



**PENN STATE BEHREND - SIGMA XI
2006
FIFTEENTH ANNUAL
UNDERGRADUATE STUDENT RESEARCH
AND
CREATIVE ACCOMPLISHMENT CONFERENCE
ABSTRACT BOOK**

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Generation of Activation-Tagged Tomato Plants for Functional Genomics

Leann Bartomioli, Adam Rhodes, and Kaile Taylor (Yi-Hong Wang), Penn State Behrend, School of Science - Biology

The tomato (*Lycopersicon esculentum*) is a member of the Solanaceae family, which includes other important crop plants such as eggplant, potato, tobacco, and pepper. To understand functions of genes in the genome, transfer DNA (T-DNA) based activation tagging is used to produce mutants that connect genes and phenotypes. T-DNA acts as a mutagen when inserted into a coding region of a gene and can result in enhancement of gene activity. Thus, activation tagging can be a highly productive means of assigning function to genes in a plant, such as tomato, because more than half of the genes belong to gene families. Plant transformations have been performed to generate mutants. The transformants (genetically altered plants) have been screened and the plants' phenotypes (physical characteristics) have been evaluated in the greenhouse. Our final goal is to develop a mutant library that will help us to understand gene functions in plants. Thus far, our results have shown phenotypic differences in leaves, fruit, flowers, and growth between the mutant and wild type plants. These mutants fall into the following categories: 1) wider and darker leaves; 2) taller; 3) delayed flowering/fruit set/maturity; 4) green back of immature fruits; and 5) reduced fertility.

Roles of Peroxidase Overexpression in Hypocotyls of Etiolated Seedlings of the Auxin-resistant *diageotropica* Mutant of *Lycopersicon esculentum*

Audra Braun (Catharina Coenen), Allegheny College - Biology

Peroxidases are enzymes that catalyze the oxidation of various substrates at the expense of hydrogen peroxide and have been implicated in the response of plant cells to auxin. To determine if peroxidases may play a role in auxin-induced hypocotyl elongation, peroxidase activity was analyzed in hypocotyl segments of the auxin-resistant tomato mutant *dgt*, a spontaneous single gene recessive mutant of the tomato cultivar VFN8. Fluid was extracted from the cells and cell walls of hypocotyl segments and analyzed using gel electrophoresis. Both wild type and *dgt* hypocotyls were found to express two main peroxidases with isoelectric points of 5.3 and 6.1; however, *dgt* was found to have more peroxidase activity than WT. Because *dgt* shows an overexpression of peroxidases, it is hypothesized that these peroxidases contribute to the insensitivity of *dgt* to auxin. Further experimentation will be done to study the role of H₂O₂, which is speculated to act as a second messenger in the auxin response; therefore a lack of H₂O₂ due to peroxidase overexpression could be specifically responsible for *dgt*'s unresponsiveness to auxin.

Nasal Carriage of Community-Acquired Methicillin-Resistant *Staphylococcus aureus* in a Healthy Population of College Students

Anita Brock (David Hunnicutt), Penn State Behrend, School of Science - Biology

The prevalence of community-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) infection is increasing. The primary reservoir is the anterior nares; nasal carriage is a factor for infection in a variety of populations. Little is known about MRSA nasal carriage rates among college students in northwestern Pennsylvania and the associated likelihood of community MRSA transmission. Nasal swabs were collected from 500 students on the campus of a small four-year college in Erie, Pennsylvania. Cultures were plated on media selective for *Staphylococcus aureus*, with or without oxacillin. *S. aureus* isolates were confirmed by coagulase testing. Antibiotic resistance was determined by the Kirby-Bauer disk diffusion method and growth measured after an incubation period. PCR testing was conducted to assess for the *mecA* gene. Students completed a questionnaire designed to determine whether or not they possess any known risk factors for *Staphylococcus aureus* infection(s). Simple univariate statistics, such as ANOVA testing, will be employed to determine the significance of results.

Aquatic Toxicity to Fish of Suspended Sediments in Stormwater Runoff from Various Unpaved Road Surfaces

Kevin Caffrey (Rick Diz), Gannon University, College of Science, Engineering and Health Science - Biology

A major source of suspended sediments in rural areas is stormwater runoff from unpaved road surfaces. Under certain conditions, suspended sediments have been found to cause gill perforations in fish, decrease spawning success of some fish species, decrease biodiversity in aquatic systems, and cause financial losses to land owners. This study evaluated the toxicity of sediments generated in the laboratory from models of various unpaved road surfaces, including a typical mining road, a logging road, and an improved road surface constructed according to the guidelines of the Center for Dirt and Gravel Road Studies at Penn State University. Toxicity was measured using the Fathead Minnow in acute and chronic laboratory tests as prescribed in Standard Methods for the Examination of Water and Wastewater.

A Strategy to Identify Novel Genes Involved in the Proliferative Response to Nutrition in the *Drosophila* Ovary

Emily Cross¹ (Daniela Drummond-Barbosa² and Steven Ropski¹), ¹Gannon University and ²Vanderbilt University, Department of Cell and Developmental Biology - Biology

Little is known about the role nutrition plays in oogenesis. The *Drosophila* ovary contains well characterized germline and somatic stem cells. Each germline stem cell divides to renew itself and produce a cyst of 16 cells. In flies kept on a protein rich medium, ovarian cells increase their growth and proliferation rates relative to being developed on a protein poor medium. This response to nutrition is mediated by the insulin pathway because flies deficient for insulin signaling cannot respond properly to nutritional changes. However, other signals are also required in addition to insulin, as over-expression of insulin in poor food medium does not mimic rich medium conditions. To identify additional signaling pathways, we are undergoing a pilot screen for proteins whose expression levels or subcellular localization patterns respond to nutritional input. To conduct this screen, we are using lines of flies with a GFP protein-trap fusion. Candidate lines showing changes in GFP fusion protein expression or localization will be examined for specific roles in the ovarian response to nutrition. Findings from these screens will provide insight into mammalian systems due to the likely conservation of signals, as is in the case for the insulin pathway.

Selection for UV-Resistant Wisconsin Fast Plants (*Brassica rapa*)

Alexa Harding (Mark Shotwell), Slippery Rock University of Pennsylvania, College of Health, Environment and Science - Biology

Fast-cycling *Brassica rapa* (Wisconsin Fast Plants) have been extensively used in classroom settings due to the plant's short life cycle, small size, and ability to grow to high densities. Because these plants are self-incompatible and cannot be maintained by self-fertilization, Fast Plant lines are genetically heterogeneous. It has therefore been possible to select for a quantifiable phenotype from a standard population. Our goal was to develop a strain of Fast Plants with increased resistance to ultraviolet light. In addition to causing cellular damage, UV irradiation induces the formation of pyrimidine dimers and other photoproducts in DNA, which, if uncorrected, result in genetic mutations. Previous experiments had determined that Fast Plants containing elevated amounts of the UV-absorbing anthocyanin pigments had a greater resistance to UV damage. We therefore started our selection with a high-anthocyanin line. Our selection involved exposing seven day-old plants to a specified dose of UV-C and identifying plants that had the least tissue damage. These plants were crossed, the seeds that resulted were planted, and the seedlings irradiated as before. Four rounds of this selection have been completed. We now will compare the UV sensitivity of the Generation IV plants with that of the original high-anthocyanin line.

Immunocytochemical Location of Relaxin Receptors on Fibroblasts from Anterior Cruciate and Palmar Beak Ligaments

Michelle Heid¹ (Tim Cooney², John Lubahn², and Elisa Konieczko¹), ¹Gannon University, College of Science, Engineering and Health Science and ²Hamot Medical Center - Biology

Anterior cruciate ligament (ACL) injuries occur up to six times more frequently in female athletes than in male athletes. Previous studies have suggested that this discrepancy may be hormonally based. Both estrogen and relaxin have been found to decrease collagen production by fibroblasts, possibly increasing the risk of ACL injury. While estrogen has been linked to the altered material strength of the ACL, little is known about relaxin's influence on this tissue. The purpose of this study was to use immunocytochemical methods: 1) to confirm the nature of the cells derived from the explants and 2) to locate relaxin and estrogen receptors on these same cells. Using immunofluorescent staining, cells derived from the explants stained positive for actin, tubulin, vimentin, clathrin, and epidermal growth factor receptor. The presence of these consensus markers of fibroblast phenotype confirmed the identity of the cells. Additionally, both relaxin and estrogen receptors were located on the cultured fibroblasts. Moreover, the immunofluorescent staining pattern of relaxin receptors on the ACL fibroblasts was similar to the immunofluorescent staining pattern of estrogen receptors on these cells. Further study is needed to determine how these hormones affect the structure, composition, and/or metabolism of the ACL fibroblast.

Identification of Bacteria in Nests and on Eggs of *Parus atricapillus*, *Troglodytes aedon*, and *Turdus migratorius*

Sara Hester (Margaret Voss and David Hunnicutt), Penn State Behrend, School of Science - Biology

Bird nests serve to protect embryonic development from outside environmental factors to increase egg viability. They also provide an environment for microbial growth in the nest and on the eggs. Different types of bacteria in the nest and on the eggs could interact and increase or decrease viability. The bacterial levels in the nest could be regulated by the on and off bouts of the parents during incubation, which raise and lower the temperatures throughout development, thereby regulating microbial growth and decreasing mortality of eggs. I am using 16S rRNA gene sequencing to identify the different types of bacteria within the nests and on the eggs to provide a general overview of the microbial flora from three American songbirds and comparing the types of bacteria found within the nest to the types of bacteria found on the eggs to determine whether there are differences among the species of birds.

Auxin and Fibonacci Phyllotaxis

Ryan Jordanhazy (Catharina Coenen), Allegheny College - Biology

Auxin is a plant hormone that controls nearly all aspects of growth, including leaf formation. Phyllotaxis, or leaf arrangement about the stem of plants, is therefore controlled by auxin. Interestingly, most plants display a phyllotaxis that incorporates the ancient mathematical sequence known as the Fibonacci sequence. However, the relationship between auxin and Fibonacci phyllotaxis remains unclear. To help explain this relationship, I am studying leaf angles in multiple auxin-resistant mutants in three plant species: tomato (*Lycopersicon esculentum*), tobacco (*Nicotiana glauca*), and *Arabidopsis thaliana*. Preliminary results show that wild type tomato plants exhibit Fibonacci phyllotaxis, while the auxin-resistant *diageotropica* mutant and the auxin-hyperresponsive *polycotyledon* mutant show different leaf angle frequency patterns. Results from all three species will be incorporated into a model, which encompasses the roles of different auxin transport and response mechanisms in the determination of Fibonacci phyllotaxis.

The Operation of Ambient Temperature on Minimum Temperatures of Incubation Bouts of the Black-Capped Chickadee

Sam Marvit (Margaret Voss and Michael Rutter), Penn State Behrend, School of Science - Biostatistics

Incubation data of ambient and egg temperatures of the black-capped chickadee can reveal behavioral patterns. In examining the incubation behavior of the chickadee, one must consider the influence of ambient temperature on egg temperature. The component of incubation that is most affected by environmental temperatures would be the minimum temperature of each incubation bout. A plot of the minimum temperatures of every incubation bout over the course of a day as a function of time appears to be sinusoidal and periodic. Furthermore, there exists a positive correlation between ambient temperature and minimum egg temperature ($R^2 \approx 0.7$). These relationships suggest that incubation may be driven more by ambient temperature than previously considered. A time series analysis of the minimum temperatures will be conducted to fully analyze inherent trends.

Distribution and Relative Abundance of Zebra and Quagga Mussels in Presque Isle Bay

Todd Nunes (Rick Diz), Gannon University, College of Science, Engineering and Health Science - Biology

Zebra and quagga mussels are aquatic invaders to the Great Lakes from the Caspian Sea region. These aquatic invaders are two of a growing number of invasive species introduced to the Great Lakes in the past 25 years. An understanding of the spread of zebra and quagga mussels may be an invaluable lesson in how aquatic invaders spread, and may help with containment of future invaders. The goal of this study is to determine the distribution and relative population densities of zebra and quagga mussels in Presque Isle Bay. Objectives include producing a map of relative density of species in Presque Isle Bay and evaluating the habitat preferred by each individual species.

Response of Round Gobies (*Neogobius melanostomus*) to Playbacks of Vocalizations in the Field

Christopher Pecoraro and Mark Upton (Gregory Andraso), Gannon University, College of Science, Engineering and Health Science - Biology

The round goby (*Neogobius melanostomus*) is a non-native fish that has had significant ecological impact on the Great Lakes. Researchers have found that male round gobies have the ability to produce vocalizations, but these sounds have been the subject of very little study. Gobies appear to make two distinctive vocalizations that we have named the “pulse” and “thump.” The purpose of this experiment was to observe the response of round gobies to playbacks of digital recordings of the “pulse” and “thump” in the field. The design of the experiment involved playback through an underwater speaker and recording of goby behavior with an underwater camera. The “pulse” and “thump” were each engineered into five-minute stimuli for playbacks. Trials consisted of both five-minute playbacks and five-minute periods of no stimulus located before, in between, and after playbacks. Sixteen trials were conducted in Presque Isle Bay. Behaviors that were quantified included the number of entries into a defined area in front of the speaker, the duration of entries, approaches toward the speaker, and the number of startle responses. The results indicate a possible attractive effect of the “pulse” stimulus and a possible repulsive effect of the “thump” stimulus.

