

PENNSSTATE



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College

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2003  
TWELFTH ANNUAL  
UNDERGRADUATE STUDENT RESEARCH  
AND  
CREATIVE ACCOMPLISHMENT CONFERENCE  
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### **The Creative Public Art Project – Fisher Hall Mural**

Deborah Allison and Merrill Gonzalez (Kong Ho), University of Pittsburgh at Bradford, Humanities Division – Art

The mural is a form of public art that contributes sociologically to the community that surrounds it by inviting those who view it to participate in its creation as well as allowing the viewer to ascribe a meaning and purpose for the outcome. The project of the mural painting at the University of Pittsburgh at Bradford offered students an opportunity to collaborate in the study of mural painting and planning, while keeping in mind the future viewer of the mural after completion. The mural course was unique to other art courses because it did not pertain to individual students, but it was a combined effort of all of the students in the class. With the design concept complete, paint was applied directly to the wall, presenting another challenge to students in that mistakes could be made, and would have to be remedied with another application of paint. Enlarging the design idea to the size of the wall presented another challenge for students trying to include all of the elements onto the wall from the original design. The result is a mural where students, faculty, and members of the community who see the mural can take ownership.

### **Density Dependent Patch Preference, Resource Abandonment, and Dispersal in *Chironomus riparius***

Catherine Brown (Pamela Silver), Penn State Behrend, School of Science – Biology

*Chironomus riparius* larvae exhibit density-dependent population dynamics, but the mechanism by which density influences the abundance of different instar larvae is unclear. In this study, we asked whether high densities of resident late instar larvae could: 1) force the larvae to disperse into low-quality habitat; or 2) prevent settlement of colonizing early instar larvae into high-quality habitat. Instar III larvae (residents) were placed into divided Petri plates in which the high-quality half contained sand and leaf particles and the low-quality half was empty. Resident larvae were left undisturbed to establish cases and feeding territories for one week before instar I larvae (colonists) were added. When resident density was high, most residents dispersed permanently into low-quality habitat and entered permanent diapause or died. Colonists were then able to acquire high-quality habitat, but their dispersal into low-quality habitat and subsequent survival was density-dependent. When resident density was low, residents settled in high-quality habitat. Colonist survival and location were dependent on resident density. Survival and density-dependent territory abandonment by late instar larvae may have determined whether early instar colonists were able to settle in high-quality habitat, thereby influencing colonist survival rate.

## **Investigating the Role of Folate Metabolism in Zebrafish Heart Development**

Jestin Carlson and Amanda Svitek (James Warren Jr.), Penn State Behrend, School of Science – Biology

Cardiovascular diseases affect over 60 million Americans, many of whom are children. Congenital heart defects occur in eight out of every 1,000 newborns making it the most life-threatening condition for children during the first month following birth. Low folic acid levels have been shown to result in high levels of plasma homocysteine, which increase the risk of cardiovascular diseases; however the precise metabolic reactions involved have not been identified. By manipulating folic acid metabolism and homocysteine levels in developing zebrafish, it is possible to study what folate-requiring reactions are critical for normal heart development. Zebrafish embryos were exposed to homocysteine, an intermediate in the metabolic pathway, and valproic acid, which mimics homocysteine-induced phenotypes, in order to determine what errors occur in heart patterning. Optimal concentrations inducing heart phenotypes were determined and subsequent induced abnormalities were documented and classified: Irregular Atrial/Ventricular Differentiation, Reduced Cardiac Tissue, Irregular Contraction, and Reduced Circulation and/or Blood. This gives an insight into the role of homocysteine and folic acid in heart patterning and development and provides us with an experimental system where we can investigate the molecular mechanisms of heart malformation.

## **Gene Expression Changes in *Arabidopsis thaliana* Exposed to Low Levels of Copper**

Melissa S. Feile (Michael Campbell), Penn State Behrend, School of Science – Biology

Low levels of heavy metal contamination are a persisting problem, especially in the regions of the Great Lakes watershed. Presque Isle Bay, located on the south shore of Lake Erie, is contaminated with low levels of lead, nickel, zinc, and copper. At specific sites within the bay, soil levels exceed the Probable Effect Concentrations (PEC) for lead, nickel, zinc, and copper. However, the biological response of plants to the PEC-levels for these metals is not known. In order to examine the PEC-level effect of copper on plants, we grew *Arabidopsis thaliana* on soil supplemented with copper to a final concentration of 175 mg/kg. Total RNA was isolated and hybridized to an *A. thaliana* Gene Chip microarray (Affymetrix). The copper-treated plants exhibited 20 up-regulated and four down-regulated mRNA sequences out of the 8,000+ genes on the microarray chip. Each experiment was replicated twice and transcripts demonstrating a +/- 1.1 fold change were selected for further analysis. A specific mRNA, encoded by the metal regulated peptide (*MRP1*), was increased by over twofold after exposure to copper. Transcript levels of *MRP1* were measured in plants exposed to other heavy metals. Quantitative real-time PCR analysis demonstrated that *MRP1* exhibits a twofold increase in expression in comparison to ACT2 and GAPDH when plants were grown in PEC-levels of lead, nickel, and copper. *MRP1* encodes for a 52 amino acid polypeptide with no significant similarity or identity to any previously characterized gene product. We have isolated a unique transcript whose expression level is altered by the presence of heavy metals.

## **Genetic Analysis for a Population of Spotted Salamanders (*Ambystoma maculatum*) Using Mitochondrial DNA and Microsatellite Markers**

Jeana Ferilla (Michael Campbell), Penn State Behrend, School of Science – Biology

Amphibian populations are declining worldwide, but it is not clear if the decline is a result of human disturbance, climate change, or destruction of habitat. The level of genetic diversity in natural populations is usually related to the ability of populations to adapt to environmental stress. This study aims to explore the effects of construction of the Eastside Access Highway upon the population of *Ambystoma maculatum* (spotted salamander) at the Penn State Behrend campus. Embryonic mitochondrial DNA sequences and adult microsatellite DNA markers were used to characterize the genetic diversity of the population. By employing polymerase chain reaction (PCR), the mitochondrial DNA was sequenced and the microsatellite DNA markers were amplified. The analysis of the mitochondrial sequences indicates a maternal line of inheritance of spotted salamanders inhabiting the campus, relating to some degree of reproductive isolation. The microsatellite markers indicated that the population is not in Hardy Weinberg Equilibrium. Allele frequencies calculated within the upland and lowland complexes were shown to be homogenous.

## ***Pisidium* Distribution in a Post Reservoir Aquatic Ecosystem**

Richard H. Gardner II and Rachel O. Gramley (Mike Campbell), Mercyhurst College, School of Biology and Environmental Science – Limnology

On a previous benthos study of the Tionesta Reservoir a freshwater clam population (*Pisidium*) was noticed at a distance below the reservoir. This clam population distribution was intriguing in that, as the distance from the dam increased, so did the number of clams present. *Pisidium* is known to be very sensitive to suspended particulate materials. The purpose of this research was to determine whether the particulate matter originating from the discharge of the dam is affecting the *Pisidium* distribution below the dam. Our investigation included analysis of clam populations in relation to major current speed variations. The study also examined the connection of the *Pisidium* population to the Allegheny River to determine whether these organisms have migrated upstream into Tionesta River.

## **Comparative Analysis of Benthic Macroinvertebrate Communities in Four of the Presque Isle Bay Watersheds**

Rachel Gramley and Richard Gardner II (Michael Campbell), Mercyhurst College, School of Biology and Environmental Science – Limnology

Urbanization has impacted the quality of water and diversity of the organisms living in our local streams. The negative impact of urbanization typically includes reduction in the diversity of bottom-dwelling animals, increases in water volume, and sediment loading during storm events. To increase our understanding of the dynamics of the streams in local urbanized areas, this research focused on a comparison of the benthos of four primary tributaries affected to varying degrees by urban developments within the Presque Isle Bay watershed and analyzing the physical chemical properties of the streams. All four streams were sampled during March of 2003 using U.S. EPA Rapid Bioassessment Protocols. The hypothesis evaluated by the investigation is that small streams situated in watersheds with higher levels of urban development will have less diverse benthic macroinvertebrate communities.

### **Increased Mitochondrial DNA (mtDNA) Copy Number in Relation to mtDNA Control Region Sequences in Cancer Progression Cell Line Model**

Justin A. Guay, Jacob A. Marsh, Aaron R. McElhinney, Tara Tauber Rock, Tan M. Lam, Seth M. Kelly, Jennifer L. Davies, and Jonathan A. Forbes (David Jones and Durwood Ray), Grove City College, Departments of Chemistry and Biology – Biochemistry and Molecular Biology

Our previous studies indicated that mitochondrial DNA (mtDNA) copy number is correlated with advanced cancers and is often amplified homogeneously throughout breast tumors. It is unknown whether structurally altered mtDNA molecules are involved in this amplification. Our long-term objectives include determining the role that altered mtDNA abundance, mtDNA structure, and expression of genes involved in mitochondrial biogenesis, play in the transitions of cancer development. To evaluate this, we developed a cell-line model of progressive cancer stages in series from NIH Swiss mice: normal Swiss embryonic cells, immortalized NIH/3T3 cells, human ras oncogene-transformed NIH/3T3 cells, highly tumorigenic ras transformed-NIH/3T3 cells (T1A), rapidly growing tumorigenic cells (T2A), cells metastatic to liver (T3HA), and cells metastatic to lung (T4PA). We found that mtDNA copy number increased by up to 25-fold in the T2A cells. Southern blot RFLP analysis of the mouse mtDNA genome has shown that there are no large deletions or DNA rearrangements in the mtDNA amplified in the T1A or T2A cells. The mtDNA control regions of the seven cell lines are being sequenced by PCR to explore mutations related to cancer progression. Our preliminary data suggest that control region mutations are not associated with increased mtDNA copy number.

### **Assessment of Environmental Contamination within the Common Snapping Turtle (*Chelydra serpentina serpentina*) within the Greater Erie Region**

Chadwick K. Knight (Jeanette Schnars and Thomas Spudich), Penn State Behrend, School of Science – Biology

Past results from testing within the Great Lakes basin has indicated high levels of PCBs, mercury, and lead. This has led scientists to research their effects on the animals in the Great Lakes ecosystem and on the food web. Some animals, including the snapping turtle (*Chelydra serpentina serpentina*), have been used as biomonitors of PCBs and metals for more than a decade. Research indicates that many of the snapping turtles collected from the Great Lakes have high levels of metals and PCBs in the blood, muscle, and fat samples removed from their bodies. The objective of this study was to determine if snapping turtles collected from different areas within the Erie region contain dangerous levels of PCBs and lead, and to determine if the diet of the turtles was related to these levels. Turtles from northwestern Pennsylvania were collected with hoop nets and euthanized. The digestive tract of each turtle was removed during necropsy, and contents were sorted, categorized, and weighed. Lead concentration in tissues and diet analysis will be presented. With respect to the place of capture and diet, the concentration of various contaminants in the tissues of each turtle should reflect the level of contamination in the specific habitat.

