spirituality (but not religious beliefs) helped domestic violence survivors achieve posttraumatic growth through meaning-making processes. These findings provide important insight into how domestic violence survivors overcome the negative effects of trauma, and yield important implications for mental health practitioners and future research on violence survivors.

Dr. Lisabeth DiLalla and Keenan Gil-McQuillan

Department of Psychology

Chewing and Consuming: Children's Food Preferences and Consumption

The heritability of food preferences may influence the emergence of disordered eating patterns. This study is one of the first to analyze children in elementary school, an age at which children become more involved in choosing their foods. For this study examining factors related to food preferences and consumption, we conducted phone interviews with 6- to 9-year-old twins and their mothers. Twenty-one families were asked how much they prefer and consume certain foods. Children's scores were compared with their mothers' and with their co-twins'. Results showed that vegetable preference for twin 1 correlates with mother's vegetable preference ($r = .55$), and vegetable preference for twin 2 correlates with mother's fruit and milk preferences (r 's = .48). In addition, pilot analyses comparing monozygotic (MZ) and dizygotic (DZ) twin correlations demonstrated much greater similarity among MZ (r 's = .52-.98) than DZ (r 's = -.49-.55) twins for food preferences, with a similar but less straightforward pattern for food consumption. This study had a small sample size, but provided an initial examination of this age group and normal eating behaviors. Results demonstrated possible genetic influences on food preferences, which may become important in terms of disordered eating behaviors as children get older. At this age, children are exposed to a world of foods outside of what their parents prefer and consume and can begin making their own choices about foods. With a larger pool of participants, these results may help us better understand how disordered eating patterns emerge.

**Jason Gumbel, Torin Hopkins, Sarah Owusu, Deborah O. Jung,
Buffy S. Ellsworth**

Department of Physiology, School of Medicine

The Role of FOXD1 in Normal Reproductive Function

The pituitary gland is important for normal growth and development. Failure of the pituitary gland to secrete two or more hormones is referred to as combined pituitary hormone deficiency. This condition is most often caused by defects in transcription factors that are required for pituitary hormone genes to be expressed. Our lab focuses on a family of transcription factors called forkhead factors. We study the role of these transcription factors using mice as a model of human disease. My main focus has been looking at the role of the forkhead transcription factor, *Foxd1*, in pituitary development and function. Previous studies have shown that loss of the *Foxd1* gene results in death within 24 hours of birth due to kidney failure. We call these mice *Foxd1* knock-outs or nulls. We study these mice at different stages of embryonic development. Loss of *Foxd1* causes a morphological defect in which the anterior lobe of the pituitary gland fails to separate from the lining of the mouth at embryonic days (e)14.5 and e16.5. *Foxd1* null embryos also exhibit significantly decreased levels of leutinizing hormone (LH) expression at e18.5. Previous studies have shown that loss the LIM homeodomain transcription factor, *Lhx3*, results in loss of LH production. Although there is a difference in expression of the gene encoding for LH in *Foxd1* null mice, the number of LHX3-containing cells is not different in ages e10.5, e11.5, e12.5, e14.5, e16.5, and e18.5.

Nathan May

Department of Forestry

Prevalence and Intensity of Parasites in Bobcats of Southern Illinois

This research was undertaken to fill a knowledge gap regarding parasite prevalence in bobcats (*Lynx rufus*) in southern Illinois. Ten bobcats collected as roadkill from the southernmost counties in Illinois were examined for internal parasites using standard necropsy procedures. Parasite specimen identification was done using standard staining and mounting procedure with use of a light microscope for hook and reproductive organ viewing. Three species of cestodes, 4 species nematodes, and 4 species of trematodes were found. Parasite intensity of nine bobcats was 1- 32 flatworms of which 3 species were identified: *Taenia rileyi*, *Taenia pisiformis*, and *Taenia pseudolaticollis*. Six bobcats contained a range of 1-46 roundworms identified as *Ancylostoma sp.*, *Molineus sp.*, *Toxocara cati* and *Toxascaris leonina*. Three bobcats contained 1-7 flukes *Alaria marciana*. These parasite numbers coincide with previous reported parasites found in other parts of the United States. Data collected during this study can be used for future comparisons in parasite host studies and for raising awareness of possible zoonotic disease transmission in the state of Illinois.