A Study of Shrew Diversity at Erie Bluffs State Park

Mark Peterson (Steven Ropski), Gannon University, College of Science, Engineering and Health Science - Biology

From April 2005 to October 2005, a census of the shrew population at Erie Bluffs State Park was conducted. The three habitats emphasized were bluff, wet woodlands, and Duck Run; Kirkland Pitfall Arrays were used. Air temperature, humidity, and moon phases were examined to see if they had any effect on capture success. When the last quarter moon phase was present, there were three shrews captured. When the waxing crescent moon phase was present, there were two shrews captured. When the first quarter, waxing gibbous, or waning gibbous moon phases were present, there was one shrew captured in each phase. Over 525 trapnights eight shrews were captured: six (4 *Sorex cinereus* and 2 *Blarina brevicauda*) in the bluff and one each in the wet woodlands (1 *S. cinereus*) and Duck Run (1 *S. cinereus*). The shrews captured were not threatened or endangered and represent the expected species. These results will help the park staff develop an appropriate management plan for the newest Pennsylvania state park.

Effects of Land Use on Water Quality and Macroinvertebrate Communities in Coastal Erie County, Pennsylvania, Streams

Will Rupp (Rick Diz), Gannon University, College of Science, Engineering and Health Science - Biology

It is hypothesized that land development has an impact on the habitat quality for macroinvertebrates in streams. The type and extent of land use are assessed in the coastal Lake Erie watershed streams of Erie County, Pennsylvania. Assessments are based on water chemistry and abundance of sensitive (EPT) taxa in those streams. Land use was determined through the use of ArcView GIS and aerial photos. Several chemical and physical parameters were quantified and related to land-use patterns within various distances from the stream corridors. Land use within various corridors was quantified by use of a Land-Use Index, which was then related to EPT abundance and diversity.

An Evaluation of Auto Salvage Yards as Sources of Heavy Metals

Megan Venum (Joseph Shostell), Penn State Fayette - Biology

We are currently evaluating auto salvage yards as sources of heavy metals in two southwestern Pennsylvania streams. Evidence suggests that fish in streams near auto salvage yards have significant reductions in growth rate and significant increases in mortality. It has also been determined that the concentrations of several heavy metals in these streams are greater than chronic concentration levels. Our study was constructed to test the hypotheses that: 1) auto salvage yards are sources of heavy metals in streams and 2) fish residing in those areas have increased concentrations of these metals compared to those in pristine habitats. As this project is in progress, we plan to present our experimental design, collection methods, and possible outcomes. We have already collected sediment, water, and fish tissue samples from two impacted streams. These samples will be analyzed for lead and copper, and statistically compared with each other as well as to governmental regulatory levels.

The Effects of Sedimentary Pollution on the Young-of-Year Population of *Ameiurus nebulosus* (brown bullhead) in Presque Isle Bay

Colleen Wellington (Scott Wissinger), Allegheny College - Biology

Ameiurus nebulosus (brown bullheads) have long been an important indicator species in Presque Isle Bay (PIB) — their tumor rates are both part of the cause for listing PIB as an Area of Concern (AOC) and for upgrading it to the first Great Lakes Area of Recovery. Recently, however, there has been concern that the contaminants causing tumors may also be affecting *A. nebulosus* reproduction. The purpose of this study was first to determine the status of the young-of-year (YOY) population of *A. nebulosus* in PIB, especially in comparison to surrounding areas. Once a problem was recognized, the focus became to determine whether pollution was the cause. Based on theories regarding the existence of *A. nebulosus* / *A. natalis* (black bullhead) hybrids with possible genetic weaknesses, I hypothesized that pollution is not responsible for the YOY disappearance in PIB. This was tested through exposing YOY bullheads and toxicologically similar eggs to bay and control sediments and food. Measurements included: survival, growth, behavior, and skin abnormalities. The results indicate no statistical significance between treatments, thus supporting the hypothesis. However, more research needs to be done, both on the effects of pollution and other possible causes such as hybridization.

Analysis of Arson Accelerants Using Gas Chromatography

Daniel Buckwalter (Naod Kebede), Edinboro University of Pennsylvania, School of Science, Management, and Technology - Chemistry/Forensic Sciences

According to the Uniform Crime Reporting (UCR) program, arson is defined as “any willful or malicious burning or attempt to burn, with or without intent to defraud, a dwelling house, public building, motor vehicle or aircraft, personal property of another, etc.” There were 68,245 arson cases reported in the United States in 2004. The main objective of this study was to create a regional database of information that can aid in the identification of common candidates for accelerants in arson. Gas chromatograms of liquid accelerant samples, as well as the headspace of 14 accelerants, were performed using a Hewlett Packard 5890 Series II gas chromatograph with flame ionization detection. Wood samples soaked in accelerant for up to a week were burnt, and the headspace gas chromatograms of each were analyzed. All chromatograms were acquired through PeakSimple® software in order to develop a database.

Investigations into the Effects of Sample Preparation on the Biochemical Content of Wheatgrass Extracts

Carrie Naccarato and Rebecca Hammer (Melissa Barranger-Mathys), Mercyhurst College - Biochemistry

For decades, the juice of wheatgrass (*Triticum sp.*) has been used to stimulate growth, strengthen immune systems, treat ailments such as bed sores, burns, and ulcers, and decrease the number of blood transfusions in patients with β -thalassemia. More recently, clinical studies on wheatgrass juice range from anti-cancer applications to anti-atherosclerosis applications to enhancing athletic performance. The literature on the best method to prepare wheatgrass is varied and ambiguous. Some methods used include juicing, chewing, and consuming the extract in dehydrated form. This project focuses on the characteristics of wheatgrass that may contribute to some of the physiological effects seen and will determine the most appropriate method to prepare the wheatgrass. The extracts of wheatgrass are examined for their chlorophyll content as well as the amount of intact chloroplasts present. A relationship between these two values has allowed us to propose a possible mechanism to explain the enhanced athletic performance. Our study also examines the influence of sample preparation on the concentration of chlorophyll and intact chloroplasts.

Contesting Identities: An Analysis of Female Olympic Athletes in Lifestyle Magazines

Lindsay Knouse (Ishita Sinha Roy), Allegheny College - Communication/Media Studies

Traditional conceptions of sports are related to the definition of masculinity in American culture. A paradox exists for female athletes because to be “female” is to be feminine according to social norms, while being an athlete is regarded as becoming masculine. One cannot be both a female and an athlete, therefore, because the gendered form of one negates the other. In order to gain acceptance into the masculine world of sports, both the media and female athletes themselves feel the need to overly emphasize their femininity. I use feminist cultural theorist Susan Bordo’s concept of the “double bind” while performing a textual analysis of visual representations of female athletes from the 2004 Olympic Games in American lifestyle magazines. My study explores how the female athlete is expected to be competitive and dominant on the playing field, yet feminine, pretty, and unthreatening off-field. The findings add to previous studies by affirming the fact that the media continues to maintain the status-quo and patriarchal approach in covering and marketing women’s sports. Although women can actively choose how the paradox of dueling identities is lived through different performances of femininity, media portrayals illustrate the complexity of this process.

Development of a Bootloader for PIC16F877 Microcontrollers

Scott Jackson (Shouling He), Penn State Behrend, School of Engineering and Engineering Technology - Computer Engineering

The purpose of this project was to do the research on the development of a bootloader for the PIC16F877 microcontroller. The microcontroller is currently used in the microprocessors (EE BD 421) course taught to electrical engineering students at Behrend. The developed bootloader is expected to provide a powerful tool for students to load and run machine code on the microcontroller, examine the running procedure of the microcontroller, and view portions of memory during execution. This will help students to understand how a microcontroller functions. Additionally, the bootloader will be designed to use as little of the microcontroller’s memory as possible, to allow students the greatest possible room in which to run their programs.

GRS - “Geo-Science Research Station”

Logan Stack, Mike Sansone, and Dan Domanski (Gary Walker and Ron McCarty), Penn State Behrend, School of Science - Computer Science

In 2005, a computer science undergraduate research team created a Web site to track atmospheric and geologic events. BACON, their project, was groundbreaking, but had shortcomings. We will build on their research and development. We propose to change the way the satellite and seismic data is made available. The goal of this task is to enable and stimulate research. We will upgrade BACON to improve reliability and add functionality. Our project will not need user interaction to recover from connection loss to the Internet. The data will be organized chronologically. We propose to allow users to create animations by specifying a starting and stopping date and time. We propose to create a dynamic update function which avoids showing partially loaded images to make our project acceptable for use on the new plasma screen display. The revised site will provide more information. For the users, we will provide more information on the images. People not intimately familiar with meteorology will then understand the data being presented. For the administrators, we will provide logging data on the server. This server-side logging data will show times so that it enables identification of choke points, pointing out where code can be optimized.

R.O.A.D.S

Dan Sweet, Katie Geiger, and Paul Corbett (Youngjoon Byun, Meng Su, and Gary Walker), Penn State Behrend, School of Science - Computer Science

Computer science students often have difficulty comprehending abstract data structures such as linked lists. When learning a new data structure, there are two areas that give students trouble. The first is understanding how a data structure is represented in memory. Diagrams are often used to help explain this, but textbooks only provide a few examples that are usually not sufficient. The second hurdle students face is learning the proper syntax and code to create a data structure. For students new to programming, this can sometimes be a bigger challenge than understanding conceptually how a data structure works. Teachers have an insufficient number of teaching aids that allow them to demonstrate various aspects of data structures. Teachers are forced to rely on examples and diagrams given in textbooks or create their own by hand, which can be hard for students to follow and prone to human error. R.O.A.D.S will allow the user to create data structures such as linked lists that will be represented graphically for the user to see. Our software will have an easy to use interface and will be beneficial to students and teachers alike.

Has Regional Inequality in China Widened after WTO Entry?

Benso Ogura (Ken Louie), Penn State Behrend, Sam and Irene Black School of Business - Economics

The issue of regional income inequality has been emerging in China, although the Chinese economy is growing dramatically. Several researchers have concluded that regional inequality has widened over several recent periods. I examine the most recent period, that of post-WTO entry (2001-present). If openness and decentralization are key variables influencing inequality, China's WTO entry is expected to widen regional inequality. This paper addresses two related research questions. The first research question is whether China's WTO entry in 2001 has resulted in more regional inequality and whether the causal factor is the greater openness due to the freer trade; this will be examined using time series analysis. The second research question is whether inequality across three broad geographic regions in China has been widening due to decentralization as well as greater openness; this will be tested using cross-sectional analysis. The paper is based on an econometric model and regression analyses will be conducted. The dependent variable used is Theil's regional inequality index. The key independent variables are decentralization, which is measured by the share of a local government's expenditure in total government expenditure, and openness, which is measured by the share of trade (imports plus exports) in total GDP.

Income Inequality in Erie: How Much is There and Why?

Jason Pflueger (James Kurre), Penn State Behrend, Sam and Irene Black School of Business - Economics

The purposes of this study are two-fold: first, to measure the level of income inequality (the gap between the poorest and richest members of the population) in Erie, Pennsylvania and to compare Erie with the state, the nation, and other metro areas; and, second, to attempt to determine the causes of income inequality in metro areas generally. Previous research on the causes of income inequality has been performed at several geographic levels—state, country, and cross-national. But to our knowledge, this is the first study to perform this analysis on a comprehensive set of (more than 300) metro areas in the United States. The study identifies a number of consistently significant—and at times surprising—relationships between specific economic and demographic characteristics of the population in a metro area and income inequality. Along with that analysis for the year 2000, the research also examines income inequality for Erie, the state of Pennsylvania, and the United States through time (1980, 1990, and 2000) to see how Erie has fared against the state and the nation on the issue.

Follow the Leader: Creating an Index of Leading Economic Indicators for the Erie MSA

Jeremiah Riethmiller (James Kurre), Penn State Behrend, Sam and Irene Black School of Business - Business Economics

This project aims to identify leading indicators of the Erie, Pennsylvania economy and then combine them into an index of leading economic indicators. A good leading index can provide a glimpse into the future of an economy. The U.S. leading index has accurately predicted the last seven recessions in the United States. While the U.S. leading index can be helpful in forecasting what is going to happen with the Erie economy, the index uses factors such as the money supply (M2), which may not be a leading indicator of the Erie economy. Other factors, such as average weekly hours worked in manufacturing, may need to be weighted more heavily because Erie has a greater than average share of manufacturing activity. A leading index for the Erie area would make local businesses more competitive because they would be able to plan better for fluctuations in economic conditions. This project attempts to find leading indicators that are more relevant to the Erie economy. These indicators are then used to create a leading index. To ensure that the leading index performs accurately, it is tested against historical data and may be branded as a useful predictor of economic expansions and contractions.

Consumer Attitudes toward Salespersons

Michael Ames (Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

Companies adopt the marketing concept and focus on the needs and attitudes of their customers to gain a competitive advantage in the marketplace. This research examines how consumers in the Erie area react to different attributes of salespersons and their interactions with them. A questionnaire was developed to assess consumer attitudes toward five salesperson attributes: product knowledge, appearance/hygiene, interaction skills, personality, and negative intentions, and how they explained feelings toward the salesperson and the sales interaction. It was distributed to a convenience sample of individuals in the Greater Erie Area. A final count of 227 individuals responded. The results showed that of the five attributes, product knowledge was the most significant in creating satisfaction with salespersons. Significant differences between men and women on their feelings toward the salesperson and the sales interaction were also found. The women surveyed felt they gave in more to the salesperson, were less satisfied by the salesperson, were less likely to deal with the salesperson again, were more frustrated by the salesperson, trusted the salesperson less, and were less likely to recommend the salesperson to others than the men who were surveyed.