### **Sixteen Base-Pair Length Polymorphism in the Promoter Region of the Human Mitochondrial Single-Stranded, DNA-Binding Protein: Presence in Some Patients with Advanced Breast Cancer**

Amanda M. Kohler, Harmony L. Tyner, Timothy R. Blosser, Rachel A. Richards, Thomas C. Grana, Benjamin T. Monroe, and Danielle G. Lovett (Durwood Ray), Grove City College, Biology Department – Molecular Biology

Mitochondrial single-stranded binding protein (mtSSBP) is a nuclear gene protein involved in the replication of mitochondrial DNA (mtDNA). We have shown that mtDNA copy number is elevated in metastatic breast cancer. We plan to ascertain if expression or structure of mtSSBP may be altered in cancer cells. PCR amplification of the promoter region of this nuclear gene unexpectedly revealed two amplicons (heterologous genotype) in some but not all breast cancer patients. We cloned these haplotypes into bacterial phagemids and sequenced the abnormal longer form finding a new 16 bp indel size polymorphism (Lovett, et al. NCBI locus AY205592). This paper describes our efforts to evaluate the frequency of this indel in the human population and in breast cancer. The presence of the indel is evaluated by agarose gel electrophoresis of PCR products. It is present in the normal and cancer cell DNAs of three advanced breast cancer patients with elevated (3.5 to 4.5 fold) mtDNA copy numbers. SKBr3 human breast cancer cell-line DNA shows an increase of eightfold in mtDNA and the heterologous form of this indel. All four non-cancer individuals show no indel. No homologous form of the indel is observed, indicating a possible homologous lethal phenotype in humans.

### **Isolation of Motility Deficient Mutants of *Flavobacterium johnsoniae***

Christopher C. Smith and Joshua A. Smith (David Hunnicutt), Penn State Behrend, School of Science – Biology

Gliding motility is a type of motion utilized by certain bacteria that does not make use of flagella or cilia. The mechanism of gliding motility is unknown. In *Flavobacterium johnsoniae*, ten genes relating to gliding motility have been identified, but the estimated number of gliding-motility genes is believed to be approximately 20. Mutants of *F. johnsoniae* were produced by introduction of a plasmid that inserted the transposon Tn4351 into the wild type strain. Tn4351 confers erythromycin resistance in *F. johnsoniae*. The resulting cultures were spread onto 1% PY2 plates with 100 µl/ml of erythromycin to select for mutant *F. johnsoniae*. Nearly 1000 erythromycin-resistant mutants were produced. From these, 25 nonmotile colonies were isolated using phase contrast microscopy and time-lapse videomicroscopy. These mutants are currently being analyzed through complementation to determine which known motility genes have been affected and to identify mutations in new, uncharacterized motility genes. Only two out of the 25 nonmotile mutants have so far been complemented by known motility genes.

### **Determining Binding Affinities of Analog Endomorphins at the $\mu$ - and $\delta$ -opioid Receptors**

Michelle F. Smith<sup>1</sup> (Henry Yamamura<sup>2</sup>, Pamela Silver<sup>1</sup>, and David Hunnicutt<sup>1</sup>), <sup>2</sup>University of Arizona, College of Medicine and <sup>1</sup>Penn State Behrend, School of Science – Biology

Among clinically used drugs, morphine has the highest efficacy for antinociception, although its therapeutic utility is limited by undesirable side effects. There is a need to discover other drugs that will produce an analgesic effect similar to that of morphine but exhibit fewer side effects. The focus of this study was to evaluate newly developed analog endomorphin(s) compounds that bind the  $\mu$ -receptor, but with a higher affinity to the  $\delta$ -receptor, than morphine. The membrane receptor assay demonstrating competitive binding is the most efficient method for determining binding affinities because it mimics the system of naturally occurring competitive binding within a cell. The results of this study showed two promising analog endomorphin compounds out of the six that were tested. AE1 and AE2 both bound with high affinities at the  $\mu$ -receptor, and bound with a higher affinity than morphine at the  $\delta$ -receptor. Each of these compounds required a minimal concentration of drug to replace the radioligand specific for each receptor. A functional assay will be the next step to determine whether these compounds can inhibit cAMP formation when bound to the opioid receptors. Optimistically, after the analyses are completed a new drug with chemical capabilities to replace morphine will have been discovered.

### **Solar Radiation and Marine Invertebrate Larvae of the Puget Sound**

Laurie A. Streble<sup>1</sup> (Scott Wissinger<sup>1</sup> and Brian Bingham<sup>2</sup>), <sup>1</sup>Allegheny College, Department of Biology and <sup>2</sup>Shannon Point Marine Center, Western Washington University – Biology

Research has shown that some invertebrate larvae are damaged by exposure to natural sunlight. To date, however, few taxa have been tested and it is unknown how general the effects are. We examined the effects of sunlight on larvae from several invertebrate groups in the Puget Sound, Washington. We isolated the PAR, UVA, and UVB portions of the light spectrum and exposed larvae to these treatments to determine mortality and sublethal effects. To examine whether laboratory results modeled natural effects, we also tested sand dollar larvae at different depths in the field. Three species of brachyuran crab larvae, rhizocephalan barnacle larvae, ascidian larvae, and sand dollar larvae had dramatically different sensitivities to sunlight. Sand dollar larvae also showed significant sublethal effects (determined by measurements of arm lengths). Sand dollar larvae in the field showed significant light damage to a depth of nearly 1 meter. The effects of sunlight on invertebrate larvae from different taxa were highly variable. Invertebrate species in different taxa vary in their vulnerability to sunlight damage and may have different protective mechanisms.

## **Analysis of Folic Acid Metabolism and its Effects on Neural Tube Development in the Zebrafish Embryo**

Amanda Svitek and Jestin Carlson (James Warren, Jr.), Penn State Behrend, School of Science – Biology

Folic Acid, a vitamin found in several types of green leafy vegetables, has a known association with neural tube defects (NTDs). These birth defects can cause death or extreme handicaps during development. Women who take folic acid supplements periconceptionally can reduce the risk of NTDs. However, the mechanism for this process is still very unclear. Using zebrafish (*Danio rerio*) embryos as an animal model, this process can be studied. The purpose of this project was to perturb the folate metabolism in zebrafish and look for resulting errors in neural tube development. Various concentrations of homocysteine (HC) and valproic acid (VA) were tested. This not only showed the ineffective and lethal chemical doses, but also varying degrees of NTDs subsequent to the chemical concentrations added. Tissue sections allowed a finer detailed analysis precise for different structures within the neural tube. Results indicated that the neural tubes were smaller and misshapen. These observations may be caused by decreased proliferation or increased apoptosis in the treated embryos. Antibody staining with a mitosis marker (Anti-Phospho-Histone H3) indicated that treated embryos had decreased mitotic activity. The use of propidium iodide signified that apoptosis is not a contributing factor.

## **The Role of O<sup>6</sup> Methylguanine DNA Repair Methyltransferase (O<sup>6</sup>MTase) and Mouse 3-Methyladenine DNA Glycosylase (Aag) in Repairing Anthracycline-Induced DNA Adducts in *Salmonella typhimurium* and *Escherichia coli*.**

Natalya Teygart and Jafa Armagost (William Mackay), Edinboro University, Department of Biological Sciences – Biology

For more than thirty years, the natural anthracycline antibiotics represented one of the most commonly used classes of anticancer drugs. However, the clinical usefulness of these drugs is limited due to acute cardiotoxic effects and a dose-related cardiomyopathy. Much effort has been involved in creating less toxic analogues with improved pharmacological properties. It is known that anthracyclines interact with DNA in a very complex manner. Studies in our lab have shown that daunomycin, adriamycin, idarubicin, and epirubicin can induce mutations in *Salmonella typhimurium*. In future attempts to improve the clinical efficacies and reduce the pre-carcinogenic effects of these compounds, it will be important to understand better the role of DNA repair pathways, which are involved in correcting anthracycline-induced DNA damage. Current research involves the analysis of the protective functional role of O<sup>6</sup>methylguanine DNA repair methyltransferase (O<sup>6</sup>MTase) and 3-methyladenine DNA glycosylase (Aag) in recognizing and repairing anthracycline-induced DNA adducts. Normal and mutant O<sup>6</sup>MTase and Aag strains were utilized in this study. Mutation frequencies and/or cell survival for each strain was determined after exposure to each anthracycline antibiotic.

## **Identification of Polymers Via Pyrolysis Infrared Spectroscopy**

Jared J. Heymann (Carl Hultman), Gannon University, Department of Chemistry – Chemistry

The identification of the type of polymer present in a polymeric material may be difficult especially when materials are opaque. A fast and simple procedure is being developed to identify polymer materials. The technique pyrolyses the polymer sample and then examines the residue formed with infrared spectroscopy. The talk will outline how the procedure works, describe the limited laboratory equipment needed to perform the procedure and show results for different polymeric materials studied to date.

## **Characterization and Use of a Digital Micro-Mirror Device in Atomic Absorption Spectroscopy**

Jennifer M. Kuntz (Thomas Spudich), Penn State Behrend, School of Science – Chemistry

This research project involves characterizing, isolating, using, and testing the placement of a Digital Micro-Mirror Device (DMD) in an atomic absorption spectrometer (AAS) for simultaneous, multiple elemental analysis. The DMD has been previously characterized determining the range of function, reliability, and resolution and also isolated proving the DMD is capable of operation outside the projector from which the DMD was acquired. Characterization has continued including determination of and calibrating the minimum column size on the DMD needed to fully detect a selected range of wavelengths produced by the AAS. Compatibility between the DMD, AAS, and the programs used for operating the DMD and collecting data is currently being explored and refined. Data, primarily in the form of graphs, will officially be collected once programming compatibility has been accomplished. Data analysis will include comparing the DMD resolution to the size of the sample spectrum produced (loss of radiation), observing limits of detection using the DMD-AAS, and distinguishing specific elements from a multi-elemental sample.

