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## 2006 Abstract Book

Undergraduate Research Forum

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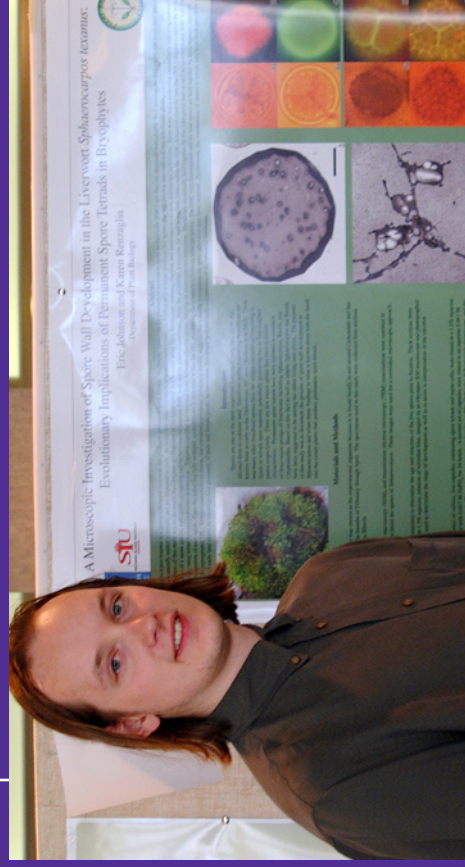
The Undergraduate Research Forum is part of REACH (Research-Enriched Academic Challenge), a campus-wide program for undergraduates coordinated by the Office of Research Development and Administration at SIUC. For more information, see [www.siu.edu/~reach](http://www.siu.edu/~reach).

The forum is being held in conjunction with the 2006 Research Day (sponsored by Phi Delta Kappa, Phi Kappa Phi, Sigma Xi, and the Society for Neuroscience) and the Illinois Junior Science and Humanities Symposium.



# UNDERGRADUATE RESEARCH FORUM

ABSTRACTS • 2006



*First-Prize Winner, 2005:  
Eric Johnson*

Student Center Corker Lounge  
April 3, 2006  
Southern Illinois University Carbondale

**Haley E. Anderson**

Department of Psychology

*Posttraumatic Growth in the Aftermath of Different Types of Traumatic Events*

With regard to the degree of impact a traumatic event has on someone, there are many individual differences, ranging from minimal effects, to the negative psychological disturbances associated with posttraumatic stress disorder (PTSD), to the positive outcomes defined as posttraumatic growth. The most common approach to studying trauma has concentrated on negative outcomes. However, the primary focus of this study surrounds the concept of posttraumatic growth, which is defined as positive changes in “perception of self, philosophy of life, and relationships with others,” after struggling with trauma.

This study investigated the relation between type of traumatic event and reports of posttraumatic growth. It was hypothesized that survivors of direct harm, due to either a natural disaster or sexual abuse, would report more growth than survivors of indirect harm, specifically witnessing serious injury or death. It was also hypothesized that individuals who have been deliberately harmed by sexual abuse would report more growth than individuals who have been unintentionally harmed by a natural disaster. Participants ( $n = 819$ ) completed the Brief Trauma Questionnaire (BTQ) and the Posttraumatic Growth Inventory (PTGI). According to the results, witnesses to serious injury or death reported the highest total scores of posttraumatic growth, followed by survivors of a natural disaster and survivors of sexual abuse. However, there was no statistically significant difference between posttraumatic growth total scores for participants who have experienced direct harm and those who have experienced indirect harm, and between participants who have been deliberately harmed and those who have been unintentionally harmed. These findings suggest that the amount of posttraumatic growth is not determined by the nature of the traumatic event.

**Maurice Betts and Dr. Lori Vermeulen**

Department of Chemistry and Biochemistry

*Synthesis and Characterization of a Zirconium Phosphate/Nicotine Intercalation Compound*

We are interested in the use of layered materials as drug delivery host systems. We have successfully prepared a series of zirconium phosphate intercalation compounds in order to investigate the effect of ultrasound on the de-intercalation rate. Here we describe the successful preparation of a zirconium phosphate/nicotine intercalation compound. The synthesis and characterization of this new intercalation compound by powder X-ray diffraction, FTIR, SEM, and Elemental Analysis are reported.

## Joshua Boone

Department of Mathematics

### *Production of Diffraction Patterns from Escher "Crystals"*

We can learn a lot about a crystal by analyzing the corresponding X-ray diffraction pattern, a discrete array containing the moduli of the Fourier coefficients of the electron density function. This idea has been behind the work of many Nobel-Prize-winning discoveries, from Bragg's determination of the structure of simple ionic crystals a century ago, to the determination of the double-helix structure of DNA a half century ago, and the mechanisms of the energy molecule ATP in 1997. The mathematics of this phenomenon involves multivariate Fourier Analysis. We can illustrate this mathematics within a context of Fourier Optics, a branch of applied mathematics that uses various operators to analyze Fresnel diffraction and the processing of light by lens systems.

Mathematicians and art lovers alike have long appreciated the studies of symmetry within the drawings works of the Dutch artist M.C. Escher. The primary goal of this project is to produce diffraction patterns from such two-dimensional Escher "crystals." We first use a scanner to digitize an Escher "crystal." We have created software that allows us to capture a unit cell and then edit the pixels corresponding to a suitably coarse digitization to enhance the art and to "exactly" preserve the corresponding symmetry. We use specialized software to then tessellate the plane with these edited unit cells and print such a crystal at 25X magnification on high-quality photo paper using a 1200 dpi inkjet printer. These patterns are then photographically reduced and placed on LPD film at SIUC's IMAGE facility. We then pass a laser beam through the pattern on the film and view (and photograph) the resulting diffraction pattern at infinity.

The final result of this collaborative effort is a set of numerous 35mm slides that can be used to illustrate the mathematical ideas of diffraction and crystallography within an undergraduate course such as Dr. Kammler's *Introduction to Fourier Analysis*. These slides will help students understand the process of reconstructing the source crystal by decoding the diffraction pattern in a friendly and interactive environment.

**Ronald R. Bristow**

Department of Psychology

*Development of a Cognitive Self-Statement Assessment*

Modern cognitive theory states that the thoughts people have influence the emotions people experience (Beck 1979). Thus, it is of importance to psychologists to examine these cognitions and develop standardized inventories based upon them to accurately gauge pathological cognitions. The goal of this study was to develop a cognitive self-statement questionnaire related to the measurement of thoughts people have when engaging in public speaking that encompasses positive, negative, self-focused, and other-focused cognitions. The new measure was administered to undergraduate students enrolled in an introductory psychology course at Southern Illinois University. Participants in the study were asked to give a short speech to an audience of confederates then complete several measures about their experience. Among these measures was a list of cognitions gathered from a pilot study that were then transformed into sentences which might represent actual thoughts experienced by participants during the speech task. "I am doing a bad job," would be an example of one of these items. Participants were asked to select thoughts they had experienced from the list of thirty-five provided. The Focus of Attention Questionnaire, Social Avoidance and Distress Scale, Personal Report of Confidence as a Speaker, and the Fear of Negative Evaluation Scale were also administered with the new measure. Data collection for this study is currently underway. Planned analyses will examine the new self-statement measure's psychometric properties by comparing it to existing measures of general social and public speaking anxiety.

**Ryan Cheperka**

Department of Psychology

*Sexual Assault and the Impact of Social Support: Helpful and Harmful Reactions*

This study attempts to understand the help-seeking experiences of women who were sexually assaulted and of potential benefits and harm of social support interventions. Interviews were conducted with eight female sexual assault survivors about their coping/help-seeking processes and perceived social support. The Consensual Qualitative Research method was used to analyze data. Results indicate that it was less helpful when the sought social support took the focus away from the survivor (e.g., parents blaming selves, anger at the perpetrator). Blame and negative reactions towards the survivor were also unhelpful. What was helpful was when others (often therapists) were nonjudgmental and accepting of the survivor. This is important to understand in order to give the proper support.