Are There Gender Differences in Expectations from College Cafeterias?

Amy Caskey (Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

Customer satisfaction in the food service industry is important to any food service distributor or provider. This is also true for college cafeterias. To determine if segment-based strategies are needed to augment cafeteria services, we tested two models for gender-based satisfaction with Bruno's, one of Behrend's cafeterias. The overall regression model suggests that the most significant factors were the quality of food and the staff. Delving deeper into the issue, we explored if satisfaction varied from one gender to the other. The data set was split into the separate genders and respective regressions were run using satisfaction as the dependent variable, while the constructs of cleanliness, atmospherics, staff, food quality, and space were used as independent variables. It was found that there were indeed differences in gender expectations from college cafeterias. The results showed that females expect a clean environment, while males expect an enjoyable atmosphere, in addition to the quality of food and the staff. Because the two influential constructs are independent of one another, cafeterias ought to be able to meet both gender expectations equally.

Relationship Satisfaction: Dating Satisfaction among College Students

Jessica Rockage, Jeffrey Stempka, Karla Murray, Jason Bologna, and Dan Mollo (Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

Common perceptions of what comprises successful dating relationships among college students have historically been built upon the notion that males and females desire and are satisfied by very different elements of the relationship. The purpose of this research paper was to investigate what constitutes dating satisfaction among college students and, further, we were specifically exploring the differences and or similarities that exist among males and females. The primary instrument used in gathering data for our research was a survey designed to explore the different variables that could potentially have a significant effect on explaining the variation in dating satisfaction among males and females. Our findings showed that surprising similarities exist between males and females when explaining the variation in dating satisfaction.

What Characteristics Constitute a Successful Date Based upon the Number of Relationships One has in a 12-month Span?

Joseph Van Riper (Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

A study was conducted to determine what constitutes a successful date for college students in the surrounding region. Surveys were handed out to students at Penn State Behrend, Mercyhurst College, Edinboro University, Gannon University, and Allegheny College. The general findings of the research found that specific variables (impression, looks, intelligence) explained a successful date. This paper examines whether the number of relationships one is in affects the perceived success of a date. The preliminary results, based on splitting the data into one vs. more than one relationship shaped an interesting story: those in a steady relationship found achievement and communication skills as key explanatory variables; those in more than one relationship also found the two variables important, but included a third variable which was attractiveness.

A Statistical Analysis of an International Multilateral Treaty Database

Patrick Carver (Michael Rutter), Penn State Behrend, School of Science - Mathematics

This project began as an exploratory search for a sophisticated statistical analysis that could be used to help explain trends from a database of international multilateral treaties. The database is part of an ongoing project headed by Dr. John Gamble in the study of said treaties. The goal of the research was to study a well-explored area of international law in a new light. Instead of looking at a specific treaty or a handful of treaties, this database would attempt to gather every treaty fulfilling given criteria from 1648 to 1995. We are using correspondence analysis in order to summarize the data set (consisting of approximately 6,000 treaties) and present it as two-dimensional graphs. These two-dimensional graphs can then represent the similarity or dissimilarity of the different categories in the data as compared to what we would expect if the categories were independent of each other. Using this procedure, we have found higher than expected similarities between conventions and humanitarian goals and similarities between exchanges of letters and agreements. The presentation will show these findings and provide an explanation as to how we came to these findings.

The Relationship between the Hausdorff Dimension of the Sierpinski Triangle and the Growth Degree of a Replacement Rule which Yields the Sierpinski Triangle

Nicholas Ross (Michelle Previte), Penn State Behrend, School of Science - Mathematics

The primary focus of this research is a replacement rule that yields the Sierpinski Triangle, which is a fractal of Hausdorff dimension $\ln 3 / \ln 2$. To aid in studying the properties of this replacement rule we have generalized the definition of growth degree to apply to replacement rules that generate non-vertex transitive graphs. A relationship between the Hausdorff dimension of the Sierpinski Triangle and this generalized growth degree has been discovered for this replacement rule. This finding may lead to a more general result that applies to a wider range of replacement rules.

Artemas Martin's Effects on the History of Mathematics

Stephanie Soergel (Antonella Cupillari), Penn State Behrend, School of Science – Mathematics

Artemas Martin was born into a family of farmers and had little formal schooling. He learned to read and write at home until he attended three terms at a district school in Venango County and later several months at Franklin Academy. This is where his passion for mathematics would start. It was during this short few months when Martin was exposed to basic algebra, geometry, and trigonometry. Though he would do much scholarly work his main source of income would be farming and gardening in the summers and chopping wood or teaching in the winter. Even with Martin's limited amount of schooling he taught district school during four separate winters. Although Martin's mathematic contributions were many, he is most known for his two publications *The Mathematical Visitor* and *The Mathematical Magazine*. These publications would help jump-start mathematics in America and were a means of connecting the world's best mathematicians with everyday workers. With such a range of problems anyone could try to figure out the questions, allowing these journals to inspire and drive many to figure out the interesting arithmetic solutions. His drive, self discipline, and determination inspired a nation of mathematicians to solve works that motivated the math world.

Modeling Idiopathic Intracranial Hypertension with Starling-Like Resistance

Jesse Stimpson (Scott Stevens), Penn State Behrend, School of Science - Mathematics

In an attempt to understand better Idiopathic Intracranial Hypertension (IIH), mathematical models display the behavior of the brain's sinuses when introduced to changes in transmural pressure—the pressure difference between interior and exterior pressures ($P_{\text{int}} - P_{\text{ext}}$). The definite causes and proper treatment of IIH escape doctors and scientists. Disturbances of the brain's blood flow system, such as sudden pressure changes, may be the origin of this disorder. We consider several models, derived from conservation equations resulting in differential equations, which describe the dynamics of pressure changes on the brain's sinuses and surrounding regions. Such changes can cause a partial collapse of the sinus, thus causing increased resistance to natural blood flow. This quality is known as Starling-like resistance — a term that increases as transmural pressure decreases. We examine upstream and downstream models by defining Starling-like resistance terms based on previously researched data. The downstream models show elevated steady states: saddle points and stable nodes. On the other hand, upstream models do not exhibit any elevated states. We conclude that IIH may be a physiological manifestation of the stable elevated state predicted to exist by the downstream model. We plan further research of the effectiveness of certain treatment regimen.

Image Compression using Quadrant Decomposition and Functional Compression

Christopher Suprock (Larry Downey), Penn State Behrend, School of Science - Mathematics

Current techniques in region-based image compression utilize set area decomposition and analysis. The purpose of this study is to explore a “conquer and divide” method that analyzes an image by selection of regional subdivisions based upon maximum color deviations. Color data are processed for regions according to quadrant logic similar to that found in quad-tree algorithms. Although the application employs the use of quadrant logic, it only outputs the lowest fractional product within the constraint of acceptable color deviation. Regions with acceptable color deviation are transformed and truncated using a unique three-dimensional form of the Discrete Cosine Transform. The introduction of a higher dimensionality for the functional transform basis allows for a greater level of cross-dimensional integration and, thus, more significant information being stored in fewer transform coefficients. Specifically, the higher the dimensionality, the more effective the transposition of basis will be. Results of the procedure are shown as superior to common lossy compressive algorithms.

Scavengers and Competing Species

Malorie Winters (Joseph Previte), Penn State Behrend, School of Science - Mathematics

The purpose of this research is to determine the behavior of a scavenger population when introduced into a system of competing species. Competing species are two interacting populations, x and y , that compete for a limited food supply. The behaviors of the competing species can be modeled by a system of two differential equations. Depending on the initial conditions and the growth and saturation rates of each population, each species will tend to a fixed point solution. To find the behavior of a scavenger species, a third differential equation is added to the system and analyzed. The solution to this equation depends on both x and y , the growth and death rate of the scavenger, and also the initial conditions of the scavenger species. We first analyze the case where the scavenger has no effect on the species x or y . We will also discuss and investigate the possible feedback that the scavenger species may have upon the competing species (due to crowding, etc.).

Measurements of the Aerodynamic Performance of Twisted Wings

Joshua Green and Russell Carter (James Sonnenmeier and Oladipo Onipede), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

Twisting of an aircraft's wings can be used to optimize the performance of the airplane. An alternative method of twisting wings with less mechanical complexity was presented in earlier research which showed that it is possible to use shape memory alloy (SMA) and an electric current source to manipulate the shape of a test wing. The previous experiments performed in the School of Engineering and Engineering Technology's wind tunnel for model wings twisted using SMA wire showed that the lift produced by wings was modified by the twisting. However, the twist distribution used then was not optimal. This work will consider measurements of the drag as well as the lift produced by the wing in an effort to produce an 'optimum' twisting from an aerodynamic performance point of view. The distribution of the SMA wire along the span of the wing will be varied to produce different distributions of twist and the performance of the wing will be measured for several of the distributions.

Effect of DC Current on the Formability of 6Al-4V Titanium

Thomas Kronenberger and Carl Ross (John Roth), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

Recent research has demonstrated that the mechanical properties of metallic materials are altered when an electrical current is passed through the material. These studies suggest that titanium, due to its low formability and potential for dramatic improvement, should be subjected to additional study. This research further investigates the use of electricity to aid in the bulk deformation of 6Al-4V titanium under tensile and compressive loads. Extensive testing will be presented that documents the changes that occur in the formability of titanium due to the presence of an electron wind at varying current densities. Using carefully designed experiments, this study also characterizes and isolates the effect of resistive heating from the change due to the electrical flow alone. The results demonstrate that the presence of an electrical current within the material during deformation can greatly decrease the force needed to deform titanium while also dramatically enhancing the degree to which it can be worked without fracturing. Isothermal testing further demonstrates that the changes are significantly beyond that which can be accounted for due to increases in the titanium's temperature. The results are also supported by data from tests using pulsed and discontinuously applied current. Furthermore, current densities are identified that cause an apparent superplastic behavior to occur. Overall, this work fully demonstrates that an electrical current can be used to significantly improve the formability of 6Al-4V titanium and that these improvements far exceed that which can be explained by resistive heating.

Metallic Forging Using Electrical Flow as an Alternative to Warm/Hot Working

Timothy Perkins and Thomas Kronenberger (John Roth), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

Many manufacturing processes (e.g., forging, rolling, extrusion, and sheet metal) rely on the application of heat to reduce the forces associated with fabricating parts. However, due to the negative implications associated with hot working, another more efficient means of applying energy is desired. Toward this end, this paper investigates the changes in the material properties of various metals (aluminum-, copper-, iron-, and titanium-based alloys) in response to the flow of electricity. Theory involving electromigration and, more specifically, electroplasticity, is examined and the implications thereof are analyzed. It is shown that, using electrical current, the flow stresses in a material are reduced, resulting in a lower specific energy for open-die forging. It is also shown that an applied electrical current can increase the forgeability of materials, allowing greater deformation prior to cracking. Additionally, elastic recovery is shown to decrease when using electricity during deformation. Finally, for most materials, these effects were dependent on strain rate.

Manufacturing Aspects Relating to the Effects of DC Current on the Tensile Properties of Metals

Carl Ross (John Roth), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

When fabricating parts, deformation is commonly conducted in a “warm” or “hot” state in order to reduce the total energy required to form the metal. However, there are several negative effects associated with this method of energy reduction (e.g., high tool/die adhesions, environmental reactivity, etc.). Hence, another, more efficient, method of reducing the total deformation energy would be very beneficial. This paper examines the use of an electrical current to reduce the deformation energy and presents the effects of an electric current on the tensile properties of several ferrous and non-ferrous materials. The influences of strain rate and cold work on these electrical effects are also shown. The results demonstrate that, when current flows through a metallic specimen, the material’s yield strength is decreased, the modulus of elasticity is decreased, strain weakening occurs, and the energy required to deform a part is greatly decreased. These changes in the deformation properties occurred in all of the materials tested. They are much greater than can be accounted for by resistive heating and they diminish with increasing strain rate. The analysis shows that applying electricity during deformation provides a viable alternative to increasing the workpiece temperature for deformation-based manufacturing processes.

Methods for On-Line Directionally Independent Failure Prediction of End Mill Cutting Tools

Christopher Suprock (John Roth), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

Tracking the health of cutting tools under typical wear conditions is advantageous to the speed and efficiency of manufacturing processes. Although techniques exist to monitor tool performance, most are dependent on cutting direction, sensor orientation, cutting procedure, or the use of computationally intensive mathematical models. In this work, several solutions are proposed such that real-time analysis of signal variance and frequency magnitudes is possible through the identification of trends in the transient behavior of tri-axial force dynamometer signals. Moreover, the nature of both the transient variance and the frequency magnitude trends are shown to be independent of direction through the observation of both linear and pocketing mill sequences. Ten autonomous methods for failure prediction are discussed, tested, and presented. All methods discussed have the potential for on-line implementation with either current commercially available computational capacity.