## **Evaluation of Antioxidant Ability in Apple Juice and Italian Wines**

Cristen A. Stephansky<sup>1</sup> (John Simpson<sup>2</sup> and James Warren, Jr.<sup>1</sup>), <sup>1</sup>Penn State Behrend, School of Science and <sup>2</sup>Penn State Beaver – Chemistry

Nutrition experts state that a healthy diet should include foods and beverages, such as wine, fruits, and vegetables, which contain antioxidants. Researchers found that chemical studies involving antioxidants support these statements. Antioxidants inhibit the formation of free radicals, the compounds often associated with causing health-damaging conditions, such as heart disease, blood clots, and cancer. The purpose of our study is to quantify the ability of commercial apple juice and Italian wine extracts to inhibit free radical formation using a new test method and to correlate the results with similar studies. The oxidation reaction that was used to evaluate samples is the radical chlorination of 1-chlorobutane. Reaction products were first determined without the presence of antioxidants; the reaction was repeated with a standard (gallic acid) or known antioxidant and finally with the wine/apple juice extracts. The inhibition of product formation (when antioxidants are present) was quantified using gas chromatography and compared to the phenolic composition using the Folin-Ciocalteu method. Thin layer chromatography is employed to identify known antioxidant compounds present in the samples.

## **An Investigation of the C# Programming Language and the Visual Studio.NET**

Ian D. Eccles (Meng Su), Penn State Behrend, School of Science – Computer Science

Recently, Microsoft unveiled its newest programming development environment, Visual Studio .NET. The .NET framework is central to this new environment. Microsoft also released a new programming language, C#. The purpose of this research was to develop a general understanding of the .NET framework and a deep understanding of the C# programming language so we could create a C# programming tutorial. The tutorial has been completed and is in the process of being made available on the Internet. Portions of the tutorial have been used to introduce students to the new system of project management introduced in Visual Studio .NET.

## **Penn State Erie's Contribution to Brain Drain and Brain Gain in Erie County, Pennsylvania and the Penn State Erie Service Area**

Timothy D. Gigliotti (James Kurre), Penn State Behrend, School of Business – Economics

Brain Drain has been an important topic to economic development officials in recent years. Young college graduates play a pivotal role in attracting new firms to a local area. When these graduates choose to locate outside the region in which they were educated, those students are taking the benefits of their education to places that did not necessarily help to cover the costs and thus providing no additional benefit to the region that contributed to the process. In economically depressed areas, such as Erie County, Pennsylvania, the lack of college graduates in the region has dissuaded new firms, while the lack of good jobs continues to push more graduates out of the area. This “snowball effect” has resulted in stagnant growth since 1980 and a recent wave of revitalization efforts. This study attempts to measure the actual amount of Brain Drain on the area by recent graduates of Penn State Erie, The Behrend College. This is done through the examination of graduates from 1994-2002, where they came from, and where they live now. The problem of Brain Drain cannot be solved until its extent has been measured.

## **Productivity Growth in Erie Manufacturing through Time**

Michael L. Hammill (James Kurre), Penn State Behrend, School of Business – Economics

Manufacturing accounts for much of the employment in Erie County, Pennsylvania. Consequently, much of the county's income relies on manufacturing jobs, which typically pay higher wages than jobs in other sectors. Output in Erie manufacturing has increased significantly over the past twenty years, but at the same time, employment has decreased. Labor productivity, the output a worker can produce for every hour worked, is the missing key that can help explain these facts. Productivity has a direct effect on wages and may help account for Erie's slower income growth as well as its increases in manufacturing output coupled with declining employment. There are good manufacturing productivity statistics available for the United States. Unfortunately, similar statistics are not available at the local level and, because of the lack of local level data, can be difficult to estimate. This report estimates and compares manufacturing productivity measures in Erie, the United States, and Pennsylvania and addresses data problems associated with estimating local productivity. The study shows that productivity in Erie manufacturing has remained flat since the early 1980s and has even experienced negative growth in some periods, but has recently improved. The United States and Pennsylvania, however, have maintained strong, positive growth in manufacturing productivity.

## **What Causes Manufacturing Productivity to Vary from Place to Place?**

Amy Hunter (James Kurre), Penn State Behrend, School of Business – Business Economics

Are some places more productive than others? If so, why? This project explores those questions by measuring manufacturing productivity (output per hour worked) for American Metropolitan Statistical Areas. Using data from the 1997 Economic Census, total value added by manufacturers will be compared with total hours worked by production workers to determine productivity and measure variation across metro areas. To explain this variation, various economic determinants such as capital stock and education will be tested using a regression model. Which factors are statistically significant, and how do they impact productivity? Finally, the results will be used to draw conclusions about what a local metro area can do to make itself more productive.

### **Does a Focus on Arts, Entertainment, and Recreation Help a City Grow?**

Katharine Joan Newcombe (James Kurre), Penn State Behrend, School of Business – Business Economics

Many of America's central cities are struggling to revitalize themselves. A seemingly viable strategy is to focus on arts, entertainment, and recreation (AER). But does this strategy work? This paper presents a cross-sectional analysis of several hundred Metropolitan Statistical Areas, examining the relationship that AER activity (measured as establishments in selected AER industries) has to growth and development. Regression analysis will be used to measure the impact of AER on growth (population change) and development (increases in personal income per capita), holding constant the effects of other possible determinants such as unemployment, human capital, innovation, climate, and the impact of other selected industries. This approach should allow determination of the contribution of arts, entertainment, and recreation to the growth and development of metro areas, above and beyond the effects of the other variables. The basic question of the model is about how arts affect growth and development. The findings will measure the degree to which increased AER activity is consistent with greater growth or development, leading to policy recommendations that city planners can use in the aid of revitalization.

### **Supplemental Instruction Integrated in the Classroom**

Brian Forsman (Kathy Holliday-Darr), Penn State Behrend, School of Engineering and Engineering Technology – Mechanical Engineering Technology

Supplemental Instruction (SI) is a peer-based academic assistance program that focuses on courses with a high rate of D or F and withdrawals. The program, developed by Deana Martin in 1973, places a peer SI leader in the classroom as well as in out of class sessions. The SI model for Introduction to Solid Modeling differs here at Penn State Erie because the SI leader plays an active role during class sessions. Working with students during a lecture helps to keep them on track while also observing areas of concern and reporting back to the instructor. This presentation will address the benefits of this type of model.

## **Experimental Force Coefficients for a Parametric Series of Spinnakers**

Kenton P. White (William Lasher), Penn State Behrend, School of Engineering and Engineering Technology – Mechanical Engineering

To date, accurate, published data for downwind sail force coefficients do not exist. These data are used in performance prediction programs for sailboats and therefore need to be highly accurate. The forces the sail can produce depend on the shape of the sail. To this end, three shape parameters (camber, aspect ratio, and sweep) were arranged in a two-level, three-factor scheme, producing eight spinnaker models, which were tested for various sailing conditions. Each model was constructed as a “rapid prototype” using a Z-corp, 3-dimensional printer. Next, an experimental procedure was developed for the testing using the wind tunnel at Penn State Behrend. The result of the testing was a database of downwind sail force coefficients. The trends from the recorded data were then analyzed both graphically and by performing an Analysis of Variance study to determine the significance of each parameter on sail performance. The analysis showed that both camber and aspect ratio have relatively little significance, whereas sweep has a high level of significance on performance. These data will be used as verification for future CFD analyses of sail flow fields and as a database that designers, sail makers, and handicappers can use when choosing spinnaker shapes.

## **The Language of Silence in Joy Kogawa’s *Obasan***

Abigail J. Aldrich (Gregory Morris), Penn State Behrend, School of Humanities and Social Sciences – English Literature

This paper examines the presence of silence in Joy Kogawa’s *Obasan*. The various ways in which silence impacts the lives of the narrator and other characters, and the numerous forms of silence that are used by the characters, illustrate that silence is actually an influential part of life. Silence is a force of repression, a language of love, and more. In *Obasan* silence affects every aspect of the narrator’s life like an inescapable tide which pushes her along. Rather than examining whether silence is good or bad, this paper asserts that in any form, silence can be as powerful as speech; it is in fact, a language that, in some instances, does more than speech ever could.

### **Aemilia Lanyer: Defender of Dreams, Poetry, and Women**

Sarah Joseph (Judith Rose), Allegheny College, English Department – English

When most people think of 16<sup>th</sup> Century English writers, male writers spring to mind. A few people may think of aristocratic women writers such as Mary Sydney. Aemilia Lanyer is a poet who falls into none of those categories. Her book of poems, *Salve Deus Rex Judaeorum*, was published in England in 1611 at a time when writing – and especially publishing creative works – was taboo for women. Her book of poems includes dedications to women patrons, a poem about Christ's crucifixion that follows the Bible with some small but major additions, and a country house poem. My presentation focuses on Lanyer's bold defense of the poem in a small section called "To the Doubtful Reader," and in a dream dedication that aligns Lanyer with the prominent aristocrat, Mary Sydney. I also address the way Lanyer gives a voice to the silenced biblical figure, Pontius Pilate's wife. These three areas of the poem that I focus on show how the poem demands respect from the readers for Lanyer as a poet, as well as for women in religion and society.

### **Turn-of-the-Century Small-Town Slice of Life**

Shelley Shirey (William McCarthy), Penn State Dubois, School of Social Sciences – History

At the turn of the century, Ridgway, Pennsylvania, was a bustling town, some fifty years young, and experiencing its greatest population to date. Lumber mills, railroads, merchants, and manufacturing drove the economy. The story of Ridgway could typify the small towns that dotted the landscape 100 years ago. To get an insider's view, a series of fictional letters was created through research, which gives the reader the feeling that they are immersed in the period. The correspondent is a middle-class lady from Ridgway who is speaking to her sister who has married and moved to Pittsburgh. The letters give the feeling that, with some luck, they may have been something that turned up in your grandmother's attic, and which, when read, transport you back in time to be part of the daily life of the small town.

### **How Salespeople Relate to Customers: A Study on the Effects of Salesperson Behavior and Service Quality on Overall Customer Satisfaction in the Bangladesh Retail Environment**

Jennifer M. Smialek (Syed Saad Andaleeb), Penn State Behrend, School of Business – Marketing

The role of salespeople in the retail environment is critical in explaining overall service quality and customer satisfaction. Using SERVQUAL variables and analysis of international customer satisfaction, this study attempts to assess the determinants of customer satisfaction in the retail environment in Bangladesh. Survey results indicate that responsiveness and assurance both have a significant impact on overall customer satisfaction with salespersons' behaviors. However, tangibles, reliability, and empathy were not found to have an effect. Implications for retail strategy in a developing country environment are suggested.