Loran Luehr and Dr. Sylvia Smith

Department of Animal Science, Food and Nutrition

The Effectiveness of Food Sustainability Education on Elementary Age Students

Increasingly, the human population is having an impact on the environment. Educating younger generations on sustainability issues may make a difference. This project's goal was to raise awareness and change attitudes toward food sustainability issues by creating an effective education program for elementary age students. The project was a four-week interactive program focusing on local foods, gardening, recycling, and world hunger. Participants included 85 elementary aged students from two local schools in southern Illinois. To determine the program effectiveness, a within-subjects, repeated measures design was utilized to compare mean scores of participants. Pre- and post-program surveys were completed regarding awareness and attitudes toward the topics taught during the program. PASW (Version 18.0) was used to analyze the data. The level of significance was established at $p < 0.05$. Results indicated that the program was more effective with fourth and eighth grade students rather than sixth grade. Both the fourth and eighth grade students had significantly higher mean scores in six areas including world hunger, composting, community supported agriculture, food impacts on the world around them, and local food. Sixth grade students had significantly higher mean scores in composting and community supported agriculture. The positive results with younger and older age groups suggest that food sustainability introduced to these ages through interactive programs can be effective at changing awareness, attitudes, and actions. The lack of positive results with sixth grade students should be researched further. Future sustainability projects should focus on finding more hands-on techniques, such as school gardening or cooking to increase student engagement. This study has shown that teaching food sustainability to elementary age students can be effective at changing attitudes and increasing knowledge. To have a lasting effect on the environment, a program like this should be implemented.

Brogan Gust and Boyd Goodson

Department of Chemistry and Biochemistry

Novel approaches in Spin-Exchange Optical Pumping: Fundamental studies and application towards the development of an open-source xenon polarizer for clinical MRI

NMR and MRI are arguably two of the most powerful techniques that scientists have at their disposal: MRI is well known for its ability to perform non-invasive 3D imaging on soft tissues, and NMR is an indispensable spectroscopic tool for probing molecular structure and dynamics with atomic resolution. However, NMR and MRI suffer from a major drawback: poor detection sensitivity, resulting from the weak magnetic response—or “polarization”—of nuclear spins. One way to increase spin polarization is called spin-exchange optical pumping, or SEOP. In SEOP, circularly polarized laser light is first absorbed by an alkali metal vapor (e.g. Rb or Cs); then, polarization may be transferred to the nuclei of chemically inert species like helium or xenon. Although limited to noble gases, the enhanced detection sensitivity can be many orders of magnitude—leading to many applications.

The purpose of our ongoing research efforts is two-fold: 1) to construct and utilize apparatus for performing fundamental SEOP studies; and 2) to contribute to our collaboration's efforts to ‘scale up’ SEOP for human-scale MRI. For (1), we will report on our efforts to construct SEOP apparatus for studying fundamental SEOP processes underlying Rb/Xe and Cs/Xe SEOP (respectively) utilizing a combination of optical electron spin resonance (ESR, for alkali metal polarization), low-field NMR (for Xe polarization), and optical Faraday rotation (to probe alkali metal density). For (2), our collaboration has built an automated Xe polarizer employing a simplified “open-source” design with mostly off-the-shelf components. Our device runs with xenon-rich gas mixtures, in part negating the usual requirement to cryo-collect the “hyperpolarized” ^{129}Xe . Now delivered to Harvard Med, we will show images obtained of the polarized gas following transfer to a MRI device with xenon polarizations exceeding 40% (signal enhancement of $>140,000$)—which should prove extremely useful for planned lung imaging experiments.