Directionally Independent Failure Prediction of End-Milling Tools during Pocketing Maneuvers

Christopher Suprock and Joseph Piazza (John Roth), Penn State Behrend, School and Engineering and Engineering Technology - Mechanical Engineering

Tracking the health of cutting tools under typical wear conditions is advantageous to the speed and efficiency of manufacturing processes. Existing techniques monitor tool performance through analyzing force or acceleration signals whereby prognoses are made from a single sensor type. This work proposes to enhance the spectral output of autoregressive models by combining tri-axial accelerometer and tri-axial dynamometer signals. Through parallel processing of force and acceleration signals using single six degree of freedom modeling, greater spectral resolution is achieved. Using the discrete cosine transform, primary component analysis was applied to the spectral output of each AR auto and cross spectrum (Method 1). Each discrete cosine transform of the six dimensional spectral data was analyzed to determine the magnitude of the critical (primary) variance energy component of the respective spectrum. The eigenvalues of these selected spectral energies were then observed for trends towards failure. The eigenvalues of the spectral matrices centered at the toothpass frequency were also monitored (Method 2) and the results of the two methodologies compared. Through the use of the eigenvalue method, it was shown that this process works for both straight and pocketing maneuvers. Using statistical thresholding, a criterion for monitoring wear was applied.

Astrobiology: Discovering Extraterrestrial Microbial Life

Amanda Reinecke (Constance Pope), Penn State DuBois - Physics

Astrobiology is regarded as the field of study of life beyond earth's atmosphere. The search for life outside of earth consists of, but is not limited to, microbial life. Microbes are organisms that are extremely adaptive to any atmosphere, including ones that could be considered too hostile or extreme to harbor life. Microbes can adapt well to the harsh climate and environments on earth. For example: archae bacteria, organisms that can survive at temperatures above 110 C, microbes that can survive extreme radiation, organisms that thrive in high salinity, bacterial communities that not only exist, but thrive in the concentrated sulfuric acid in acid-mine drainages, and microbes that require hydrostatic pressure for survival. It is not presumptuous to say that other microbes could adapt to the harsh physical and chemical conditions that an extraterrestrial environment presents. Astrobiology research attempts to define the conditions necessary for the beginning, growth, maintenance, and progression of life, be it microbial or a more complex form, while examining and studying the history and evolution of such life on earth.

The Effects of Mold Closing Speeds and Positions on the Pinch-off Strength of an Extrusion Blow-Molded Bottle

Andy Lesser and Ben McElhaney (Jon Meckley), Penn State Behrend, School of Engineering and Engineering Technology - Plastics Engineering Technology

This study will show the effects of mold closing speed and position on the pinch-off strength of an extrusion blow-molded bottle. It is important to have an optimal mold-closing speed and position so the pinch-off strength is most advantageous to the part integrity. Today, the industry uses past knowledge to process the pinch-off strength. The study will add more scientific knowledge to the industry and improve overall pinch-off strengths. This is needed because simply relying on past experience may not help in new and more difficult situations. Data acquired from the study will give the necessary results to optimize the mold-closing speed, position, and pinch-off strength on an extrusion blow-molded bottle. It was found that the slower mold-closing speed and larger mold-closing position created the greatest pinch-off strength and thickness.

Gender Differences in Educational Group Work

Justin Curry, Michael Johnson, and Jalise Velez (Derek Mace), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Recent research has shown the benefits of working in peer groups in a classroom setting; for example, students collaborating on a group project. The purpose of the current research was to explore gender differences in group selection and evaluation. Students were administered the Co-operative and Collaborative Learning Questionnaire, a measure adapted from a 2003 article. The questionnaire consists of seven vignettes which measure attitudes toward working in groups. The gender of the subjects in the vignettes is manipulated between two experimental sets, and our participants were assigned to only one experimental set. The design of this study is a 2x2 factorial in which we varied the gender of the subject name and the gender of the participant as a quasi-independent variable. We are currently running subjects and have no data to report, but we predict that our results will show that females will be comfortable working with other females in groups, and that females will be more understanding of family situations and personal problems than their male counterparts.

Computer-Based Spatial Training Modules

Jonathan Hika¹ and Robert Budden¹ (Gary Walker¹, Kathy Holliday-Darr², Jennifer Trich Kremer³, and Ron Del Porto¹), Penn State Behrend, ¹School of Science, ²School of Engineering and Engineering Technology, and ³School of Humanities and Social Sciences - Psychology

Research has shown that the abilities to visualize and perceive objects in space are vital tasks in most career fields. We have developed a visual and spatial perception simulator called "Envision: Spatial Courseware" that helps students train and improve their spatial skills. The user navigates throughout a three-dimensional maze, collecting rings placed in different areas. Each ring spawns a training module that works on a different spatial skill. Throughout these training modules, the user earns points based on a variety of scoring methods. The internal scoring matrix keeps track of user performance with information on each type of skill. Scoring shows which skills they are strong and weak in and causes the system to adjust its difficulty level automatically. Data from the maze and training modules are collected via a connection to the VIZ database. This allows research to be conducted to determine the best means of improving spatial skills and will provide a wealth of information to VIZ researchers. Our system is built to allow future researchers to produce add-ons and additional training modules and contains a detailed instruction manual for the completion of these tasks.

Working Memory Capacity as a Predictor for Reactions to Mortality Salience

KaSandra McMillen and James Wardrop (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

According to Terror Management Theory, when people are reminded of their own mortality, they shift to a much more conservative mind-set and attempt to protect their own interests and those of others close to them. These intrusive thoughts of death must be processed and maintained in working memory. Those with higher working memories have been found to be able to inhibit irrelevant information more easily. In the current study, we investigated whether working memory capacity could predict the degree to which people can be unconsciously influenced by a mortality threat (thinking about the process of one's own death). Participants consisted of college students at Penn State Behrend. All participants completed the Operational Span task to measure working memory. They were then randomly assigned to one of two groups, a control condition where they wrote about a college exam or a mortality salience condition where they wrote about their own death. All participants then completed a word filler task to measure death accessibility. Although data collection is ongoing, initial results suggest that those with higher working memory are not necessarily better at inhibiting intrusive thoughts about death.

Lifestyle and Personality Variables and their Relationship with Academic Performance

Greg Parker¹ (John Fizek² and Victoria Kazmerski¹), Penn State Behrend, ²Sam and Irene Black School of Business and ¹School of Humanities and Social Sciences - Psychology

The prediction of academic success has been a hot topic of research for many years. Currently only high school GPA and SAT scores are used for admissions criteria within most universities; however, research has shown that many other variables can affect college performance. The current study employs four taxonomies of variables, each of which has been found to possess significant relationships with college performance in prior research: health behaviors (sleep, alcohol use), time management (study time, involvement in relationship), demographic variables (number of siblings, parent's education), and personality variables (motivation, goals). Data were collected (N=155) from undergraduate students enrolled in Penn State Behrend via a 30 item questionnaire which was written by the researcher based on previously validated measures. Students' actual GPA from the college registrar was used for data analysis. Data were analyzed using linear regression equations to predict college cumulative GPA based on 30 independent variables. Multiple linear regression equations were calculated in order to determine the model that offers the best prediction of college performance. The results of this study could help to develop more complete admissions criteria for universities. The results will also help students understand the academic consequences of their behaviors.

Does Resiliency Predict Social Aptitude in School-Age Children

Charlotte Siemiatkowski, Erin Mathes, and Kimberly Shell (Derek Mace), Penn State Behrend, School of Humanities and Social Sciences - Psychology

The purpose of this study was to determine the correlation between resiliency, the ability to overcome everyday stress, and social aptitude, the ability to make meaningful connections with other people, in elementary school children. Sixty children in participating preschool, kindergarten, and first-grade classrooms were asked to complete a series of age-appropriate jigsaw puzzles within a 15-minute time limit to determine resiliency to stress. They were then observed in a playground setting and rated on social aptitude using a checklist of criteria, and the parents of all participating children were asked to complete the Behavioral/Emotional Rating Scale (BERS) survey to determine the resiliency level of the children. This is a within-subjects design, as all of the children were given the same stimuli and were observed using the same criteria. The predicted results should show a high, positive correlation between resiliency and social aptitude.

Individual Differences in Intelligence and Working Memory on Speech Production

Lauren Wagner, Garrett McCloskey, and Courtney Hopkins (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

The current study examines the relationship between verbal intelligence, working memory, and speech production. Working memory capacity can be described as the amount of information that can be stored while one is also processing information. Research has shown that standard measures of intelligence are often correlated with working memory. However, little research has examined whether working memory influences the ability to produce high-quality spontaneous speech. Participants were asked to debate the issue of women in the military. Video and audiotapes were then coded for production speed, the number of fillers used, and the quality of the arguments. We hypothesized that verbal intelligence and working memory would correlate with speech quality and rate of speech. Although data collection is ongoing, preliminary results suggested that verbal intelligence was correlated with working memory. Although rate of speech and filler use was not predicted by working memory, quality of the speech was related. In addition, logical-mathematical intelligence was correlated with the ability to present a quality logical argument.

Affective Aspects of Adult Memories of Childhood Zoo Outings

Arthur Wenzel (Carla Bluhm), Allegheny College - Psychology

Examining adult memories of childhood visits to zoos has shown that the effects of these visits have an impact on children. Another student concluded that: 1) children seek out interactive experiences at zoos; 2) interaction with animals results in more positive memories; 3) there is an affective slump in the middle part of zoo memories where more negatively connotated emotions are remembered. The purpose of the current study was to qualitatively and quantitatively analyze a sample of approximately 200 memories from male and female college students to see what, if any, relationship exists between affect and animal/non-animal components of zoo memories. Studying the emotional ties to specific animals and experiences supports the hypothesis that children were motivated by a desire to affiliate with animals during their zoo visits, but may not have had that desire fulfilled. Some children associate more positive emotions more closely with snacks than watching animals, which may be due to a lack of interaction with the animals in zoo memories. Understanding how children interpret zoos should help parents, zoo personnel, and psychological researchers focusing on the intersection of humanity and wildlife better introduce the natural world to children.

Gender Differences in Priming of Attractiveness

Crystal Willis, Josh Hannold, and Gordon Greene (Derek Mace), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Research on priming has shown that memory for persons, places, or things may become biased by what characteristics were presented to the subjects first. Currently, there has been no previous research on how priming affects genders differently. The purpose of the current research is to study if priming affects subjects differently due to their gender. The design of this study is a 2x3 factorial where the independent variables are gender (male and female) and type of prime (attractive, unattractive, and no prime) given. The expected results are that female images will be affected more by priming overall and male participants will be affected more by the priming. These results were predicted based on research that suggests females are viewed more for their attractiveness in society; conversely males seek attractiveness more readily.

The Sarbanes-Oxley Act and Its Effects on Small Business

Amanda Wilbert (Gayle Morris), Edinboro University of Pennsylvania, School of Science, Management, and Technology - Accounting and Economics

The accounting fraud scandals at corporations such as Enron, WorldCom, and Tyco led to the passage of the Sarbanes-Oxley Act in 2002, which is being enforced by the U.S. Securities and Exchange Commission. Publicly owned companies are now subject to more stringent regulations and reporting requirements. This research focuses on the high costs associated with compliance and how these increased costs are negatively affecting smaller businesses. For example, Bluefly, a discount retailer based in New York, has annual sales revenues of only \$43.8 million. The company's chief financial officer expects the company's current auditing costs of \$150,000 per year to triple or quadruple. Some companies could lose up to 20% of their earnings to compliance. Small companies can either bear the extra costs, or go private and no longer be subject to the regulations. However, public-to-private transactions can be expensive, with costs reaching \$2 million or more. This research explores the reasons why compliance costs are so high. The research also includes information on how these high costs affect small business and the possible implications.

Amino Acid Profiles and ALS Expression in Tomato

Andrew Collins-Hed (Michael Campbell and Yi-Hong Wang) Penn State Behrend, School of Science - Biology

The branched chain amino acids (BCAAs) are essential for nutrition and can only be acquired through diet. The biosynthetic pathway resulting in the BCAAs involves a key enzyme, acetolactate synthase (ALS). The objective of this study is to determine if modification of ALS expression can change BCAA composition in tomato fruit. To begin this study, amine profiles of developing tomato fruits were characterized. Fruit development was broken into five stages from one, young and green, to five being red and ripe. Amines were extracted from the fruit and derivatized with 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate. Profiles of fluorescently tagged amines were produced using high performance liquid chromatography. The fluorescent profiles were compared to profiles of single-known amino acids and the common retention times were used to infer possibilities for peak identities. All the stages revealed peaks that correlated with glutamate and the BCAAs. Manipulation of ALS expression is being accomplished by constructing two mutants; one will be an ethanol inducible RNAi resulting in ALS inhibition, and the other will result in over expression of ALS in fruits. Examination of the amine profiles in these mutants will determine if altered ALS expression results in changes in amino acid composition.

Interaction of NDP1 and OHP2 in *Arabidopsis thaliana*

Joshua Meyer, Amy Raslawsky, and Frank Pagel (Michael Campbell), Penn State Behrend, School of Science - Biology

Overlapping genes are rare in eukaryotes. In the plant *Arabidopsis thaliana*, the genes NDP1 and OHP2 overlap at the 3-prime end. Overlapping should result in overlapping RNA products of NDP1 and OHP2 and thus should result in interaction of expression. OHP2 encodes for a chloroplast protein associated with the light-harvesting system. NDP1 has an unknown function. Our goal is to determine the interaction of NDP1 and OHP2 and the function of the NDP1 gene product. Transcript levels for NDP1 and OHP2 were measured over a 24-hour cycle using RT-PCR. Results showed varying levels of expression with OHP2 being influenced more than NDP1 by the circadian light cycle. We have isolated a knockout mutant of NDP1 which exhibits sensitivity to high light and an inability to move chloroplasts. Additionally, we are attempting to produce double-stranded, RNA-mediated, ethanol-inducible knockouts of the NDP1, the OHP2, and the overlapping coding sequences by cloning regions of the NDP1/OHP2 genome into the plasmid pMW4. Observation of the generated phenotypes will yield clues to the interaction of NDP1 and OHP2 and the effects of overlapping genes in eukaryotes.