## **Customer Satisfaction in the Hospital Industry**

Dane Youkers (Syed Saad Andaleeb), Penn State Behrend, School of Business – Marketing

The purpose of this research was to determine whether there were any items that increased customer satisfaction in hospitals. Recent research has shown that there are four major causes of customer satisfaction with hospitals. The results showed that the first positive correlation is between primary care (physicians) and customer satisfaction. The second is secondary care (nurses), the third is tertiary care (appearance and quality of facility and employees), and the fourth is hospital signage. By looking at the results, hospitals can identify strategic areas of improvement and work by improving those areas to ensure the highest level of customer satisfaction possible.

## **Constructing a Computerized Search Algorithm for Certain Combinatorial Designs**

Ian D. Eccles (Paul Becker), Penn State Behrend, School of Science – Mathematics

If  $G$  is a group with  $v$  elements, and  $D$  is a subset of  $G$  with  $k$  elements, then  $D$  is a  $(v, k, \lambda)$  difference set if  $g = d_1 d_2^{-1}$  has  $\lambda$  solutions for non-identity  $g$  in  $G$ . Difference sets are the subject of study for their applications in digital communication, error-correcting codes, and combinatorial designs. If  $G$  admits a normal subgroup,  $N$ , then difference sets in  $G$  imply quotient images in the quotient group  $G/N$ . The purpose of the current research is construction of an algorithm for finding quotient images of a group. Smaller quotient images are unfolded into larger groups with the goal of identifying  $(120, 35, 10)$  difference sets. Presently, we have successfully unfolded quotient images from a group of order 12 to one of order 24 (namely  $Q_{12}$  and  $U_{24}$ , respectively). We will continue the process to unfold images in  $U_{24}$  into groups of order 120 to determine the existence of difference sets within these groups.

## **Can Calculus Techniques Help to Predict Stock Market Fluctuations?**

Amanda Hovis (Joseph Previte), Penn State Behrend, School of Science – Mathematics

We propose a buying/selling strategy using concepts from calculus and numerical analysis based on historical pricing data. We first assume that stock prices are well-estimated by a differentiable function. Numerical formulas are computed for the derivatives of the approximating function using Taylor's series. These formulas are then used to make our buying/selling decisions. Lastly, we present the results of the preliminary tests of our strategy on a large sample of historical data.

## **Algebra Tutorial Program for Calculus Students Using Java Servlets and LaTeX**

Andrew J. Sobotka (Amos Ong), Penn State Behrend, School of Science – Mathematics

An algebra test is given to all Penn State Behrend students taking Calculus I or Calculus II. A large majority of those students get a D or worse on this algebra test. These students do not have the background and strengths necessary to succeed in studying Calculus, which requires extensive use of algebra skills. In a desire to improve these test scores and the students' understanding of algebra, this test has been moved to an online medium, where multimedia examples can be delivered to the student with ease. However, the implementation and maintenance of this test is difficult and requires knowledge of LaTeX, HTML, Linux, Java Servlet, and PHP web scripting. Another duty is to maintain and update the Math Web site, also requiring knowledge of HTML and PHP, as well as any little odds and ends that may need to be done.

## **Calculating Left Ventricle Stroke Efficiency from 3-D Sonometric Data and Aortic Flow Data**

Lee J. Steen, Andrew Sobotka, and Eric Knox (Scott Stevens), Penn State Behrend, School of Science – Mathematics

My research began by finding the change in volume of the left ventricle in heart during systolic and diastolic cycles. We need this information so we can confirm or deny hypotheses being tested at The International Heart Institute of Montana regarding the role of the chordae tendanai in ventricular contraction. To do this, several crystals were placed on the walls of the left ventricle and their positions were recorded. The data of the positions were then placed in data files and I used MatLab to analyze the data. Using these data I began to find shapes that would cover the volume made by the crystals and compare that to known data of the volume at a given time. These data produced a graph of the volume change, which I compared to the known volume change during ejection from the integrated flow data. Once my graph matched the known volume change during ejection, I then plotted a graph of the volume itself. I ran into a problem finding this area because there were not enough crystals placed near the apex, where much of the change happens. To fix this, I overestimated the bottom of the ventricle. Using the information I found, I will then compare it with the others working with me. If our volumes and other data match, it will then provide us with information to confirm or deny the hypothesis that the chordae tendanai aid in ventricular contraction.

### **A Three-Species, Predator/Prey Food Cycle**

Patrick G. Stephenson (Joseph Previte), Penn State Behrend, School of Science – Mathematics

Consider three groups of species whose interaction creates a food cycle, that is, species A preys on species B, species B preys on species C, and species C preys on species A. For example, an upper level species may prey on a much smaller species. That smaller species may prey on bacteria, and the bacteria may feed on the upper level species. This research proposes a population model involving a system of differential equations to study this situation and analyzes all possible outcomes of the proposed model.

### **Evaluating the Content of Video Clips: The Effects of Viewing Aggressive Behavior**

Kelly Conroe, Yelana Kerr, and Radhina Ramirez (Derek Mace), Penn State Behrend, School of Humanities and Social Sciences – Psychology

Research on normative beliefs – beliefs concerning what is/is not acceptable behavior – suggests that attitudes are an important predictor of behavior by regulating individuals' responses to aggressive situations. Other research found that relational aggression for females and physical aggression for males are the normative aggressive behaviors. Furthermore, an individual's emotional state influences the amount of aggression she or he uses. In this study, we are investigating the priming effects of relational aggressive and non-aggressive video clips on the normative beliefs about aggression, in conjunction with the emotions attached to aggressive situations and the amount of aggressive behavior used by college students. Male and female participants are equally divided between the two experimental groups, with Group 1 viewing relational aggression and Group 2 viewing non-aggressive behavior. Results are expected to show that viewing relational aggression increases the acceptance of aggression. Additionally, differences in the emotional states provoked by the video clips and differences in amounts of aggression used within the last year are expected. Any significant differences in normative beliefs or emotional states would result from priming by relationally aggressive videos.

### **Development of an Interactive Multimedia Module for Dimensioning**

Jacob A. Cornwell<sup>1</sup>, Holly Blasko-Drabik<sup>2</sup>, Mike Harter<sup>3</sup>, Stephanie Ames<sup>1</sup>, and Evan Fecko<sup>1</sup> (Kathy Holliday-Darr<sup>3</sup> and Dawn Blasko<sup>2</sup>), Penn State Behrend, <sup>1</sup>School of Business, <sup>2</sup>School of Humanities and Social Sciences, and <sup>3</sup>School of Engineering and Engineering Technology – Psychology

Typically freshmen engineering students have trouble with spatial visualization, that is, the ability to express three-dimensional objects two-dimensionally. One of the goals of the VIZ dimensioning module is to provide engineering students with a tool to help them enhance this visualization skill. By providing an easy-to-use and interactive module that is easily accessible through the Internet, students can practice and further enhance their visualization skills and better understand necessary dimensioning rules and concepts. Several tools were used in the development of the VIZ dimensioning module. Pro-ENGINEER and FreeHand were used to create two-dimensional views of objects dimensioned correctly and incorrectly and some three-dimensional views. Macromedia Flash was used to build interactive and animated versions of some of those images. The animated and interactive objects were used to demonstrate correct dimensioning techniques as well as visually showing how three-dimensional objects would be represented two-dimensionally. Macromedia Authorware was used to combine text, images, and animation into one interactive module that gives students hands-on experience, showing correct and incorrect techniques, as well as giving specific feedback as to why a particular approach or answer may be incorrect.

### **The Modality Effect and Suggestibility in College Students**

Sarah Hildreth, Brandi Napenas, and Rebekah Jimenez (Derek Mace), Penn State Behrend, School of Humanities and Social Sciences – Psychology

False memories may be dependant on the modality of stimulus presentation. Findings support the notion that the means of information presentation can affect how accurately the information is remembered. However, studies have used paradigms such as the DRM that limit the ecological validity of the results by using only word lists. By using the Gudjonsson Suggestibility Scale (GSS) we hope to find more ecologically valid results. The current study examines presentation modality with the GSS using a Penn State Behrend subject pool. Using the GSS, participants are asked to either read or listen to a short story. Afterwards, they are asked to give free recall about the story as well as answer 20 questions about the story, some of which are misleading. Initial results seem to suggest that participants who read the GSS are less susceptible to false memories than participants who hear the GSS. This research hopes to contribute to a greater understanding of the factors that influence suggestibility and false memories, and how false memories are affected through auditory and visual presentation.

## **Does Masculinity Influence Female Criminal Behavior Compared to Female Non-Criminal Behavior**

Brenna Morgan, Matthew Miller, and Nicole Steetle, (Derek Mace), Penn State Behrend, School of Humanities and Social Sciences – Psychology

In the past, criminology has mainly focused on male offenders. Today, because of the lack of research in the area, more researchers are studying the area of female criminology. Research indicates that when a high level of masculinity is found, the participant seems to show a higher level of pathology. We decided to test this theory. Our study is designed to compare the female criminal population and the female non criminal population on their level of masculinity, femininity, and androgyny using the BSRI (Bem Sex-Role Inventory). We will be surveying fifty inmates from Cambridge Springs Women's Prison and fifty women from the Penn State Behrend campus. We will test each with the BSRI to find their level of masculinity. After receiving all the data, we will compare the data using the independent Samples *t* test. Our hypothesis is that female criminal participants will show a higher amount of masculinity than the non criminal female populations. We are in the process of obtaining data for the two groups and feel that our hypothesis will be correct.

## **Jealousy-Induction and its Influence on Aggression in College Love Relationships**

Jennifer Stanford, Lindsay Pfahler, and Amy McElhaney (Derek Mace), Penn State Behrend, School of Humanities and Social Sciences – Psychology

The purpose of this study is to investigate the relationship between jealousy-induction and aggression in college romantic relationships. While there is a large body of research on romantic jealousy, prior research has focused mainly on gender differences and evolutionary perspectives. Very few researchers have looked at jealousy-inducing stimuli, particularly various levels of the stimuli. In addition, the uses of jealousy-inducing stimuli have been found to predict various forms of aggression and interpersonal control. College students, who have been in a dating relationship, are given hypothetical vignettes then asked to complete the Buss Aggression scale (1981). We anticipate that the vignettes containing high jealousy would have higher aggression scores than those with low jealousy. Data collection is ongoing.

### **Detecting Virulent *Yersinia enterocolitica* in Processed Pork Using PCR**

Jafa Armagost and Summer Slater (William Mackay), Edinboro University of Pennsylvania,  
Department of Biological Sciences – Biology

*Yersinia enterocolitica* is a small gram-negative rod bacterium that causes the disease Yersinosis. This pathogen has become a great concern for the pork-processors of the United States. Eating raw or undercooked pork products can infect individuals. *Yersinia enterocolitica* can survive in cold temperatures and after irradiation of processed pork. The objective of this study is to identify virulent *Yersinia enterocolitica* by detecting a *virF* gene using the polymerase chain reaction (PCR).

