

Fifteenth Annual
Student Scholarship Exposition

Bradley University
Expo
2007
Student Scholarship Exposition

Bradley Hall
April 13, 2007

WELCOME

2007 Student Scholarship Expo

SCHEDULE OF EVENTS

8:00 a.m. – 10:00 a.m.	Student Project Set-Up
2:00 p.m. – 4:00 p.m.	Oral Presentations
3:00 p.m. – 5:00 p.m.	Poster Presentation Public Viewing
5:00 p.m. – 6:00 p.m.	Removal of Projects from Bradley Hall

Refreshments will be provided during oral and poster presentations on the 3rd floor of Bradley Hall.

Acknowledgements

Dr. Robert Baer, Dean
Dr. Edward Sattler, Associate Dean
Foster College of Business Administration

Dr. Claire Etaugh, Dean
Dr. Jerome Hahn, Associate Dean
College of Liberal Arts and Sciences

Dr. Jeffrey Huberman, Dean
Mr. James Ludwig, Associate Dean
Slane College of Communications and Fine Arts

Dr. Richard Johnson, Dean
Dr. Robert Podlasek, Assistant Dean
College of Engineering and Technology

Dr. Joan Sattler, Dean
Dr. Lori Russell-Chapin, Associate Dean
College of Education and Health Sciences

Faculty Mentors

Personnel

Dr. Erich Stabenau
Director for Research Development

Kim Willis
Student Expo Director

Student Scholarship Exposition Committee

Student Participants & Areas of Knowledge

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Marcel Bartik

Do Gp96 Oligomers Form in Vivo?

Department of Biology and Biochemistry

Faculty Mentor: Dr. Kristi McQuade

Gp96 is a highly conserved and abundant endoplasmic reticulum (ER) chaperone protein that is upregulated in response to stress. It has been previously shown by our lab that gp96 undergoes spontaneous self assembly into high molecular weight complexes when exposed to temperatures as low as 42°C and that self assembly is inhibited by physiological concentrations of ATP. Through electrophoresis and immunoblot analysis of Chinese hamster ovary (CHO) cell lysates, our lab has shown for the first time that high molecular weight complexes containing gp96 form *in vivo*. It is not immediately clear whether the observed complexes are gp96 homooligomers or protein complexes containing both gp96 and other proteins. We are developing concanavalin A batch chromatography and immunoprecipitation protocols to purify these complexes so that their protein content can be determined by a combination of one- and two-dimensional electrophoresis and immunoblotting.

Chase Bolt, Dan Dressel

Expression Analysis of Two New Tyrosine Kinase Genes in the Freshwater Cnidarian Hydra Vulgaris

Department of Cell and Molecular Biology

Faculty Mentor: Dr. Nicholas Stover

Tyrosine phosphorylation is a vital part of cell signaling in all metazoans. Many protein tyrosine kinases (PTKs), including members of the Ryk family, are membrane-bound and contain a receptor domain, allowing them to directly receive and transmit signals from other cells or the surrounding environment. Other PTKs, the non-receptor tyrosine kinases, are not membrane-bound and are free to move about the cytoplasm. The purpose of this study is to analyze the expression patterns of a Ryk family member and a non-receptor tyrosine kinase, both of which were revealed during the recent sequencing of the *Hydra vulgaris* genome. These patterns may provide clues to the ancestral functions of these kinases.

Angelina F. Bonner

Restoration of Muscle Function Following Pyrene Exposure and Depuration in Rana pipiens

Department of Biology

Faculty Mentor: Erich K. Stabenau

Polycyclic aromatic hydrocarbons (PAHs) are a major group of diverse environmental organic pollutants formed mostly by incomplete combustion of fossil fuels. The purpose of the present studies were to: (1) analyze the physiological effects of in-water PAH (i.e., pyrene) exposure temperature on muscle performance, (2) determine whether a PAH-exposure interval of 7 or 14-days altered results, and (3) to examine whether the effects of an in-water pyrene exposure could be reversed during depuration experiments. Frogs were exposed to a pyrene-saturated environment for 7-days (at 19.6 and 27.5°C) or 14 days. Depuration experiments involved transferring (7 or 14-day) pyrene-exposed frogs to clean water environments for periods of 4 to 25 days following pyrene exposure. Swimming performance, muscle contractile force, mitochondrial O₂ consumption, and membrane potential were analyzed in control frogs, frogs immediately following pyrene-exposure, and frogs depurated at various periods (e.g. 4, 7,13, and 25 days). Exposing frogs to pyrene-saturated water at temperatures of 19.6 and 27.5°C produced comparable decreases in swimming performance and muscle mitochondrial O₂ consumption. Moreover, a 7-day pyrene exposure significantly ($P \leq 0.05$) reduced swimming performance to 22±6% of control. Following 25 days of depuration swimming performance was 98 ±8% of control. Mitochondrial O₂ consumption was 78±4% of control immediately following a 7-day pyrene-exposure, and 77±2%, 85 ±2%, 94± 2%, and 97±7% of control at 4,7,13,25 days post-exposure, respectively. Effective depuration was also evident for muscle contractile force and mitochondrial membrane potential. 14-day pyrene exposures produced significant,

yet comparable decreases in swimming performance and mitochondrial O₂ consumption to that measured following 7-day exposure. These data suggest that (1) pyrene exposure produces adverse effects to frog muscle performance, despite varying the exposure temperature or the length of the exposure period, and (2) the adverse effects of pyrene exposure on frog muscle function could be reversed providing that the frogs are transferred to clean water environments for extended periods of time. Funding support provided by a Bradley University Biology Department Bjorklund Research grant, SURF and Sherry Foundation grants, and a Tri-Beta Research grant to AFB.

Ashlyn Borges

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Nutrient Dynamic Differences in Wetland and Former Wetland Soils Following 80+ Years of Agriculture

Department of Biology

Faculty Mentor: Dr. Sherri Morris

Soil C content and nutrient dynamics are important factors to developing plant communities and can be altered by moisture regimes. This study examines C dynamics at Emiquon, a large-scale wetland restoration project along a major river system following soybean/corn cultivation for 80+ years. At this site are two former wetlands that existed for 50 and 1,000+ years. A current wetland site is located just outside the levee. As a comparison for the Emiquon site, an additional wetland site approximately 10 miles up river was examined. This site also has current wetland and agriculture on a soil type similar to Emiquon. Composite cores from 0-10, 10-25, and 25-50 cm depths were taken. Soils were analyzed for bulk density, total and resistant carbon and nitrogen, and net nitrogen mineralization rates determined using two 30-day incubations. Differences in C and N content were not detected in former wetland soils. Both former wetlands have similar C and N content to the adjacent wetland, but a much lower C:N ratio. At the second wetland site, agricultural lands at this site have much lower C than the adjacent wetland. This wetland C content did not differ from the Emiquon site, suggesting a wide range of C values for this wetland system, even on similar soil types. At Emiquon resistant C, resistant N and the RC/RN ratio were higher in the younger former wetland at 10-25 cm. However when summed to 50 cm, resistant C/N was higher in the older former wetland. Percent resistant carbon was

higher in former wetland soils than the adjacent wetland. Nitrogen mineralization, nitrification, and percent nitrification were significantly higher in 0-10 cm current wetland soils following 30 days incubation. After 60 days, current wetland soils had significantly greater N mineralization and nitrification at 0-10 cm. However, the older former wetland had higher nitrogen mineralization and nitrification at 10-25 cm. These results suggest that nutrient content and nitrogen turnover currently differ between the former wetland sites and wetlands. We predict that restoration will result in changes in soil carbon dynamics and increased nitrogen turnover as sites are returned to wetlands. Further investigation is needed to evaluate whether the differences are associated with soil type, topography or moisture.

Megan Ciesko, Elaine Lencioni, Fran Berner, Samantha Bush
Morphology and RAPD Banding Patterns in Gentian Hybrids
 Department of Biology
 Faculty Mentor: Dr. Janet Gehring

Since the mid 1800s, human expansion has converted Illinois prairie into farmland. Today, only a fraction of Illinois' original prairie exists. Restoration efforts are underway to return prairies to the Illinois landscape. While prairie restoration has many benefits, including restoring species diversity and genetic diversity to prairie sites, man-made prairies tend to qualify as disturbed environments, making it easier for species that do not normally co-exist to live in the same site. This is the situation at Switzer Prairie, where two gentian species have hybridized. Because these hybrids may be better adapted to a disturbed environment than their parents, they may out-compete their parents for resources, which has the opposite effect of prairie restoration goals. The purpose of this experiment is to determine the extent to which *Gentiana flavida* and *Gentiana puberulenta* have hybridized at Switzer Prairie. We compared phenotypic characteristics of individuals to their genotype, which we determined using RAPD-PCR analysis. Our results indicate that the majority of our sample size consisted of pure *G. flavida* and hybrids, the latter of which were all similar in appearance to *G. puberulenta*. In the sample size, as the percent of *G. puberulenta* RAPD markers increased in individuals, so did physical characteristics of *G. puberulenta*.

Kelly Hall, Amanda Gillett
In Vitro Chemotaxis of Human Bone Marrow-derived Mesenchymal Stem Cells Following Exposure to Soluble Factors from Epithelial Ovarian Carcinoma Cell Lines
 Department of Biology
 Faculty Mentor: Dr. Craig Cady

Introduction: Ovarian cancer is the deadliest of the gynecologic malignancies. In 2007, an estimated 15,280 women will die of this disease. No significant breakthroughs have been made over the past 20 years to treat advanced stages of ovarian cancer. Tumor hypoxia is one of the obstacles to the effective treatment of ovarian cancer. BMSCs are effectively recruited from the circulation into malignant tissues following hypoxic stress or injury. We hypothesize that human mesenchymal stem cells from bone marrow (HBMSC) and umbilical cord blood stem cells (UCBSC) migrate to ovarian cancer cells. **Methods:** Three in vitro models of invasion/chemotaxis were used to evaluate migration of HBMSCs and UCBSCs toward ovarian cancer cells: Matrigel invasion assay, tumor spheroid chemotaxis assay and co-culture chemotaxis assay. Experiments were repeated a minimum of three times. **Results:** For the Matrigel invasion assay, direct exposure of BMSCs or UCBSCs to Hey cells or to concentrations of $\geq 40\%$ serum-free Hey cell-conditioned media resulted in significantly increased invasion by BMSCs compared to that observed following exposure to serum-free media alone ($p < 0.001$). Stem cell attachment was observed after 24 hours of co-incubation of BMSCs with tumor spheroids, stem cell were closely associated both at the surface and interior of the spheroids. Control fibroblast cells neither penetrated nor attached to spheroids. Evaluation of co-culture chemotaxis assays is underway. **Conclusions:** Our preliminary data suggests that human mesenchymal bone marrow stem cells migrate toward and associate with ovarian cancer cells. Further studies are required to demonstrate this proof of concept.