## **Amanda Chiavini**

Department of Psychology

### *Dose Effect Analysis of a Multi-Component Caregiver Intervention: An Evaluation of Component Impact*

Traditional research on dose-effect in psychotherapy has focused on the number of sessions administered and client outcome. This study examined the relations between time spent on specific components (Affect, Knowledge, Problem Solving, and Social Support) and client outcome. The purpose was to examine the importance of tailoring an intervention to the client and its relation to outcome after short-term therapy. Participants were caregivers of older adults obtained through the SIU Rural Caregiver Telehealth Intervention Trial. The intervention was completed through one of two modalities, a regular scheduled session or as a helpline where participants could call in when they needed assistance. Participants were administered the Outcome-Questionnaire-45.2 (OQ-45.2) at baseline, eight weeks, and six months following the intervention. Regression analysis was used to evaluate the dose-effect relation, with dosage and time of measurement as within group variables. Change in OQ45.2 scores between baseline and time 2, as well as baseline and time 3 were examined. Preliminary analyses indicated that clients in the treatment condition exhibited greater improvement in functioning based on the OQ-45.2 at the six month follow-up and that the greatest amount of session time was spent on the Affect and Problem Solving components. Additional results and implications for short-term therapy will be addressed.



**Jonathan M. Cohen**

Department of Forestry

*Place-based Attitudes Towards Forest Management: Shawnee National Forest, Illinois, USA*

Over the past decade the U.S. Forest Service (USFS) has updated its framework for developing and revising Forest Management Plans to better integrate stakeholder attitudes into the planning process. The USFS Environmental Management System is designed to emphasize this renewed commitment to public involvement and collaboration. The Proposed Land and Resource Management Plan, issued by the Shawnee National Forest (SNF) in January 2005, follows this new framework.

The objective of the present study is to develop a photo-elicitation survey protocol to better understand and measure the attitudes of the public related to management practices on the SNF. Participants were shown nine photographs portraying three different applications of forest management practices: trails, fire, and harvesting. Each application was represented by three scenes depicting different phases of management treatments. Participants were asked to look at each photograph carefully and then respond on a semantic differential scale. An important feature of this study is the addition of a follow-up interview phase. Ten randomly selected respondents were asked to participate in an in-depth interview to discuss feelings and beliefs underlying the attitudes expressed on the semantic differential scale and to better understand the level of place attachment respondents assigned to the region.

Attitudinal data were analyzed using SPSS and MANOVA. Interview transcripts were coded and analyzed with qualitative research techniques. Study findings address the potential of photo-elicitation techniques to assess the ability of various SNF user groups to discriminate among management treatments as well as the role of prior place attachment to treatment evaluation.

## **Caitie Cusack**

School of Art and Design - Sculpture

### *Plastic and Rubber: An Exploration of Mold Making Methods*

The goal of this research was to attain a firm grasp of mold making techniques, utilizing a range of rubbers and plastics. I hoped to transmit these new skills into the construction of several sculptures included my BFA thesis show. The first step was investigating various ways in which casting has been utilized to produce and reproduce practical, historical, and artistic objects. After studying, with the aid of books, Internet resources, and models, I began experimenting with the material itself. The initial molds were simple, open face molds using wax as a positive. I tested three different kinds of rubber, a silicone, latex, and polyurethane, and found that polyurethane was the best option. It is affordable and also quite durable with moderate tear-resistance. Following the tests, I produced 12 two-part molds of books, from novels to encyclopedias. These molds were painted with Poltek's Poly 74-30 rubber. They were then released and a mother mold of plaster was added in two separate parts for structure and support. After the molds were completely cured, brown victory wax was cast into each of them. The replicas of this process were then integrated into a piece of sculpture. Since the completion of this project I have made several other components utilizing similar processes. I have been experimenting with plastics as well. I will display a body of work incorporating these objects at my thesis BFA show. The event will take place on May 5, 2006, at the Murphysboro Event Center at 8:00 p.m. and is open to the public.

## **Jason Dickson**

Department of Information Systems Technologies

### *The Representation of African-American Women in Television Advertisements*

Mass media is a means by which people gather ideas and beliefs about each other. The way people think and what is perceived as common consumer behavior is also influenced by mass media. Television plays a substantial role in communicating prototypical ways of thinking. The focus of this research study is to observe the way that African-American women are portrayed in television advertisements. The research was conducted through a content analysis of prime-time advertisements featuring women. Trends associated with African-American women in advertisements were compared to trends associated with Caucasian women in advertisements. Previous research has revealed that African-Americans are significantly underrepresented in the media; however, these figures have changed over time. The relevance of this study was to observe the way that African-American women are represented in today's media. The study yields information that will prove to be valuable when researching minority women, the mass media, and how they affect each other interdependently.

## **Sydney Dillard and Kristine Kranenburg**

Department of Journalism

*Is Black Beautiful? A Content Analysis of Beauty Characteristics of African-American Women in the Advertisements of Cosmopolitan and Essence*

Some consider beauty to be in the eye of the beholder, but what if the beholder is the media, and the gatekeepers to the media constantly place advertisements that tell women to change who they are? Previous research indicated that African-American women were not only underrepresented in advertising, but were often shown with physical characteristics that were Eurocentric instead of Afrocentric. This study used content analysis to examine the frequency of representation and the images of African-American women in the magazine advertisements of *Cosmopolitan* and *Essence* between the years 1974-2003. Over 2,700 advertisements were examined and those featuring African-American women were studied based on the following physical features of the models: skin tone, hair texture, body type, and eye color. Results indicate that the African-American women found in advertisements of both *Cosmopolitan* and *Essence* were more likely to have Eurocentric characteristics. Furthermore, while the number of advertisements featuring African-American women in *Cosmopolitan* had increased over time, the number in *Essence* had decreased, with most recent numbers falling below the percentage of readers who were African-American.

**Jennifer Dilliner**

Educational Psychology and Special Education

*Impact of Supplemental Reading Instruction on the Reading and Writing Skills of Alternative School Youth*

The purposes of this study were to examine the impact of intensive supplemental reading instruction on (a) the development of reading fluency, and (b) the influence on writing skills, e.g., spelling, grammar, and sentence mechanics. Furthermore, the study also examined (c) the generalization and maintenance of the skills acquired.

The participants of the study were five middle school students who attended an Illinois Safe School. The intervention utilized was two 30-minute periods of intensive supplemental reading instruction. During each session, reading comprehension lessons were delivered through the use of direct instruction. The direct instruction program provides for extensive modeling of skills and strategies to guide students to mastery and generalization.

Throughout the study, participants' progress was monitored by the use of curriculum-based measurements. Students were given reading and writing probes every two weeks to measure students' progress.

At the time of this publication, the baseline and intervention phases were completed. Analysis of the data will take place at the end of the generalization and maintenance phase, which is currently underway.

## Paul Dixon and Dr. Scott Ishman

Department of Geology

### *Recent Ostracod Distribution in the Larsen Ice Shelf Region, Eastern Antarctic Peninsula and Environmental Analysis*

The Larsen Ice Shelf, located on the eastern side of the Antarctic Peninsula, began disintegrating in the mid-1990's and has lost approximately 10,000 km<sup>2</sup> of ice. In 2005 (from February 11-March 11), the *Laurence M. Gould* sailed to the Larsen-B (LMG05-02) to study the area of the shelf that was most recently exposed. On cruise LMG05-02 Smith McIntyre grab (SMG) samples were collected, sieved through a 63 micron sieve, dried, picked, and identified. References used were Brady (1880), Samolyk, and Olempska (2005), Sars (1866), and Hornibrook (1952).

There were 12 SMG samples that contained ostracods. Also, from earlier cruises on the *Nathaniel B. Palmer*, 8 additional SMG samples were used. From these 20 samples, 10 genera were identified, including 18 podocopid species and 1 myodocopid species. Overall the most common genus was *Cytheropteron* (containing 6 different species), and the most common species was *Cytheropteron testudo* (Sars). In total, 253 specimens of *C. testudo* were found, making up 28.2% of all species.

All species were analyzed using multidimensional-scaling and cluster analysis (*Primer 5*). Results from both analyses are interpreted to represent four ostracod groups. The Larsen-A group is diverse, and abundant in *Cytheropteron abyssorum* (Brady). A distal Larsen-B group is nearly monospecific containing *C. testudo*. The mid Larsen-B is diverse and abundant in *C. testudo*. The near shore Larsen-B group is diverse, and has an abundance of *Polycope kinnetorgenis* (Hartman).