### **Constraints on Time Allocation during Incubation: Small Birds with Big Problems**

Susan Ellis (Margaret Voss), Penn State Behrend, School of Science – Biology

Small birds such as the House Wren (*Troglodytes aedon*) face challenges when attempting to balance time allocations to incubation and foraging. One particular challenge is that of maintaining optimal egg temperature for proper embryonic development. I used optimal foraging models based on the maximization of the percent time devoted to incubation to explore how female House Wrens balance these conflicting needs. I found that the model predicted a different time allocation for foraging than actually observed from field data. Time allocation to foraging appeared to change as incubation progressed. Each incubation bout consists of cycles when the female actively heats the eggs, holds the eggs at an equilibrium temperature near 37°C, and allows the eggs to cool while she is away foraging. The female tends to hold the eggs at the equilibrium temperature longer as embryonic development progresses, but actively heats the eggs for less time. This is due to development of the circulatory system and metabolic changes in embryos making the eggs more efficiently heated late in incubation thus allowing the female to readjust her time allocations. We suggest that time allocation to incubation is cued by embryonic needs as opposed to ambient temperature or parental energetic needs.

## **Does Highway Construction Impact the Genetic Diversity of Amphibians?**

Jeana Ferilla and Andrea Drayer (Michael Campbell and Pamela Silver), Penn State Behrend, School of Science – Biology

Amphibian populations are declining worldwide, but it is not clear if the decline is a result of human disturbance, climate change, or destruction of habitat. The ability of a population of organisms to adapt to environmental stress is often associated with the level of genetic diversity in the population. In 1995, we initiated a long-term study designed to examine the effects of highway construction on the population dynamics and genetic diversity of the spotted salamander on the 725-acre campus of Penn State Erie in northwest Pennsylvania. We monitor the breeding population annually using drift fences and pitfall traps. The number of breeding salamanders depends on weather conditions, but they are most abundant in ponds surrounded by forested uplands. We began collecting DNA in 1996, five years before PennDOT began constructing a four-lane highway that will bisect salamander habitat on campus. We used polymerase chain reaction to sequence mitochondrial DNA from eggs to amplify microsatellite DNA from adults. Our analysis of microsatellite alleles indicates that, at present, sufficient gene flow occurs across campus to maintain a high level of genetic diversity in the population. However, mitochondrial sequences differ between salamanders breeding in ponds on opposite sides of campus, indicating that some degree of reproductive isolation does exist under present conditions. Because of its location, the new highway has the potential to disrupt gene flow, thereby increasing the reproductive isolation of subpopulations of salamanders on campus. This may have the effect of decreasing genetic diversity, placing the population at risk.

## **Synaptic Targets of CR-Containing Axons in the Prefrontal Cortex**

Hannah K. Gehman<sup>1</sup> (Darlene Melchitzky<sup>1</sup> and David Lewis<sup>2</sup>), <sup>1</sup>Mercyhurst College, Department of Biology and <sup>2</sup>University of Pittsburgh, Department of Psychiatry – Biology

In the prefrontal cortex there are many types of neurons that use the inhibitory neurotransmitter GABA (gamma-aminobutyric acid). These GABA neurons are divided into subclasses, which can be identified by calcium-binding proteins. For example, parvalbumin (PV) and calretinin (CR) are expressed by chandelier cells and double bouquet cells, respectively. PV containing chandelier cells form specific vertical arrays of axon terminals that provide inhibitory input exclusively to the axon initial segment of pyramidal cells; whereas PV containing wide arbor neurons synapse onto the cell bodies and dendrites of pyramidal cells. CR containing double bouquet cells have axons that extend vertically in a tight bundle. In contrast to PV, little is known about the synaptic targets of CR axons. Therefore, we are examining the targets of CR axons in the superficial and deep layers of the monkey prefrontal cortex. Preliminary data reveals that in the superficial layers CR axon terminals form mostly inhibitory synapses onto dendrites, whereas in the deep layers excitatory synapses onto spines predominate. Future studies will examine the identity of postsynaptic targets by determining whether dendritic shafts also belong to GABA cells.

## **Mitochondrial Sequence Analysis of Freshwater Unionids**

Herb Gilroy and Trevor Manendo (Michael Campbell), Penn State Behrend, School of Science – Biology

The native populations of freshwater mussels residing in Presque Isle Bay have been rapidly declining over the last decade. Presently, extant populations are concentrated in the Thompson Bay area located within Presque Isle State Park. It is unclear as to why these mussels are located primarily in this area and it is also unknown if these populations are stable and reproducing. The anticipated goal of this study was to generate mitochondrial consensus sequence data for the five most common species of mussels found in Thompson Bay and look for genetic differentiation between those species. The five species examined were *Pyganodon grandis*, *Fusconia flava*, *Lampsilis siliquoidea*, *Amblema plicata*, and *Ligumia nasuta*. Mitochondrial DNA was amplified through polymerase chain reaction (PCR) using primers flanking the first and second internal transcribed spacer (ITS) regions. PCR products were then sequenced using either flanking or internal primers. Sequence results indicated that the combined mitochondrial ITS regions are approximately 1,000-1,500 bp in length for each of the five species. Comparisons of these regions between species show significant genetic variation is present. Therefore, we have determined that these mussels contain species specific mitochondrial DNA sequences.

## **A Putative Kinesin Light Chain Alters Plant Growth and Chloroplast Morphology in *Arabidopsis thaliana***

Amanda L. Gruver and Matthew Hillwig (Michael Campbell), Penn State Behrend, School of Science – Biology

A random clone (*NDPI*) was isolated from a cDNA library produced from dormant potato meristems. The full-length cDNA was 1,463 base pairs in length and encoded for a putative polypeptide composed of 421 amino acids. Microarray analysis revealed that *NDPI* transcript levels were similar in dormant and actively growing potato meristems. Further analysis on *NDPI* was conducted in *Arabidopsis thaliana* because a single copy homologue exists at At5g02130. The *A. thaliana* and potato *NDPI* homologues are highly similar and share greater than 50% identical and 73% conserved amino acids. Blast analysis of both the *A. thaliana* and potato *NDPI* genes demonstrated sequence similarities to kinesin light chain proteins in *Nostoc* sp. Examination of an *A. thaliana* T-DNA knockout mutant of the *NDPI* locus reveals that the loss of *NDPI* resulted in growth rate reduction of 93% in comparison to controls. Additionally, loss of *NDPI* results in an increased sensitivity to salt. The *NDPI* and control plants exhibited a similar level of pigmentation when grown at light intensities of 20  $\mu\text{mol m}^{-2} \text{s}^{-1}$  but *NDPI* plants grown at a light intensity of 100  $\mu\text{mol m}^{-2} \text{s}^{-1}$  exhibited a darker pigmentation in comparison to the wild type. Microscopic examination of *NDPI* revealed that mesophyll cells contain a similar number of chloroplasts per cell but the morphology of the chloroplasts is altered. We hypothesize that *NDPI* encodes for a putative kinesin light chain that may interact with the photosynthetic apparatus.

## **Investigating Branched-Chain Amino Acid Metabolism by Analyzing *Arabidopsis thaliana* Knockout Mutants**

Melinda S. Hanes (Michael Campbell), Penn State Behrend, School of Science – Biology

Although the synthesis of amino acids dictates an organism's growth and development, amino acid metabolism is poorly understood in plants, the source of essential amino acids. We have taken a biochemical approach to analyze amino acid levels found in knockout mutants of *Arabidopsis thaliana* containing T-DNA inserts in genes with high sequence similarities to enzymes in the biosynthetic pathway for the branched-chains (BCAAs), leucine, isoleucine, and valine. Using HPLC and fluorescent labeling of free amino acids, mutants were screened for aberrant profiles. Among the 40 mutants, the levels of BCAAs and phenylalanine were strongly conserved, confirming the importance of the BCAAs. A fivefold increase of a non amino acid amine was present in mutant 628\_C04, a putative knockout of acetolactate synthase, and a threefold increase in phenylalanine in a putative knockout for branched-chain amino acid aminotransferase 5 (mutant 033104). Further research will focus on sequencing the genes and proving heritability.

## **Characterization of a Unique Calciphyte Perennial, *Parnassia glauca***

Matthew L. Hillwig (Michael Campbell), Penn State Behrend, School of Science – Biology

Grass of Parnassus, *Parnassia glauca*, is a threatened plant species in Pennsylvania that grows in the Wintergreen Gorge located on the Penn State Erie campus in Erie, Pennsylvania. Grass of Parnassus is a unique calciphyte needing specific conditions to survive; constant moisture and high soil pH. Therefore, habitat loss is a major concern for this species. The plant is a perennial with unique flowers, but little biological and genetic information is available for this species or any species in the genera of *Parnassia*. Thus, any information generated for this plant would be a contribution to the scientific community. A cDNA library was produced for *Parnassia glauca*. However, the gene library yielded small sequence fragments. Nuclei were isolated from *Parnassia glauca* tissue for genome size analysis using flow cytometry. Based on comparison to *Arabidopsis thaliana* nuclei of a known genome size (AGI), the size of the *Parnassia glauca* genome was determined to be 162 Mb. To facilitate future research, a technique was developed for growing plants outside of their natural habitat, making it possible to collect tissue samples year-round.

## **The Sequencing and Characterization of a *Danio rerio* Necdin-like Gene**

Molly E. Means (James Warren Jr.), Penn State Behrend, School of Science – Biology

Prader-Willi syndrome is a genetic disorder caused by a lack of gene expression on human chromosome 15. Characteristics of the disease include mental retardation and obesity. Exact genetic causes of this phenotype are unknown. Within the Prader-Willi region lies the NDN gene, coding for necdin, a growth suppressor that is expressed predominantly in postmitotic neurons in the central nervous system. It has been sequenced and characterized in the mouse and human, but few studies have been done on necdin in other model systems. Here, we sequence and characterize a necdin-like gene (zebrafish NDNL) in *Danio rerio*. The DNA sequence was determined through methods of dideoxy sequencing and primer walking, and expression of the zebrafish NDNL gene was then characterized in normally developing zebrafish embryos by whole mount mRNA *in situ* hybridization. Sequence analysis reveals a unique protein sequence 72 amino acids in length, which shows ubiquitous expression in younger-staged embryos and more localized expression in somites and neural masts at later stages of development. Future studies aimed at knocking out zebrafish NDNL activity should help clarify the role of this gene in zebrafish development.