Zebrafish as a Model System to Study Fragile X Related Mental Retardation

Stacey Olechowicz and Julie Miller (James Warren Jr.), Penn State Behrend, School of Science - Biology

Fragile X syndrome is the leading cause of inherited mental retardation in humans, and is caused by defects to the FMR-1 gene. The FMR-1 gene, along with its two autosomal homologs (FXR1 and FXR2) produce RNA binding proteins that are thought to regulate gene expression in the developing embryo, although their precise role in normal development is unknown. Zebrafish were used as a model system in which to decipher what roles the Fragile X gene family may play in normal development. The objective of these experiments was to perturb the expression of the Fragile X gene family through the use of morpholinos derived antisense oligonucleotides which inhibit translation within cells. Zebrafish were injected with a known volume of morpholino between the 1 to 8 cell stages. Survivorship was determined, gross abnormalities were documented, and the embryos were fixed in 4% paraformaldehyde for subsequent immunohistochemical analysis. To assess whether the nervous system developed normally, neuronal axons were visualized using an anti-acetylated tubulin antibody and both peroxidase-based and fluorescent 2° antibodies. These experiments are still underway to determine what defects may arise when the Fragile X gene family is “knocked down” and how that will affect early development.

Rapid Isolation and Identification of Pathogenic Bacteria and Virus in Water

Cody Smith and Jayme Dylewski (Steven Mauro), Mercyhurst College - Biology

Last year, Presque Isle State Park closed 18 beaches due to high levels of aquatic bacteria. Similar problems were reported nationwide in 2005, accounting for over 4,000 beach closures. This alarmingly high incidence of beach water contamination has caused great concern for public welfare, providing an impetus for the development of rapid and thorough methods for identifying disease-causing microbes in recreational waters. To address this concern, we are developing novel methods for the simultaneous isolation of bacteria and viruses from water samples. After extracting DNA from the isolated microorganisms, we can then identify and enumerate specific bacteria and viruses by quantitative PCR. This method allows for a greater repertoire of bacteria that can be identified compared to current protocols, and can be streamlined for completion in less than three hours, a dramatic reduction compared to the current EPA-approved protocol that requires 24 hours. To date, we have utilized this protocol to simultaneously isolate and identify bacteria and viruses from contaminated water samples, including those that are pathogenic to humans. Our future goal is to test the beach waters of Presque Isle, with the hope of providing more information on the extent of microorganism contamination of these waters.

The Relationship between *Cheyltra serpentina serpentina* and Species of Hirudinea in Lake Pleasant, Siegel Marsh, and Presque Isle State Park

Kayla Smith (Jeanette Schnars), Penn State Behrend, School of Science - Biology

This study compared the community composition and location of leeches on the common snapping turtle found in Lake Pleasant, Siegel Marsh, and Presque Isle State Park. Leeches, Hirudinea, were collected from the exterior of *Cheyltra serpentina serpentina*, the common snapping turtle, during daily trap checks. Turtles caught in traps were examined for leeches and macroinvertebrates. These organisms were removed and preserved in vials. All turtles were weighed, measured, and tagged prior to release. Leeches as well as other macroinvertebrates were found on the flesh and carapace of turtles with the most Chlorophyta, green algae. Using a Simpson's Index, the diversity of the leech population was relatively high ($D = .2139$), there was great sample diversity ($1-D = .7860141$), and the evenness of individuals' distributions among the habitats in this community was relatively low ($E_D = .0178321$). Analysis of data indicates that six species of leech were found outside their previously known home range and that six species are indigenous to Pennsylvania. This could be due to tourism; the leeches hitchhiked on boats or the turtles themselves. The low evenness of this population may be a result of competition for snapping turtles with the most green algae.

Recycling on a College Campus: Survey and Strategic Plan

Toni Snyder (Joseph Shostell), Penn State Fayette - Biology

We surveyed each building of a college campus in order to determine if the current level of recycling was compliant with governmental-stated policies and if the “garbage” collected had a significant percentage of recyclable materials. The college campus met the local township’s minimal criteria for recycling, but only partially fulfilled the county’s regulations. The percentage of recyclable material varied greatly among garbage cans, with some values as high as 95%. These findings were presented to the staff, students, and faculty of the campus as part of the spring 2005 colloquia series. In addition, these findings were disseminated to the Fayette County Recycling Coordinator and were included in an environmental protection grant. This funding (\$30,000) will be used to purchase external and internal recycling containers and to initiate a strong recycling program at this college campus.

In Vitro Characterization of the Zebrafish DHFR Gene

Peter Tagala (James Warren Jr.), Penn State Behrend, School of Science - Biology

Folate metabolism is an essential process for the proper function of an array of different biological processes. Dihydrofolate-reductase is an enzyme that catalyzes the conversion of dihydrofolate to tetra-hydrofolate, which is essential for the proper utilization of folates. Many different biological processes such as nucleic acid synthesis, methionine regeneration, and other one-carbon pathways that include oxidation and reduction rely on this reaction. Dihydrofolate-reductase (DHFR) has been studied since the 1950s and it has been a target for the design of drugs that act as anti-microbial and cancer therapeutic agents. The study that will be conducted will be an *in vitro* characterization of zDHFR enzyme activity from a collection of previously cloned zebrafish zDHFR genes. Subcloning and genetic transformation will be used to insert the PCR-amplified zDHFR into the p-AMB-CAT expression vector. This method was determined to be the most optimal approach for these translation studies. Currently, the study is in the process of screening bacterial clones for successful insertion of the zDHFR gene into the expression vector. Once identified, this recombinant clone will be used to generate in vitro translation products of the zebrafish zDHFR genes to determine the biochemical properties of this very enzyme in fish.

The Effects of Clutch Volume on Heating and Cooling Rates of Eggs and Reproductive Implications in Black Brant

Kala Wolfe (Margaret Voss), Penn State Behrend, School of Science - Biology

Black or Pacific Brants (*Branta bernicula*) are colony nesters that nest in Coastal Alaska and the Canadian Arctic. The sample population for this study was a Brant colony on the Tutakoke and Kashunuk Rivers of the Yukon-Kuskokwim Delta, Alaska. Egg volume varies < 5% within clutches, but total clutch size, and thus volume, varies markedly due to such factors as female quality and nest initiation date. Incubation is done solely by the female who lines the nest with down for added insulation and protection. The objective was to determine the effects of clutch volume on heating and cooling rates of the eggs, and what implications this has on factors such as duration of female absences, incubation period, and hatching success. Large volume clutches were expected to heat more slowly and retain heat longer during female absences than relatively small clutches.

Studies Toward the Synthesis of Alpha-Hydroxy-Beta-Amino Acids from Isoxazoles

Robert Blanner III (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

Isoxazoles have proven to be useful intermediates in the synthesis of a number of biologically interesting molecules. The focus of this research was the use of functionalized isoxazoles as precursors for the synthesis of biologically important alpha-hydroxy-beta-amino acids. The importance of alpha-hydroxy-beta-amino acids can be attributed to their well-documented biological activity. These amino acids have been utilized in the synthesis of a number of biologically significant compounds, including anti-HIV, anti-cancer, and anti-bacterial agents. A key step in the synthesis of alpha-hydroxy-beta-amino acids involves the functionalization of the monosubstituted isoxazoles. A new synthesis of isoxazoles substituted at the 3-position from silyl isoxazoles has been developed. The applications of this to a series of isoxazoles will be reported. While there are numerous methods for the synthesis and opening of isoxazoles, the chemistry of the carbon-carbon double bond has not been well documented. The desired reactions to be used to exploit the chemistry of this double bond include oxidations, with a variety of oxidants, as well as additions of halogens using X_2 or HX . The results of these investigations will be discussed. The ongoing progress of our synthetic studies toward the transformation of these functionalized isoxazoles into alpha-hydroxy-beta-amino acids will also be reported.

The Study of Complexation of Brooker's Merocyanine in α - and β -Cyclodextrin

Anthony Campitella (Jennifer Holt), Penn State Behrend, School of Science - Chemistry

Guest-host complexes are used in a variety of fields of study such as chemistry, material science, plastics, and biology. A guest-host complex is comprised of a host material that has a cavity into which another molecule can enter. Guest-host complexes are important because they can vary the properties of a material by the way the molecules bind to each other. The spectrum of Brooker's Merocyanine is especially sensitive to the environment of molecule, which was used to probe the formation of the complex. The binding constant for both alpha- and beta-cyclodextrin with Brooker's Merocyanine was determined using UV-Vis spectroscopy. The binding constant of the data was fit with linear and nonlinear models using a modified Benesi-Hildebrand equation. These results were confirmed by measuring the binding constant using fluorescence spectroscopy. It was determined that the binding constant for the beta-cyclodextrin was $413 M^{-1}$, which is in good agreement with the literature value of $480 M^{-1}$. The binding constant was also determined for alpha-cyclodextrin with Brooker's Merocyanine to be $72 M^{-1}$ indicating less preference for binding to alpha-cyclodextrin than to beta-cyclodextrin.

Matrix Isolation Infrared Spectroscopy Observation of the Azide Radical (N_3) from a Nitrogen Microwave Discharge Plasma Source

Christopher Dine, Jessica Collier, and Nancy Saxton (Jay Amicangelo), Penn State Behrend, School of Science - Chemistry

The asymmetric stretching band of the azide radical (N_3) at 1657.5 cm^{-1} has been observed by directing the output of a nitrogen microwave discharge plasma source onto a CsI window at 12 K using matrix isolation infrared spectroscopy experiments. The identification and assignment of this band to the N_3 radical has been accomplished by performing isotopic experiments with $^{15}N_2$, matrix annealing experiments in which the CsI window is warmed to 30 K and back to 12 K, photolysis experiments in which the light from a mercury-xenon lamp is directed at the 12 K sample, and theoretical calculations (ab initio and density functional theory methods) using the Gaussian 98 program. As well, the observed N_3 isotopic band positions are compared to literature frequencies observed by other experimental methods. Temperature dependent deposition spectra (10 – 20 K) were also performed in an effort to determine if the N_3 radical is being formed in the gas phase or by matrix surface reactions. The intensity of the N_3 band was observed to decrease with increasing deposition temperature, which is consistent with a gas phase formation mechanism.

Synthesis of Substituted 1-Benzoxepin Derivatives from Isoxazoles

Matthew Jackel (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

The 1-benzoxepin ring skeleton has been found in a variety of natural and unnatural biologically active molecules. Some examples include pterulone, which shows antifungal activity, and heliannuol C, which has ubiquinone oxidoreductase inhibiting properties. Currently, there are few methods known to synthesize the highly functionalized benzoxepins from readily available starting materials. This work focuses on expanding the known methodology for the synthesis of the benzoxepin-ring system. A method to synthesize substituted 1-benzoxepin derivatives by a tandem ring-opening/cyclocondensation sequence has been developed. The appropriately substituted 3-bromoisoxazoles have been readily opened by ferrous chloride tetrahydrate giving beta-cyanoketones. These compounds have been found to spontaneously undergo intramolecular condensation followed by a dehydration to give 1-benzoxepins in good yields. The application of this methodology to a series of 1-benzoxepins will be reported. This methodology has the limitation of allowing only cyclocondensation with aldehydes, giving benzoxepins unsubstituted at the carbon adjacent to the aromatic ring. An analogous ring opening/cyclocondensation of 3-carboxyisoxazoles was also investigated. The ongoing progress of the application of this method to the synthesis of a series of benzoxepins will be discussed.

The Selective Oxidation of 2,2,4-trimethyl-1,3-pentandiol in the Organic Laboratory

Justin Kubas (Tracy Halmi), Penn State Behrend, School of Science - Chemistry

Based on a recent article in the *Journal of Chemical Education*, the oxidation of 2,2,4-trimethyl-1,3-pentandiol has been incorporated into the organic laboratory. In this experiment, students work in teams to predict and characterize unknown and unpredictable products from a common set of reactions. The oxidation was accomplished using two unique pathways. The first reaction used household bleach to selectively oxidize the secondary alcohol of 2,2,4-trimethyl-1,3-pentandiol. The second reaction used iodobenzene diacetate along with the radical initiator TEMPO to oxidize the primary alcohol. Two polymer-based reagents were incorporated into this project to improve reaction times and increase yields. Polyiodobenzene diacetate replaced the reagent in the selective oxidation of the primary alcohol and a chromium(VI) oxide resin was used to provide a third unique product. IR, GCMS, and ^1H NMR were used to characterize the products. Results of these reactions will be discussed.

Analysis of Volatile Organic Compounds in Wheatgrass

Casey O'Brien (Jack Williams and Candee Chambers), Mercyhurst College - Chemistry

Although wheatgrass has been known to be a powerful natural supplement that not only increases oxygen levels in the blood, but also provides the body with essential nutrients and vitamins, a comprehensive analysis of the chemical components of wheatgrass has not yet been done. The purpose of the current research is to use a GC with a headspace sampler to analyze samples of wheatgrass grown in different conditions. We will present results showing a correlation between the age of the wheatgrass and amount of volatile organics present.