Ice Shelf break-up affects primary production and changes pelagic and benthic marine ecosystems. Recent ostracod distributions in the Larsen-A and Larsen-B ice shelf regions will further understanding of climate change and effects on these organisms.

**Michelle Donahue**

Department of Plant Biology

*Changes in Carbon and Nitrogen Contents of Boreal Peat-accumulating Wetlands after Wildfire*

Boreal peatlands, like those found in western Canada, ecologically serve as carbon sinks due to rates of production exceeding rates of decomposition. The internal cycling of both carbon and nitrogen throughout the upper aerobic peat (the acrotelm), however, is little understood and critical for carbon accumulation processes. For this reason, five peatland sites were chosen in northern Alberta, Canada, from which five cores were extracted from each, and analyzed for both carbon (inorganic and organic) and nitrogen contents. Results were used to determine how carbon/nitrogen ratios change over time with depth of the peat column. Wildfire is the single most important disturbance within the boreal zone and wildfires burn an average  $1,470 \text{ km}^2 \text{ yr}^{-1}$  of peatland in boreal western Canada. Recovery of peatlands after wildfire is critical for continued carbon sequestration. I examined how the ratios of carbon and nitrogen varied after wildfire along a 102-year chronosequence.

**Stephanie Dulgar, Dr. Scott Ishman, and Stefanie Brachfeld, Department of Earth & Environmental Studies, Montclair State University**

Department of Geology

*Deposition, Diagenetic, or Bacterial Origin of Magnetite in Sediment Drifts from the Western Antarctic Peninsula*

A 607 meter sediment core from the western Antarctic Peninsula was collected during Ocean Drilling Program (ODP) Leg 178 at Site 1096. We observed an abrupt shift at 18 meters below seafloor (mbsf), in the magnetic mineral assemblage in core 1096A. The shift was first recognized during the construction of the geomagnetic reversal stratigraphy. This shift in the magnetic mineral assemblage led us to question the accuracy of the geomagnetic reversal record. We evaluated magnetic material concentration using magnetic susceptibility, magnetic grain size using hysteresis loops and scanning electron microscopy (SEM), and magnetic mineralogy using Curie temperature analysis.

Magnetic susceptibility showed variable concentration of magnetic material with depth, but not an abrupt change at 18 mbsf. Magnetic particle size measurements show that with increasing depth the magnetic grain size gets larger. SEM results showed that above 18 mbsf the iron-oxide assemblage is more diverse than below 18 mbsf. Curie temperature analysis indicated that magnetite is present above and below 18 mbsf, but with an iron sulfide presence that is constrained to the top 18 meters of the core.

The SEM and hysteresis data both reveal a grain size change at 18 mbsf. The possibility of a grain size shift resulting from very fine-grained bacterial magnetite is a possibility, but is not conclusive until transmission electron microscopy (TEM) images can be collected. Dissolution of magnetite could also cause the grain size shift, with the smaller grains being dissolved below 18 mbsf. The presence of magnetic iron sulfides above 18 mbsf suggests diagenesis. Normally dissolved iron would precipitate to make pyrite, a non-magnetic mineral, which could explain why the bottom of the core is magnetically weaker. The top of the core is different because the iron is precipitating as pyrrhotite, a magnetic mineral, which is evident from Curie temperatures around 350 degrees Celsius.



**Danielle Estes**

Department of Sociology

*For the Children's Sake: Student Parents' Rationalizations for Childcare Use*

This study examines, through the analysis of thirteen in-depth interviews, the ways in which college student parents rationalize their childcare choices. This study seeks to understand how parents decide what is most important in a childcare arrangement and how they explain these decisions to others. Parents found themselves in a state of cognitive dissonance resulting from the realization that their ideas regarding what it means to be a good parent often conflict with the demands inherent in pursuing an education. In order to relieve this dissonance, parents offer what Scott and Lyman call "accounts" to explain their behavior. These accounts help parents to align their actions with cultural expectations for what is considered acceptable behavior, hence relieving the dissonance. I have identified seven accounts used by parents to justify their actions. The first three revolve around the idea that parents are going to school for the children's sake. The last four accounts explain why putting their children into someone else's care is "the right thing to do." The findings suggest that parents draw their accounts from culturally available vocabularies of motives and accounts appropriate for their situations. Furthermore, because they share a similar cultural background, they offer similar accounts.

## **Brandi Frey**

School of Art and Design

### *Reduced, Reused, and Recycled: A Thoughtful Path into Mixed Media Art*

One of the most satisfying things to me in creating art is the process. I am interested in using alternative materials and experimenting with various methods of making marks on textiles with paint, thread, and bleach. A constant theme in my work is a fascination with material and investigation of different mediums on textile surfaces.

My current body of work involves the use of plastic bags as foundation on gessoed canvas for paintings. The canvas and plastic are bonded together with polycrylic and once dry, painted into with acrylic paint. I use a stamping technique to lay the paint into the plastic and canvas, and use a variety of tools to experiment with varying marks, such as palette knives, pen tips, cups, and my hands.

This same process is also used on the quilts I make; however, the plastic bags are used in a different function. First, the bags are pressed with an iron between layers of fabric into squares. Fabric is cut to match, and the bags become the batting in the squares of fabric which are then sewn into blocks to form a quilt. I use the quilts as if they are canvases, and paint into them. Again, this is a process of experimentation where I am testing different tools, colors, and techniques to express my own created visual vocabulary. I have found that the lines and divisions of fabric and thread racing across the quilts have patterns of their own, and I am able to find paths and rhythms by painting into and altering the surface through an abstract visual exploration. I am excited and intrigued by the divisions and subdivisions in a quilt, and enjoy finding the narratives hidden within the design.

**Laura Gibson and Dr. Bakul Dave**

Department of Chemistry and Biochemistry

*Controlled Release of Molecules from Environmentally Responsive Non-Toxic Matrices*

The objective of this research is to develop a biodegradable gel matrix capable for sustained drug release. These gel systems are made of polysaccharides, and such materials are ideal for drug delivery because of their non-toxicity, inexpensiveness, and biocompatibility. A gel drug delivery system would be particularly useful where the conventional method for administering a drug is not effective. One such case would be ocular disease where the typical treatment involves a regime of highly concentrated eyedrops administered in frequent intervals. Despite the high drug concentration, most of the drug molecules never reach the inner tissues of the eye, and this prolongs the treatment for the patient. This research aims to design a system such that a drug-containing gel is implanted in the patient's eye, and the drugs are released over a period of time due to the dissolving of the gel.

This poster presents the results of preliminary experiments conducted with dye-containing gel matrices. Results from these trials indicate that the release of the dye molecules from the gel matrix is dependent on the electrical charge of the dye and of the gel matrix, as well as the pH of the environment in which the gel is placed. Ultimately, more experiments will be conducted using ocular drugs and pH conditions to mimic conditions within the human eye.

## **Jeremy Griffith**

School of Art and Design - Glass

### *Glass Compatibility: The Combination of Spruce Pine 87 and System 96*

Blown glass as an art medium has only been in America since the early 1960's. Before this time it was unknown how to operate a small scale glass furnace. In 1963, Dominic Labino introduced a formula of raw materials that could easily be melted into a usable glass in about twenty-four hours. This same formula is still used today, but is now called Spruce Pine Batch 87. The process of melting raw batch and using it directly from the furnace is called furnace-worked glass.

The other way to obtain glass is in sheets and rods. The sheets are used in kilnforming and the rods are used for torchworking. Approximately two years ago, System 96 devised these sheets and rods from a similar recipe to create a glass whose molecular makeup is very similar to that of the Labino furnace glass. This new glass made my research possible and opened many new doors for glass artists. These two glasses do not have the same coefficient of expansion, which is what determines their compatibility, but they are very close. To test their compatibility I created sheet glass of various colors from the Spruce Pine glass. From there I took one centimeter samples of each color and fused them together with every color produced by System 96. These samples were then viewed using a polariscope that will reveal stress due to incompatibility.

