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# PENN STATE BEHREND - SIGMA XI 2010 NINETEENTH ANNUAL UNDERGRADUATE STUDENT RESEARCH AND CREATIVE ACCOMPLISHMENT CONFERENCE ABSTRACT BOOK

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Richard Hoag, Kelly Nowacinski, and Raine Raven (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

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Jaclyn Stottlemyer and Kevin Jackson (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

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Krista Temonoff and Katherine Legler (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

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Danielle Young, Kristin Stranahan, and Kara Sementilli (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

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Julianne Baron (Milton Ostrofsky), Allegheny College - Biology

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Jesse Boorman-Padgett and Travis Turkalj (Pamela Silver), Penn State Behrend, School of Science - Biology

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Lee Layton (Dean DeNicola), Slippery Rock University, College of Health, Environment, and Science - Biology

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Cara McLeod (J. Michael Campbell**)**,Mercyhurst College - Biology

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Chris Mosebach, Nick Kniseley, and Amy Caroline (Beth Potter and Margaret Voss), Penn State Behrend, School of Science - Biology

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Marcie Ryhal and Kristi Gdanetz (Carley Gwin), Penn State Behrend, School of Science - Biology

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David Stull Jr. (Margaret Voss and Jeanette Schnars) Penn State Behrend, School of Science - Biology

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Anthony Firetto and Matthew Ruston (Sarah Ewing and Elisa Konieczko), Gannon University, Morosky College of Health Professions and Sciences - Biology

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Blair Gleeson (Tricia Humphreys), Allegheny College - Biology

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Alyssa Gleichsner and Roxanne Alsbury (Michael Campbell), Penn State Behrend, School of Science - Biology

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Moriah Johngrass and Abraham Kibbey (Christopher Gee), Penn State Behrend, School of Science - Biology

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Noelle Lawrence1 (Sarah Ewing1 and James Warren Jr.2), 1Gannon University, Morosky College of Health Professions and Sciences and 2Penn State Behrend, School of Science - Biology

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Jeremy Alfieri1 (Mike Ganger1 andTroy Skwor1,2), 1Gannon University, Morosky College of Health Professions and Sciences, 2Children’s Hospital Oakland Research Institute - Biology

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Kristin Blankemeyer and Ashley Adamson (Rodney Clark), Allegheny College - Neuroscience

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Jennifer Caprez (Timothy Smith [Physical Therapy] and Susan Rehorek), Slippery Rock University, College of Health, Environment and Science - Biology

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Crystal Sasinoski (Matthew Foradori), Edinboro University of Pennsylvania - Biology

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Jacob Bernstein (Beth Potter), Penn State Behrend, School of Science - Biology

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Jillian Bona (Lisa Unico, Naod Kebede, and Paul Edwards), Edinboro University of Pennsylvania, School of Science, Management and Technology - Biochemistry

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William Boylan III (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

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Jessica Kenemuth and Allison Hensler (E. Lee Coates), Allegheny College - Neuroscience/Biology

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Rachel Edwards (Caroline Pharr), Mercyhurst College - Chemistry

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Olivia Hoermann (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

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Kurt Maloney (Jennifer Holt), Penn State Behrend, School of Science – Chemistry

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Jason Renninger, Terri Gardner, and Gabrielle Brennan (Arshad Khan), Penn State DuBois - Chemistry

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Andrew Rusnak (Ron Brown) Mercyhurst College - Theoretical Chemistry

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Kathleen Yungwirth (Alan Jircitano), Penn State Behrend, School of Science - Chemistry

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Bridget Gutting, Jason Hallenbeck, and Christopher Pekelnicky (Gary Walker, Ronald McCarty), Penn State Behrend, School of Science - Computer Science

**Jamming of Low Aspect-Ratio Granular Media**

*(Contains proprietary information - no abstract included)*

Jeffrey McCausland and Fiona Steel (G. William Baxter), Penn State Behrend, School of Science - Physics

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*(Contains proprietary information - no abstract included)*

Brent Plansinis and Nicole Gall (Bruce Wittmershaus), Penn State Behrend, School of Science - Physics