Loren Reed, Megan McGirk, Ashely Little, Jennifer Carroll, Deanna Gotkowski

Effects of cocaine/hypoxia exposure on cerebral complex I and complex II initiated mitochondrial oxygen consumption in two rat species

Department of Biology

Faculty Mentor: Dr. Erich K. Stabenau

Cocaine use produces multiple pathological consequences, specifically cerebral vasoconstriction, which induce hypoxia or decreased oxygen levels in the brain. The pathological effects of cocaine/hypoxic exposure on complex II (CII)-initiated cerebral mitochondrial oxygen consumption in juvenile Fischer rats have been studied in our laboratory. This present study focused on comparing the effects of cocaine/hypoxia on complex I (CI) and CII-initiated cerebral mitochondrial oxygen consumption in Fischer rats and Sprague Dawley rats. Experimental rats were injected with cocaine dissolved in saline (30 mg/kg, IP) and were exposed to hypoxic conditions at either 20°C or 32°C. Control rats were injected with saline (IP) and were exposed to normoxia at either 20°C or 32°C. Following cocaine/hypoxic exposure, core body temperatures were shown to drop significantly at 20°C in both rat species, indicating hypoxia-induced hypothermia. When Fischer and Sprague Dawley rats were exposed to an ambient temperature of 20°C, oxygen consumption by CI decreased significantly. CI oxygen consumption was shown to significantly increase when Fischer rats were exposed to an ambient temperature of 32°C. However, this significant increase was not seen in Sprague Dawley rats, possibly due to an increased hypoxia resistance. Previous studies in Fischer rats have shown C2 oxygen consumption increases at 32°C, which is consistent with our findings of CI-initiated oxygen consumption. Additional studies to determine the cause and possible benefits of changes in oxygen consumption are needed to further our understanding of cerebral activity under hypoxic stress, such as stroke.

Kaylee M. Rosenbaum, John D. Lueck

Effects of Cocaine/Hypoxic Exposure on Rodent Body Temperature

Department of Biology

Faculty Mentor: Erich K. Stabenau

Previous studies have reported that cocaine administration causes body hyperthermia (Crandall et al., 2002) and induction of cerebral hypoxia (Weese-Mayer et al., 1994). In light of the neurological benefits of hypoxia-induced hypothermia (HIH) during hypoxic and/or ischemic episodes, and the subsequent potential inhibition of that mechanism during cocaine exposure, the purpose of the present study was to examine whether cocaine administration alters HIH in juvenile and adult rats. Juvenile (n=27) and adult male (n=48) Sprague-Dawley rats were exposed to normoxia (21% O₂, balance N₂) or hypoxia (6% or 9% O₂, balance N₂) at cold (20°C) or warm (32°C) ambient temperatures. For a comparison between species, juvenile Fischer rats (n=17) were exposed to the same normoxic and cocaine/hypoxic exposure protocols. Prior to exposure, the rodents were randomly placed into one of three injection treatment groups: (1) those receiving no injection, (2) those receiving isotonic saline (1mL/kg IP), and (3) those receiving cocaine (30mg/kg SC or IP). Normoxic rodents from each group were then placed into thermostated chambers for 155 min, while hypoxic rodents were exposed to 60 min of normoxia, 35 min of hypoxia, and 60 min of normoxia. Rectal body temperatures were measured in juvenile animals after 30 min of normoxia and 35 min of hypoxia, and at 1-min intervals during exposures with implanted biotelemetry units in adult rats. No significant changes in body temperatures were detected in any control (i.e., non-injected and saline-injected) rodents exposed to normoxia at cold or warm ambient temperatures. In Sprague-Dawley juveniles, however, cocaine appeared to elicit body hypothermia during the normoxic phase. During hypoxia at reduced ambient temperatures, cocaine-exposed rats exhibited a dose-dependent drop in body temperatures with larger temperature

changes occurring with increased hypoxia. Finally, Fischer juvenile rats had a significantly greater drop in body temperature during cocaine/hypoxic exposure than in juvenile Sprague-Dawley counterparts. Successive days of exposure resulted in reducing the magnitude of the hypoxia-induced hypothermia. Taken together, these data suggested that (1) cocaine does not alter HIH, despite previous studies demonstrating induction of body hyperthermia following cocaine administration, and (2) juvenile species respond differentially to cocaine/hypoxic exposure. Funding support provided by a Biology Department Bjorklund Research grant, a Peoria Next seed grant to EKS, a Bradley University Student/Faculty Collaborative Research grant, SURF and Sherry Foundation grants, and by a Biotechnology Research and Development Corporation internship to KMR.

Julia Schurr

Spliced Leader Addition in Phylum Cnidaria

Department of Biology

Faculty Mentor: Dr. Nicholas Stover

Spliced leader addition, a form of RNA *trans*-splicing, is a post-transcriptional modification similar to internal intron splicing made to a significant portion of *Hydra* mRNAs. In each case the mRNA is *trans*-spliced to an RNA encoded within *Hydra*'s 5S rRNA gene repeats. The *trans*-splicing machinery specifically recognizes and removes terminal introns of mRNAs, replacing them with spliced leader sequence. Spliced leader addition seems to be unnecessary for the survival of the organism, as terminal introns are not an obvious hindrance to mRNA translation and the spliced leader is not added to many mRNAs. Taken with the seemingly random distribution of spliced leader genes in taxa related to *Hydra*, this knowledge poses two interesting questions about the evolution of *trans*-splicing. First, did *trans*-splicing evolve in a common ancestor, only to be lost in some lineages, or did spliced leader addition evolve multiple times, with each evolution event occurring independently? Second, from what gene(s) did *trans*-splicing evolve? To answer these questions, we sequenced DNA from a relative of *Hydra*, an anthozoan called *Renilla*, and compared the genes found in its 5S rRNA repeats to known DNA sequences using a BLAST search. Unlike *Hydra*, we found that *Renilla* contains U1 small nuclear RNA genes interspersed in the 5S rRNA gene repeats. Finding both the U1 small nuclear RNA gene and the spliced leader gene in the same location within related taxa suggests complex events in the evolution of spliced leader addition in *Hydra*.

Alec Witty, Danielle Steker, Lauren Hughes

In Vitro Transdifferentiation of Mesenchymal and Hematopoietic Stem Cells into Dopaminergic Neurons

Department of Biology

Faculty Mentor: Dr. Craig Cady

Introduction: Parkinson's Disease (PD) is a neurodegenerative disorder characterized by the loss of midbrain dopaminergic (DA) neurons and the subsequent reduction in striatal dopamine levels. Current treatments for PD have profound side effects. The most promising treatment for PD may come from research involving transplantation of stem cells or transdifferentiated stem cells into the brain. The objective of this study was to induce the transdifferentiation of human bone marrow (BMSCs) and umbilical cord blood stem cells (UCBSCs) into functional DA neurons.

Methods: Human and Rat BMSCs and human UCBSCs were cultured in an FBS D-MEM medium and incubated at 5% CO₂ and low oxygen (9%). Cells were treated with growth factors, cell cycle agents, and cell-specific conditioned media. Transdifferentiated cells were evaluated for general neuronal morphology and immunocytochemistry for neuronal and glial specific protein expression (MAPII and GFAP). Tyrosine hydroxylase immunostaining was used to assess DA expression. Mouse substantia nigra neurons were used as control cells for immunocytochemistry studies of transdifferentiated cells.

Results: Dramatic changes in morphology were observed between control and experimental groups. Spindle-shaped stem cells began to exhibit characteristic neuronal morphology such as rounded somas with extensive, branching processes. Experimental groups stained positively for neuronal, glial, and dopaminergic cell markers. Preliminary electrophysiology recordings show evidence of voltage-gated channels.

Conclusions: This study demonstrates the potential of mesenchymal and hematopoietic stem cells to transdifferentiate into dopaminergic neurons *in vitro*. Future studies include transdifferentiated stem cell transplantation experiments in a PD animal model.

Vicki Wu

Expressing and Purifying GP96 in E. Coli

Department of Biology

Faculty Mentor: Dr. Kristi McQuade

Gp96 is a chaperone protein that is found in higher-level eukaryotes. Our group has previously examined the heat-induced self-assembly of this protein *in vitro*. The objective of my research is to express Gp96 in *E. coli* in order to purify it in large enough quantities for future biochemical analysis. The ultimate goal of this project is to compare the oligomerization and biochemical properties of site-directed Gp96 mutants in order to map the specific regions of the protein that are involved in self-assembly.

I have introduced three different Gp96 constructs (two His-tagged, one GST-tagged) into several bacterial strains and conducted pilot protein expression studies on them. GST-tagged Gp96 was expressed at high levels in BL21(DE3) pLys and Rosetta-gami-B strains of *E. coli*, but a significant amount of truncated or partially-degraded protein was present in both strains. Lysates from both strains were subjected to batch chromatography with glutathione agarose. Whereas GST-Gp96 from BL21(DE3)pLys did not bind significantly to the beads, the protein expressed in Rosetta-gami-B did bind and could be eluted from the column with glutathione. Truncated products were also eluted. The study of the His-tagged construct is currently still in progress.

Amy Zepp, Kate Donovan, McKenna Pencak, Lyndsey Withers
Trick-or-Treat Your Pet
 Department of Communication
 Faculty Mentor: Dr. Michael Thurwanger

Facing the threat of impending competition from a national dog bakery chain that recently opened in Peoria, My Dog's Bakery (MDB) needed to enhance its image in the community and its relationships with current customers. MDB teamed up with Creative Communications, a group of four Bradley University public relations students, to raise visibility and awareness through a partnership with Foster Pet Outreach (FPO), a small not-for-profit organization that cares for unwanted animals. After conducting both primary and secondary research and setting objectives, Creative Communications developed several strategies to help MDB and obtain publicity. We chose to tie in with Halloween and host a week of "Trick-or-Treat Your Pet" events featuring a costume contest for pets. To increase the chances of receiving media coverage, we solicited costume contest judges from local media outlets and wrote several press releases focusing on different news angles. Finally, we endeavored to reach members of the local pet community by distributing informational flyers at pet-related events and businesses. Over 200 people attended the Saturday "Howl-o-Ween Party" which attracted extensive local media coverage including all three local television news stations and the *Journal Star*. Following the party, MDB was able to donate \$350 and 49 gently-used pet items to FPO. As a result of the efforts of Creative Communications, MDB received over \$7,000 worth of advertising equivalency as well as a 9.5 percent increase in community awareness.

Amanda Decker-Fitts
An Interdisciplinary Study of Indigenous Healing Practices from Counseling & Anthropology Perspectives
 Department of Educational Leadership and Human Development
 Faculty Mentors: Dr. Christopher Rybak

This project is designed to produce video, audio, and written documentation of the American Indian healing practices that are used by community members at Seven Circles Heritage Center in Edwards, IL. Members and participants are being interviewed to explore their concepts of healing and in what ways the programs at Seven Circles contribute to the experience of healing from an indigenous American Indian perspective. A digital documentary will serve to instruct future counseling classes about the culture of American Indians and how counseling might be aligned with these views in order to be effective.

From an American Indian perspective, "healing" is not the same as curing, but relates much more closely to the cultural concept of coming into greater harmony with the Whole of life that includes the emotional, the intellectual, the physical, as well as the spiritual dimensions. This is entirely unlike western medical science that commonly tends to view health and illness in more absolute and linear terms, rather than in the complex and multifaceted way that American Indians have traditionally viewed wellness.

The photo essay presentation at the Student Scholarship Exposition demonstrates several healing practices conducted at Seven Circles, including those performed at the annual veterans' powwow, those that revolve around the performance of traditional drum and flute music, sweat lodge ceremonies, pipe ceremony, traditional dancing, and the use of native herbal medicines.