There was very little to no stress in over ninety-five percent of my samples, although when two colors with high metallic content were tested, such as Canary Yellow, there was an unacceptable amount of stress within the sample that did or could cause cracking. This research is being compiled into a manual that will further other artists' knowledge about the possibilities of combining kiln, torch, and furnace-worked glass, without having to worry about incompatibility.

**Maria Guerrero and Dr. William Wells**

Center for the Study of Crime, Delinquency and Corrections

*Racial Disproportionality in Prisons across the United States*

African-Americans in the United States represent a large portion of state and federal prison populations. There are two central explanations that are given to explain the large representation of African-Americans in prison: (a) imprisonment rates are the result of bias in the system and (b) African-Americans are involved in more serious crimes than other groups. Previous studies have tried to estimate which explanation is the strongest; however, important gaps in the understanding of this phenomenon still exist. The current analysis builds on the strengths of the previous research by using the most current data available to provide a more up-to-date and accurate test of these two claims. The study relies on longitudinal data from 1980 to 2002; furthermore, these data are disaggregated to the state level. The disaggregated data help in understanding trends in regional variation over time. Through the use of the disaggregated data, the researcher was able to conclude that the percent of African-American imprisonment that can be explained by differential involvement in index arrests has overall increased since 1996, with the North Central region consistently being the region with highest explained percent of racial disproportionality in prison populations.

## **Emmett T. Harrison**

School of Architecture

### *The Design of a School of Architecture*

As Southern Illinois University at Carbondale plans its expansion into the next decade with a “facelift” for the entire campus, few student groups look on with as much vested interest as those in the School of Architecture. The purpose of my research is to help generate interest and awareness of the developments surrounding campus life at SIUC within the Architecture Department through a competition to design a School of Architecture for the campus. The competition and research is funded from outside by the Precast/Prestressed Concrete Institute, which provides for website development, printings and mailings, an \$8,000 fellowship, plus \$15,000 in Design Awards.

The projected site is located to the North of Quigley Hall at the intersection of University Avenue and Mill Street. My research has included analysis of the site and the construction of a topographic site model. The use of Precast Concrete as a material addresses several issues important in building construction, including an emphasis on sustainable and local resources. In addition to the standard architectural problems of building construction, student participation in such a competition brings key issues of politics, context, and community infrastructure to the surface. Participants will be forced to consider how a building can *teach*, as well as how their particular corner of the university affects and is affected by the greater campus. In addition to providing a valuable opportunity for students, thousands of dollars of ideas are currently being generated from within our own department as well as those of participating schools.

**Michael A. Holland and Dr. Michael R. Hoane**

Department of Psychology

*Acute Neuroprotective Effects of Nicotinamide Treatment in the Traumatically Injured Brain*

Previous studies in our laboratory have demonstrated the preclinical efficacy of nicotinamide (vitamin B<sub>3</sub>) treatment following fluid percussion injury (FPI). Nicotinamide at a dose of 500 or 50 mg/kg significantly facilitated recovery of function on a variety of motor and sensorimotor tasks and the 500 mg/kg dose improved cognitive performance. The purpose of the present study was to examine the neuroprotective ability of nicotinamide following FPI. Rats were given a moderate FPI injury or sham craniotomy. Nicotinamide (500 or 50 mg/kg) or saline was administered 15 minutes and 20 hours after FPI. Rats were sacrificed at 24 hour or 7 days following injury and prepared for histological analysis. This analysis included the examination of the injury cavity and the analysis of degenerating neurons, by Fluoro-jade-B (FJ) immunohistochemistry. Systematic volumetric measurements were conducted to examine cortical loss. Cell counts of FJ<sup>+</sup> neurons were performed in the cortex and subcortical structures. The lesion analysis suggests that nicotinamide reduced edema in the ipsilateral hemisphere at 24 hours. At 7 days, both treatments groups demonstrated reduced loss of cortical tissue compared to the saline-treated group. Both doses also reduced FJ expression at the 24 hour and 7-day time intervals. However, the 500mg/kg dose showed a greater reduction in FJ<sup>+</sup> neurons at the 7 day interval. At 24 hours, there was high FJ expression in the contralateral cortex and the data showed a reduction in this expression in a dose dependent manner; this expression was not observed at 7 days. Additionally, cell counts were performed in the hippocampus and thalamus. It was found that nicotinamide treatment reduced this expression, which was especially evident at the 7-day sacrifice interval. The results of this study suggest that nicotinamide has strong neuroprotective abilities in the injured brain and may have immense therapeutic potential for brain injury.

**Jami Jackson**

Department of Psychology

Examining Factors on Academic Motivation in College Students: Intrinsic vs Extrinsic Influences

This research project intends to assess the degree to which academic motivation in today's Southern Illinois University Carbondale cohort is influenced by (a) themselves (intrinsic factors) and (b) outside relationships (extrinsic factors). I will also attempt to find if there is any relation between participants' ages, ethnicities, gender, majors, year in school, and their influences on motivation. The Academic Motivation Scale College Version (AMS-C 28) (Vallerand, Pelletier, Blais, Briere, Senecal, and Vallieres, 1993) is used to assess the degree to which college students are influenced by intrinsic factors, extrinsic factors, or amotivation (i.e., no influences either way). I will sample 100 SIUC students comprised of 25 students from each year in school. I expect that after collecting data, I will find that the participants reported to be more extrinsically motivated. I expect this because although college students now understand the value their education, they will ultimately report that they chose to continue their education in an effort to have a successful future.



## **Christopher Jenkins**

Department of Electrical and Computer Engineering

### **BIST Test Pattern Generation Mechanisms**

In the manufacturing of digital circuits with millions of transistors packed into increasingly smaller areas, the possibility of fabrication error is continually increasing. Unfortunately, as circuit complexity rises, existing methods of verification, such as external testing equipment and software solutions, become impractical due to their rising costs and intrinsic inefficiency.

Fortunately, testing solutions can be created by supplementing a chip with additional circuitry for the purpose of on-chip, automated testing. This method is referred to as Built-In Self-Testing (BIST). Its practicality directly emerges from the testing mechanism residing on the chip itself, allowing it to access and test the chip's components extremely fast.

The interest of this research is in the hardware mechanisms for testing, referred to as Test Pattern Generators (TPG). The goal is to utilize common TPGs such as Linear-Shift Feedback Registers (LSFRs) and Cellular Automata (CA) in such a way that fault coverage is maximized for a pre-defined number of clock periods. The methods examined include permutations of CA cells for enhanced randomness, comparison of non-primitive characteristic polynomials in LSFR's, identification of characteristic polynomials with equidistant coefficients for their inherent design superiorities, and discovery of new types of TPGs. The research hopes to reveal that minor logical and pattern application techniques to common TPGs can yield appreciable improvements in fault coverage and reduce the time required to test a circuit for a given coverage demand.

**Ryan T. Jones, Isha Tyagi and Dr. Peter R. Patrylo**

Department of Physiology

*Synaptic Transmission is Compromised Preferentially in the Aged CNS During Metabolically Challenging Conditions.*

Among the most common neurological changes seen during aging is a decline in cognitive function. The capacity of the central nervous system (CNS) to execute cognitive function is dependent on synaptic transmission, a process with a “high” energetic cost (glucose requirement). Data indicate that CNS bioenergetics is affected adversely during aging and correlates with the degree of cognitive impairment. Consequently, we hypothesized that synaptic efficacy is compromised preferentially in the “aged” CNS during metabolically challenging conditions. To test this hypothesis, electrophysiological experiments (field potential recordings) were performed in hippocampal slices from adult (8-10 months) and aged (20-26 months) male Fischer 344 rats (n = 8 adult slices; n = 8 aged slices). Synaptic transmission was monitored in the dentate granule cell layers in “normal” aCSF (11 mM glucose) for 10 minutes, then in aCSF containing 1 mM glucose (90 minutes; the glucose concentration seen in vivo), and finally in “normal” aCSF once again (70 minutes). In “normal” aCSF, no significant differences were noted in orthodromic or antidromic evoked responses in slices from adult and aged rats. In contrast, in 1 mM glucose aCSF aged slices showed a preferential decrease in synaptic activity ( $p < 0.0001$ ; ANOVA for repeated measures). Specifically, the synaptic evoked population spike was lost in 100% of aged slices versus 12.5% of adult slices ( $p = 0.0004$ ; chi-square). Antidromic responses did not differ with age, however, and thus indicate that the decrease in synaptic activity is not due to an inability of aged neurons to fire action potentials. Upon returning to “normal” aCSF, synaptic evoked responses recovered comparably in both groups. These results reveal that synaptic efficiency is compromised preferentially in the “aged” CNS under conditions known to occur in vivo, and consequently could contribute to the aging-related decline in cognitive ability.