## **Atrial-Venous Myocardial Sleeves: An Expanded Histological Analysis**

John M. Oshlick<sup>1</sup> and James D. Maloney<sup>2</sup> (Elisa Konieczko<sup>1</sup>), <sup>1</sup>Gannon University, College of Science, Engineering, and Health Sciences and <sup>2</sup>Hamot Medical Center, Medicor Associates – Biology

Atrial fibrillation (AF) frequently originates from myocardial sleeves of pulmonary veins (PV) and less frequently from the superior vena cava-right atrial (SVC-RA) junction. Studies have described the histology of the PV-left atrial (PV-LA) junctions; however, the histology of the SVC-RA and inferior vena cava-right atrial junctions (IVC-RA) is less understood. PV-LA, SVC-RA, and IVC-RA specimens were prepared as 4  $\mu$ m serial longitudinal sections and stained with either H&E or Masson-Trichrome. PV myocardial sleeves (PVMS) were present in most specimens and extended microscopically at least 1 cm beyond the atrial junction. PVMS consisted of two to three lattice-like layers of muscle bundles that entwined around the PV and diminished as they approached the lung. PVMS contained both typical and atypical myocardial cells (AMC). The AMC were pale staining, had fewer myofibrils, and were surrounded by more connective tissue. AMC appeared in the PVMS as single cells and as distinct bundles. SVC-RA specimens showed prominent sleeves and scattered AMC. Sleeves were absent or rudimentary in the IVC-RA specimens, and no AMC were observed. The IVC-RA junction is clearly different from atrial-venous junctions that function as AF culprits. Future studies will identify the function of AMC in the myocardial sleeves.

### **Isolation of Motility Deficient Mutants of *Flavobacterium johnsoniae***

Joshua A. Smith and Christopher C. Smith (David Hunnicutt), Penn State Behrend, School of Science – Biology

Bacterial gliding-motility is a form of cell movement over surfaces. Gliding cells lack cilia, flagella, and other known systems of movement. The bacterium *Flavobacterium johnsoniae* is one of the best-studied organisms that exhibit this particular form of movement. In order to study this organism and its movement, its motility genes are being analyzed. Non-motile mutants were created by transposon mutagenesis. The cultures were plated on erythromycin plates. This selected for mutants which contained the transposon because the transposon carries an erythromycin-resistance gene. Erythromycin-resistant colonies were screened for motility by observing colony morphology and individual cell movement. A total of 999 erythromycin resistant colonies were produced and 25 of these were nonmotile. The nonmotile colonies were isolated and frozen for storage. Additionally, the nonmotile mutants were complemented with known motility genes in order to determine which contain mutations in previously characterized gliding motility genes. The focus of this study now will be to characterize the non-complemented mutants.

### **Comparison of Mitochondrial DNA between Canada Geese and Brant Populations**

Joshua C. Snyder and Page E. Tobelmann (Durwood Ray and Fredrick Brenner), Grove City College, Department of Biology – Genetics

Mitochondrial DNA was isolated from liver tissue obtained from Canada geese (*Branta canadensis*) and black brant (*Branta bernicla*). Canada geese were obtained from Manitoba, Canada, and northwestern and southeastern Pennsylvania. Brant were obtained from the Chesapeake Bay region of Virginia. Chicken primers effective on the goose mitochondrial DNA d-loop (control region) were used on both the Canada goose and the brant. The PCR products of these d-loop primers were sequenced, and polymorphisms were discovered in both the brant and goose d-loop DNA. Studies are currently focused on isolating and sequencing additional regions of the control region since this region is more variable than other portions of the genome. Also, the d-loop regions of several other geese are being sequenced. In the Canada goose, the 12s rRNA, and a portion of the control region has been isolated and sequenced; primer pairs are being developed to attempt to bridge the 12s rRNA and d-loop regions of the brant and goose, to establish the gene order or the mitochondrial genome. With the sequencing of the highly variable control region, it will be possible to compare the genome of these and other species from different geographic subpopulations.

## **The Effect of Body Size and Coloration on the Aggressiveness of the Round Goby (*Neogobius melanostomus*)**

Patricia A. Speares (Gregory Andraso and Edward Phillips), Gannon University, College of Science, Engineering, and Health Sciences – Biology

The round goby is an invasive species to the Great Lakes that has become a great threat to the biodiversity of waterways throughout the United States. This research project looks at male competition and intrasexual selection. More specifically, this research explores the roles of body coloration and size in inhibiting or promoting aggression between male round gobies. This experiment will confront resident male round gobies with model intruders. The fish will be recorded and their interactions tracked. Interactions that we are looking for include, but are not limited to: the amount of time spent outside the shelter, the approaches being made, and the amount of bites the “intruder” receives. This experiment will help us to determine if body size is the deciding factor in promoting aggression as hypothesized, and what role, if any, coloration plays in the aggressiveness of males in intrasexual selection. Thanks to a grant from Tri-beta, we started collecting data in 2002. According to preliminary data both larger body size and darker coloration have had an intimidating effect on female gobies. Black coloration also seems to trigger some aggression in males. It appears that males exit their shelter quicker when they are exposed to light models.

## **Trace Metal Analysis of Snapping Turtles Collected from Erie County, Pennsylvania**

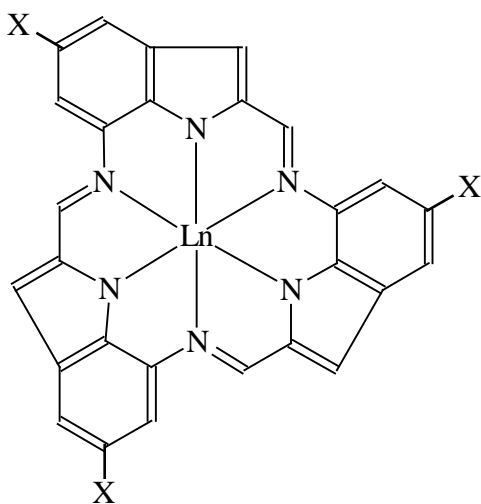
David P. Duberow, Jr. (Thomas Spudich and Jeanette Schnars), Penn State Behrend, School of Science – Chemistry

Samples of blood, liver, fat, and muscle have been harvested from snapping turtles (*Chelydra serpentina serpentina*) collected from Lake Pleasant, Presque Isle Bay, and Seigle Marsh in Erie County, Pennsylvania. These samples will be analyzed for lead content using graphite furnace atomic absorption spectrophotometry. All tissue samples will be dried to determine water content, and microwave-assisted sample decomposition with nitric acid and hydrogen peroxide will be used to digest the dry samples prior to analysis. Emphasis will be placed on developing a suitable instrumental method for eliminating biological matrices and obtaining acceptable results. The results of the study will then be used to characterize the occurrence of the metal by correlating lead levels to diet, age, and location among the turtles. Environmental factors specific to each site will also be analyzed in terms of relative lead levels. In addition to the lead analysis, other trace elements such as arsenic, mercury, and selenium are under investigation for possible inclusion in this study. Correlation of metal concentrations in all tissues with metal concentration in blood is also under investigation in an effort to avoid euthanasia in future studies.

## Synthesis and Characterization of a Potential Magnetic Resonance Imaging Contrast Agent

Brandon Ryan Galan (Alan Jircitano), Penn State Behrend, School of Science – Chemistry

Magnetic resonance imaging (MRI) is an advanced medical technique primarily used to produce high-quality images of the inside of the human body. MRI contrast agents are compounds that are introduced to the body prior to the MRI and enhance the contrast between healthy and diseased tissues. MRI can also aid in diagnosing various physiological disorders. Complexes of lanthanide(III) ions are effective as MRI contrast agents because of the dispersive effect of their unpaired *f*-electrons on the absorption peaks of water molecules bonded to the metal ion. This research involves a macrocyclic ligand (**I**), which has been designed as a neutral complex when coordinated to various 3+ metal ions. The ligand can be synthesized through a Schiff-base self-condensation reaction of three molecules of 7-amino-2-indole-carboxaldehyde. The first step in making the ligand precursor is the synthesis of a nitro-phenylhydrazone through a diazonium salt intermediate; known as the Japp-Klingemann reaction. The hydrazone undergoes a Fischer Indolization forming a nitro-indolecarboxylate. The next step involves reducing the nitro group to the amine, followed by the reduction of the carboxylate group to an alcohol. The alcohol is then oxidized to the 7-amino-2-indole-carboxaldehyde. The ligand precursor has been synthesized as well as a 5-methyl and 5-methoxy derivatives. The synthesis, characterization and progress towards making macrocyclic complexes will be discussed.



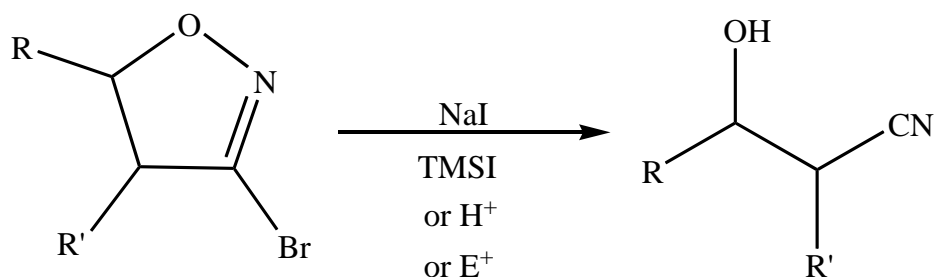
X = H, CH<sub>3</sub>, OCH<sub>3</sub>

**I**

## Novel Methods for Ring Opening of 3-Bromo-2-Isoxazolines

Kyle P. Kalbarczyk (Martin Kociolek), Penn State Behrend, School of Science – Chemistry

Isoxazolines have been found to be useful intermediates in the synthesis of natural products. Numerous methods exist for the ring opening of isoxazolines to 3-hydroxy carbonyls or 1,3-amino alcohols. However, few methods exist for the conversion of this heterocycle to 2-hydroxy nitriles or unsaturated nitriles; both of which are also useful synthetic intermediates. This research is focused on new methods for the conversion of bromoisoxazolines to 2-hydroxy nitriles. The use of sodium iodide in combination with trimethylsilyl iodide, protic acids or other electrophiles has been shown to promote ring opening. In addition, these methods have been applied to a number of substituted isoxazolines in order to establish a generalized method applicable to a variety of substrates. The scope and usefulness of these methods will be reported on.



## Identification of the Most Intense Odorants in Key Lime Juice

Erika D. Mack (Mary Chisholm), Penn State Behrend, School of Science – Chemistry

The food and beverage industry uses large quantities of lime products as a key flavoring in soft drinks and many confectionery items. Key limes and Persian limes are both widely used and have different aroma profiles. The Key lime odor is described as more harsh and intense, while Persian lime is described as fresh, fruity, and mild. The objective of this study was to examine the aroma profile and identify the most intense odorants in Key lime juice. The intensity of the individual odorants was determined using gas chromatography-olfactometry (aroma bioassay) and the identification of major odorants was achieved using gas chromatography-mass spectrometry. Flash chromatography was used to concentrate the extracts to help identify the trace odorants. Major odorants found in the analysis of Key lime juice included  $\alpha$ -pinene, limonene, cineole, and linalool.