Monitoring the Oxygenation of Blood from Ingesting Wheatgrass Juice

Meghan Pascuzzi (Candee Chambers and Melissa Barranger-Mathys), Mercyhurst College - Chemistry

Clinical studies in the medical research literature strongly suggest that ingesting wheatgrass juice can help the body to heal from many diseases. While no studies have attempted to explain why wheatgrass juice has clinically proven benefits, many of the studies hypothesize that wheatgrass juice increases the oxygenation of the blood (and this leads to removal of toxins and increased cellular health). We have administered two ounces of pure, fresh wheatgrass juice to adults and monitored the blood oxygen level using pulseoximetry. The results of our study will be presented along with preliminary data regarding altering other variables, such as the age of the grass and the care of the juice once made (such as freezing the juice).

Spectroscopic Investigations of Novel Host-Guest Materials Using Merocyanine Dyes in γ -Cyclodextrin Cavities

Jennifer Sidun (Jennifer Holt), Penn State Behrend, School of Science - Chemistry

Using host-guest chemistry, new composite materials can be created by inserting a guest molecule into a host molecule. The new composite materials often have properties that are not seen in the guest or host molecule individually. Brooker's Merocyanine (4-[(1-methyl-4(1H)-pyridinylidene)ethylidene]-2,5-cyclohexadien-1-one) was the guest molecule used due to the unique way it responds to different environments (free in solution versus complexed in the cyclodextrin) as observed in a UV/Visible spectrum. The host material used was a γ -cyclodextrin molecule. Using UV/Visible spectroscopy, the equilibrium constant of the system was measured over time while the experimental conditions such as pH, temperature, and UV light exposure were changed. An equilibrium constant, K , was determined using both a linear expression and a nonlinear regression based on the modified Benesi-Hildebrand equation. A temperature study on the guest-host complex determined that the complex equilibrium is not temperature dependent. The wavelength shifts in the complex as the temperature was increased were consistent with the shifts of the dye reference of respective temperatures. Time and UV light exposure showed no effect on the formation of complexes. The outcome of this research increased the understanding of the interactions of guest-host systems based on their environmental conditions.

Distribution and Security Settings of Wireless Access Points in DuBois, Pennsylvania

Garrett Roen (Jason Long), Penn State DuBois, School of Information Sciences and Technology - Computer Science

As costs have decreased over recent years for high-speed internet access and wireless technology, use of both has increased throughout rural Pennsylvania. I am investigating the distribution and security settings of wireless access points in four areas of DuBois, Pennsylvania. On the first Tuesday of each month from October 2005 to February 2006, I have driven four geographically separated, but randomly selected paths. Using a Hewlett Packard Tablet PC, a Global Positioning System Unit, Netstumbler (a program that records all access points within the laptop's wireless range), and online mapping software, I have created maps of the locations of wireless access points throughout the DuBois community. In late February, we will publish our preliminary findings in the local newspaper to inform citizens of the importance of securing their wireless access points. By that time, we'll have constructed a Web site which will help members of the community to use easy-to-follow instructions on securing the most common access points. I will continue my sampling in March and April. We will assess any changes in the security settings. Later analysis should be able to determine if socio-economic status or other demographic data influence the usage and security settings of wireless access points.

GRS - “Geo-Science Research Station”

Logan Stack, Mike Sansone, and Dan Domanski (Gary Walker and Ron McCarty), Penn State Behrend, School of Science - Computer Science

In 2005, a computer science undergraduate research team created a Web site to track atmospheric and geologic events. BACON, their project, was groundbreaking, but had shortcomings. We will build on their research and development. We propose to change the way the satellite and seismic data are made available. The goal of this task is to enable and stimulate research. We will upgrade BACON to improve reliability and add functionality. Our project will not need user interaction to recover from a connection loss to the Internet. The data will be organized chronologically. We propose to allow users to create animations by specifying a starting and stopping date and time. We propose to create a dynamic update function which avoids showing partially loaded images to make our project acceptable for use on the new plasma screen display. The revised site will provide more information. For the users, we will provide more information on the images. People not intimately familiar with meteorology will then understand the data being presented. For the administrators, we will provide logging data on the server. This server-side logging data will show times so that it enables identification of choke points, pointing out where code can be optimized.

R.O.A.D.S

Dan Sweet, Katie Geiger, and Paul Corbett (Youngjoon Byun, Meng Su, and Gary Walker), Penn State Behrend, School of Science - Computer Science

Computer science students often have difficulty comprehending abstract data structures such as linked lists. When learning a new data structure there are two areas that give students trouble. The first is understanding how a data structure is represented in memory. Diagrams are often used to help explain this, but textbooks only provide a few examples that are usually not sufficient. The second hurdle students face is learning the proper syntax and code to create a data structure. For students new to programming, this can sometimes be a bigger challenge than understanding conceptually how a data structure works. Teachers have an insufficient number of teaching aids that allow them to demonstrate various aspects of data structures. Teachers are forced to rely on examples and diagrams given in textbooks or create their own by hand, which can be hard for students to follow and prone to human error. R.O.A.D.S will allow the user to create data structures such as linked lists that will be represented graphically for the user to see. Our software will have an easy to use interface and will be beneficial to students and teachers alike.

Experimental Engineering Education Kits for K-12 Students

William Cutter¹, Tim Heisler¹, Teri Ritenour², and Lauren Wagner² (Robert Weissbach¹, Jennifer Trich Kremer², and Dawn Blasko²), Penn State Behrend, ¹School of Engineering and Engineering Technology and ²School of Humanities and Social Sciences - Education

A cross-disciplinary team of students from engineering and psychology developed classroom education kits to stimulate K-12 students' interest in electrical engineering. Kits were designed for students in first, fourth, seventh, and tenth grades. Each kit contained materials for students and detailed lesson plans for teachers to utilize the kit in subsequent years. The kits were developed to be educational, easy to implement, fun and cost-effective. The team followed a product development lifecycle to develop the kits. This allowed each member to contribute to the development of the kits based on their unique skill set. The engineering students focused on developing prototypes of the hands-on activities, while the psychology students tailored the kits to fit educational standards and the classroom environment, and developed an evaluation tool to assess the kit's effectiveness.

Hands-on Lesson Plan with the Pythagorean Theorem

Stuart Daman¹ and Crystal Willis¹ (Dawn Blasko¹, Antonella Cupillari², and Jonathan Hall²), Penn State Behrend, ¹School of Humanities and Social Sciences and ²School of Science - Education

Hands-on math and science projects were designed, implemented, and evaluated as part of the summer course YFE 211: Foundations of Civic and Community Engagement. The service project was intended to support the goals of the Math Options program at Penn State Behrend. The project was also intended to meet community needs by bringing hands-on activities to schools and work with diverse populations. Students developed a lesson plan teaching the Pythagorean Theorem and implemented it at two targeted schools. Pre- and post-questionnaires were used to obtain feedback on the effectiveness of the lesson plan. It was found that the hands-on lesson plan significantly increased the understanding and ability to use the Pythagorean Theorem.

YFE 211 Civic Engagement: The Parachute Drop

Carly Kosinski, Natasha Chrebet, and Dwayne Duféal (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Education

For the YFE 211 class, a service learning project was presented to seventh and eighth grade students from two area schools. The service learning project coincided with the Math Options program provided at Penn State. Both Pennsylvania and New York state teaching standards were to be met. The goal of the evaluations was to see if the kids responded differently to their feelings toward math and science after the activity was completed. The students filled out pre- and post-test evaluations about the activity they were carrying out to help us see if we were successfully teaching them concepts in geometry, and showing them ways that math and science are enjoyable. The data from the evaluations were analyzed to see if we had significant findings. After running the analysis we found that there were no significant changes from before the activity to after the activity.

Service Learning in the Classroom: Population Simulation Using M&M's

Teri Ritenour¹ and Alla Sokolyuk¹ (Dawn Blasko¹, Antonella Cupillari², and Jonathan Hall²), Penn State Behrend, ¹School of Humanities and Social Sciences and ²School of Science - Education

The goal of this project was to develop and conduct a hands-on math and/or science activity for seventh and eighth grade students. It was modeled after the Math Options program at Penn State Behrend, which was designed to help get girls interested in pursuing higher level math and science courses in high school. These activities had to be fun and interesting yet follow educational standards for Pennsylvania and New York. Once they were completed we went into four area schools to teach our lessons. Our lesson focused on environmental problems and how they affect the population growth and decay of a species. The students developed equations and graphed their results. We conducted an evaluation of the learning activities. Each student filled out a pre- and post-survey to assess their knowledge. The classroom teacher also evaluated the activity and the presenters. The results showed that the teachers thought that the activities were very worthwhile. The middle school students enjoyed the activity and felt more confident about their grasp of the math concepts and environmental issues.

An Investigation of The Venango Third Oil Sand in Erie County, Pennsylvania

Angie Bell and Nathan Harris (Dale Tshudy), Edinboro University of Pennsylvania, School of Science, Management, and Technology - Geoscience

An investigation of the Venango Third Oil Sand was done to constrain better the environment of deposition and determine if there were any transgressive-regressive cycles in the southern Erie County unit. The most diagnostic features of this unit are the petroleum smell and the relative abundance of hummocky cross stratification in the upper bounds of the Third Oil Sand. It was interpreted that the lower Venango Third Oil Sand, which contains a paleosol, was deposited in a marginal marine environment, while the Upper Third Oil Sand was deposited in a shallow marine setting above a storm wave base. These two features, coupled with other field data, suggest that there was indeed a transgressive-regressive cycle documented in the Third Oil Sand and that there were two different paleoenvironments in the unit.

Soil Study of a Possible Lateral Moraine in the Edinboro Quadrangle (Erie County, Pennsylvania)

Scot Layman and Angie Bell (Eric Straffin), Edinboro University of Pennsylvania, School of Science, Management, and Technology - Geosciences

The purpose of this research, part of an ongoing study of alluvial soils within the French Creek watershed, was to aid in geologic mapping through the analysis and identification of soils and parent materials of a possible lateral moraine with surrounding outwash coverage, located west of the intersection of Perry Lane and Route 99 near Edinboro, Pennsylvania. Three pits of approximately 80 cm depth were dug at various elevations of this feature, including its base and crest. Soil horizons were identified in the field and field tests were conducted, including color, consistence, and gravel content. Samples of each horizon were collected for laboratory tests, including bulk density, porosity, water content, pH, and grain size. Grain size distribution was determined using sieves for coarse particles and laser diffraction for particles smaller than 1mm. Clay mineralogy was examined using an x-ray diffractometer. Pronounced differences in gravel content between sites indicate a parent material of glacial till at the midpoint and crest of the feature, and glacial outwash at and around the base. In addition, the amount of clay present in the topmost horizon, combined with a trend of decreasing pH with depth, indicates soil development over a previously eroded surface.

Determining the Temperature along a Metal Rod While DC Current is Passed through

Kyle Barry (Russell Warley and John Roth), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

The main objective of this research was to determine the temperature along the length of a cylindrical tensile bar while the bar is being stretched and simultaneously carrying a large electric current. This was done by solving the transient heat transfer equations using finite difference techniques. The resulting temperature profile was used to estimate the load on a bar undergoing tensile deformation while carrying electric current. Once this was achieved, we were able to predict the stress strain curve under the influence of the current and compare it to the measured values. This work supports research into the effect of electric current on the energy required to form and machine metals. Being able to decrease the energy required to machine metals by using electric current would be an extremely useful tool for metal-working companies to use. The cost of machinery would be greatly decreased as the metal would be far easier to work with and require less force to stretch and mold due to the altered stress-strain curve. Not only would the machinery not need to exert as much force on the metal of interest, but it would also be able to get the job done in a more timely fashion since the effects that electricity has on the metal take place in less than a minute.

Extending the Tool Life of Solid Tungsten Carbide Endmills using Cryogenic Treatment

Amanda Evans (John Roth), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

Previous research has indicated that by cryogenically treating tungsten carbide tooling, its life can be extended. However, more research was necessary in order to understand the means by which this occurs. Beginning this summer, research was conducted on tooling from Saegertown Manufacturing Corporation, Steris, and Carnegie Mellon University. The tools were first cut in half; one half was left untreated and the other half was put in a cryogenic freezer. After the cryogenic treatment was completed, both the treated and untreated sections were prepared for microstructure analysis. Through a process of polishing and etching, the microstructural phases of alpha, gamma, and eta were revealed in the tools. A metallograph and scanning electron microscope were used to take highly magnified pictures of the tool surface. These resulting pictures are now able to be compared to each other in order to find a correlation between a change in microstructure and a change in tool life.

Temperature Evaluation of Metallic Bars Using a Multifield Finite Element Model

Marc Hoffman (Amir Khalilollahi and John Roth), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

The objective of the current work was to create a theoretical/finite element model that would determine the temperature at every given point along the length of a cylindrical bar in a tensile test. Prior research has shown that passing electric current through a metal bar can drastically change its material properties. It is well known that temperature plays a significant role in material properties. If a model can be created to accurately show the temperature of the metal bar during the experiment, then it can be determined if it is temperature and/or electricity that affects the metals stress-strain curve. This can then directly validate the research done in the past by Dr. John Roth and his student team. This research can lead to new methods of manufacturing, involving bending and cutting. Newer and more cost-effective methods will help save money and increase company profits. An ANSYS finite element model was created to show the temperature distribution in a metal test specimen. The model matched well for experimental data with an aluminum test specimen. However, it does not accurately show temperature distribution along a titanium sample. Current modeling efforts are underway to understand this inconsistency and consequently refine the model.