**Matthew E. Lancaster**

Department of Psychology

*Causal Perception in Multiple Events and Types*

Causal perceptions are implicitly processed and pervasive, in that such perceptions are maintained even when participants are told that the events are merely temporally and spatially contiguous. Previous studies focused on one type of causal event. The purpose here was to examine multiple types of causal events. In this experiment participants were shown a variety of mechanical events, varying across temporal elements, spatial elements, and the number of objects, denoting various components of causality. They were asked to rate each event on a scale of 1 to 5. It was expected that participants would rate the types, in order of highest to lowest, direct, gap, delay, delay/gap. They would not rate the different events, launching, entraining, and traction, any differently from each other. The presence of multiples of objects would enhance the causal perception, and thus events containing three objects would be rated higher than those with only two objects.

## **Ryan Lawber**

School of Architecture

### *Interactive Structures Facilitated Through Precedent Technology*

Music and choreography have a unique bond with visual form, and incorporating this into architecture creates an interactive structure. Including prior Theremin technologies as an interface to the reality of the dancers invokes a proximal empathy from the patrons of this dance theater. This creates an interactivity that allows users to preview what they will observe in the upcoming performance and, after the show is over, mimic what has been seen on the stage inside and adapt the technology to become one of the performers. This Theremin interface creates a bond between the users and the professionals. To enhance the experience, the structure is clad in lighted panels which respond to the orchestral tones and volumes produced. A higher pitch creates a stronger pronunciation of light; a louder tone creates a larger geometry, etcetera. Inside, the theater is canopied by arrays of lights creating a sea-like collection of amorphous shapes produced by ambient sounds. During performances, dancers maneuver between sets of glass panes which are illuminated by exciting molecules, making the transparent walls translucent. These movable sheets contain Theremin equipment to produce the audio/visual show. The exterior skin reveals hints of the occurrences inside, uniting the internal and external.

## **Virginia Smith and Ryan Lawber**

School of Architecture

### *Illumination of Ohio River Confluence Riverboats*

Historically, the confluence of the Ohio and Mississippi rivers has been a key element in the development of America. Many boats passed through the confluence and held port at Cairo, Illinois. With the help of the Cairo Public Library, Professor Robert Swenson and fellow undergraduate assistant Ryan Lawber, we are creating a series of books documenting packetboats, tugboats, and other steamships that have made their mark in the southern Illinois area. Documenting the Cairo Public Library's collections, and researching the boats and their importance in the area will give the Cairo Public Library a reserve for the future and, once online, a valuable community resource.

## **Danita Little**

Department of English

*“Jones don't think it is acceptable”*

*Attitudes of College Educated Professionals and Students Toward the Usage of Proper Grammatical Constructs*

Over the years, teachers in classrooms spend many hours on direct instruction in grammar constructs despite dismal results in student learning of grammar. With this wide variance in grammar instruction and usage, there is a need to discern what grammar constructs are most important for the successful transition from secondary through higher education and into the workforce. Therefore, it is important to identify the most essential knowledge in terms of grammar usage that will provide for immediate acceptance. This study is a replicate of a study conducted by Maxine Hairston in 1981. Using Hairston's survey instrument of 67 items which included one open-ended question regarding the level of irritability where respondents select from the following: 1) does not bother me, 2) bothers me a little, 3) bothers me a lot, for grammatical errors. The survey was administered to a convenience sample of students and professors at a Midwestern university as well as personal contacts who are professionals in the workforce. Results were tabulated and disaggregated by groups identifying the grammatical constructs deemed most important according to the responses of the participants. The total number of participants was 112. Over half of them were women, Caucasian, and between the ages of 18 and 25. In every category, over 50% of the items irritated all participants. When it came to both the simple and advanced grammatical constructs, females were more concerned with the errors than males which proved my hypothesis; while both males and the females seemed indifferent to the constructs of grammar that were considered miscellaneous. As the age of the participants increased in each section, the more tolerance decreased. The highest tolerance was with males, participants ages 18-25 and the "Others" ethnicity, which included Hispanic, Native American, Asian, and others, with miscellaneous grammatical constructs. The lowest tolerance was with females for advanced constructs and participants aged 34 and over for simple grammatical constructs; which concludes, if you had a female teacher over the age of 34, you would be expected to know all proper grammatical constructs. A male teacher aged 25 or younger would most likely only expect you to know the simple constructs. It is not conclusive to say what constructs are most important because for each grammatical section, the findings were inconsistent.

**Patrick McGill and Dr. Punit Kohli**

Department of Chemistry

*Nanoscale Tailored Materials for Thermal Interfaces Used in Microelectronic Devices*

The problem of thermal management in microprocessors is ever growing due to increased speed and increased density of transistors on a single microelectronic device, for example, a central processing unit. The goal of this project is to demonstrate a new concept of nanowire ensembles that are expected to have thermal conductivities that are 10-15 times greater than currently available thermal interface materials (TIMs). TIMs are thermally conductive materials that are placed between a device and a metal heat sink for transporting heat from the device to the heat sink.

We have previously synthesized nanowire ensembles that we believe will meet this challenging demand of providing TIMs with high thermal conductivity. The matrix of the nanoTIM has been etched at both sides so that conductive nanowires are exposed to a solid-air interface, and these protruding conductive nanowires are in thermal contact with the metal heat sink and device. Therefore, there is a continuous, high surface area conducting path for the heat transfer between a device and a metal heat sink. Thermal conductivities are currently being measured in collaboration with Tony Tong at the University of California-Berkeley. The initial results of the nanoTIMs were not expected. The nanoTIM was slightly less efficient than the current thermal interface material; however, the nanoTIM matrix had not been etched to the desired depth at that time. Currently work is being done to determine the optimal etching time to produce the best surface contact between the nanoTIM, heatsink, and processor.

**Frederick W. Mclevich III and Dr. Laura L. Murphy**

Department of Physiology

*The Effect of Devil's Club Root on Insulin Secretion and Cell Proliferation in Insulinomic Pancreatic Beta Cells.*

Diabetes and insulinoma are two of the most common causes for abnormal blood sugar levels. Insulinoma, the most prevalent pancreatic endocrine tumor, is the most common cause of hypoglycemia resulting from endogenous hyperinsulinism. Devils Club, or *Oplopanax horridus*, is a commonly used medicinal plant among 38 linguistic groups of Northwest North America. One of its many medicinal uses is in controlling blood sugar levels in hypoglycemic and hyperglycemic suffering patients. The goal of this project was to study the effects of Devil's Club on proliferation of cells associated with insulinoma and levels of insulin secretion.

Pancreatic beta cells, which secrete insulin, were obtained from a cell line (Rin-m) of a tumorigenic rat. Cell proliferation tests were conducted and repeated by treating the Rin-m cells with doses of Devil's Club ranging from 0.01mg/ml to 0.5mg/ml for six days. Results showed that proliferation was inhibited with an average IC50 at 0.026mg/ml with maximal inhibition occurring with doses >0.5mg/ml of DC.

Concentrations of insulin from the secretion of Rin-m cells during treatment were quantified using an ELISA rat insulin sensitive assay kit. A BSA protein array was used to determine if changes in insulin concentration was a result of a decrease in Rin-m cells, an effect of the Devils Club on the insulin secretion of the cells, or perhaps both. Further tests will be repeated to prove or disprove the mechanism of action causing changes in insulin concentration.