Wayne Bogart, Justin Middleton

Autonomous Connect Four

Electrical and Computer Engineering Department

Faculty Mentors: Dr. James Irwin, Jr., Mr. Nick Schmidt

This project will take a Connect Four board game and automate the game play. Two different phases of game play will be available; Person vs. Computer, and Computer vs. Computer. Computer refers to the use of the EMAC development board and its 80C535 microcontroller. Goals for the project are to be able to fully automate every aspect of the game, resetting the game, placing the pieces, and playing the game, without human interaction.

The use of embedded controls is combined with image processing to play the actual game instead of creating a virtual environment. The project currently demonstrates video modifications, color sorting, and game piece manipulation using the microcontroller which controls the motors and solenoids.

Jarrod Cook, Nathan Grove

Ultra-wideband Research and Implementation

Electrical and Computer Engineering Department

Faculty Mentors: Dr. Brian Huggins, Dr. In Soo Ahn, Dr. Prasad Shastry

Ultra-wideband (UWB) is a wireless transmission standard that will soon revolutionize consumer electronics. UWB is interesting because of its inherent low power consumption and high data rates of up to 480 Mbps. This new standard has recently been approved by the FCC for unlicensed use and has been gaining interest throughout the consumer electronics industry.

The goal of the project is to increase interest in UWB technology. The project will utilize the Texas Instruments' TMS320C6416 DSP development board to implement a model of a scaled down version of a UWB communication system with Matlab Simulink and Code Composer Studio software. This project uses multi-band orthogonal frequency division multiplexing (MB-OFDM) to transmit data. The transmitter portion of the model will take a binary signal from an analog to digital converter (ADC), modulate the signal into a stripped down version of UWB, up-convert the signal, and then finally transmit the signal. This project will also include radio frequency (RF) hardware to externally up convert the transmitted signal to a higher frequency around 3 GHz. The receiver portion of the model will take the transmitted signal and down convert, frame synchronize, demodulate, and symbol synchronize it, to finally realize the original signal. This signal will be sent to a digital to analog converter (DAC) for comparison.

Cody Doremus, Keegan Roach

Electric Motor Control with Regenerative Braking

Electrical and Computer Engineering Department

Faculty Mentor: Dr. Steve Gutschlag

Regenerative braking is a process whereby energy may be recovered that would otherwise be lost to friction braking. Regenerative braking is used for automotive and industrial applications. The Electric Motor Control with Regenerative Braking project will develop a regenerative braking simulink model and a test bench will be constructed to verify the simulation model. Once the model is verified, the model will be modified to predict the influence of motor characteristics on the efficiency of regenerative braking.

Stephen Friederichs

Design of a Low-Power Data Acquisition Board for Embedded Controls

Electrical and Computer Engineering Department

Faculty Mentor: Dr. Gary Dempsey

This project involves the design and construction of a data acquisition system for use with embedded control systems. Embedded control systems are becoming more numerous in a variety of devices. These control systems help to improve efficiency and autonomy in these devices. The control systems depend on outside data for their operation. This data must be digitized through the use of transducers, interfacing analog hardware, and software to perform data manipulation. One of the most common tools used to implement control systems and support their associated transducers is the microcontroller. In most applications, one microcontroller is responsible for the the transducer interfacing hardware and software as well as implementing the controller. Thus, extra design time is necessary to accommodate both of these tasks, and useful microcontroller resources are expended on the transducers. An alternate approach is to offload all of the tasks associated with acquiring data for the control system to another microcontroller. This would act as a subsystem of the main controller. In addition, the data acquisition could be made generic so that it could have enough analog hardware and software to interface a variety of transducers quickly. This is the goal of the project. Currently, analog hardware has been constructed to allow interfacing of resistive and capacitive transducers as well as a configuration interface for the data acquisition system, and a serial communication link to Matlab to display collected data. The demonstration system monitors room temperature via a thermistor and graphs the data in Matlab.

Dan Leach

NES On-A-Chip

Electrical and Computer Engineering Department

Faculty Mentor: Aleksander Malinowski

The NES On-A-Chip (FPGA NES) is a proof-of-concept project designed to illustrate the possibility of implementing and replacing aging (legacy) computers and electronics using field-programmable gate arrays (FPGAs). Legacy systems are abundant in corporate mainframes, airports, and military facilities. If a component in one of these systems fails, installing a readily available FPGA may be far more economical than tracking down a compatible application-specific integrated circuit (ASIC) to use as a replacement. In addition, by utilizing more modern integrated circuit manufacturing technologies, the power consumption of the component or system to be replaced can be drastically reduced. By using FPGAs, the design also has the capability of being upgraded or even performing the work of more than one system – with little added expense. The Nintendo Entertainment System (NES) was chosen to demonstrate this idea. At the time of its release, this system utilized a microprocessor requiring a two-phase clock, a complicated function generator used for audio, a video processing unit, and several types of memory interfaces. All of this functionality is spread out over more than a dozen components on the motherboard. In such a system, if one of the ASICs were to fail, it would be quite difficult to replace it. However, if all of the functionality is implemented on a single FPGA, maintenance costs such as these decrease sharply. The goal of this project is to implement the entirety of the NES on a single Altera Cyclone FPGA.

Rob Ruber, Austin Scott, Bryan McKinney, Adam Salisbury

Search and Rescue Application for Cooperative Autonomous Vehicles

Electrical and Computer Engineering Department

Faculty Mentor: Dr. Brain Huggins

The purpose of the senior design project is to design and implement cooperative autonomous robots for search and rescue applications. The robots will cooperatively search an unknown terrain for certain objects (“victims”) that are located in the environment. The task will be accomplished with each robot cooperatively mapping the area and communicating with the other robot. The robots will communicate to each other an updated map, their current position, position of victims, and the possible need for help with saving victims. The project focuses largely on optimizing cooperative function of the robots. The goal is to demonstrate that they will be more effective and efficient completing a search and rescue task cooperatively, rather than independently. The measurable for this are as follows:

- Number of victims recovered
- Amount of total area mapped
- Execution time

Emberly Smith, Chris Edwards

Design of Simulink-Based 2-DOF Robot Arm Control Workstation

Electrical and Computer Engineering Department

Faculty Mentor: Dr. Gary Dempsey

The design of the Simulink-based 2-degree-of-freedom (2-DOF) robot arm control workstation allows the user to interact with a model of the physical workstation outside of the laboratory setting. The physical workstation consists of the robot arm system, power amp, joystick, computer, and several devices used to collect and analyze data. This is a continuation of a previous project done by Adam Vaccari and Kain Osterholt in 2004-2005. They modeled the robot arm with only one degree of freedom, excluding the rotary flexible joint from the software model.

The new design includes a model of the second degree of freedom which treats the robot arm as a mass-damper-spring system and addresses the friction in the springs and joint. All additions to the model are based on data from the physical workstation using the software packages: Matlab, Simulink, SimMechanics, Virtual Reality Toolbox, and Real-time Workshop. Several different controllers have been designed for the robot arm to enable greater precision and speed. A graphical user interface and a virtual reality workstation have been constructed using the software packages in order to enable the user to interact with the simulation in real-time. After the project is completed, control theory students will be able to use the robot arm control workstation for homework problems and design projects which will allow a better understanding of the concepts. The control workstation can also be used by graduate students as a platform for advanced controller algorithms such as artificial neural networks.

Sureshbabu Sundaram

Wideband Power Amplifier for Wireless Systems

Electrical and Computer Engineering Department

Faculty Mentor: Dr. Prasad Shastry

Monolithic Microwave Integrated Circuit (MMIC) technology facilitated a tremendous growth of contemporary wireless systems. In MMICs all passive and active circuit elements and interconnections between them are created in the same substrate. This is important for system applications that need improved performance, reliability, reproducibility, and small size and weight.

Modern wireless systems operate in various bands spread over a wide frequency range. Radio Frequency (RF) power amplifiers (PA) are used in wireless systems such as Cellular telephone, Wi-Fi, Satellite TV/Radio, and GPS. A PA is a circuit for boosting the strength of a signal. Hence, a wideband PA design for multitude of applications is of significance.

This is a Bradley-MiniCircuits collaborative project on the design of wideband power amplifiers for the frequency range 100 MHz to 5000 MHz with a gain of 20 decibels and output power of 200 milliwatts. The topology used here is that of a Distributed Amplifier (DA) which has an inherent wideband performance characteristic with excellent flatness.

To achieve the desired specifications the following three techniques were implemented: 1) Conventional Cascaded Distributed Amplifier (CCDA), 2) Cascaded-transistor cell Distributed Amplifier (CADA), and 3) Matrix Distributed Amplifier (MXDA). The transistors used in the designs are MESFETs from the TriQuint's TQTRx process. The design and simulation results of the amplifiers are presented.

Stacy Ederle

Influencing Factors of Calcium Consumption

Department of Family and Consumer Sciences

Faculty Mentor: Dr. Erin Devlin

The purpose of this study is to examine the relationship between factors that influence adequate calcium intake in children, focusing on how ethnicity affects food preferences. Food frequency questionnaires combined with focus groups were used to discover how school children perceive calcium, their taste preferences of foods high in calcium, and how ethnicity affects calcium consumption.

This study attempts to explore the main factors that influence students' food choices and preferences for either American or other ethnic diets and to examine if there is a correlation between the ethnicity of a child and the amount of calcium in his diet. Also, this study hopes to evaluate whether ethnically diverse children receive sufficient amounts of calcium-rich foods in their diets and whether their calcium consumption reflects a typical American diet or a more ethnically based diet reflecting their home life.

Data was collected from 4th graders at a local Peoria area private school. Food tasting of four different ethnic dishes including a dish from the following cultures: American, Hispanic, Asian, and East Indian were included in the focus group. Focus groups were conducted to explore preferences and food habits of the students pertaining to calcium consumption. Preliminary data shows that a student's ethnicity does play a role in his food habits and calcium intake. However, a child's ethnicity did not necessarily correlate to food preferences as seen through the focus groups. The results will hopefully help to draw better conclusions on the impact of a child's ethnic background on calcium intake.

Molly Hammar

Change in Aerobic Capacity in Cyclists After Diet Intervention

Department of Family and Consumer Sciences

Faculty Mentor: Dr. Jeanette Davidson

Measuring VO₂max is a way to assess aerobic capacity and fitness level. Previous research has demonstrated that increased aerobic capacity will positively impact cardiovascular health, diabetes risk, the aging process, and athletic performance. The aim of this research is to determine whether VO₂max increased in elite cyclists after 6 weeks as a result of diet intervention to aid in training. In this research, the VO₂max of ten cyclists from the Tri-Peoria Triathlon Club was obtained. Resting energy expenditure (Korr Medical), body composition (Tanita), and hematocrits were measured to gain a better understanding of each cyclist's dietary needs. Each cyclist kept 7-day diet and training logs that were analyzed using a dietary analysis program (Food Processor II). Based on each cyclist's measurements, dietary recommendations were made individually and were delivered to each cyclist via email. There were 9 males and 1 female in the study with a mean age of 38.5 years. Mean baseline measures indicated VO₂max of 50.76 ml/kg/min, resting energy expenditure of 2200 kcal, body fat percentage of 16.2%, and hematocrit values of 44.5%. We plan to repeat all measurements to assess changes in these variables over time. The results will be presented at Bradley University Expo. This data will reveal if diet intervention aided in training and subsequent increase in VO₂max after 6 weeks in elite cyclists.