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Geoffrey Sanko (Antonio Mastroberardino), Penn State Behrend, School of Science - Mathematics

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Molly Thomas, Zachary Higgins, and Oleg Solovyanov (Kenneth Miller and Charles Burchard), Penn State Behrend, School of Science - Computer Science

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Beth Bimber (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

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David Carley (Chris Coulston) Penn State Behrend, School of Engineering - Computer Engineering

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David Carley1,  Matt Cantrell1, and Mark Gates2 (Vibhuti Davé1, Chris Coulston1 and Thomas Hemminger2), Penn State Behrend, School of Engineering - 1Computer Engineering and 2Electrical Engineering  
  
**WINNER -** [**Solar Energy Simulation for use in Energy Storage Systems**](#Cheers)

Jason Cheers (Robert Weissbach), Penn State Behrend, School of Engineering - Electrical and Computer Engineering Technology

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Dane Clark (Bob Edwards), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

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William Kilmer and Justin Milner (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

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Gerardo Ruiz (Kathleen Muhonen), Penn State Behrend, School of Engineering - Electrical Engineering

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Trevor Sepich and Jessica Patz (Jonathan Meckley), Penn State Behrend, School of Engineering - Plastics Engineering Technology

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Derek Suen (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

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Derek Suen (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

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Derek Suen1 (Richard Sowles2, David Loker1, and Kathleen Muhonen1), 2HEIDENHAIN Corporation and 1Penn State Behrend, School of Engineering - Mechanical Engineering

#### HISTORY AND PHILOSOPHY

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Mary Halpainy (John Rossi), Penn State Behrend, School of Humanities and Social Sciences - History

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Akshat Srivastava (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

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Meg Atkinson (Calion Lockridge), Allegheny College - Psychology

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LaSheena Barnes, Stephanie Cattron, Jesse Eisert, and Paris Norwood (Dawn Blasko and Victoria Kazmerski), Penn State Behrend - Psychology

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Erin Bliley1, Kaylee Curilla2, and Ryan Richards2 (Dawn Blasko2 and Kathryn Holiday-Darr1), Penn State Behrend, 2School of Humanities and Social Sciences and 1School of Engineering - Psychology

[**The Effects of Stress on College Athletes**](#Bricher)

Courtney Bricher and Rachel Richardson (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Stereotyping in Vocal and Electronic Communication**](#Donofrio)

Justin Donofrio, Stacy Gorney, and Ashley Nocera (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

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William Frackowiak and Angelina Caputo (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

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Janice Jerome, Leyna Grove, and Danielle Wilson (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Personality and Morality: What’s the Connection?**](#Stuntz)

Jaime Stuntz, Terra Carrier, and Hunter Kraus (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

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Abby Zehe, Janice Jerome, Danielle Wilson, Jacyln Stottlemyer, Katie Van Epps, Tom Weir, and James Heubel (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

## ORAL PRESENTATION ABSTRACTS

### BIOLOGY, BIOCHEMISTRY, AND ENVIRONMENTAL SCIENCE

#### Aquaponics – Waste to Food Technology

Chris Bonessi and Justin Gaudi (Thomas Eatmon Jr.), Allegheny College – Biology and Environmental Science

When many people think of environmental education**,** they imagine a binder full of lessons that connect students with nature.  But rather than activities to be implemented over short segments of time, environmental education should be integrated into the way that we live and our daily experiences.A holistic approach to environmental education requires that it be expanded beyond classroom curriculum and nature centers to involve all members of the community.  In this project, we examined the potential for using aquaponic systems, an “appropriate technology,” to foster community development around environmental education in Meadville, Pennsylvania.  Aquaponics can be used as a tool for teaching such ecological principles as interdependence, diversity, cycles, flows, and dynamic balance within systems while demonstrating ecosystem services such as renewable resource production and removal of pollution and waste.  As a result of this project we have worked toward creating a small scale, low cost, easily re-created technology that local educators can implement in their classroom. This project has also formed a network of teachers, environmental educators, college students, farmers, businesses, non-profits, and community members that are communicating principles of sustainability through their interactions with this technology.