## **Tyler Mehler**

Department of Zoology

*Examining the Joint Toxicity of Chlorpyrifos and Atrazine Antrazine in the Vertebrate Species: Lepodmis macrochirus and Pimephales promelas*

Although some potential environmental hazards involve significant exposure to a single contaminant, most instances of environmental contamination involve a mixture of compounds. This is common in many Midwestern aquatic systems where a variety of pesticides are frequently detected, primarily due to the regional dependence on agriculture. Of these pesticides, atrazine, a triazine herbicide, and chlorpyrifos, an organophosphate insecticide, are frequently detected concurrently and have been noted in previous studies to cause synergistic effects to many aquatic invertebrates. This study was conducted to determine if the joint toxicity of atrazine and chlorpyrifos would exhibit similar toxicity to chlorpyrifos alone to discern any greater than additive response. In addition, acetylcholinesterase inhibition was investigated to evaluate the toxic mode of action. The results of this study suggest that the joint toxicity of atrazine and chlorpyrifos is not significantly different to that of the chlorpyrifos-only treatments, which does not follow previous studies performed with invertebrates. Examinations on other vertebrates may reveal dissimilar results and are required to further assess the risk of these pesticides to non-target species.

## **Debo Osisanya**

School of Journalism

### *Boob TV versus Boom-Boom TV: Why Congress and the FCC Have Attacked Televised Indecency Yet Failed to Regulate Broadcast Violence*

Under federal law—18 U.S.C. Section 1464—broadcasters can be fined if they air any "obscene, indecent, or profane language." However, this statute says nothing about violence. Since the late 1980s, the Federal Communications Commission has actively fined broadcasters for what the FCC concluded was "indecent." Only recently have Congress and the FCC started focusing on violence on television; but so far, there is still no statute criminalizing violent broadcast. Using traditional legal research methods generally employed by legal scholars, this project analyzed FCC actions, congressional documents and a Supreme Court opinion. These primary materials suggested two possible reasons why Congress and the FCC have regulated televised indecency but not violence. One, as a former FCC chairman opined, indecent words and images are "not essential to the exposition of ideas." However, at least some depictions of violence may seem essential to relaying the content and context of a realistic story. Two, Congress members and the FCC seem to find it easier to define (and therefore regulate) "indecent" than "violent" content.

## **Ashley Parker**

Department of Psychology

### *Brain Responses to Smoking-Related and Emotionally Positive Pictures in Smokers and Non-Smokers*

Previous studies have shown that a brain wave pattern known as contingent negative variation (CNV) can be used to measure anticipation of an important event. In heterosexuals, larger CNV waves occur when anticipating the picture of an attractive nude of the opposite sex than when anticipating a nude of the same sex. The present study examined whether CNV can be used to evaluate the attractiveness of smoking-related stimuli. Thus, I examined differences between smokers and non-smokers in CNV response amplitude in anticipation of the presentation of smoking-related (e.g., someone smoking) images. Emotionally positive (e.g., romantic heterosexual couples) and neutral pictures served as controls. The participants were 6 smokers and 6 nonsmokers (gender balanced in each group). The mean age was 20 years. EEG was recorded with an EEG cap composed of 16 electrodes. The participants viewed color pictures that were repeated 5 times each for 150 trials. Each trial consisted of a picture being presented on a computer monitor for 500 ms, followed by a blank screen with only a fixation cross for 1500 ms, followed by the presentation of the same picture a second time for 2000 ms. Because the interval between the end of the first picture and the onset of the second presentation of that same picture was fixed, participants could anticipate the onset time of the second picture. Previous research has shown that the greater the anticipation and importance of the picture, the greater the amplitude of the CNV just before the onset of the second picture. Ten of the pictures were smoking-related, ten were positive, and ten were neutral. Smokers were predicted to respond with greater CNV amplitude in anticipation of smoking-related stimuli relative to control stimuli. Preliminary results indicate that smokers do exhibit greater CNV amplitude in response to all three stimuli classifications, as compared to nonsmokers. These results support the hypothesis that smokers generate a greater CNV response, overall, as compared to nonsmokers. If the present study's completed results conclude that smokers have an attentional bias toward smoking-related stimuli, innovations in cognitive therapy could be made to produce better and more efficient techniques for smokers who wish to conquer their addictions. The CNV procedures used in the present study could also be used to index severity of nicotine dependence and to assess the progress of therapy to help smokers quit smoking.

**Jeremy L. Pierce and Dr. Michael R. Hoane**

Department of Psychology

*The Window of Opportunity for Nicotinamide Treatment Following Cortical Contusion Injury in the Rat*

Each year approximately 80,000 to 90,000 people become permanently disabled as result of a traumatic brain injury (TBI). Compounding this public health crisis is that no therapeutics are currently available to attenuate injury severity. Several promising compounds have entered clinical trials, yet none have proven effective. The failure of a number of compounds may have been the lack of preclinical investigation into the window of opportunity for administration. Patients sustaining a TBI typically have a several hour delay before medical intervention, thus a clinically relevant therapeutic must have a window of opportunity extending four to six hours post-injury. Recent studies have demonstrated nicotinamide, a soluble B-group vitamin, to be an effective treatment in experimental models of TBI. However, research on this compound has been limited to administration regimens starting shortly after injury. This study was conducted to establish the window of opportunity for nicotinamide administration following controlled cortical impact injury to the frontal cortex. Groups of rats were assigned to nicotinamide (50mg/kg) or saline (1ml/kg) treatment conditions and received contusion injuries or sham procedures. Animals received i.p. injections at 15 minutes, 4 hours, or 8 hours post-injury, followed by five boosters at 24-hour intervals. Following last injection, blood was taken for serum nicotinamide analysis. Animals were tested on a variety of tasks to assess somatosensory performance (bilateral tactile adhesive removal) and cognitive performance (acquisition and working memory) in the Morris water maze. Preliminary analysis has shown that on the tactile removal test all 3 nicotinamide groups facilitated recovery of function compared to saline treatment. The acquisition of reference memory showed that no treatment groups significantly improved performance. However, in the working memory task both the 4-hour and 15-minute groups improved working memory compared to saline. These results suggest that the window of opportunity for nicotinamide extends to 4 hours following injury in the CCI model.

## Adria Pilsits

Department of Zoology

### *Phylogeny and Population Genetics of Alloteuthis (Loliginidae) and Discovery of a Cryptic Species*

*Alloteuthis* is a group of small loliginid squids of minor fisheries importance found in the Mediterranean Sea and the eastern Atlantic Ocean. There are three recognized species of *Alloteuthis*: *A. subulata* (North Sea to Morocco and east to the Aegean Sea, but uncommon in the Mediterranean); *A. media* (overlaps with range of *A. subulata*, but common in the Mediterranean and rare in the Atlantic); and *A. africana* (Atlantic coast of Africa from Morocco to Angola). Some evidence suggests that *A. media* and *A. subulata*, despite apparent morphological differences, are actually one species. To address this possibility and to investigate the phylogenetic relationships within *Alloteuthis*, I obtained sequence data from two mitochondrial genes (COI and 16S) from representatives of all three species from several locations, including the Aegean Sea, the Bay of Biscay, and the coasts of Italy, Portugal, France, Spain, Angola and Mauritania. Phylogenetic analyses revealed three genetically distinct groups that do not correspond with traditional taxonomy—one group includes most of the sampled individuals currently recognized as *A. media* and *A. subulata*; a second group includes all individuals sampled from Angola and Mauritania (referable to *A. africana*); and a third group consists of squid that look like *A. media* but which are, in fact, genetically distinct. This group, perhaps representing a cryptic species, has thus far only been found in Italian waters. Within the large “*A. media*”/“*A. subulata*” group there are genetic hints of geographical structure (i.e., a Mediterranean group and an Atlantic group). This data set is an excellent example of two intriguing evolutionary phenomena: 1) a pair of morphologically distinct “species” (“*A. media*” and “*A. subulata*”) that are genetically nearly identical, and 2) cryptic speciation within a morphologically homogeneous population.