Molly Hammar, Becca Hannon, Rachel Rogers
Influences on Cookware Choices of Young Adults
 Family and Consumer Sciences Department
 Faculty Mentors: Dr. Nina Collins, Dr. Kevin Randall

By examining what influences cookware choices, a company such as Healthy Gourmet can better position themselves in the market. The Healthy Gourmet Company manufactures a high quality, American-made, stainless steel cookware sold only through direct distribution. By creating a focus group, this research examined what contributes to cookware choices for young adults ages 20-25. Research shows that increase sales result from marketing efforts that focus on education, such as classes on how to use types of cookware and cooking lessons. The place that people buy cookware also influences their choices. In addition, research shows that consumers have a preference according to the composition of cookware. For example, stainless steel cookware has grown rapidly between 2003 and 2005. The sales of stainless steel cookware are projected to increase even further of an annual rate of about 8.1% through the year 2010. This research project used a focus group of Bradley University students ages 20-25. Questions regarding cookware choices were asked before and after a demonstration of a high-quality stainless steel cookware product developed and marketed by The Healthy Gourmet Company. The demonstration of use and care of the Healthy Gourmet cookware increased the propensity for these young adults to purchase high-end cookware.

Mary Lou Strong, Andrea Willis, Vanessa Smith, Honog Ricket,
 Suparna Misra
Diabetes Fashion Pump/Pack
 Department of Family and Consumer Sciences
 Faculty Mentors: Dr. Nina Collins, Dr. Kendra Brandes, Dr. Chang-Ok Choi,

Children who must wear insulin pumps have encountered a shortage of affordable accessory packs that are suited for their ages and activity levels. This creative production was designed to provide individualized fashionable accessories for diabetic children. Five Bradley students majoring in foods, nutrition and dietetics and retail merchandising met with fifteen children and their parents in December. These two majors used their knowledge of diabetes and fashion production to develop this project to meet these unique needs. A questionnaire was used to determine children's preferences for color, fabric choice, type of accessory for how they managed their diabetes, hobbies and other personalized needs. Using this information, Bradley students met at the beginning of second semester to divide the work load and to determine a process to create these very individualized packs. A community individual who creates packs for one child came to share information about the design process for her "client" to this creative research group. Bradley students designed packs for three different clients using the questionnaire as a guideline. Dietetics majors shared their knowledge about diabetes and Retail Merchandising students shared their knowledge about production with the group. The project culminated with a Fashion Show in which the children-clients were given at least two accessory packs specifically designed for them. During the fashion show, the Bradley designers discussed the design process while the child/client "modeled" their new accessory for friends and family.

Andrea Willis, Allison Rose, Jamie Portnoy
Waterless Cookware Comparison
 Family and Consumer Sciences Department
 Faculty Mentor: Dr. Nina Collins

The purpose of this research was to determine the effects of cooking techniques of vegetables in Healthy Gourmet Cookware compared with other cook wares, the resulting color retention, cooking time, and consumer taste acceptability as well as the usability of the Healthy Gourmet's preparation guidelines and consumer support for their company's product. There are many claims that Healthy Gourmet makes that will in essence pay for the cookware over a period of time. Reduced fat, reduced cholesterol, reduced meat shrinkage, increased nutrition, increased energy, and increased health are among the many claims, however, this study specifically concentrated on reduced cooking temperatures and time and enhancement of natural color in vegetables as well as directions given to their customers. The waterless cooking process allows foods to use their own moisture instead of adding additional water or oil. A water seal is formed with the cover from the food's natural moisture which prevents vapor from escaping. Consumer acceptability was determined with a consumer acceptance standard preference taste panel scorecards. Measurement of color was done with the spectrophotometer. Preliminary data shows that Healthy Gourmet does show some greater color retention than other cookware but the results have thus far been mixed. Directions used by customers for Healthy Gourmet were superior to other cookware directions. In addition consumer support for Healthy Gourmet was also superior.

English 190 Class Project

A Collection of New Nancy Drew Mysteries: History, Women's Movements, Sexuality, Evolution of the Feminine
 Department of English
 Faculty Mentor(s): Dr. Jean E. Jost and M. Shayne

This project is a creative writing production composed of a series of short stories by members of Women's Literature Class (ENG 190). The task is for each member of the class to write his or her own version of a mystery story in the style and manner of the original. As a class, we have discovered the template of the tales, the formulaic beginnings, the particular characters and their traits, introduction of the complications, the predictable and surprising elements of the plots, the kinds of violence and danger, the male and female relationships within the tales, the type and nature of the villains, the changes evidenced in sexuality over time, and the role of women in society. We have discussed the unreal qualities akin to fairy tales, the evolving otherworld-magic of coincidences, the nature and source of rescues, and the dialogue used between characters.

Written as pre-teen and teenage tales for young girls, this series of 180 novels was initially spectacularly received, and recent volumes published in 2001 and 2007 continue to charm and delight young readers. After reading numerous mysteries, critical articles, and books, our students have internalized the mystery and fairytale models and creatively envisioned new variants in either past- or present-day contexts. Our class is thrilled to participate in Bradley's Student Expo for 2007 by submitting their own creative renditions of these classic tales, true to the style and fashion of the original. We hope the judges and others are as enthralled with the process and products as we are.

English Class Project

A Collection of Lost Arthurian Tales Based on the Morte Darthur of Sir Thomas Malory

Department of English

Faculty Mentor: Dr. Jean E. Jost

This collaborative creative writing project is a compilation of Lost Malory Tales, medieval stories in the style and language of Sir Thomas Malory's *Morte Darthur*. After reading hundreds of pages of Arthurian stories of the early fifteenth century, students have envisioned their own stories of medieval bravery and battles, chivalry and courage, magic and mysticism, heroism and treachery, compassion and cruelty. In appropriate episodic form, each tale reveals intrigue and enigmatic deeds enacted by recurring interlaced characters, all set in specific times and places, at feast days in castle-towns of the late Middle Ages.

The forceful and poetic language of the original has been carefully recreated with insight and imagination. These lost tales of Sir Thomas Malory embody the history, tone, ethical value system, actions, and artifacts (such as candles, named swords, and horses) of Round Table Knights and their Ladies in a society devoted to advancing civilization in a barbarous world.

Sean A. Carter

A Biomechanical Analysis of Back Squat with Utilization of Elastic Supplemental Resistance

Department of Physical Therapy

Faculty Mentor: Dr. Kurt Neelly

The use of elastic bands for supplemental resistance to the back squat has become increasingly popular in weight rooms. The technique and set up has been explained in articles; however, the actual resistance of the bands during a squat has never been quantified. **PURPOSE:** This study provides a biomechanical analysis of an experienced lifter demonstrating supplemental elastic resistance in the back squat, which includes detailed force breakdowns. **METHOD:** One experienced weight lifter was analyzed performing a back squat exercise utilizing elastic bands to augment the barbell resistance plates. Plate weight of approximately 50% of the subject's 1 RM and a set of elastic bands (light or average) were attached. The lifter performed 1 set of 3 repetitions with each set of bands. Load cells were attached to the elastic bands to quantify the resistance of the bands during the squat. **RESULTS:** The pair of light (purple) elastic bands had a maximum resistance of 27.97 kg. The average (green) elastic bands had a maximum resistance of 41.29 kg. **DISCUSSION:** The elastic band manufacturer provided a 'pressure chart' that showed the resistance of different bands in the back squat at different heights of a lifter. The values in this study are 40% lower than the predicted value given by the manufacturer. **CONCLUSION:** This descriptive study quantified the resistance of 2 different elastic bands during a lift of a 1.83 m tall subject, which is the first step to ultimately comparing traditional weight training to variable resistance training.

Kate Mabry, Andy Wiggers

Anodyne Therapy and its' Effects on Balance in Patients who have Diabetic Peripheral Neuropathy

Department of Physical Therapy

Faculty Mentor: Dr. William McGehee

Diabetes and associated peripheral neuropathy has become a major health care issue in the United States with costs progressively increasing. New treatments, such as the Anodyne Therapy System®, are currently being explored in an effort to limit the disabling effects and impairments of this disease.

Purpose: The purpose of our study was to determine the effectiveness of physical therapy intervention including Anodyne treatments on patients experiencing peripheral neuropathies and/or gait dysfunction.

Methods: Retrospective data was gathered on 259 subjects, all having received Anodyne Therapy® treatment. Twenty-six of these subjects, having all necessary demographic information and required pre and post treatment measurements, were included in our study. Patients were assessed with pre- and post- Berg and/or Tinetti balance tests. Analysis was performed using these scores and available demographic data using a paired t-test and independent samples t-tests.

Results: Analysis revealed that patients assessed with either the Berg and/or Tinetti balance tools had significant improvements in scores. Patients demonstrated an average increase of 5.8 in their Berg scale and a 4.6 increase in their Tinetti scale scores. Analysis was performed examining the relationship between age, gender, and the number of treatment visits, and other therapy utilized with the balance scores. However, no significant differences exist when the analysis of the interactions of these variables was examined.

Discussion and Conclusion: Patients displayed significant improvements in the Berg and Tinetti balance assessments. However, a limited sample size, possible patient co-morbidities, and the other received therapies, may limit the strength of our conclusions.

Erica Peterson

Use of an Arts Program to Promote Self Expression and Communication in a Population of Chronically Homeless Men

Department of Nursing

Faculty Mentors: Dr. Wendy Carter Kookan, Dr. Francesca Armmer

This Bradley University Special Emphasis collaboration proposes to develop and present an arts program, in collaboration with nursing students, for the men in the Safety Net program at the Salvation Army. Men in Safety Net are a chronically homeless population, many of whom exhibit symptoms of mental illness and substance abuse. Nurses have many responsibilities in the engagement of persons with mental illnesses; specifically a duty to develop therapeutic relationships and facilitate client self-expression. Populations such as the men in Safety Net often feel isolated and have difficulty expressing themselves. In nontraditional psych mental health settings nurses must be creative in ways to engage clients who may need treatment, but do not meet the requirements for hospitalization. We believe an arts program using hand-drumming, vocal music, and spoken word/poetry, embedded within our standard clinical experiences, may address client issues of isolation and difficulty in self-expression. Eight nursing students enrolled in the psych mental health nursing practicum, have volunteered to participate in a clinical experience that uses artistic expressions as a communication medium. Each week, the students will engage the men using the aforementioned techniques for a total of eight meetings under the guidance of faculty member Wendy Kookan, PhD(c), RN and arts experts from the community. Progress will be measured by weekly student logs; client attendance, client and students comments, and the preparation of a manuscript for publication.