Collaborators: Panayiotis Nikolaou, Aaron Coffey, Laura Walkup, Nicholas Whiting, Iga Muradyan, Gregory D. Moroz, Matthew Rosen, Samuel Patz, Michael J. Barlow, Eduard Chekmenev

Derrick Haan

Department of Psychology

Does Post Traumatic Stress Disorder Worsen Functional Recovery after Traumatic Brain Injury?

Current military actions in the Middle East have resulted in large, significant spikes in traumatic brain injuries (TBI) and post-traumatic stress disorders (PTSD). These two conditions have become major public health issues that have no easy solutions (Wieland et al., 2010; Thurmond, et al., 2010). Currently there is little data on the relationship between TBI and PTSD. Therefore, it is unknown at this time if TBI increases the frequency at which PTSD occurs. It is also unknown if PTSD worsens the outcome of a TBI. Given that there are well established animal models for TBI and PTSD, it is possible to experimentally test these concepts. The purpose of this study is to examine the effect of PTSD exposure prior to TBI in order to assess if this exposure worsens functional recovery following TBI. It is hypothesized that exposure to the stressor that induces PTSD will worsen functional recovery following TBI. This study is an important step in understanding the neural plasticity associated with TBI and how PTSD might interact with this plasticity and functional recovery. Using a rat model, I induced PTSD 24 hours prior to TBI surgery, and then followed up with behavioral tests, including Bilateral Tactile Adhesive Removal, Foot Fault test, Morris Water Maze, Elevated Plus Maze and Open Field with Predator Scent Challenge. Data has yet to be analyzed using statistical methods, but it appears that there are some interesting interactions with PTSD and TBI.

Zachary Loconsole^{1,2}, Kathie Lorentz², & Stephanie Clancy Dollinger¹

Department of Psychology¹; University Housing²

Students Who Are Less Likely to Succeed in College and the Efficacy of LLCs

Due to the delay of approximately 80 million dollars owed to SIUC by the State of Illinois for fiscal year 2011, the issue of obtaining funding for higher education has never been more pressing. The second greatest source of funding is the student body, yet recent statistics indicate SIUC is losing more than 30 % of its freshmen incoming class every year. While it may not be possible to retain every student, research indicates that, with proper intervention programs designed to help the first-time freshmen succeed in college, retention issues can be mediated.

The Living Learning Community (LLC) program is one of several popular interventions that have been shown to have a significant, positive effect on retention at other universities. Since the pilot year of the program here at SIUC in 2001, preliminary analyses of the program have identified several years where the program appears to have a statistically significant effect on retention. Furthermore, analyses have also indicated the program also has a significant, positive effect on grade point averages during the semesters in which students are enrolled in the program.

The aim of this study is to not only examine the effects the LLC program has on retention at SIUC, but also to identify who the program helps most. For the purposes of examining within group differences, researchers have identified a group of students who, based on the measurable student outcomes (i.e., High School rank/GPA, SAT, ACT, etc.), has been operationally defined as "less likely to succeed."

Duane J. Lickteig & Vjollca Konjufca

Department of Microbiology

Uptake of Particulate Lumen Antigens by Goblet Cells of the Small Intestine

Goblet cells (GC) are a type of epithelial cell of the small intestine (SI) whose main function is secretion of mucus into the lumen. Mucus traps microorganisms and prevents their direct contact with epithelial cells, thus providing a layer of defense. Despite this, small viruses (such as Norovirus and Rotavirus) can cross the mucous layer, get in contact with epithelial cells and infect the SI. Recently it was shown that GCs can also serve as portals of entry for small soluble lumen antigens (McDole et al., 2012). In this work, we aimed to investigate whether GC also allow larger particulate antigens (such as bacterial cell debris and viruses) to enter the mucosa. As model antigens for our studies we used red fluorescent nanoparticles (NPs) of various sizes (20nm - 2µm). NPs were administered either per-orally or directly into the SI of the anesthetized mice. After NP administration, we used immunofluorescence and two-photon microscopy to visualize the uptake of NPs by GCs. We found that GCs can take up particulate antigens (20-100nm) from the lumen of the SI. Particles <50nm are taken up most efficiently. Next, we investigated the transport of the particles into the immune cells underlying the GCs. A major subset of dendritic cells (DC) displaying the cell marker CD11c⁺ were observed co-localizing with NPs that were taken up by GCs. The significance of this finding is that CD11c⁺ DCs are antigen presenting cells that function in presenting foreign antigens to T-cells in order to produce an adaptive immune response. We are currently characterizing the transport of NPs by CD11c⁺ DCs to the mesenteric lymph nodes and initiation of immune responses to NP-conjugated protein antigens. These studies are important for understanding 1) oral tolerance to food antigens; 2) pathogenesis of enteric viruses such as Norovirus; 3) development of NP-based mucosal vaccines.