**Reardon, Sara**

Department of Physiology

*Haploinsufficiency Of DEAF-1 Produces Parent-Of-Origin Defects in Spermatogenesis*

DEAF-1 is a transcription factor that binds to DNA containing CpG dinucleotide repeats and maps to within 650 KB of the telomere at human chromosomal region 11p15.5. The 11p15.5 region is associated with human infertility and cancer and is thought to contain yet-to-be-identified imprinted tumor suppressors and fertility factors. We have observed monoallelic expression of DEAF-1 in a human cell line suggesting DEAF-1 may be imprinted. DEAF-1 knockout mice were generated and homozygous deletion of DEAF-1 was found to be neonatal lethal due to neural tube defects. Following a long latency period, mice heterozygous for DEAF-1 developed spontaneous tumors of the lung, liver, and prostate. Males heterozygous for the DEAF-1 null allele were backcrossed (N) to wild type C57Bl/6 females for 11 generations and defects in spermatogenesis were observed in mice heterozygous for DEAF-1 starting at approximately N=5. The severity of spermatogenic defects increased with age and mice at 18 months of age showed an average 75% defect in their seminiferous tubules. Defective spermatogenesis was also observed in wildtype littermates suggesting paternal haploinsufficiency of DEAF-1 produces an epigenetic defect in the male germ cells that affects both normal and heterozygous offspring. When DEAF-1 heterozygous females were bred to males congenic for a C57Bl/6 background, defects in spermatogenesis were reversed and heterozygous offspring usually displayed less than 20% defects in spermatogenesis. These data suggest DEAF-1 haploinsufficiency results in complex epigenetic defects in parental germ lines that predispose offspring to infertility and cancer. Supported by NIH Grant R01 CA89438A.

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(TBI). Compounding this public health crisis is that no therapeutics are currently available to attenuate injury severity. Several promising compounds have entered clinical trials, yet none have proven effective. The failure of a number of compounds may have been the lack of preclinical investigation into the window of opportunity for administration. Patients sustaining a TBI typically have a several hour delay before medical intervention, thus a clinically relevant therapeutic must have a window of opportunity extending four to six hours post-injury. Recent studies have demonstrated nicotinamide, a soluble B-group vitamin, to be an effective treatment in experimental models of TBI. However, research on this compound has been limited to

administration regimens starting shortly after injury. This study was conducted to establish the window of opportunity for nicotinamide administration following controlled cortical impact injury to the frontal cortex. Groups of rats were assigned to nicotinamide (50mg/kg) or saline (1ml/kg) treatment conditions and received contusion injuries or sham procedures. Animals received i.p. injections at 15 minutes, 4 hours, or 8 hours post-injury, followed by five boosters at 24-hour intervals. Following last injection, blood was taken for serum nicotinamide analysis. Animals were tested on a variety of tasks to assess somatosensory performance (bilateral tactile adhesive removal) and cognitive performance (acquisition and working memory) in the Morris water maze. Preliminary analysis has shown that on the tactile removal test all 3 nicotinamide groups facilitated recovery of function compared to saline treatment. The acquisition of reference memory showed that no treatment groups significantly improved performance. However, in the working memory task both the 4-hour and 15-minute groups improved working memory compared to saline. These results suggest that the window of opportunity for nicotinamide extends to 4 hours following injury in the CCI model.

**Cassandra E. Rogers**  
**Andrew J. Blackwell, Graphic Designer**

Department of Biological Sciences

Ultrastructure of the Motile Gamete Cell of the Liverwort *Pellia epiphylla*.”

The motile male gametes of lower land plants show the most structural complexity of all plant cells. Liverworts show the most variety of motile cells. This study uses transmission electron microscopy to examine the fine-structure of the male gamete of *Pellia epiphylla*, a liverwort that produced the largest gamete among all bryophytes (mosses, liverworts, and hornworts). Micrographs were taken of cells still inside the male sex organ. A three-dimensional illustration of this gamete was drawn using Adobe Illustrator. *Pellia* gametes coil dextrally 4 times and are supported by a band of 16 microtubules (the spline) that taper to 6 microtubules toward the posterior. The cell measures approximately 100  $\mu\text{m}$  in length and has an average coil diameter of 9.0  $\mu\text{m}$ . The long, cylindrical nucleus lies under the spline and extends most of the length of the cell. An elongated mitochondrion that averages 15  $\mu\text{m}$  in length is located at the cell anterior. Two staggered flagella are inserted along the interior-most coil. The anterior flagellum emerges from the right-hand side of the cell, whereas the posterior flagellum emerges one half revolution away on the left-hand side. At the posterior end of the cell, behind the nucleus, is another mitochondrion averaging 2  $\mu\text{m}$ . An elongated starch filled plastid extends 5  $\mu\text{m}$  to the terminal end of the gamete. Compared to other liverworts, *Pellia* is longer and larger in diameter. Although this cell contains the same number of components, the organelles are larger and the flagella are staggered more than any other liverwort. *Pellia epiphylla* motile gametes are striking in comparison with bryophytes on account of their massive size and organelle dimensions.



## **Mario Romano**

Department of Psychology

### *Substitutability in Second-Order Schedules of Token Reinforcement in Rats*

The purpose of this ongoing study is to extend current behavioral economic research on cross price dynamics utilizing a token reinforcement context. According to behavioral economic demand analyses, the consumption of a good is a function of the price of that commodity and the prices of other simultaneously available commodities. According to the economic principle of substitutability, as the price of a certain good rises we should see an increase in the consumption of goods that meet the same functional requirements (e.g., if the price of movie tickets rose, then sales of a substitutable service, movie rentals may increase). Rats will be trained to press levers to earn marbles (tokens) that are subsequently exchanged for edible rewards (sweetened condensed milk, or food pellets). The prices of different reinforcers (i.e., the number of marble deposits required per reinforcer presentation) will be systematically manipulated to determine if the findings of previous research on substitutability could be extended to a token reward context. Presently, the subjects are in a preliminary training phase, wherein they are learning how and when to exchange tokens for back-up reinforcers. Data from these training phases will be presented and discussed.

## **Dorothy Schachel**

Department of Psychology

### *Academic Self-Handicapping: Identifying the Motivation of Self-Defeating Students*

The rationality of doing well in college and being rewarded with increased life opportunities is disrupted when students engage in self-defeating behavior. Students who practice self-handicapping tendencies, a form of self-defeating behavior characterized by an individual intentionally not doing as he or she could, irrationally limit the benefits that can be received from the endeavor of college. This study is an examination of college students' academic values and how these values predict self-handicapping behavior. Knowing the academic values of self-handicappers could allow the reinforcement of beneficial academic values in order to help students overcome self-handicapping tendencies. Students from Southern Illinois University Carbondale ( $N=159$ ) participated in this study by completing Wong's (1998) Academic Attitude Scale and Jones and Rhodewalt's (1982) Self-Handicapping Scale. The academic motivators of External Pressure from others and the belief that one has No Better Option significantly predicted self-handicapping behavior. Implications and future directions are discussed.

**LaQuita Denise Smith and Matthew Pais, Intelligent Systems Center/University of Missouri  
Rolla**

Department of Civil Engineering

*Fail Safe Child Car Seat*

*The purpose of this research was to decrease the number of infant and child fatalities that result from the improper use of child car seats. The National Highway Traffic Safety Administration (NHTSA) has stated that 71% of infants and 54% of toddlers killed in automobile accidents could have survived if their car seat had been properly installed. Because the laws and regulations mandated by the NHTSA are not always remembered, or properly understood, numerous children are dangerously placed in automobiles; and, unfortunately, suffer from serious injuries or fatalities when involved in an automobile accident. Based on this information, the Fail Safe Child Car Seat (FSCCS) research team was created to support car seat users with the correct installation process for a child car seat. The objective was to design an alarm system that detects a child's security in the car seat, the child car seat's security in the car, the child's correct weight for the orientation of the car seat, and whether or not all the safety regulations have been correctly implemented. The FSCCS research team focused on making the car seat versatile, inexpensive, and user-friendly. These objectives were met by designing the child car seat with both infants and toddlers in mind, and by acquiring affordable sensors for checking the child's weight, car seat orientation, and detecting the row that the child car seat was installed in.*

## **Joel Taddei**

School of Architecture

### *Reconstructing Cantonment Wilkinsonville*

Nearing the end of the 18<sup>th</sup> century a revolutionary war cantonment would be erected on a site on the lower Ohio River we know today as “New Grand Chain.” This cantonment would serve the many new U.S. Army recruits as a training grounds as well as providing a strong military presence on the Ohio River. A few short years later, after obtaining the title of largest military encampment in the forming country at the time, the cantonment was abandoned as a result of poor living conditions, inopportune weather events, and attacks on the camp. So where does this Cantonment - named after the Gen. James Wilkinson belong in our history books? What proof exists today that we can use to recreate the camp layouts?