Stability and Performance of the U.S. Brig Niagara under Partial Sail

Terence Musho (William Lasher), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

The captain of the U.S. Brig Niagara, Walter Rybka, has expressed interest in using Computational Fluid Dynamics (CFD) to model the Niagara under partial sail. It is reasoned that the results will aid in the maneuvering and safety of the vessel. The initial state of interest deals with the performance and optimum trim of the sails that corresponds to a maximized driving force. The second state of interest deals with the determination of a range of trims for a given point of sail in which the heeling moment of the boat is safe. Prior research modeled the Niagara in Fluent and has been used to analyze the run position. The current research used the same model and process previously used to analyze the remaining three points of sail. The outcome will provide Captain Rybka with the required data to determine an optimum sail trim for a given wind condition.

Cryogenic Treatment of Tungsten Carbide Tooling to Extend Tool Life

Nathan Russell (John Roth), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

A maximum profit is the goal of all capitalist companies. In a competitive market, such as manufacturing in the United States, prices must be held down. Therefore, profits are maximized by minimizing costs. For a machining company, tools are a large part of the cost of production. It has already been shown that tool life can be extended by cryogenic treating in some instances. The goal of this research is to apply this to a specific company, a specific tool, and a specific process. The tool in question is a tungsten carbide endmill, the process is the machining of a door which must seal perfectly to store biologically hazardous materials, and the company is STERIS Erie of Erie, Pennsylvania. STERIS Erie will provide tools and work pieces for this research.

The Effect of Cryogenic Treatment on the Performance of Uncoated Carbide Tools

Zachary Sadowski¹ (John Roth¹ and Eralp Demir²), ¹Penn State Behrend, School of Engineering and Engineering Technology and ²Carnegie Mellon University, Department of Mechanical Engineering - Mechanical Engineering

Previous research studies have shown that the effect of cryogenic treatment of tungsten carbide tools can lead to an increase in tool life; however, research has also shown that the same cryogenic treatment can lead to a decrease in tool life. The mechanism by which these processes occur remains to be determined; therefore, this research is focused on identifying the source for either an increase or decrease in tool life. The information presented herein compares the changes that occurred to the microstructure of two different uncoated inserts during specific operating conditions. The turning tests performed were conducted using the same testing parameters for both the cryogenically treated and untreated inserts. In order to ensure that the main wearing process on each insert occurs through diffusion wear, specific testing parameters were chosen. These testing parameters help to demonstrate the effect of changes within the microstructure on the bonding phase of the tungsten carbide inserts. The research of the treated and untreated inserts includes analysis of the cutting forces and the chips produced under specific testing parameters with flank wear on the tool representing the main wear criterion. Additional analysis includes the determination of total wear area to provide supplementary information regarding relationships among cutting forces, chips produced, and the total wear area.

The Aerodynamics of an Actively Twisted Wing

Shawn Stahlman (James Sonnenmeier), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

Aerodynamic performance of aircraft can be manipulated by changing the shape features of the wing. An alternative method of changing the performance with less mechanical complexity was presented in earlier research. The previous research concluded that it is possible to use shape memory alloy (SMA) and an electric current source to manipulate a test wing. Given these findings and prior data from wind tunnel tests, mathematical models based on Prandtl's lifting line theory have been developed to predict the lift coefficients of a twisted wing. The purpose of the current research was to use the mathematical models to solve for the lift coefficients of various wing shapes for comparison. The geometrical features of the wing, chord, and the tip-to-root-chord ratio were varied. The input lift curve slope and angle of attack of the wing were also varied. Results were calculated and plotted using these variations along with the twist angles found in previous testing. From the results for these different variations, it was concluded that the mathematical model can predict the outcome of twisting various wings. Future research would include implementation of more detailed mathematical models for comparison.

Vibration Analysis of Electrostatically Driven Micro-Beams

Kevin Sunealitis (Oladipo Onipede), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering

Several high frequency microelectromechanical (MEMS) devices, such as electronic signal resonators and filters, can be modeled as electrostatically driven micro-beams. While their static structural response depends solely on the magnitude of the applied voltage and their elastic stiffness, their dynamic response also depends on their mass, damping properties, and the applied voltage frequency. In designing these devices, critical parameters include the maximum voltage, voltage frequency, and the natural frequency of the system. Even though the electrostatic force developed by the voltage is non-linear, the system can be modeled as a harmonic system due to the periodic nature of the response. ANSYS, a commercial finite element analysis computer software, was used to model and analyze micro-beams in electrostatic fields. The deflection and maximum voltage results from ANSYS were compared with results from finite difference models. Results from beams with various boundary conditions and loading conditions were obtained and will be presented. Results from harmonic analysis using ANSYS show the influence of the applied voltage on the natural frequency of the beam. The effect of various mechanical properties on the natural frequency will also be presented.

The Effects of Close-Range Obstructions on Predicted Fan Operating Points

William Cutter (Bob Edwards), Penn State Behrend, School of Engineering and Engineering Technology - Mechanical Engineering Technology

Most modern electronic equipment requires one or more fans for cooling. It is important to be able to predict how much air will flow through the device for any given fan. This prediction is a routine process involving matching fan flow characteristics with back pressure characteristics of the system or device. However, it seems to be general knowledge that the fan will perform at lower than predicted levels if obstructions are placed in close proximity to the inlet or outlet to the fan. Most fan manufacturers recommend eliminating as many of these close proximity obstructions as possible, but fail to provide any quantitative data about the effects. This project will try and analyze the effect that close-range obstructions have on the predicted flow versus the actual flow. To do this, tests will be conducted to predict the performance of a fan based on characteristic matching. Then the actual operating point of the fan if the flow obstruction is close to the fan vs. being farther away will be determined. An attempt will be made to produce design guidelines based on the test results.

Effects of Nasal Carbonic Anhydrase Inhibition on CO₂ Discrimination in Rats

Katheryn Ferris (E. Lee Coates and Rodney Clark), Allegheny College – Neuroscience

A previous study reported that Long-Evans rats have the ability to discriminate inspired CO₂ concentrations as low as 0.5%. The first objective of this study was to determine CO₂ detection thresholds for Sprague Dawley and Zucker rats. The rats were operantly trained to discriminate between CO₂ and control air (0% CO₂) and then were subjected to various CO₂ concentrations (0.5-12.5%) to determine their threshold. It was found that there was a difference between strains, with Zucker rats having an average threshold of 1.32% CO₂ and Sprague Dawley rats having an average threshold of 0.53% CO₂. A second objective of the study was to determine if the carbonic anhydrase (CA) inhibitor, methazolamide, would affect the CO₂ threshold. CA is found in a small number of olfactory neurons in rats and may play a role in the discrimination of CO₂. The thresholds of seven Zucker rats were determined and then retested after the CA inhibitor was applied topically to the nasal mucosa. The results show that the CA inhibitor significantly increased the detection threshold in Zucker rats. These findings indicated that CA is required for the detection of low concentrations of nasal CO₂.

The Effects of Temperature on the Ventilatory Responses of Sprague-Dawley Rat Pups to CO₂ and the Implications for Sudden Infant Death Syndrome (SIDS)

Abigail Grant (E. Lee Coates), Allegheny College - Neuroscience

Increased temperature and accumulation of CO₂ are both risk factors associated with SIDS. The purpose of the current study was to examine the effects of temperature on the ventilatory response of Sprague-Dawley rat pups to CO₂. The design of this study was to test rat pups on days 1, 2, 3, 5, and 7 following birth. Each rat pup was placed into a low (23-25C), medium (32-35C), or high (37-42C) temperature group. Thirteen rat pups were used in each treatment group. Each rat was placed in a plethysmograph chamber for detection of pressure changes during ventilation recordings. A 15-minute air sequence, including exposure to control air and 8% CO₂, was delivered to each rat pup. Ventilatory traces were recorded with BIOPAC software and analyzed to determine breathing frequency, tidal volume, and minute ventilation. The normal response to increased levels of inspired CO₂ is to increase ventilation. The results of this study suggest increasing temperature may blunt the normal ventilation response to CO₂. The middle and high temperature treated groups showed less of an increase in breathing frequency, minute ventilation, and tidal volume in response to 8% CO₂ than the low temperature treated group.

Experimental Study of the Dynamics of Foraging Ants

Justin Walker and Richard Fetzner (G. William Baxter), Penn State Behrend, School of Science - Physics

We study the search paths of foraging ants in order to describe their behavior mathematically. Ants have become popular as simple agents in models of artificial life. Here, the ant is presented the problem of finding food when no food cues are present. In this experiment, individual ants (*Formicinae lasius flavus*) are allowed to forage on a two-dimensional textured surface in the absence of a food source. The position of the ant as a function of time is determined with a high resolution digital camera. The scaling properties of the resulting foraging paths compare favorably with those of certain types of random walk.

Multilaterals: Reconciling Legal Notions with Empirical Reality

Chris Strayer (John Gamble) Penn State Behrend, School of Humanities and Social Sciences - Political Science

The honors program at Penn State Behrend has been compiling a database of multilateral treaties signed between the years 1648 and 1995—with a projected expansion to 1500-1999 to take place throughout summer 2006. This database includes virtually all multilateral instruments developed over this timeframe on an equal footing, which although accepted by the international legal community is not necessarily factual. For example, an ILO Convention on Night Work in Bakeries may not be of the same importance as the United Nations Charter. So as to reflect better this gradient, two new variables were developed and implemented; one notes the function of treaties and thereby facilitates a hierarchy of importance, and the other tracks treaties designed to modify or otherwise affect previous instruments. The project will enhance the ability of resident students and faculty to study trends in international law.

An Interdisciplinary Project for the Development and Evaluation of Spatial Training

Jenna Beck¹, Ivan Lopez², Kristen Macha², Lauren Wagner¹, Nehal Kachalia², Gary Krugger², and Stuart Daman¹ (Dawn Blasko¹, Kathy Holliday-Darr², Derek Mace¹, Ron Krahe², and Jennifer Trich Kremer¹), Penn State Behrend, ¹School of Humanities and Social Sciences and ²School of Engineering and Engineering Technology - Psychology

Many careers involve the need for high spatial ability. Unfortunately, many people lack this necessary ability to be competitive in their career. Research has shown increased practice with different spatial skills improves spatial ability. This project was designed to create hands-on games to strengthen an individual's spatial skills. Spatial abilities addressed by these games were mental rotation and spatial visualization. The mental rotation game is a 3D block version of the card game Spoons. The MRSpoons game consists of 13 different block shapes in sets of four, and 13 different cards with the corresponding shapes on the cards. The spatial visualization game is a 3D version of tangrams. In this game a 3D pyramid is assembled by placing pieces of wood in the correct location. The user must mentally visualize the tangram to be able to successfully complete the puzzle. A third game was designed to strengthen feature identification, a necessary engineering skill. Aftershock was designed to improve recognition of unique features, such as holes, ribs, and boss. The hands-on games were developed to strengthen spatial ability. Ease of use was assessed during an initial usability evaluation. A spring 2006 grant was obtained to conduct the formal evaluation of the games.

Influence of Reality TV Cosmetic Surgery and Body Image

Jenna Beck and Melissa Schmidt (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

In recent years, reality TV has begun to feature shows revolving around cosmetic surgery. This study was designed to examine whether these reality TV shows negatively impact body image. Participants viewed one of three clips. The realistic clip showed an individual planning to have cosmetic surgery, the surgery, the recovery and the results of the procedure. The unrealistic clip showed an individual planning to have cosmetic surgery, the results of the plastic surgery without showing the surgery and recovery. The control clip was taken from a home improvement show. Participants watched one clip then completed surveys that measured body image and internalization. It was hypothesized that females would have a lower body image and higher level of internalization than males. It was also hypothesized that those who viewed the unrealistic clip would demonstrate a lower body image and a higher internalization than the individual that saw the realistic or control clip. The results found that neither men nor women were impacted by the video clips. The results have implications for theories of media influence on body self-image.

The Effects of Equivocation on the Opinions of Potential Voters

Kiyle Brosius and Stuart Daman (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

When politicians answer questions they often avoid direct answers in order to save face. In this study we examined the impact that equivocation has on the audience of a political interview. Three simulated interviews were viewed by participants in which a candidate either answered a question directly in an affirmative or negative way or equivocated by speaking indirectly about the issue. Participants were then asked their views of each candidate, how they judged their personality, and whether they would vote for them. According to the Face Model, politicians who equivocate in a conflict situation, instead of giving a straightforward answer that makes him or her look bad, will be perceived as more likable than one that answers honestly and directly. However, the results showed that participants did not like the equivocating politician more than those that answered directly. Women were even less likely to view the equivocating politician favorably, suggesting that equivocation may not always be a good political strategy.

Science Activity Learning and Spatial Abilities in Fourth and Fifth Graders

John Crane, Aimee Frey, Eileen Haase, and Renee Jerge (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

This study investigated how hands-on science learning relates to spatial abilities. Fourth and fifth grade participants in an afterschool science program were split into two groups. The nonspatial group (10 males; 7 females) completed activities based on the Ology Web site, while those in the spatial group (10 males; 7 females) completed activities requiring more construction and spatial manipulation. The activities for both groups were inquiry-based, requiring making predictions, drawing conclusions, as well as cooperative learning. Participants were given modified pre- and post-Vandenberg & Kuse's (1978) Mental Rotation tests. Significant improvement on spatial abilities was found overall, $F(1, 47) = 40.85, p < .05$. The age by pre-post interaction was not significant, indicating that it is not an aging effect. These findings suggest that science-related after-school activity involvement enhances spatial abilities and scientific interest regardless of the nature of the scientific activity. This shows that using an afterschool, hands-on program can enhance students' cognitive abilities and interests in the science curriculum. Early interests in science could lead to lifelong goals that include pursuing a science-related career.