An'Drea Hall

Department of Criminology and Criminal Justice

Rethinking the Effects of Absentee Fathers on African-American Female Delinquency

In recent times, there have been significant shifts in family arrangements; modern family arrangements are different than they once were, and now may range from single-parent households to extended families. Few studies have focused on how race and gender may interact with family functioning, specifically maternal attachment, to affect delinquency. The present study draws on Hirschi's social control theory to examine the relationship between family structure, maternal attachment, and delinquency, paying special attention to race and gender differences. Using the publically-available dataset from the 1995 National Longitudinal Study of Adolescent Health, this study explores the individual and combined effects of race, gender, family structure, and maternal attachment on both violent and nonviolent juvenile delinquency.

Dustan Heidel

College of Science

Assessing Students' Earthquake Knowledge and Preparedness: Past and Current Outreach Efforts

Historically, the central U.S. has experienced major earthquakes, and most experts agree that the region is at risk of a potentially dangerous earthquake. Although earthquake outreach has been going on in the area for over three decades, very few studies have attempted to assess the effectiveness of these efforts. This study, which is part of an ongoing earthquake outreach program sponsored by the *Illinois Emergency Management Agency/ Federal Emergency Management Agency*, is a brief summary of our attempts to evaluate some of these outreach efforts. Specifically, we consider the effective use of the award-winning "Suddenly on an Average Day" video which seeks to inform elementary children in the Southern Illinois region about earthquake preparedness. The awareness program involves Southern Illinois University experts visiting schools and presenting earthquake information to students. A pretest and posttest opinion survey with 21 questions and a Likert-based scale was used to collect students' and teachers' perceptions and attitudes. A 21-item content questionnaire will be administered to test students' and teachers' *General Earthquake Knowledge, Local Earthquake Knowledge, and Earthquake Preparedness Knowledge*. Data was analyzed using inferential statistical methods, such as simple t-Tests to evaluate the differences in means between paired groups and one-way analysis of variance (ANOVA) to test for significant differences between means of two or more groups. Results from past assessments were used to modify our educational interventions and improve our assessment design and instruments. Additionally, our preliminary results show that overall the educational outreach helps students become more aware and prepared for a major earthquake.

Austen Knapp and Joe Cheatwood

Department of Anatomy, School of Medicine

Effects of Daidzein on cell survival and PPAR γ expression after oxygen glucose deprivation

Occlusive stroke is a leading cause of lasting disability in humans, often resulting in persistent deficits in sensory and motor functions. There is still a need for a better treatment that will reduce cell death following injury. Therefore, it is necessary to investigate potential easily implemented lifestyle alterations aimed at improving post-stroke outcomes. Preliminary data show the isoflavone daidzein - a key bioactive component of soy-based foods - can provide neuroprotection, administered following oxygen glucose deprivation (OGD) injury in PC12 cells in vitro. However, the mechanism of action of the observed neuroprotection is unknown. The current study examined the effectiveness of daidzein as a post-stroke treatment by inspecting the mechanism through which it is neuroprotective following stroke in a cell culture model of stroke-like injury. We hypothesized that the treatment of PC12 cells with the soy isoflavone daidzein would reduce cell death and/or result in increased expression of PPAR γ at 3 days following OGD via a non-estrogenic pathway. To determine the mechanism through which daidzein is neuroprotective following stroke, PC12 cells were cultured in 12-well poly-D-Lysine-coated plates at 70% confluency. Three different groups were used: a control group that received no treatment, an OGD plus vehicle group, and OGD with the vehicle and daidzein. Cells were harvested after 72 hours and analyzed, and the effects of the above criteria were assessed. At this time, results are inconclusive and further studies are needed.