Kara Rathmel, Janet Gayan

The Effect of the Knee and Ankle Angles on the Forces Through the Achilles Tendon During Graded Treadmill Ambulation in College-Aged Students

Department of Physical Therapy

Faculty Mentor: Dr. Steve R. Tippet

Background and Purpose. Rehabilitation programs following Achilles tendon injuries often employ weight bearing activities on a treadmill. Treadmill speeds and inclines may impact the stresses on the Achilles tendon as well the surrounding musculature. The purpose of this study was to examine the kinematics of the knee and ankle joints as well as the foot pressures at various treadmill inclines. **Subjects.** The subjects consisted of 30 college-aged students without history of Achilles tendon injuries or pathologies and without leg length discrepancy. **Methods.** Subjects walked on a treadmill at 0%, 5% and 10% grades of incline. Gait cycles were videotaped and subsequently digitized for motion analysis program. Subjects also walked at matching gait cadence across the GAITRite mat placed on a ramp at 0%, 5% and 10% grades of incline. **Results.** One-way ANOVA testing revealed statistically significant differences between ankle dorsiflexion angles at midstance between 0 and 10 degrees ($p=.000$) and between 5 and 10 degrees ($p=.002$). Statistical significance was also found for differences in knee flexion angles at heel-off between 0 and 10 degrees of flexion ($p=.05$). Peak pressures at the rearfoot increased with treadmill grade and decreased at the midfoot with treadmill grade. **Discussion and Conclusion.** Changes in pressures and knee/ankle motion as seen on varying degrees of incline may indirectly impact loads on the Achilles tendon. Results of this study suggest that ankle dorsiflexion angles at inclines seen at less than 5 degrees treadmill incline and knee flexion angles at inclines may prove beneficial in guiding clinicians using the treadmill to rehabilitate Achilles tendon injuries.

Sarah Ribando, Melissa Fox

The Functional Status of Men and Women at Least 65 Years Old as the Result of the Presence of Chronic Disease(s) Arthritis, Coronary Heart Disease, Chronic Obstructive Pulmonary Disease and Diabetes and Their Correlation with Muscle Strength, as Assessed by the Hand Grip Dynamometer

Department of Physical Therapy

Faculty Mentor: Dr. Mary Jo Mays

Objective: To assess handgrip strength in the elderly population who have specific chronic diseases (arthritis, coronary heart disease, chronic obstructive pulmonary disease, and diabetes) and those who do not have the specific diseases.

Methods: Sixteen subjects (10 female and 6 male) over 65 years old were obtained and handgrip strength was assessed using the hand dynamometer. Prior to testing, a health questionnaire was given to participants to gather past medical history and a blood pressure reading was taken to screen for hypertensive individuals. After gathering data, descriptive and paired samples statistic were used to interpret the data.

Results: Eight subjects had the presence of the specific chronic disease and eight subjects had an absence of disease. Coronary heart disease was found to have the highest average grip strength. This is followed by diabetes and then the group without any of the four diseases. Lastly, arthritis showed the lowest mean grip strength. With regard to function, all subjects without disease currently drive. Of the eight with the presence of disease, three currently drive while five subjects checked they no longer drive.

Discussion: We found there was no difference in handgrip strength between the two groups. Those labeled "absence of disease" did not have the four specific diseases studied; however, other diseases participants listed on the health form could have had an outcome on overall function. According to the results, those labeled "presence of disease" did show they had a decrease in function compared with the disease group in independence in driving.

Monica Stewart, Nicole Nauyalis

The Prevalence of Hypermobility Syndrome Among College Age Women and its Association with Musculoskeletal Injuries

Department of Physical Therapy

Faculty Mentor: Rob Bertram

Study Design: Cross-sectional and matched pairs study. **Background and Purpose:** Research indicates hypermobility may be prevalent in up to 10% of the population and be responsible for a higher number of musculoskeletal injuries in hypermobile individuals. Research also indicates hypermobility is more prevalent in women than men. This study hypothesized that hypermobility would be present in at least 5% of the sample population and with hypermobile individuals reporting an increased number of musculoskeletal injuries compared to non-hypermobile individuals. **Subjects and Methods:** 100 college age women were recruited from a nonrandom sample. Subjects were assessed using the modified Beighton scoring system, the Baecke Questionnaire of Habitual Physical Activity, and a comprehensive injury questionnaire. The hypermobile subjects were matched by age and activity level with non-hypermobile subjects to determine if hypermobile subjects had more injuries compared to non-hypermobile subjects. **Results:** Hypermobility was found in 11% of the subject population. A positive correlation was found between the total number of injuries and hypermobility score and between the number of sprains and hypermobility score. After matching hypermobile to non-hypermobile subjects on age and activity level, no significance was found for any injuries. **Conclusion:** Hypermobility was prevalent in 11% of the subject population but hypermobile subjects did not have a significant increase in injuries compared to non-hypermobile subjects, which may indicate higher activity levels lead to more injuries. Further research is needed to determine the relationship between hypermobility and the number and location of musculoskeletal injuries and the contribution of activity.

Jamie Stieglitz, Chris Esterling

Relationship Between Maximal Step Length (MSL) and Common Clinical Balance Measures

Department of Physical Therapy

Faculty Mentor: Dr. Chris Esterling

Purpose: To determine if a relationship exists between maximal step length (MSL) and common clinical balance measures and to determine if maximal step length can distinguish between non-fallers, fallers, and frequent fallers. **Methods:** 22 subjects were recruited through contact with a retirement facility and researcher word of mouth. Subjects performed a battery of clinical balance measures including timed sit-to-stand, one-leg stance test (OLST), functional reach test (FRT), timed up-and-go (TUG), four-square step test (FSST), and MSL. Balance confidence was measured using the Activities-specific Balance Confidence Scale (ABC), and activity level was measured and the Physical Activity Scale for the Elderly (PASE). **Results:** No significant differences were found between fallers and non-fallers in mean score on balance measures, self-report measures, or mean MSL. The subjects stepped over 50% of their height with both dominant and non-dominant legs in each direction when considering height. MSL was moderately related to age, ABC, STS, FSST, and TUG. A relationship was observed between ABC and most clinical measures, while FRT was not related to most clinical measures. **Conclusion:** This study found relationships between MSL and all measures of clinical balance, with the exception of FRT. MSL could not distinguish between fallers and non-fallers. However, this study indicated that the MSL test may indicate the need of an AD. Specificity and sensitivity data may indicate that MSL may be a useful clinical measure in the need for the use of an assistive device (AD).

Kim Szaradowski

*Analysis of Spatial and Temporal Characteristics of Gait
in Normal and Overweight School Children*

Department of Physical Therapy

Faculty Mentor: Melissa Peterson

Obesity is a rising health care risk which has been linked to various health impairments. This research looks to quantify gait differences between 6-7 year olds based on their body mass index, a measure used to classify individuals based on the ratio of their weight and height. Researcher grouped children with a BMI greater than the 85th percentile for age as overweight and those lower than the 85th percentile as normal. Overweight children were gender and aged matched to normal children for comparison. Participants were studied under three conditions: baseline, fast walk, and dual task walking while collecting data with Gaitrite data software. Spatial and temporal differences were seen between the two groups. Normals were able to increase normalized velocity by 42.2% while the overweight group increased by 45.1% when comparing normalized velocity between baseline and fast walk. In addition the normal group showed a decrease in normalized velocity of 33.0% in normal and 18.5% in overweight groups when comparing the dual task to baseline. Other spatial and temporal data including gait velocity, cadence, step width, and step length over conditions also exhibited differences; however the groups' small sample size and large standard deviations limited the conclusions drawn from these values. Comparing individual data showed possible differences which may be more evident in a larger study where patient outliers would produce less skew to the data set.

Mary Walder, Megan Swearingen

Physician Perceptions of Physical Therapy: A Pilot Study

Department of Physical Therapy

Faculty Mentor: Dr. Dawn Hall

The purpose of this descriptive survey research was to explore physicians' perceptions of the education and skill set of the profession of physical therapy. A sample of 63 Central Illinois family practice physicians who are members of a practice-based research network known as the Ambulatory Network for Scholarship and Research were mailed a survey which was developed from the Normative Model of Physical Therapy Education and a demographic form. Thirty-four surveys were returned. Frequency counts for demographics data as well as means and cross tabulations for the knowledge and skill sets data were analyzed using SPSS. Of the participants, 58.8% were introduced to physical therapy during medical school, primarily through observation; 20.5% reported that there is a graduate degree requirement for entry level physical therapist; and 17.6% were uncertain as to the minimum entry level requirement. Physicians were asked to rank physical therapy education and skills from not skilled to expert. Physicians rated physical therapist as less than competent in taking vitals as well as in head, eyes, ears, nose and throat; cardiopulmonary, developmental delay, abdominal, cancer and metabolic disease screenings. With the progressive changes in the physical therapy education both in degree and content, it is apparent that physicians are unaware of the depth and breadth of physical therapy education and the basic skills of a physical therapist. There is still a need to educate physicians on the physical therapy education and skill set.

Abigail Walk

The Relationship between Maximal Step Length and Activity Levels in Young Adults

Department of Health Sciences

Faculty Mentor: Dr. Andrew J. Strubhar

Purpose: To determine if a relationship exists between maximal step length (MSL) and a person's height and to determine if a relationship exists between a person's MSL and their activity level. **Methods:** 68 subjects between the ages 18-22 were recruited by the researcher through word of mouth. Subjects completed the Baecke habitual physical activity level survey. Height and weight were recorded. Subjects performed the MSL test by taking a maximum step in three directions with five trials in each direction on each foot: forward, backward, and sideways. **Results:** A significant correlation was found between height and MSL raw values (r values ranged from 0.66 to 0.76, $p < .01$). A significant relationship was found between subjects sport activity level index and MSL measured as a percent of the subjects height (r values ranged from 0.21 to 0.39, $p < .05$). **Conclusion:** A moderate to good relationship was found between a person's height and MSL. This suggests that a person's height should be taken into consideration when conducting a MSL test. A fair degree of relationship was found between MSL and a person's sport index. The work index and the leisure index were not related. More research needs to be conducted to determine if activity level should be considered in the MSL test.

Jamie Way, Maureen Egizii

The Relationship Between Body Mass Index, Body Composition and Balance in Children Ages 6-8

Department of Health Sciences

Faculty Mentor: Dr. Stacie Bertram

Background and Purpose. Some research has focused on the effect of childhood obesity on gait and motor performance in young children. The effect of obesity on balance in this age range has not been studied. The purpose of this study was to examine the effect of obesity on balance in children aged 6-8. **Subjects.** Thirty subjects from a local elementary school participated. **Methods:** BMI was calculated for each subject and weight category was determined (overweight, at risk for overweight, or normal weight) utilizing the Center for Disease Control's guidelines. The Pediatric Clinical Test of Sensory Interaction of Balance (P-CTSIB) with force plate analysis was used to test the balance of each subject. Data was analyzed using descriptive statistics and an independent t-test based on category of obesity. **Results.** A significant statistical difference was found in one of the sensory conditions used to assess postural stability. The normal weight group had more postural control than the overweight group when standing on a compliant surface with sway referenced visual input. **Discussion and Conclusion.** Results suggest there may be a relationship between obesity and balance and that higher levels of balance may be affected by obesity in young children. More research on the effects of childhood obesity on motor performance and balance in young children is warranted.

Jessica Darlington

How Fair is Fair Trade Coffee?

Department of Political Science

Faculty Mentor: Dr. Craig Curtis

The basis of my study is concentrated on ethical consumerism and to what extent consumers are willing to go in order to assure that the products they purchase have been acquired and produced ethically. My research attempts to investigate the many different facets of ethical consumerism and give the reader a better understanding of all the ramifications involved.

I will be looking at the types of ethical issues that are relevant in products sold in the United States and elsewhere in the world. These issues include human rights, labor conditions, animal well-being, environmental concern, etc. Some forms of ethical consumption benefit the natural environment and other forms of consumption benefit people. It is important to know what kind of ethical issues are involved behind a product because this is the first step in understanding how people will respond.