### **Host-guest Cyclodextrin- I<sub>3</sub><sup>-</sup> Complexes in Aqueous Solution**

Jason W. Minns (Arshad Khan), Penn State DuBois – Chemistry

Cyclic molecules,  $\alpha$ - and  $\beta$ -Cyclodextrins (CD) include six and seven glucose units (C<sub>6</sub>H<sub>10</sub>O<sub>5</sub>) respectively, and are known to enclose variety of molecules like drugs, cholesterol, etc. in their cavities, and find applications in pharmaceutical and food industries. Because of potential medicinal applications, the I<sub>3</sub><sup>-</sup> complexes of  $\alpha$ - and  $\beta$ -CD are studied here. The UV-Visible spectroscopic study on aqueous solutions of CD and I<sub>3</sub><sup>-</sup> suggests that a complex of composition CD<sub>2</sub>I<sub>3</sub><sup>-</sup> forms in the solution. The semi-empirical quantum mechanical PM3 calculation on  $\alpha$ CD<sub>2</sub>I<sub>3</sub><sup>-</sup> suggests the formation of two sandwich type complexes in which the I<sub>3</sub><sup>-</sup> ion (with vertical and horizontal orientations) remains in between two CD molecules. At present, similar calculations are going on to determine the structure of  $\beta$ CD<sub>2</sub>I<sub>3</sub><sup>-</sup> complex. In addition, the formation constants for these complexes will also be determined at different temperatures so that the concentration of unbound triiodide ion in the solution is known.

### **Acousto-Optic Background Correction System for UV Atomic Emission Spectroscopy**

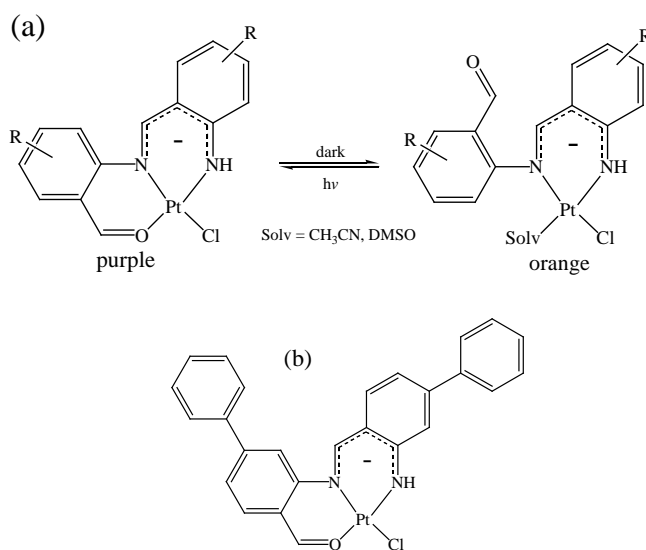
Nita C. Mulyawan (Thomas Spudich), Penn State Behrend, School of Science – Chemistry

Current research involves the development and use of an acousto-optic (AO) background correction system for atomic emission spectrometry. The ultraviolet (UV) region of the spectrum is being characterized due to the fact there are a high number of emissions that can be observed in this region as opposed to the visible region of the spectrum. Most emission methods typically introduce high background signal fluctuations (noise) which can hinder detection. An acousto-optic device (AOD) was chosen to control background correction since it is a solid state (no moving parts) device, and is relatively inexpensive. Initial research consisted of optimizing the spectrometer, which included adjusting the entrance and exit slits, adjusting the focal length and size of the image and calibrating the monochromator utilizing a mercury lamp. The AO was then adjusted to maximize AO diffraction and was also characterized using various driver power settings. Research also consisted of attempting to determine the limit of detection for copper and iron utilizing microwave-induced plasma for analyte excitation. Further research directions include using the AO with atomic absorption spectroscopy to do background correction on the absorption measurement.

## Photochromic Pt(II) Complexes of o-Aminobenzaldehyde and Derivatives

William T. Parker (Alan Jircitano), Penn State Behrend, School of Science – Chemistry

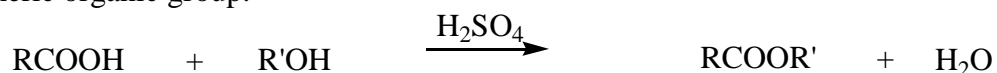
The molecule o-aminobenzaldehyde (oab) undergoes a Schiff-base self-condensation reaction where the aldehyde of one molecule reacts with the amine of another molecule producing an imine. Four molecules of oab can condense around a metal ion and coordinate to the metal through the imine nitrogens. What results is a macrocycle called TAAB. In this study, Pt(II) does not form TAAB directly, but instead forms an intermediate linear dimeric condensate called cis-[N-(o-aminobenzylidene) anthranilaldehydrato-O,N,N']-chloroplatinum(II), or Pt(AAA)Cl. This molecule undergoes a photochromic reaction in which the platinum-oxygen bond breaks and the platinum then coordinates to the solvent (a). Previous research has focused on adding substituents to the phenyl groups of the complex. These new derivatives were then analyzed to see how the electronic and substituent position affects the photochromic reactions. So far, six derivatives have been synthesized: 4-chloro, 5-chloro, 4-fluoro, 5-fluoro, 4-methyl, and 5-methyl. All are photochromic, with the fastest color change in the chloro derivatives and the slowest color change in the methyl derivatives. The next step of this study is to find what effects a phenyl group will have on the photochromic reaction. The final complex synthesized for this part of the research will be 4-phenyl Pt(AAA)Cl (b).



## Research Project Incorporated into Organic Chemistry Lab

Michelle M. Rizzo and Andrew Joy (Tracy Halmi), Penn State Behrend, School of Science – Chemistry

A Fisher esterification involves the reaction between a carboxylic acid and alcohol to synthesize an ester. A typical procedure prepares the ester by heating the carboxylic acid with excess alcohol and a mineral acid catalyst, usually sulfuric acid. This reaction is shown below where R is any generic organic group.



Our goal was to design a six-week organic chemistry experiment using this reaction. In the experiment, students are given an unknown impure carboxylic acid and an unknown impure alcohol. Using six basic organic techniques and a final synthesis, they will produce a pure ester. The different techniques used are recrystallization, distillation, acid/base extraction, column chromatography, thin-layer chromatography, and infrared spectroscopy. The final goal was to determine the identity of the starting materials based on the analysis of the final ester. In addition students will be asked to prepare a final research report similar to those prepared when a student participates in undergraduate research. Eight successful ester reactions were completed and characterized by  $^1\text{H}$  NMR and IR spectroscopy.

## Diastereoselective Synthesis of Isoxazolines

Jolene Schuster and Chayanant Hongfa, (Martin Kociolek), Penn State Behrend, School of Science – Chemistry

2-Isoxazolines have been used as versatile synthetic intermediates. These 2-isoxazolines may subsequently be converted to 3,5-dihydroxyamines or 3,5-dihydroxycarbonyl compounds, which serve as precursors to a variety of natural products. While numerous methods for the synthesis of these compounds have appeared in literature, new stereoselective syntheses of substituted 2-isoxazolines are still highly desired. The stereoselectivity of the reaction of homoallylic alcohols with nitriles oxide gives a mixture of diastereomeric isoxazolines. This stereoselectivity can be controlled with magnesium which acts to chelate the alcohol and the nitrile oxide. The application of this magnesium-mediated reaction to the cycloaddition of a variety of chiral homoallylic alcohols and  $\beta,\gamma$ -unsaturated carboxylic acids is presented.

### **Laser-Guided Rocket Prototype**

Jason Kocher (Thomas Hemminger), Penn State Behrend, School of Engineering and Engineering Technology – Electrical Engineering

This research project is based on the design of a laser targeting system. It requires analog and digital circuits integrated into a functional prototype. The current system is being implemented using a small rocket, which will eventually be tested in a wind tunnel. The target is illuminated by an encoded infrared light source and the receiver circuitry orients the fins to guide the rocket to the target. For the current design, there are four phototransistors that provide input signals to band-pass filters. These signals are converted into appropriate logic levels and interpreted by a digital controller. The orientation of the rocket is controlled by two independent circuits driving actuators that operate along orthogonal axes. Currently, experiments are being conducted to determine the best type of controller for this application. Several variables need to be considered such as the mass of the rocket, the projected speed, and the aerodynamic properties of the entire system. Range and surface characteristics of the target are also a primary concern which will be addressed in further research.

### **Determining Sedimentation Rates of Edinboro Lake**

Erin S. Diurba (Brian Zimmerman and Eric Straffin), Edinboro University of Pennsylvania, Geosciences Department – Environmental Science/Geology

Many older residents of the Edinboro area have suggested that Edinboro Lake has been rapidly filling with sediment due to poorly monitored and regulated development around the lake. The purpose of the present research is to develop a procedure to determine past sedimentation rates for lake sediments. Several cores were extracted from Edinboro Lake, sectioned, and analyzed for the occurrence of Cesium 137. Nuclear testing in the 1960s should be recorded as a Cesium "spike" in the sediments, providing a temporal marker that can be used to calculate the average rate of sedimentation since 1960. Clay mineralogy, grain size, and organic carbon were also analyzed to describe sedimentation processes in the lake through time. We plan to use our analyses of lake sedimentation to document how urbanization has impacted Edinboro Lake in the past, so that we may contribute toward improvements in environmental quality of the lake in the future.

## **Calculations of Left Ventricle Volume from Sonometric Data and Filling Tetrahedrons**

Eric Knox (Scott Stevens), Penn State Behrend, School of Science – Mathematics

The purpose of this investigation was to obtain an efficient method to approximate volume of the left ventricle by filling the space between the locations of implanted crystals with tetrahedrons. The research relied on data, both before and after the chordae tendenai were cut, which was supplied by the International Heart Institute of Montana (IHIM). Our data contained three cycle's worth of information. Concentrating on the first cycle only, it was possible to generate curves for volume changes based on tetrahedrons and volume changes from integrated flow data. The curve generated from the tetrahedrons was matched against the curve from integrated flow data, which resulted in similar curves. This let us know our tetrahedron method was acceptable. Ejection fraction and stroke volume were then calculated. This process was repeated for the remaining two cycles both before and after. The hypothesis to be tested is that ejection fraction decreases after the chordae tendenai are cut. The confirmation or rejection of this hypothesis is valuable to researchers at IHIM.