#### Determining the Role of N-glycans in Apical Sorting within Polarized Epithelial Cells

Jessica Burnett (Beth Potter), Penn State Behrend, School of Science - Biology

Polarized epithelial cells contain two distinct membrane domains, apical and basolateral, to which proteins are sorted. The domains interact separately with external and internal environments respectively and function in protection, regulation of nutrients and ions, and signaling. Delivery to these surfaces is dependent on the presence of specific sorting signals. Apical sorting signals include glycosylphosphatidylinositol (GPI) lipid anchors, trans-membrane domains, and both N- and O-glycans. To gain insight into how N-glycans mediate apical sorting, the sialomucin endolyn will be used as a tool. This is a lysosomal protein that is trafficked to lysosomes via the apical surface. Previous studies have revealed that two N-glycans located on a disulfide loop structure are important for its apical sorting. The purpose of this experiment is to determine whether this secondary disulfide loop structure is necessary for the recognition of endolyn’s N-glycans by a receptor. Site- directed mutagenesis has been used to mutate the cysteine residues and disrupt the disulfide loop and the mutated endolyn constructs have been stably transfected into Madin Darby canine kidney (MDCK) cells. Trafficking of the mutants constructs will be monitored using immunofluorescence, western blot, biotinylation, and confocal microscopy.

#### The Effects of Blue (405 nm) and Red (670 nm) Light-Emitting Diodes on Staphylococcus aureus Growth

Greg Delost1 and Amanda Stolz1 (Janis Eells2 and Troy Skwor1,3), 1Gannon University, Morosky College of Health Professions and Sciences, 2University of Wisconsin – Milwaukee, 3Children’s Hospital Oakland Research Institute - Biology

The increasing prevalence of antibiotic resistance has led scientists to pursue new methods of treating bacterial infections. Research studies have demonstrated an alternative method of controlling bacterial growth through the use of different wavelengths of light. Particularly, the use of 405 nm (blue) and 670 nm (red) wavelengths from light-emitting diodes (LEDs) has restricted growth of various gram-positive and gram-negative bacterial pathogens. The objective of this study was to determine the effect of two-different portable LEDs on *Staphylococcus aureus* growth. Dilutions of an overnight culture were exposed to 4.0 – 7.68 J/cm2 of either blue or red light emitted from portable LEDs (Quantum WARP 10A, Quantum Devices, Inc.). After varying durations of LED exposure, viability of bacteria was assessed by determining bacterial colony-forming units (CFUs) on tryptic soy agar (TSA) and comparing the plates to controls that were not exposed to LEDs. Our data demonstrate a significant decrease in CFUs to both LEDs, dependent on time of exposure. Additionally, *S. aureus* colony sizes were smaller on blue LED plates compared to controls. Together, these data demonstrate the use of LEDs as a portable anti-bacterial de**v**ice against *S. aureus*, which might aid in future food handling and medical applications.

#### Examining the Regional Utility of a Fish Index of Biotic Integrity (IBI) in the Oil Creek and French Creek Watersheds of Northwestern Pennsylvania

Brandon Goeller (Scott Wissinger), Allegheny College - Biology and Environmental Science

Biomonitoring is often used to assess the net effects of multiple stressors on running water ecosystems. Fish IBIs have been adapted for use in the French Creek watershed of northwestern Pennsylvania; however, these IBIs have not been evaluated in neighboring watersheds. The purpose of this study was to use the French Creek IBIs to assess the effects of land use on tributaries in the Oil Creek watershed of northwestern Pennsylvania. During the late 1800s, Oil Creek was impacted by intense deforestation and stream habitat degradation associated with oil exploration, whereas French Creek was mainly impacted by agriculture. I predicted that IBI scores would be lower in second order tributaries of Oil Creek than in tributaries of French Creek with similar forest cover because of these differences in legacy effects. Preliminary results show that for a given percent of watershed forest cover, fish species richness is lowerin Oil Creek than in French Creek tributaries. This suggests that metric cutoff values will need to be modified to increase the regional utility of the IBI. My results also address other between-watershed differences that affect the construction of a regional IBI, including differences in β diversity (pool of available species) and stream gradient.