Another aspect of ethical consumerism I will be looking at is the availability of these ethically produced goods in comparison with goods that have not taken ethical production into account. The question I will be examining is how far are people willing to go in order to assure that the products they are buying are of fair trade quality or are environmentally friendly?

There are many different aspects of ethical consumerism and many relevant examples that surround our economy and market. I will be looking at the extent to which a consumer will go in order to purchase ethically produced goods. Not only what price they will pay, but also how other aspects such as convenience and availability are factored into the equation.

Sara Maki

The Effects of Globalization on International Health:

From Infectious Disease Transmission to Contemporary Governance Challenges

Department of International Studies

Faculty Mentor: Dr. Shah Tarzi

Globalization is a fundamental part of the international system that affects states and individuals in many different ways. Defined as the process of increased transnational movement of people, goods, services, capital, ideas, information, and cultures, globalization has influenced the growing interdependence of countries. The resultant cooperation has created and will continue to bring about challenges in all sectors of the political economy. This paper will explore the process of globalization and its effects on public health infrastructure. More specifically, it will address the following question: How and in what ways do the processes of globalization influence the spread of infectious disease and result in the evolution of subsequent governance approaches by international actors? To answer this, the paper will examine historical data and scholarly research regarding the breakdown of the border between international and national health concerns, recent advances in science and technology, the changing determinants of public health, changes in international law, and the resultant forms of innovative governance. After reviewing a case study on tuberculosis, I will address the specific features of infectious disease management and incorporate these into my analysis of the theories behind globalization of public health. Finally, the paper will offer some general policy insight for institutions of international public health. My findings support the hypothesis that globalization has indeed shaped the global health landscape and is the foremost contributor to the changing governance of health on both the international and national levels.

INDUSTRIAL AND MANUFACTURING ENGINEERING AND TECHNOLOGY

Matt Reese, Andrew Wallis, T.J. Collins, Kyle Corn

Correlation between Tensile Strength, Chemical Composition, and Hardness for Ductile and Malleable Irons

Industrial & Manufacturing Engineering & Technology Department
Faculty Mentor: Dr. Alexey Sverdlin

Cast Iron is not a single material, but a family of versatile cast irons exhibiting a wide range of properties which are obtained through microstructure control. The most important and distinguishing microstructural feature of Ductile Iron is the presence of graphite nodules which act as “crack-arresters” and give Ductile Iron ductility and toughness superior to all other cast irons, and equal to may cast and forged steels. Malleable Iron is formed by the heat treatment of White Cast Iron, which produces rounded clumps of graphite. It exhibits better ductility than gray or white cast iron. It is also very machinable.

The tensile strength can be substituted by the hardness test to obtain easier results. There is less equipment with the hardness test and you are able to obtain more than one result on a single specimen. It is fast, primarily nondestructive and can be performed directly on the component. However, the tensile test should not be cancelled out. Other mechanical properties can not be obtained by the hardness test, i.e. ductility.

MATHEMATICS AND COMPUTER SCIENCE

Meredith Cier, Julia Cozad, Brooke Barnebe, Ashley Mitchell

Addressing the Shrinking Pipeline: An Outreach Model for Attracting Girls into Computer Science

Department of Computer Science & Information Systems
Faculty Mentor: Dr. Monica McGill

Computer science has been enduring years of low enrollment from minorities, especially women. This lack of diversity is alarming to people inside and outside the field. The reasons for this gender gap have been well-researched, with various approaches being taken to address this problem. These groups are primarily targeting younger girls before they enroll in college, with a few developing presentations to this target group to show how diverse and interesting computer science is. The goal is to address the shrinking pipeline of women in the computer science field. In line with our research, we analyzed reasons for the gender gap, current methods being implemented to resolve it, and developed a unique method to present to eighth-grade girls that captures the non-programming world of computer science. This paper outlines our objectives, presentation and findings from our work.

Udai Kumar Jujaray, Vikram Swamy Medishetty

Secured Mobile Application using .NET

Department of Computer Science and Information Systems

Faculty Mentor: Dr. Jiang-Bo Liu

In this era of Global Communication the de-facto standard for information exchange has become “Wireless”. Due to too many advantages of wireless communications wireless networks is continuously developing but these wireless networks are unsecured. Data transferred between these networks can be easily eaves dropped.

In our system we try to make communication between any two devices securely. In our system we used a laptop and a PDA for communicating securely in unsecured wireless network. We use .NET’s Mobile application and RSA Algorithm for encrypting and decrypting the data at sender and receiver ends. For transferring encrypted data between laptop and PDA we use a web service.

In 128 bit RSA Algorithm it uses a pair of private keys and public keys. For each device RSA Algorithm we create a private key and public key pair. Data will be encrypted using the public key of the other device and decrypted using the private key of its own.

Gabrielle Olivera, Brooke Barnabe, Anthony Osafo, Andrew Sablan, Tyler Tippett

Building a Database Environment for the Smithsonian Tropical Research Institute

Department of Computer Science and Information Systems

Faculty Mentor: Dr. Steven Dolins

The Capstone Project is a new course offered by the Department of Computer Science and Information Systems. The purpose of this course is to give students experience working in a team environment where they gather requirements and design and implement software for real world problems. During the 2006-2007 academic year, students in this course are working with scientists at the Smithsonian Tropical Research Institute (STRI). We are creating and implementing a database and data environment for studying the growth of trees in the tropical rainforest. This presentation gives an overview of the project requirements and database design, and details about our December trip to STRI in Panama. During the trip to STRI, we attended a conference to meet with other botanists from around the world who build similar databases and we also visited the Barro Colorado plot, where the research is taking place.

Andrea Schoch

Do Airbags Do More Harm Than Good?

Department of Mathematics

Faculty Mentor: Dr. David Quigg

As motor vehicles have become a constant and numerous presence on the United States roadways, lawmakers and concerned individuals alike have sought to implement measures to enhance the safety of these vehicles. Seatbelts and airbags are two examples of such safety measures. Statistically, seatbelts have been shown to clearly save more lives in motor vehicle accidents than not. However, airbags are a different story, and the jury remains out as to whether airbags prevent more deaths than they cause in accidents. The National Highway Traffic Safety Administration estimates that over 10,000 lives have been saved since 1990 due to the use of airbags. However, statistical analysis by Meyer and Finney (2005) suggests that airbags significantly increase the probability of death under low-speed crashes where the occupant is not wearing a seatbelt. Additionally, their results indicate that airbags are not statistically significant when considering individual factors such as wearing a seatbelt or the speed of collision. Thus, the purpose of the present research is to review conflicting sources on airbags as well as to reanalyze and replicate the statistical measures used by Meyer and Finney. As a goal, a logistic regression model will be generated to determine the statistical significance of any variables as well as interactions among the presence of airbags, seatbelts, and collision speeds.

Jeff Hohlfeldt, Jeff Mischley

Complex Pulley Design an Analysis Abstract

Mechanical Engineering Department

Faculty Mentor: Dr. Sam Kherat

This project will consist of different ways to utilize pulley systems for lifting various objects. This design of a pulley system will allow for the safe transport of a handicapped individual weighing 180 lbf. (800N) up a set of stairs (10 ft). The goal of this transportation is to lift the 800 Newton person with only a 2 Newton force. This will be done by using both 7-1, 6-1 and 2-1 ratio pulleys in series with one another taking into consideration cost. The basic idea of pulley systems is to form a ratio of force exerted in to the system and force applied to the system. For example our goal is to formulate a system by which 2N is exerted into the system and a 180N is applied (lifted) to the system. This type of system has been implanted in many types of applications whether it be the in the Building of the Great Pyramids or the hoisting of boats in a barn, Pulley systems have been made for centuries.

Patti Olszewski, Joe Chambers, Josh Peters
Design of Components for an Ultralight Urban Vehicle
Department of Mechanical Engineering
Faculty Mentor: Dr. Martin Morris
Client: Jesse Maberry

With EPA emission standards and fuel costs rising, people in the 21st century are forced to look into alternative methods of transportation and drive sources. Short routes to and from work or to the grocery store can be more efficiently accomplished by using an ultralight urban vehicle that emits zero hydrocarbons and provides cost savings to the customer. An energy balance was formulated to determine feasibility and to narrow energy regeneration choices for an ultralight urban vehicle that weighs less than 500 pounds and can hold two passengers. Three vehicle concepts were designed, prototyped, and tested in a wind tunnel to determine a realistic coefficient of drag to verify calculations in the energy model. Wind tunnel results showed a drag coefficient between 1.0 and 2.0 for both a tandem and a side-by-side seating arrangement. Mechanical spring, electric, and hydraulic regeneration methods were designed and compared based on weight, cost, efficiency, feasibility, and safety. Spring regeneration was ruled out due to its high weight and size. Hydraulic regeneration was determined to be the best option based on its lightweight and efficient regeneration capabilities. This system has been coupled with a 2 hp DC electric motor for the drive system. A technology demonstrator is being built to demonstrate the vehicle in order to test the regeneration efficiencies for the system.

David Baudo, Jessica Gereg
Preparation of 5-Aryl-3-oxo- δ -lactones by Potassium Carbonate Promoted Addition of β -Keto Esters to Substituted Benzaldehydes
Department of Chemistry and Biochemistry
Faculty Mentor: Dr. Brad Andersh

While investigating conditions for Knoevenagel condensation reactions, we discovered that a side product, 5-(2-allyloxyphenyl)-3-oxo- δ -lactone, often formed when inorganic bases were used for the reaction between 2-allyloxybenzaldehyde and ethyl acetoacetate. Upon further investigation, we found that potassium carbonate in ethanol induced the addition of ethyl acetoacetate to 2-allyloxybenzaldehyde yielding 5-(2-allyloxyphenyl)-3-oxo- δ -lactone as the major product after workup with aqueous hydrochloric acid. Subsequently, we have found that these conditions can be used to prepare a variety of 5-aryl-3-oxo- δ -lactones (6-aryl-dihydro-2H-pyran-2,4(3H)-diones) bearing substituents with varying electronic contribution to the aromatic ring. We have also found that alkyl substituents on the keto ester are tolerated by our conditions. Results from a study on the use of substituted benzaldehydes and β -ketoesters for the preparation of 5-aryl-3-oxo- δ -lactones, a class of compounds which exhibit a wide variety of biological activities, will be presented.

Bryce A. Cunningham

Lewis Acid Catalyzed Amination of Cyclopentane Using Nitrogen Trichloride

Department of Chemistry and Biochemistry

Faculty Mentor: Dr. Kurt W. Field

The nature of the reaction between cyclopentane, nitrogen trichloride, and Lewis acids was further examined. The purpose present study was to investigate and optimize the experimental parameters (stoichiometry, Lewis acid, reaction of the temperature, solvent, and work-up procedure) leading to the formation of nitrogen containing products. Mechanistic implications as well as the synthetic utility of the process will be discussed.