Kennington AK¹, EA Scholl¹, HM Rantala¹, MR Whiles¹, G Garcia², GV Wilkerson²

Department of Zoology¹; Department of Civil and Environmental Engineering²

Predicting Ecological Responses to a Proposed River Restoration: Influence of Enhanced Flow on Duckweed, Light Penetration, and Oxygen in an Illinois River

Alterations to the Cache River in southern Illinois have partially diverted it from the Mississippi River into the Ohio River in order to drain surrounding wetlands for timber interests. These changes divided the watershed into the Upper Cache River (UCR) and the Lower Cache River (LCR). While the UCR maintains flow throughout the year, the LCR has effectively been disconnected from its headwaters, drastically reducing its natural flow regime. Lack of flow during summer allows for the formation of a thick layer of duckweed to accumulate across the entire channel of some reaches of the LCR. The objectives of this study were to 1) examine the effects of duckweed cover in the LCR on dissolved oxygen and light penetration; 2) test for the possible presence of an oxygen refugium directly beneath the macrophyte layer due to photosynthesis by the duckweed; and 3) quantify velocity requirements necessary to remove duckweed from the system. Both dissolved oxygen and light penetration were significantly lower in areas of the LCR with 100% duckweed cover compared to areas with no cover ($P < 0.0001$). Additionally, water directly beneath duckweed mats was completely devoid of oxygen, indicating that photosynthesis by duckweed does not create an oxygen refugium. In hydraulic flume experiments, isolated duckweed patches traveled downstream at the same velocity as the surface water in the channel, whereas thick channel-spanning mats remained intact until a threshold velocity of ~ 0.07 m/s. Results indicate that while a higher initial velocity is needed to remove established duckweed mats, minimal velocity can prevent the formation of future mats. Hence, proposed restoration activities aimed at increasing discharge in the LCR may significantly enhance light penetration and dissolved oxygen levels.

Jason Henry and Dr. Karen Renzaglia

Department of Plant Biology

The role of cell wall constituents in the stomata function of vascular and non-vascular plants

Stomata are essential for two of the most important functions of photosynthetic plants: gas exchange and evapotranspiration. Both of these processes are regulated by the two guard cells that constitute each stomata. Guard cells are specialized parenchyma (living) cells that border the aperture (opening into plant tissue), and open and close the stomata on a diurnal cycle due to changes in turgor pressure. The ability to open and close the pore is directly related to specialized thickenings in the guard cell walls that, with increase in water pressure (turgidity), prevent certain parts of the wall from stretching and enable guard cells to separate, thereby forming a pore or aperture. However, not all stomata are 'functional' in this way; less-specialized bryophytes, such as mosses and hornworts, have stomata that open but do not close. While much is known about the formation, anatomy, and function of stomata in crop plants and model seed plants, no attention has been paid to the specific features of guard cells in plants with 'functional' stomata compared with those that open and never close.

My hypothesis is that the constituents of guard cell walls are different in those plants with non-functional stomata compared to stomata in plants that cycle between the open and closed condition. Aside from cellulose, commonly identified components of guard cell walls are callose and pectin, and these are the wall polysaccharides I intend to examine and compare.