It has been my interest as an undergraduate researcher to collaborate with Archaeologist Mark Wagner and Architect Bob Swenson to collect as much data as necessary to recreate how Cantonment Wilkinsonville was laid out with the aid of 3d Digital Modeling software. It is in such virtual spaces that was able to test layouts, run simulations, check sightlines, and communicate with other researchers about why or why not the cantonment would be laid out in such a way. The research and images I’ve created based on texts are important for the ongoing discussions regarding the history of the New Grand Chain town and can effect further economic development in the region much as Fort Massac in Metropolis, IL has done.

**Randi Lynn Vaughn**

Department of English

Sensationalism and *The Narrative of A. Gordon Pym of Nantucket*

This project addresses the question of how the literary market and racial climate of the 1800's influenced Edgar Allen Poe's writing of *The Narrative of A. Gordon Pym of Nantucket*—one of his most debated texts—and how reading *Pym* with sensationalism in mind provides an accurate view of racism and sensationalist expectations in the antebellum society of the 1800's. Using textual analysis, criticism, personal letters between James K. Paulding and T.W. White, and a brief historical sketch, a more accurate view of sensationalist influences in a pre-Civil War society will come to view, at the same time providing a better idea of what people in the 1800's expected from literary fiction. Emphasis is placed on Poe's attempt to "write for the masses" and the exaggeration found in *Pym*. The results found from this reading, applied to recent criticism on Poe's work and the present view of *Pym*, will contribute to the pool of knowledge concerning the affect differing views in the Northern and Southern divisions of the United States had on literature. As *Pym* was written before the Civil War, it acts as a good indicator of rising tension and conflict between the two factions, as well as serving as an excellent example of a sensationalist style of writing.

## **Myranda Vaupel**

Department of Plant Biology

*Water Chemistry of Boreal Peatlands: Responses to Seasonality and Wildfire*

*Peatlands are unique ecosystems that sequester large amounts of atmospheric carbon. They have played an important role in the landscape development of the boreal region of Alaska, Canada, and Siberia. Peatlands consist of two types, bogs and fens. Bogs are peat-accumulating wetlands that have acidic waters and are typically dominated by Sphagnum moss. Bogs are ombrotrophic systems - that is they receive nutrients only from precipitation. Fens, on the other hand, are peat-accumulating wetlands that have neutral or basic waters and are dominated by either Sphagnum (poor fens) or brown mosses (rich fens). Fens acquire nutrients from precipitation, groundwater, and upland runoff, thus they are minerotrophic. Given the importance of water chemistry in these different peatland types, I examined three gradients in detail. I studied three aspects of the water chemistry of peatlands, the bog-poor, fen-rich fen gradient, the seasonal gradient, and a wildfire chronosequence. I will analyze my data to determine if there is significant variation along the bog-poor, fen-rich fen gradient and the seasonal gradient. I will examine if there are water chemistry changes after wildfire along a 102-year chronological sequence of bogs. The chemical components of the poor waters that I am analyzing are pH, electrical conductivity, calcium, magnesium, sodium, potassium, ammonium, and phosphorous. My data have been gathered from 16 sites in northern Alberta, Canada. Two of my sites are poor fens, 4 are rich fens and 10 are bogs.*

## Ashley Webb

School of Architecture

### *Message T-shirts: Threats to Perceptions of Safety?*

Purpose. The purpose of this research was to examine visual harassment via message t-shirts. Visual harassment is exposure to a message "that continues for a length of time and is experienced by the recipient as intimidating and intrusive;" recipients feel unsafe and insecure (Larkin, 1994). Offensive t-shirts are those with "offensive or obscene symbols, signs, slogans, or words degrading any gender, cultural, religious, or ethnic values; or contain language or symbols oriented toward violence, vandalism, sex, drugs, alcohol, or tobacco" (NSBA, 1993). According to a high school principal, "If an article of clothing offends one person, it is considered visual harassment" (Schultz, 1997). Students have a right to freedom of expression; however, offensive t-shirts involve rights of other students who are required to attend school and, thus, are a captive audience (Murphy, 1991). A captive audience includes unwilling "listeners." (Murphy, 1991).

Procedure. T-shirts (n = 31) depicting a range of offensiveness were chosen based on news articles of controversial dress codes and perusal of dress codes. T-shirts were placed on a dress form and photographed. A questionnaire was compiled with items accompanied by Likert-type scales asking level of offensiveness of each shirt (10 = Offensive; 1 = Not offensive) and "If you were in class with a person wearing the t-shirt shown, how would it make you feel?" (10 = Safe; 1 = Not safe). Students viewed slides of the t-shirts and recorded their impressions.

Findings. Participants were 123 university students (20 males, 103 females, M age = 21.33; 13 African-Americans, 7 Asians, 94 Caucasians, 5 Hispanics, 4 others) from 44 different majors. Mean offensiveness ratings of t-shirts ranged from a high of 6.26 (Confederate flag), 6.03 (Hey Sweet Cheeks Fetch me a Beer) and 5.01 (Marilyn Manson) to a low of 1.84 (If at first you don't succeed, skydiving is not for you), 1.82 (Pisces) and 1.74 (Fly High in Rhode Island Hot Air Balloon Festival). Lowest mean ratings for safety were Confederate flag (m = 5.88) and Marilyn Manson (m = 5.41) t-shirts. Feelings of safety were rated at 10 by only 26% of students for the Confederate flag and 20% for the Marilyn Manson t-shirts. There was a negative correlation (-.45,  $p < .001$ ) between ratings of offensiveness and safety.

Implications. Using the standard of offending even one person, all of these t-shirts would be a means of visual harassment. Indeed, a majority of students (75-80%) indicated some feelings of a lack of safety as a result of another student in the classroom wearing an offensive t-shirt. Being exposed to some of the messages affected perceptions of safety. As ratings of offensiveness increased, ratings of feelings of safety decreased.

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*Age and Growth of Asian Carp in the Illinois River*

Silver carp *Hypophthalmichthys molitrix* and bighead carp *H. nobilis* are non-native species to North America and have spread throughout the Mississippi River drainage. As with many other exotic species, these fish could potentially cause negative economic and environmental impacts to the regions they inhabit. The Illinois River is an important lotic ecosystem that connects the Mississippi River to the Great Lakes and supports commercial fisheries and native fish assemblages. Therefore, the goal of this project was to determine age structure and calculate growth and mortality rates of adult silver carp and bighead carp in the Illinois River. A total of 105 fish of both species were collected in the Illinois River from March through September 2005 using trammel and hoop nets. Hard parts of fishes, such as fin spines, form concentric rings that correspond to each year the fish lived. The relative distance between each ring, or annuli, represents a period of increased or decreased growth, and the sum of the annuli equals the age of the specimen. A fin spine was removed from each fish collected. Each spine was sectioned and aged by two independent readers using a dissecting microscope. Growth and mortality estimates were calculated for each species using established fisheries models. Bighead carp comprised 72% of the sample, with 69% of the population between 4 and 5 years old. Silver carp between the ages of 4 and 5 also dominated the catch, comprising 85% of the population. Neither age structures nor sex ratios were different between species. The results reveal that 2000 and 2001 were strong year classes for both species. These age and growth data may reveal ways in which bighead and silver carp are becoming established in the Illinois River and therefore aid in effectively controlling the spread of these species and preventing further environmental and economic impairment.



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*The Impact of the Positive Behavior Implementation Support Program on Special Education Enrollment in Southern Illinois.*

Schools are commonly faced with deficiencies in behavioral guidance and questions about the appropriateness of student placement in special education programs. This problem is especially pertinent in Illinois because the state has a special education enrollment of 14.70% compared to the national average of 11.55%. The Positive Behavior Intervention Supports (PBIS) program was developed in 1998 to bring focus and direction to students by training teachers to demonstrate positive behavior. This study examines the possible relationship between the implementation of PBIS and the percentage of students in Special Education programs. The researcher gathered data about the level of implementation of PBIS and the percent of students enrolled in special education programs in various southern Illinois schools. The results of the current study do not indicate a significant relationship. Implications for future research are discussed.