David Jackson, Man Shan Tong

Synthesis of 5-Aryl-3-oxo-delta-lactones: Potential Cyclooxygenase Inhibitors

Department of Chemistry and Biochemistry

Faculty Mentor: Dr. Brad Andersh

Eifler-Lima has reported that 3-oxo-5-phenyl- δ -lactone (**A**) and 3-oxo-5-(4-fluorophenyl)- δ -lactone (**B**) have antinociceptive (pain relieving) activity in mice. Based upon Eifler-Lima's observation that the pain relieving ability of compounds **A** and **B** was significantly lower when administered orally, we have prepared derivatives of compounds **A** and **B** that have a greater potential to dissolve in water. Because the solubility of a compound in water is dependent upon the compound's ability to hydrogen bond to water, we have prepared compounds that have more oxygen and nitrogen atoms than compounds **A** and **B**, which increases the compounds solubility in water because there will be more sites for hydrogen bonding. To meet this goal, compounds bearing, a nitro (NO_2) group, an ether group (RO), an acetyl group (CH_3CO), or an acetylamino group (CH_3CONH) have been prepared using the method that we have developed for preparing 5-aryl-3-oxo- δ -lactones. We have also attempted to test these compounds for cyclooxygenase inhibition, a potential measure of analgesic activity.

Brett Kolditz

Novel Structures in Annealing Low Temperature Grown Silver on Si(111)

Department of Physics

Faculty Mentor: Dr. Kevin Kimberlin

Silver films of 1.35 ML (0.85 ML above the wetting layer) and 6.2 ML (5.7 ML above the wetting layer) have been grown epitaxially at 104 K using *in situ* molecular beam epitaxy and studied with scanning tunneling microscopy (STM). Annealing from 300 K to 550 K produces a diverse distribution of heights and sizes of flat topped, vertical sided islands. The maximum height of the islands is 20 ML in the 1.35 ML deposition, but in the higher coverage, dendritic structures are formed which are exactly 20 or 24 ML in height. Finally, annealing above 550K produces typical 3D island “wedding cake” structures atop the $\sqrt{3} \times \sqrt{3}$ wetting layer on Si(111). These results will be discussed in terms of Quantum Size Effects, which are thought to stabilize particular island heights, producing this unusual flat island growth.

Kaylee Korte, Kyle Ithal

Mediated Synthesis of Gold Colloids

Department of Chemistry and Biochemistry

Faculty Mentor: Dr. Dean Campbell

Two different methods for the synthesis of Au nanoparticles were investigated. One method involved a two step reaction combining solutions of AuCl₄⁻ and of aged S₂⁻. The colloids produced by this process have been described by two different models, either Au₂S cores covered with Au shells or Au aggregates held together by sulfur containing species. The other method involved direct reduction of AuCl₄⁻ using amino acids. The twenty most common amino acids were studied. The colloids produced by both methods were examined by visual characterization (Au nanoparticle plasmons tend to appear pink, purple, or blue), by UV-vis spectroscopy, scanning electron microscopy, and electron dispersion analysis of X-rays. Au nanoparticles produced by combinations of AuCl₄⁻ and of aged S₂⁻ appear to be consistent with the aggregate model. Amino acid reduction of AuCl₄⁻ can produce a variety of nanoparticle shapes, including what appear to be rod and multipod structures produced using threonine.

Paul Morrison, KaReisha Robinson

Synthesis and Characterization of Tetraiodomercurate Salt Colloids

Department of Chemistry and Biochemistry

Faculty Mentor: Dr. Dean Campbell

Photonic crystals are periodic structures that use optical diffraction of light to produce a photonic band gap, which prevents light from propagating through the crystals. The goal of these experiments was to produce photonic crystals containing the thermochromic particles of Cu_2HgI_4 and Ag_2HgI_4 salts. Thermochromic phase changes in these salts should produce reversible changes in the band gaps of the photonic crystals. Nanoparticles of Cu_2HgI_4 have not yet been synthesized, instead tending to form CuI when low reactant concentrations are used. Nanoparticles of Ag_2HgI_4 have been synthesized and characterized by scanning electron microscopy (SEM). SEM measurements showed that most syntheses produced a wide range of particle sizes, even when using a technique called "focusing," which helped to decrease the average particle sizes. Electron dispersion X-ray spectroscopy (EDX) and X-ray diffraction (XRD) indicated that colloidal particles of Ag_2HgI_4 can decompose to produce AgI . Multiple methods have been attempted to produce photonic crystals containing Ag_2HgI_4 , many of them based on methods developed in the Xia group at the University of Washington.

Steven Yeninas

Analysis of Diethylamine on Si(100): Thermal and Non-Thermal Processes

Department of Physics

Faculty Mentor: Dr. Jose Lozano

Electron stimulated desorption (ESD), temperature programmed desorption (TPD), high resolution electron energy loss spectroscopy (HREELS), X-ray photoelectron (XPS), and temperature programmed desorption (TPD) were conducted on diethylamine (DEA) dosed Si(100) surfaces. HREELS and TPD show carbon is thermally removed from the surface with the ethyl groups via a beta-hydride elimination process. This process leads to little contamination of the silicon substrate. Non-thermal decomposition of DEA was studied by irradiating the surface with 600-eV electrons at temperatures of 100K. TPD and HREELS data indicates decomposition of the parent molecule upon irradiation. After electron irradiation, TPD shows desorption of ethyl and methyl groups from one site. Following irradiation, XPS data shows deposition of carbon and nitrogen, which could not be removed thermally.

Kristi Bell, Tara Kulkarni, Alison Elias
The Development of Inhibitory Control
 Department of Psychology
 Faculty Mentor: Dr. Derek Montgomery

Preschoolers' inhibitory control is typically assessed by instructing them to label a set of pictures with a term that conflicts with the picture they are viewing. A common method, the day-night paradigm, instructs children to say 'day' when they see a picture of the night and 'night' when they see a picture of the day across a series of 16 trials. One theory attributes preschoolers' difficulties within this paradigm to the salience of the picture capturing their attention and activating the natural tendency to use the typical label for the picture (e.g., 'day' for the day picture). Another theory predicts that merely *thinking* about the depicted item, even when *not* fully viewing it, is sufficient to pose inhibitory challenges for preschoolers.

In our research, the pictures children viewed were partially hidden, thus minimizing the perceptual salience of the picture. Nevertheless, preschoolers still experienced inhibitory difficulties; that is, they responded with the label that matched the identity of the partially hidden picture when instructed to respond with another label. Thus, results from our study indicate that thinking of an item, instead of viewing it, is sufficient to pose significant inhibitory challenges for preschoolers.

Shannon Calvert
Spirituality, Religious Practices, and Self-Assessment of Health
 Department of Psychology
 Faculty Mentor: Dr. Marjorie Getz

The research literature has documented the positive impact that religious and spiritual beliefs have on health (Koenig et al., 2001). However, whether to distinguish between these two concepts has been a problematic issue in study design. In addition, most of the research on this topic has used samples of older adults (Idler et al., 2001). This study attempts to determine whether younger adults make a distinction between organized religious practices and the concept of spirituality. The project also attempts to determine how these two concepts are related to health. It is hypothesized that there will be a positive correlation between spirituality and health as well as participation in religious practices and health. This study used a correlational research strategy and cross-sectional survey research design to assess the association between a person's religious practices and spiritual beliefs and health. Undergraduate students at Bradley University were surveyed using an anonymous questionnaire distributed during three psychology classes (response rate was 165 out of a possible 230 participants or 72%). Most respondents were women (67.3%), white (83.8%) and considered themselves to practice a specific religious faith (83.6%). The average age of the participants was 19.6 years. Results showed that the relationships between religious practices and health and spirituality and health was complex and influenced by presence of chronic illnesses. Between 30-40% of respondents indicated that neither religious practices nor spirituality brought strength and comfort to them during times when they were not feeling well.

Pat Campbell, Nancy Schwartz

Four Decades of Gender Stereotypes in Children's Picture Books: Different Patterns for Children and Adults

Department of Psychology

Faculty Mentor: Dr. Claire Etaugh

Recent research on gender stereotyping in children's books has focused on trends over time in the portrayal of female characters and, to a lesser extent, male characters. We address whether trends in gender stereotyping differ for adults and children.

We examined 81 Caldecott Medal winners and Honor books published between 1970 and 2006. Four raters independently examined both illustrations and text of the books for instances when women, girls, men, and boys showed any of 20 communal behaviors and 20 agentic behaviors. For each book, women and girls were labeled gender stereotyped if the ratio of communal to agentic behaviors was 1.5 or higher and men and boys were labeled gender stereotyped if the ratio of agentic to communal behaviors was 1.5 or higher.

Surprisingly, stereotyping of women was essentially unchanged over the four-decade span. Stereotyping of girls decreased between the 1970s and 1980s, rose in the 1990s, and fell again in the 2000s. Interestingly, boys showed the exact reverse of these trends: they were significantly more stereotyped in the 1980s than in the 1970s, decreased in the 1990s and increased in the 2000s. Boys were significantly more stereotyped than girls in the 1980s and 2000s. As with boys, stereotyping of men rose significantly in the 1980s and then declined in the 1990s. Men were significantly more stereotyped than all other gender/age groups in every decade (with the exception of boys in the 2000s). These nonlinear patterns of gender stereotyping reflect society's attitudes about gender during particular periods.

Pat Campbell, Nancy Schwartz

Integrating Psychology of Women into Developmental Psychology Texts

Department of Psychology

Faculty Mentor: Dr. Claire Etaugh

Considerable research on women and gender issues in psychology has been conducted since 1990. One PsycLIT database search found over 25,000 articles mentioning gender, women or feminism published between 1990 and 1995 alone. Florence Denmark (1994) examined undergraduate psychology textbooks for citations of selected women psychologists and inclusion of gender-related topics. Denmark concluded that, despite progress, contributions of women psychologists and research on gender-related issues were not well represented.

Currently, women receive 83 percent of the Ph.D.s in developmental psychology. The scholarly contributions of female developmental psychologists have been especially rich. We review the progress made in including contributions of women psychologists and research on gender-related issues in undergraduate developmental textbooks since the early 1990s.

We examined 15 undergraduate developmental psychology texts published in 2006 and 2007, and 15 texts published from 1996-1998. Each time period included 10 child development and 5 lifespan books. We recorded citations of 35 female developmental psychologists selected as noteworthy contributors, and noted inclusion of the gender-related topics used by Denmark.

Seven women were cited in all texts in both periods. Two women whose work focuses on later adulthood were cited in nearly all lifespan books but, predictably, few child development texts. The classic work of several women pioneers in developmental psychology were cited by some child and lifespan texts in each time period, but less frequently than were more recent researchers. Progress has been made in covering some topics (e.g. social construction of gender, women in leadership), but textbooks still do not portray women adequately.

Maisie Fay

Factors Associated with Satisfaction in Love Relationships

Department of Psychology

Faculty Mentor: Dr. Marjorie Getz

Love is something that most people can feel yet defining this construct completely and adequately has been difficult. One way to better understand love and love relationships is to determine what components are essential. Research by Sternberg (1986) found that romantic love has three basic elements: passion, intimacy and commitment. Using this model this study describes love and love relationships from the perspective of young adults. Two time points in a relationship—the early stage and after the relationship matures—serve as anchors for participants to describe factors that define love for them. This study used a descriptive research strategy and cross-sectional survey design to assess definitions of love for undergraduate students. One hundred and forty-two students (142 of approximately 230 students available to participate or 62%) at Bradley University enrolled in three psychology classes were surveyed using an anonymous questionnaire distributed during class times. Survey items were designed by the student researcher after a review of the literature. Several novel variables were included to measure passion, intimacy and commitment. Participants also were asked about relationship status and possible reasons that the relationship might have ended. Over half of respondents (52.9%) indicated that they had considered ending their relationship during the early stage with almost 60% citing problems with commitment as being the leading cause of relationship dissatisfaction. A higher percentage of respondents (64%) indicated that they had considered ending the relationship after it had matured. About 65% cited commitment as important in this decision.