#### Production and Characterization of an Indolic Compound in Pseudomonas fluorescens

Kristyn Gumpper1, Brittany Schneider1, and Jessica Brazelton1 (Brian McSpadden Gardener2 and Catharina Coenen1), 2OARDC and Ohio State University and 1Allegheny College - Biology

Some strains of *Pseudomonas fluorescens,* a plant-associated soil bacterium, can enhance root growth through the production of the plant hormone indole-3-acetic acid (IAA). We recently used a colorimetric assay to characterize the production of indolic compounds by strains of *P. fluorescens* that produce the plant-protective antibiotic compound 2,4-diacetylphloroglucinol. None of the ten strains tested produced IAA in either half-strength TSB or in M9 minimal medium supplemented with 500 µM tryptophan, 20% glucose, and 0.5 µg/ml thiamine. However, some of these strains, classified as B and S genotypes, produced an unidentified indolic metabolite (UIM) in both types of media. Production of this UIM was suppressed by the addition of 25 µM IAA. By contrast, these strains produced IAA in Castric minimal media supplemented with 500 μM tryptophan. We are now in the process of identifying which components of M9 and Castric media induce the switch between IAA and UIM production. We will also compare the elution profile of the UIM from C18 columns to that of known indolic metabolites for a preliminary identification. Regulation of IAA and indole metabolism may explain differences in colonization success and growth-promoting abilities of different plant protective *P. fluorescens* strains and hence contribute to the development of biological methods of plant protection.

#### Effects of E1 Ubiquitination Inhibitor on Auxin-Induced Gene Transcription

Sylvia Kauffman (Catharina Coenen), Allegheny College - Biochemistry

Auxins constitute a class of plant growth hormones critical to a wide range of developmental processes.  Indole-3-acetic acid (IAA) is the most prevalent form of auxin in plants, but the mechanism by which IAA induces gene transcription has not been fully elucidated. A model was developed to explain the pathway of auxin-induced gene transcription, in which IAA enables the ubiquitination-dependent degradation of AUX/IAA proteins to initiate gene transcription. To further test this hypothesis, an ubiquitination inhibitor, UBEI-41, was utilized. The E1 ubiquitination inhibitor disrupts the first stage of ubiquitination, preventing AUX/IAA from degradation and thus inhibiting auxin-induced gene transcription.  I used *Nicotiana plumbaginifolia* seeds transformed with an auxin-responsive *GH3::luciferase* promoter::reporter construct to obtain time-dependent, quantitative measurements of auxin-induced promoter activity.  In the presence of 0.1 μM IAA and 0.001 μM UBEI-41, all gene transcription was eliminated. I am now testing lower concentrations of the inhibitor to define the minimum effective concentration and to determine the kinetics of the inhibition process.

#### In vitro Studies on the Conduction Velocity in Rat Sciatic Nerve Following Exposure to Penta BDE and Deca BDE

Nathan Kubeldis1 and Charles Nelatury2 (Mary Vagula1), 1Gannon University and 2Penn State Behrend, School of Science - Biology

Polybrominated diphenyl ethers (PBDEs), synthetic organic flame retardants belonging to the brominated flame retardant superfamily, are found in many household products. Being lipophilic and resistant to chemical/physical degradation, their levels in the environment and humans have been increasing steadily in the past 30 years. It has been shown that PBDEs have a certain neurotoxicity, manifesting in behavioral change, learning and locomotor delay, and reduced quantity of hippocampus nicotinic receptors. A recent study established that neonatal exposure to a single oral dose of PBDE-99 during the brain growth spurt period disrupted normal brain development in mice. Lower brominated PBDEs have a higher potential for bioaccumulation than their poly counterparts. Thus neurodevelopmental toxicity has been more significantly related to these lower brominated congeners. Several proteins are involved in the neurodegeneration and neuroplasticity, energy production, and metabolism which can be confirmed indirectly through electrophysiological studies. In our research work we experimented with penta as well as deca BDEs. This paper presents the neurotoxic effects of PBDEs on some physiological properties of nerve impulses, such as nerve threshold voltage, maximum compound action potential amplitudes, and conduction velocity in an isolated rat sciatic nerve exposed to penta and deca BDEs.