## **Calculating Left Ventricle Stroke Efficiency from Aortic Flow and Ventricular Pressure Data**

Andrew J. Sobotka, Lee J. Steen, and Eric Knox (Scott Stevens), Penn State Behrend, School of Science – Mathematics

The instantaneous pressure-volume loop of the left ventricle provides an excellent indication of the blood-pumping efficiency of the heart. One important parameter associated with the loop is the volume elastance. Volume elastance requires pressure data and some volume information that is not difficult to obtain. By taking the flow data from contiguous cardiac cycles and integrating, the change in volume during ejection can be calculated. A regression line can be found which will determine one of the critical factors in calculating volume elastance. This regression line consists of the points of end systole on the pressure-volume loop. Using these data regarding the efficiency of the heart, the effect of disabling the chordae tendenai were studied. Three cardiac cycles of data from a sheep were recorded before the chordae tendenai were severed, and three cycles after. The chordae tendenai are hypothesized to play a role in the efficiency of the ventricle in pumping blood, and are sometimes severed during the procedure for inserting a new mitral valve. Results indicate that the chordae tendenai do play a role in the efficiency of the left ventricle's blood pumping ability.

### **Feeling Wavey: An Introductory Physics Seminar**

Stacey L. Gorniak (Blair Tuttle), Penn State Behrend, School of Science – Physics

In recent years, it has been shown that most students learn more effectively when they participate in group activities. The purpose of this research project was to find and incorporate group activities relating to wave theory into the introductory physics seminar, “The Physics of Music.” Activities were drawn from or influenced by a variety of sources. Sources such as books, teaching journals, university Web sites, and current lab demonstrations were used. Research criteria included: relevance to lecture topics, activity length, materials needed versus availability, and preparation time. The result was a series of group activities including investigation of electricity and magnetism and the speed of sound.

### **Parental Outcomes as Correlates to Risk-Taking, Sensation-Seeking, and Sexual Behavior**

Stacey Barnes, Kimberly Hajec, Erin Garrett, and Kimberly Wagner (Robert Howells) Penn State Behrend, School of Humanities and Social Sciences – Psychology

This study was conducted to examine the outcomes of the four parental styles termed by Baumrind (1991): authoritarian, authoritative, permissive, and neglectful. We examined three specific behavioral areas, sensation-seeking, risk-taking, and sexual behavior, as correlates to parenting styles. It was hypothesized that children from authoritative environments would have lower scores in each area (sensation-seeking, risk-taking, and sexual behavior) than those from either authoritarian or permissive parents. A random sample of 110 college students was selected to complete four surveys/questionnaires measuring perceived parental authority, sensation-seeking behaviors, risk-taking behavior, and sexual behaviors. Data were analyzed using one-way ANOVA and chi-square statistical tests. Results of this study showed that, although there were no significant differences between authoritatively and authoritarian parented subjects, permissively parented subjects had a significantly higher risk-taking and sensation-seeking tendencies than authoritatively parented subjects. Although results from this study may have problems with generality due to sampling error, they are still valuable as a baseline for further exploration in this area. The results may also provide parents with a resource of the best methods in which to deal with their child.

## **Evaluation of an Interactive Tutorial: Applications of Key Concepts in Engineering Graphics**

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This study focused on using a multimedia-based program to assist students in learning the basics of dimensioning. The interface was created using Macromedia's Authorware, allowing students to freely navigate throughout the program and giving them access to extra examples, glossary of terms, an assessment section, and lesson quizzes supplemental to each lesson. In the first stage of the evaluation, we observed the students using the program. Participants were given a quiz of general dimensioning knowledge before and after using the module. An observational coding sheet was devised to code participants' navigation. Focus groups were conducted to get qualitative feedback about the module. The students in the second stage of the evaluation used the module throughout the semester. Participants were given surveys which asked them to rate how much the program helped them understand dimensioning concepts. Participants completed a more in-depth quiz of the concepts they learned in the module. The results of the first stage showed no difference between the pre- and post-tests. Although participants felt the module contained enough information, they did not find it very fun to use. Most participants in the second stage of evaluation liked using the dimensioning module, found it very helpful, easy, and fun.

## **Emotional Intelligence and Aggression: A Comparison of College Students and Incarcerated Individuals**

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The present study sought to investigate the relationship between emotional intelligence and aggression in a sample of college students (N=41) and incarcerated individuals (N=39). It is proposed that individuals with higher levels of emotional intelligence will have lower levels of aggression. Participants were tested in group settings and data were collected in two sessions. Researchers measured emotional intelligence using the Emotional Intelligence Questionnaire, a 33-item self-report questionnaire and the Multifactor Emotional Intelligence Scale, an ability-based assessment test. The aggression Questionnaire, a 29-item self-report measure, was used to assess levels of aggression. The study indicates a significant difference in emotional intelligence and aggression when using the self-report measure, but no significant difference with the ability-based measure.

## **Using a Case Study to Teach Observational Research**

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Courseware for Observational Research (COR) is a piece of educational software that is used to illustrate the basic concepts of observational research and to give students real-life situations for which they observe, record, and present results for specific behaviors. To teach these concepts, six interactive lessons and a laboratory module have been built. A case study has also been recently added that allows students to apply what they learned in the lessons, asking them to recommend a solution to a situation involving a child whose behavior is potentially harmful to her classmates. The case study begins by describing the situation as well as introducing Dr. Wellington, the students' guide through the case study. As students progress through the case, they are presented with various questions that lead them through the observational research process. Dr. Wellington provides expert feedback pointing students toward correct responses. In order to provide the flexibility of recording student answers and creating dynamically changing content, much programming was used behind the scenes. Many functions were written to save student responses, access, and manipulate the saved data, and perform other computations to make the case a stronger and more effective teaching tool.

## **Mini Course in Spatial Skills: Gender And Attitudes**

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The present study examines the effects of a short-term training course designed to improve spatial abilities. Participants completed a five-session testing and training seminar where they were randomly assigned to one of three groups: mixed-sex, all male, and all female. A mixed-sex comparison group met for sessions focusing on verbal skill improvement. Previous research led us to predict that females in an all female group would perform better than those in a mixed group. A questionnaire was given to determine if there were a relationship between participants' attitudes toward spatial skills and performance on the tasks. Participants completed an initial testing of the Mental Rotation Task, Water Level Task, and Paper Folding Task located on the VIZ (Visualization and Assessment Training) Web site (<http://viz.bd.psu.edu/viz>). Participants then completed three training sessions focusing on spatial or verbal related activities. Following the training sessions, everyone was again tested using the VIZ site. The results showed that scores improved from the beginning to the end of training. However, there was no interaction with group type, suggesting that group status had no effect on improvement. Correlations between previous spatial experience and scores on the three spatial tasks showed that attitudes did have a small, but significant relationship to performance on the spatial task.

## **Influences of Stress on the Behavior of College Students: Increased Stress Level in Relation to Risky Sexual Behavior**

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Lazarus' Transactional Model of Stress emphasizes the combination of an individual's emotions and his or her surrounding environment. This model categorizes an individual's response to stress into two separate methods of coping: problem focused and emotion focused. Problem-focused coping occurs when an individual actively attempts to alter the situation to reduce stress while emotion-focused coping occurs when the individual feels unable to change the situation and therefore attempts to relieve stress through maladaptive behavior. The purpose of this research is to examine risky sexual behavior as one such maladaptive coping mechanism that increases in relation to an increase in stress level. This is accomplished through a correlational research design carried out through the administration of two separate surveys in which gender was also identified as a third variable of interest. Initial data collected show a trend that supports this hypothesis.

## **Language and Emotionality in Bilinguals**

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Bilinguals are individuals who speak two languages, which have different syntax, speech sounds, and semantics. It has been observed that bilinguals commonly code switch (switching from one language to another while speaking) when in an emotional state. This study focuses on observing how Spanish-English bilinguals relate language to emotion. We asked bilinguals to rate eighty word pairs that were either presented in English or Spanish on their semantic relatedness, imagery, and emotionality. After completing a filler task, participants were then given a recognition recall task. This novel study will enable a better understanding of the social, cultural, and situational influences that bilinguals experience through their first language.

## **What a Great Presentation! Sarcasm in the Brain**

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Social communication goes far beyond the literal meaning of a speaker's words. Yet, how do we process and understand the difference between a sarcastic and literal statement? This is an area of research that has received little attention in the past despite its considerable importance. The purpose of the present research was to begin to identify the electrophysiological processes involved in the understanding of sarcasm. A 64-channel ERP system collected the brain's electrical signals time-locked to a critical utterance, e.g, "What a great presentation!" in the context of a story where students might either give an award winning presentation or an incompetent rambling mess. We presented seventy-two passages in each of two lists and participants read word by word. Twenty-four passages were literal/sincere, twenty-four were sarcastic, and twenty-four were fillers. If the waveforms of the literal and sarcastic utterances differ, we will be able to precisely map the time course and brain regions associated with sarcastic understanding.

## **The Effects of Delay on Implicit Stereotype Activation**

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Prejudice attitudes can be measured through explicit and implicit tasks. Explicit tasks are those in which responses are recorded using self report. Implicit tasks that are intended to reveal a person's true prejudicial attitudes include presenting faces and judging the valence of words. Negative racial stereotypes, which are normally suppressed in explicit tasks, can be activated with little awareness and affect the response to members of the stereotyped group during implicit tasks. It has been shown that after the presentation of an out-group face, participants are more likely to quickly categorize the word as being negative. Participants will receive a standard implicit priming task followed by one of three delay conditions between the presentation of the facial prime and word. We expect that even after a delay between the face and word, high-prejudiced people would continue to display stereotype activation and rate the valence of a word negatively. By finding out if high and low prejudiced people differ in responses after a delay on implicit tasks, we may be able to predict behavior in the presence of an opposite race face.

## **A Demonstration of Stroop-Like Interference with Instrument Timbres**

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One of the most widely known phenomena in cognitive psychology is the “Stroop effect.” Although most studies have been done visually, there also have been several auditory demonstrations of Stroop interference, such as when reporting a gender of a voice speaking a word that is associated with a particular gender (e.g., *girl*). Stroop interference appears to reflect general attentional mechanisms that are similar or shared across modalities. The current investigation sought to establish whether or not similar attentional mechanisms across modalities are reflected by this non-verbal demonstration of Stroop-like interference. In this experiment stimulus conditions included the dichotic presentation of two tones that could have the same or different instrument timbre (clarinet or violin). Listeners identified the timbre of the tone in an assigned target ear. We also examined two potential individual difference variables; working memory and laterality, because susceptibility to attentional interference has been shown to vary widely among individuals.