Emily Grasser, Alison Elias, Michele Hart, Celeste Starks, and May Zeid

Let's Cut the Fat: The Skinny on Wanting to Be Skinny

Department of Psychology

Faculty Mentor: Dr. Marjorie Getz

In today's image-obsessed society, it seems natural that a high proportion of people would worry about appearance and take measures to improve it through diet and exercise. However, research suggests that certain groups—college-aged students and persons from a higher socioeconomic status—are more influenced by societal pressures to be thin. DeMarest (2000) showed that both female and male college students report significant disparities between their perceived and ideal body images. More frequent dieting among college students also has been found to be positively associated with eating disorder symptoms and exercise preoccupation (Ackard et al., 2001). Although college students as a group exhibit negative beliefs about and practices concerning dissatisfaction with their bodies, one sub-group, students from a higher socioeconomic status, has not been adequately profiled. Associations have been found between high socioeconomic status and level of body dissatisfaction, the amount of exercise used to lose weight, and the frequency of dieting among younger and older females (Drewnowski, 1993). This study examines whether these latter finding hold for both women and men and describe dieting frequency, weight control methods, and body dissatisfaction among students attending a private Midwestern university with a special emphasis on students from higher socioeconomic groups. This study used a correlational research strategy and cross-sectional survey design. One hundred and forty-four college students (67.8% female, average age was 19.7 years) enrolled in psychology courses participated for extra credit. Several novel variables were developed to determine discretionary spending and its relationship to diet, exercise and health.

Richard Griggs

Unsafe At Any Speed: Factors Associated with Correct Installation of Child Safety Seats

Department of Psychology

Faculty Mentor: Dr. Marjorie Getz

Motor vehicle occupant injury is the leading cause of unintentional injury-related death in children ages 4-14. Proper use of car safety seats can reduce these traffic fatalities by 80%. This study examines characteristics associated with proper installation and use of child safety seats (CSS). This research used secondary SPSS data analyses of a large (37,880 records) database containing individual profiles collected by the National Safe Kids Campaign during child restraint inspection events in 2001-2002. Over 150 variables were collected with 100 of these related to type of restraint system, installation and misuse. Additional composite variables, created for this study, provided more details on characteristics of persons/vehicles related to correct CSS installation. Only 12.7% of CSS inspected for correct usage had been properly installed. Inappropriate use of type of CSS based on child size was the most common misuse (up to 49% depending on type of CSS). CSSs were more likely to be installed correctly in vehicles manufactured by companies that emphasize vehicle safety (e.g., Volvo, 15.8%) and in newer vehicles (14.0%). Parents were more likely to have installed the safety seat correctly compared to persons identified as grandparents in their relationship to the child ($p < .000$). Kolcraft and Britax models of CSS had more correct usage (20.8% and 15.3%, respectively). Urban locations had a lower percent of correct use compared to non-urban (9.6% vs. 11.1%). This study highlights the utility of secondary data analyses of existing databases as tools to better understand causes of injury and to promote injury prevention.

Michelle Moran, Melissa Jones, Whitney Lawson, Kaylee

Rosenbaum, Rashé Threatt

Students' Perception and Definition of Health

Department of Psychology

Faculty Mentor: Dr. Marjorie Getz

The research literature documents in myriad studies the inconsistency of health behaviors engaged in by college students (Malinauskas et al., 2006). However, studies that actually define health from the perspective of these young adults are lacking. This project was undertaken in order to better define health from the perspective of young people who are making decisions about behaviors that may have lasting implications for health in later life. It is hypothesized that the perception of health will vary between females and males, with women being more attuned to current recommendations for diet, exercise and other health behaviors. It was further predicted that women would prefer body shapes that are less healthy than those preferred by males. However, for both sexes, persons who are most accurate about health information will prefer a healthier (mid-range) body size. This study used a correlational research strategy and survey design to assess the association between college students' perception of personal health contrasted with their actual definition of health using guidelines promulgated by leading public health organizations. Undergraduate students at Bradley University were surveyed using an anonymous questionnaire distributed during several psychology classes. Participants included xxx students (xx% female, average age=xx.xx years). Results showed that men were more likely to believe that several risky behaviors (related to drinking, fast food consumption, and few doctor visits) could fit within a definition of health. As predicted, women preferred the leanest body sizes and shapes. Implications of this study for health promotion activities are discussed.

Jessica Sampias, Melissa Sherrill, Jennie Klesman, Sarah Brooks,
Brooke Bond

Psychopathy Related to Relationship Aggression

Department of Psychology

Faculty Mentor: Dr. David P. Schmitt

This study examined the relationship between psychopathy and relationship aggression, hypothesizing that there would be a positive correlation between psychopathy and relationship aggression. Our psychopathy measure included four different facets; antisocial behavior, impulsive thrill-seeking, interpersonal coldness, and shallow affect. Relationship aggression was assessed using measures of domestic violence and sexual aggression. Samples from 14 different countries completed our measures of psychopathy, domestic violence, and sexual aggression. Results showed the expected correlations among all three measures. Results also showed a near universal positive correlation of psychopathy with domestic violence and sexual aggression in each country, even after controlling for social desirability.

Jennifer Stirlen, Ishmael Bew, Kassie Brown, Cindy Grose, Kirsten
Juhl

Gender differences in mood following exercise

Department of Psychology

Faculty Mentor: Dr. Marjorie Getz

The research literature documents the positive influence that exercise has on mood. In one randomized controlled study, 40 individuals who were receiving treatment for major depressive disorder completed either one session of moderate exercise walking on a treadmill for 30 minutes or rested quietly for 30 minutes. Participants completed both the Profile of Mood States (POMS) and Subjective Exercise Experiences Scale (SEES) as indicators of mood 5 min before, three times following their experimental condition. Although both groups reported similar reductions in measures of psychological distress, depression, confusion, fatigue, tension, and anger, only the exercise group, however, reported a significant increase in positive well-being and vigor scores.

This study will extend that line of research to assess the effects of exercise on mood for women and men while controlling for possible confounding factors such as the presence of chronic illness conditions (for example, arthritis and asthma) that may be related to both exercise and mood states. This study uses a correlational research strategy and cross-sectional survey design. Forty people from the Bradley University community were surveyed twice, before and after exercise, using anonymous questionnaires distributed inside Haussler Hall and Heitz Hall. It is hypothesized that participants will show a change in mood state following exercise.

Christine Stoka, Jade Peters, Heather Frye, Caitlin Peplinski
Religion and HIV: A Cross Cultural Look

Department of Psychology
 Faculty Mentor: Dr. David Schmitt

In the present study, the relationship between religion, religiosity, HIV risk, and HIV knowledge was examined. Previous research has shown that more religious individuals have lower HIV risk, and that HIV risk positively correlates with HIV knowledge. This study explored whether higher religiosity correlates with both lower HIV risk and lower HIV knowledge. Data were collected through self-report surveys administered to college students across 14 nations. All results controlled for gender effects. It was found that higher religiosity was correlated with lower HIV risk in most nations. It was also found that religiosity negatively correlated with HIV knowledge in almost all nations. In most nations, HIV risk was positively associated with HIV knowledge. Significant exceptions to this trend included Ethiopia and Germany.

Jared Voelker, Kevin Machak, Jennifer Guzman-Muelling and
 Jessica Damron

The Association Between Diet Familiarity and Belief in Effectiveness on Health Behavior

Department of Psychology
 Faculty Mentor: Dr. Marjorie Getz

Health behavior specific self-efficacy is a person's optimistic belief about being capable of following recommendations related to adopting a healthy lifestyle. The research literature has documented the positive association between self-efficacy and a person's ability to follow through with several health behaviors including diets designed to reduce the symptoms of chronic illnesses such as diabetes and hypercholesterolemia. This study assessed whether familiarity interacts with self-efficacy to determine a person's eating habits. In particular, participants were asked to provide their opinions about nine well-known eating plans. This study used a correlational research strategy and cross-sectional survey research design to assess the association between a person's familiarity with and beliefs about a particular diet's impact on health and for those persons who had tried the eating plan, how closely they followed the diet guidelines. Participants also were asked about their current eating habits. Undergraduate students at Bradley University were surveyed using an anonymous questionnaire distributed during three psychology classes with an approximate enrollment of 230 students. One hundred and forty-four students completed the survey forms (63%). It is hypothesized that there will be a positive correlation between familiarity with the diet and belief in health effects of the diet and how close the guidelines of the diet are followed by the individual.

Brandon Wright

Sleep, Academic Motivation, and Grades: An Assessment of Attribution

Department of Psychology

Faculty Mentor: Dr. Marjorie Getz

The research literature is replete with studies that document strong associations between sleep hygiene and academic performance. It is well recognized that a number of factors lead to diminished total sleep time, particularly in undergraduate students. Chief among these are distractions provided by campus activities and sleep phase delays associated with cognitive stimulation later in the evening. This study attempts to determine whether younger adults are attuned to the importance of sleep in academic performance and to assess whether for this student group there is an association between quality of sleep and school performance. It is hypothesized that there will be a positive correlation between good sleep hygiene and academic performance. This study used a correlational research strategy and cross-sectional survey research design to assess the association between sleep habits and academic performance. Undergraduate students at Bradley University were surveyed using an anonymous questionnaire distributed during three psychology classes (142 out of 230 students available to participate completed the questionnaires, or 62% response rate). Variables assessed for this study included demographics, current GPA, academic year and program, living situations, comparative health measure and other self-reported physical measures, and perception of sleep. Two standard measures to assess sleep habits, the Epworth Sleepiness Scale and the Pittsburgh Sleep Quality Index, were used in this study. A novel measure of attribution was designed for this project that presented a vignette about an episode of academic failure and asked respondents to rank reasons, including poor sleep, which might have led to poor performance.

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Stressed Out!: The Association Between Certain Time Periods in a University Semester and Perceived Stress and Health

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The research literature has long documented the influence of stress on health. The association is so well established that most textbooks in Introductory Psychology contain a chapter devoted to stress and health. Genuine interest in this topic can be traced back more than 80 years to the work of Walter Cannon who extensively studied the stress response and Adolph Meyer, a psychiatrist who kept detailed notes on each client and believed that patients could be best understood in the context of their life situation. His notes contained details about the person from a medical, psychological and sociological perspective. Other mid-century researchers documented the influence of life events on the health of people (for example, through the work of Holmes and Rahe and the Social Readjustment Scale). The present study used a stressful life events measure designed for undergraduate students to trace the effects of common stressors on their self assessment of health. This correlational/cross-sectional research uses a repeated measures design to assess the association between stress and undergraduate students' perceived health over the course of the semester. Undergraduate students at Bradley University were surveyed using an anonymous questionnaire distributed during three psychology classes. Surveys were distributed in February, March and April (approximately 15 days apart for each administration). It is hypothesized that stress levels will be higher during mid-terms and quarterly exam periods than any other time of the semester and related to perceived health. It is hypothesized that stress levels for seniors will be higher than for other students.

Notes