The plant materials I examined were: the capsules of the moss *Polytrichum ohioense* and *Physcomitrella paten* (Pea). My model plant for stomata that open and close was Pea. I used Immunogold-labeling to examine the specimens in the TEM (Transmission Electron Microscope) to give a more precise picture of how these constituents are arranged in the cell wall. In order to view my samples using the TEM, I first put them into a resin and then mounted them on blocks so that they can be sectioned using a microtome. They were then placed on grids (200 mesh gold), treated with anti-callose, antibodies, and stained with Uranyl acetate and lead citrate. All grids were then taken to the SIUC image center for viewing.

In both images of Pea and *Polytrichum*, labeling for callose was detected. In *Polytrichum*, the labeling was found in cell walls and in the pea samples, there was abundant labeling present in the cell itself. So there is a difference in distribution of callose. However, I still need to examine *Physcomitrella* grids to further interpret the distribution of callose in the guard cells.

Hollis Johnson

Department of Physiology, School of Medicine

The effects of progesterone and testosterone on tyrosine hydroxylase promoter activity

Progesterone and testosterone are hormones with significant influence over the eventual expression of the neurotransmitter dopamine. Testosterone is an androgen found in higher levels in males, while progesterone is found more highly concentrated in females. When the hormones attach to the respective progesterone receptor or androgen receptor in the promoter region of a DNA sequence, they initiate the expression of a gene. Specifically, in this study, the influence of these hormones on the production of tyrosine hydroxylase (TH) will be determined. TH is important because it is a highly regulated enzyme responsible for the production of dopamine in the presynaptic terminal of dopaminergic neurons. Dopamine in turn demonstrates control over many other functions such as motor abilities, reward systems, sexual behavior, and prolactin release. If the influence of the hormones on the production of TH can be determined, this would lead to better understanding of dopamine regulation especially with relation to sexual behaviors and differences between males and females. Both testosterone and progesterone caused concentration-dependent increases in TH promoter activity. When androgen receptors were expressed in the cell, exposure to a 5 nM testosterone solution fully activated the TH promoter. When progesterone receptor B was expressed, TH promoter activity reached maximal levels with a 20 nM dose of progesterone. In contrast, when the shorter progesterone receptor A isoform was expressed, progesterone was unable to activate the TH promoter. These data indicate that activation of the TH promoter by progesterone and testosterone is dependent on expression of a specific receptor as well as hormone concentration. This experiment will give insight to the importance of hormone concentration and the effects of hormone interaction.

Brock Kabat

Department of Physiology, School of Medicine

The Role of FOXO1 in Pituitary Development

The pituitary gland is a small endocrine gland found at the base of the brain. It secretes hormones responsible for growth, lactation, sexual development, and other functions. It is comprised of the anterior, intermediate, and posterior lobes.

Mouse pituitary organogenesis begins at embryonic day 8.5 (e8.5). By e12.5, a structure known as Rathke's pouch begins to develop from the oral ectoderm. This invagination will pinch off to become the anterior lobe of the pituitary while part of neural ectoderm differentiates into the posterior lobe.

Forkhead box O1, or FOXO1, is a forkhead transcription factor expressed in the early neural ectoderm of the developing mouse embryo. Forkhead transcription factors are helixed proteins that regulate the expression of genes involved in embryonic development, cell proliferation, and cancer. FOXO1 functions as a tumor suppressor by inhibiting cell proliferation and promoting apoptosis. Apoptosis is natural cell death required for development and the maintenance of homeostasis.

Foxo1-knockout mice die by e10.5 due to defects in angiogenesis. To prolong the life of the embryo, a conditional knockout was created. Conditional knockouts are mice that express a full genome in all parts of the body except the area of interest. For my purposes, I breed mice that contain FOXO1 in all areas but the pituitary. This way, embryos may be studied beyond the age of e10.5.

Foxo1-knockout mice are confirmed through polymerase chain reaction and gel electrophoresis. I have obtained several embryos at e18.5 that are of the appropriate genotypes. I will compare apoptosis and hormone production of the pituitary in conditional knockout mice to the pituitary in wild-type mice throughout embryonic development. These studies will allow me to determine the role of FOXO1 in pituitary morphogenesis and cell differentiation.