Leadership and Its Impact on a Multiple Goal, Multilevel Model of Individual and Team Performance

Christopher Engelhardt and Kelly Miller (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Although the leaders of an organization are often fired or resign, there has been relatively little research on the impact of leadership succession on team performance. The purpose of the current study was to examine whether leadership succession would interact with the type of feedback that team members received to influence individual and team performance. Undergraduate psychology students in three person teams worked (in three, 30-minute sessions) on a computerized game (Oregon Trail). The variables included: 1) leadership succession (leader fired vs. not) and 2) type of feedback (individual vs. team). They were also asked to set goals and rate their self-efficacy. It was hypothesized that if leaders were given feedback about their poor performance, regardless of actual performance, then this evaluation would adversely impact future individual and group performance. Teams were given negative feedback at either the individual or team level. Preliminary results demonstrated that leadership succession in this task played a relatively minor role on performance although it did impact self-efficacy. On the other hand, the type of feedback was a much stronger predictor of performance.

Is It What You Say or How You Say It? Word Placement in Metaphor Processing

Sandra Grgic and James Morosky (Dawn Blasko and Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Two main theories of metaphor processing are currently competing: structure mapping theory and categorization theory. The structure mapping approach suggests that at the early stages of metaphor processing the similarities between the topic and the vehicle are examined at the same time regardless of word order. The directionality from vehicle to the topic emerges in the later parts of metaphor interpretation. Contrary to this, the categorization approach states that processing of metaphors will be asymmetrical. Meaning that, directionality is a necessary part of early metaphor processing where inferences are made from vehicle to topic. Various techniques have been used to find behavioral support for both theories. The focus of our study was to utilize the sensitivity of event-related potentials (ERP) to analyze metaphor comprehension in its earliest stages. The participants were presented with metaphors that were either high or low in similarity and in either normal or reversed order. Behavioral results were consistent with previous research in that they supported the structure mapping approach, showing no significant difference between the response times of the reversed and normally presented metaphors. However, analysis of ERP data provided evidence of directionality in early high similarity metaphor processing, thus supporting the categorization approach.

Familial Socialization Influences on Relational Aggression

Eileen Haase and John Crane (Victoria Kazmerski and Charisse Nixon), Penn State Behrend, Humanities and Social Sciences - Psychology

The negative influence of peers on behaviors such as teasing, gossiping, and rumor spreading are clear. To date, most work has examined the role of peers in establishing and maintaining relationally aggressive (RA) behavior. This has left a paucity of work investigating how familial factors (e.g., sibling and marital relationships) influence and promote RA behavior. This study explored the influence of familial factors, such as sibling and marital relationships, on RA behaviors as self-reported by older adolescents. Data were obtained from 159 participants (male = 59, female = 100; 14 - 56 years, mean = 20.74). Of these participants, 104 were from intact families and 55 reported having divorced parents. Participants completed self-report questionnaires measuring adolescents' network of relationships and involvement in RA. The relationships between positive familial process variables and RA were not significant. Only female adolescents' negative interchanges with their fathers (e.g., criticism, dominance, antagonism) were related to their involvement in RA, both as an aggressor and a victim. Recognizing the importance of multidimensional factors will help develop more successful opportunities for a positive support system and will decrease the likelihood of RA socially.

Computer Based Spatial Training Modules

Jonathan Hika¹ and Robert Budden¹ (Gary Walker¹, Kathy Holliday-Darr², Jennifer Trich Kremer³, and Ron Del Porto¹), Penn State Behrend, ¹School of Science, ²School of Engineering and Engineering Technology, and ³School of Humanities and Social Sciences - Psychology

Research has shown that the abilities to visualize and perceive objects in space are vital tasks in most career fields. We have developed a visual and spatial perception simulator called "Envision: Spatial Courseware" that helps students train and improve their spatial skills. The user navigates throughout a three-dimensional maze, collecting rings placed in different areas. Each ring spawns a training module that works on a different spatial skill. Throughout these training modules the user earns points based on a variety of scoring methods. The internal scoring matrix keeps track of user performance with information on each type of skill. Scoring shows which skills they are strong and weak in and causes the system to adjust its difficulty level automatically. Data from the maze and training modules are collected via a connection to the VIZ database. This allows research to be conducted to determine the best means of improving spatial skills and will provide a wealth of information to VIZ researchers. Our system is built to allow future researchers to produce add-ons and additional training modules and contains a detailed instruction manual for the completion of these tasks.

Computer-Based Spatial Training Modules

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Research has shown that the abilities to visualize and perceive objects in space are vital tasks in most career fields. Last summer we worked to develop a variety of different computer simulations to train these areas. The first of these was a prototype way-finding simulation. It allows the user to navigate throughout a three-dimensional maze, collecting rings placed in different areas. The second was a three-dimensional dart game where the user shoots darts at an array of balloons. The intent of this game is to help the user focus his or her spatial perception skills. Users were to be scored on the number of balloons they successfully pop with a limited set of darts. The third and final simulation focuses on mental rotation by having the user build a bridge from a finite set of pieces that will only fit together in a specific pattern. In order to successfully complete this task the user must use the given pieces to complete a bridge across a pit of lava. The overall goal of this research was to develop these different educational and entertaining simulations. A spring 2006 grant was obtained by Jonathan Hika and Robert Budden to redevelop the maze simulator, add database connectivity, and allow access to a variety of different spatial training modules.

Improving Spatial Abilities in Second Graders with Science Activities

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This study looked at the relationship of hands-on science learning and spatial abilities in first and second graders. We predicted that working with science activities that involved building and manipulating objects would enhance students' spatial abilities along with their scientific knowledge. Preliminary results with fourth and fifth graders showed improvement at the end of the research period. Because of the cognitive and social differences between the early and later elementary grades, the researchers modified the activities to make them effective for younger children. We measured to see whether these activities would have the same impact on a group of younger students. All students will receive pre- and post-testing of their spatial abilities. In addition, we recruited a small control group who will be given the pre- and post-test, but will not participate in the afterschool activities. The anticipated outcome of this research is that students who participate in the afterschool program will increase their spatial abilities as measured in the post-test more than students who do not participate in the program.

The Effect of Body Shape Attractiveness on Memory

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Over the past several years, body image and the idea of the body ideal has become an area of great interest. The purpose of the current research is to explore how physical attractiveness of the body relates to cognition and memory. For females, one of the most important predictors of physical attractiveness is the waist-to-hip ratio (WHR). Within this study, participants will view three sets of female photographs, varying in weight and WHR that will be paired with an individual vignette. Participants will be asked to rate each photograph on attractiveness and will be required to subsequently answer questions about the vignettes. We expect to find that both males and females will have a greater recall for information found in the vignettes paired with the physically attractive body shapes, as opposed to the neutral body shapes. Also, we predict that the WHR of 0.7 and average weight will have the highest body attractiveness rating. Overall, we expect our results to show that body fat and its distribution on females will have a relationship to the physical attractiveness of a female's body.

Implicit Gender Stereotypes in Disney Animated Films

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Implicit gender stereotypes affect everyday thoughts and actions without conscious awareness. However, not much research has been conducted on how these stereotypes about how men and women should behave can be triggered by outside events. According to social cognitive theory, a main factor in an individual's gender role development is modeling from the media. Participants first viewed one of three movie conditions: 1) extreme gender stereotypes; 2) non-extreme stereotypes; or 3) control clips, and then completed the Gender Implicit Association Test (IAT). We hypothesized that viewing the extreme gender stereotypes would increase the activation of implicate gender stereotypes. However, the results showed no increase in implicit stereotypes.

Effect of the CASS (Creating a Safe School) Project on Students' Behaviors and Beliefs as a Function of Process Variables

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Recent research has demonstrated the prevalence of relationally aggressive (RA) behavior among middle school students. The consequences attached to this insidious behavior are detrimental (e.g., internalizing and externalizing difficulties) and often times, tragic (e.g., suicide). The next step for researchers is to begin to develop effective strategies to reduce RA behavior. The majority of intervention studies have thus far focused on reducing physical bullying within the school context. These interventions have been met with some success, yet the results are inconsistent and vary across intervention programs. Interestingly, there have been very few published intervention studies examining the affect of intervention efforts on students' subsequent RA behavior. This study examined the affect of a systemic intervention program (CASS; Creating A Safe School) on students' reported behaviors and beliefs. Importantly, results will examine intervention effects as they relate to various process variables (e.g., length of intervention, teacher involvement, administrative cooperation, etc.). Results will be discussed within a contextual framework.

Influence on Protective Factors on Children and Adolescents' Relationally Aggressive Behavior

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Bullying is a serious problem, not only in the United States, but all over the world, including countries such as Norway, United Kingdom, Canada, Finland, Japan, Russia, and China. Past work has demonstrated a cogent relationship between relational aggression (RA) and internalizing (e.g., loneliness, depression) and externalizing behaviors (e.g., delinquency). Tragically, recent studies have shown a relationship between social exclusion and suicide. However, few researchers have examined protective factors as they relate to relationally aggressive behavior. Specifically, how do students' forgiveness, beliefs about aggression, ability to regulate emotions, school connectedness, self-efficacy, and empathy relate to their involvement in RA. This study examined the relationship between students' assets (as mentioned above) and their reported victimization and aggression. Results revealed significant negative relationships between students' protective factors and RA. Multiple regression analyses were conducted to examine which protective factors were significant predictors of relationally aggressive behavior.

A Service Learning Study: Effects on the Attitudes of College Students

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We examined the impact of service learning on the attitudes of college students. In service learning, students work in the community as part of their coursework. We surveyed students in a college class that had a mandatory service-learning component, and compared them to students in a similar non-service-learning course. At the beginning and the end of the semester, all students completed a brief measure of personality and the Community Service Attitudes scale. Those in the service-learning group also kept a log where they reflected on their experiences. There were few differences between the groups. Most students that completed the service-learning component felt that it was beneficial, but overall, women were more positive about the experience than men. Those that rated themselves more highly on the personality characteristic of agreeableness also felt that the experience was more valuable and more enjoyable.

The Effects of Positive Feedback Given to Females in a Threatening Environment

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When individuals feel they are being negatively stereotyped, their performance in a given task may decrease. Stereotype threat is when an individual, who cares about a given domain, knows that a stereotype about his or her social group can provide a potential explanation for poor performance in that domain. There are widely known stereotypes in this society that say women have fewer abilities in mathematics. Simply being in a situation where one can confirm negative stereotype about one's group, such as a woman sitting down for a math test, can be enough to cause stereotype threat. A between-subject research design will be used in this project, with two independent variables and one dependent variable. The first independent variable will have two levels consisting of a minority group (one female, two males) and a same-sex group (three females). The second independent variable will be feedback. We predict females will underperform on a given math test when they are outnumbered by males. Furthermore, we predict that by giving the females positive feedback about their performance on a math test, their performance will increase while remaining in a threatening environment.

The Effects of Gender, Thin Internalization, and Televised Media on Body Dissatisfaction

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The purpose of the current study was to determine the affects of televised media and thin internalization on the body dissatisfaction of college-aged males and females. Participants were first tested on their level of thin internalization during a prescreening session. These participants were all invited back to participate in further research. Those who agreed to come back were then randomly assigned to view a video of either appearance-related or non-appearance-related clips from currently running television shows. They then completed a body dissatisfaction scale. We expected females to show lower body satisfaction than males and the results showed that this was the case. We also expected those that saw the appearance-related clips to show lower body satisfaction, and for this to impact women more than men. This hypothesis was not confirmed. Finally the hypothesis that high internalizers would be more affected by video clips was not supported. The results will be discussed in terms of recent theories of gender and body satisfaction.

Correlations of Attitudes toward Abortion and Capital Punishment

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Recent research has demonstrated that attitudes on capital punishment and abortion are highly indicative of religious affiliation and political affiliation. The purpose of this research was to explore alternative correlations. Participants will complete a demographic survey, a capital punishment attitude survey, and a gender-specific abortion attitudes survey. We are in the process of running subjects and are unable to report data, but we predict that the more religiously and politically affiliated a person is, the more they are likely to oppose capital punishment and abortion.

How is Your Relational Aggression Affecting Your Sarcasm Today?

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Previous research has found that sarcastic criticism is very common in natural language. It tends to be used most often by people in close relationships, yet it has the potential to harm those relationships. Our previous work suggests that those high in relational aggression (RA) seem to process sarcastic statements differently and this can be seen in their patterns of brain waves. The current study looks at why this might occur. Are people with high RA more likely to see sarcastic criticism as funny? Are people with low RA more sensitive to this aggression? We asked college students (N=100) to rate themselves on their use of sarcasm. They completed the Mini-Marker personality scale, an RA scale, and a physical and verbal aggression scale. In the second session, all the participants read 80 of the 160 sarcastic statements used in the previous research. Each student rated the statements on seven different variables: the speaker's intent to be mean, humor, sarcasm, surprise, and negative and positive emotion. The results showed a relationship between personality, aggression, and sarcasm. Those with higher RA scores tended to use sarcasm more frequently. Those with lower RA scores detected positive and negative emotion more accurately.