#### An Assessment of the Potential of Essential Oils as a Treatment of Chancroid

Zach Lindeman, Hillary Bedell, and Patrick Furey (Tricia Humphreys), Allegheny College - Biology

*Haemophilus ducreyi* is the bacterium responsible for the genital ulcer disease chancroid. Many strains of *H. ducreyi* have developed resistance to common antibiotic treatments over the past 40 years; a development that is particularly disturbing considering that chancroid is a cofactor for the transmission of HIV. In light of these facts, it is important for alternative treatments for chancroid to be explored. One such alternative that has proven to be effective in other species of bacteria is the use of essential oils. We tested the susceptibility of two strains of *H. ducreyi* (35K and HMC112) to a panel of five essential oils (eucalyptus, lemon, wintergreen, thyme, and cinnamon) at concentrations of 5% and 100% using disk diffusion assays. Thyme and cinnamon were the most potent bactericides at 5% with average zones of inhibition measuring approximately 18 mm and approximately 37 mm in diameter respectively. All essential oils except wintergreen exhibited zones of inhibition at 100% with thyme and cinnamon completely inhibiting bacterial growth at this concentration. Thyme and cinnamon in particular seem to be promising candidates for clinical trials to assess their potential as a treatment for chancroid.

#### Salicylic Acid Inhibition of Indole-3-Acetic Acid Induced GH3 Promoter Activation

Julia Muntean (Catharina Coenen), Allegheny College - Biochemistry

Trade-offs between plant growth and defense responses are agriculturally important, but their biochemical mechanisms are poorly understood. I am using the *GH3:Luc* reporter construct to investigate the interaction of the defense hormone salicylic acid (SA) and the growth hormone indole-3-acetic acid (IAA, auxin) with the TIR1 auxin binding site. I have hypothesized that SA directly competes with IAA at this site, which is supported by the current data. It is also apparent that SA is itself acting as a weak auxin. The competition of IAA and SA at the TIR1 binding site implies that the TIR1 auxin receptor may have evolved to fit both salicylic acid and auxin, two hormones with antagonistic roles.

#### Behavioral Response to Olfactory Cues in the Convict Cichlid, Amatitlania nigrofasciatum

Jessica Rack (Simon Beeching), Slippery Rock University - Biology

Chemical cues in an aquatic environment can serve as a forewarning of predation or an assessment of mates in an environment where visual signals are often compromised. We examined the behavioral response of convict cichlids (*Amatitlania nigrofasciatum*) to olfactory cues with the goal of determining the presence of a chemical communication system. In each trial, subjects were presented with a choice between an olfactory cue and a control. We tested behavioral response to a simple olfactory cue unaccompanied by other stimuli, and then the response to an olfactory cue coupled with a visual cue, an ethological model, or “dummy.” It was predicted that coupled cues would elicit a more robust response than olfactory cues alone. Analysis revealed that in the presence of a dummy, the frequency with which subjects entered the control zones was significantly larger than the frequency of entrances to stimulus zones. This result suggests that fish were deterred from the combined visual and olfactory cue, perhaps as a consequence of some component of the olfactory cue. These results suggest the presence of a chemical communication system, though one that may serve to warn fish, rather than attract them, as expected with a familiar conspecific cue.

#### Alterations in Glucose Absorption across the Small Intestines of Rats Exposed to Penta and Decabrominated Diphenyl Ethers

Joshua Reynolds1, Nathan Kubeldis1, and Charles Nelatury2 (Mary Vagula1), 1Gannon University and 2Penn State Behrend, School of Science - Biology

Polybrominated diphenyl ethers (PBDEs), a class of liposoluble, persistent organic compounds, are commercially produced fire retardants used in many household products. Due to their high molecular stability and relative unreactivity, they have become a significant environmental concern. It has been reported that their congeners cause changes in neurological, reproductive, and endocrine functioning in animals. Unfortunately, the toxicity profile of PBDEs is not yet fully understood; however, limited studies demonstrate that PBDEs act as potential endocrine disrupters, neurotoxins, and lead to developmental and behavioral problems in laboratory animals. Recently USEPA has encouraged research efforts for assessing the toxic effects of PBDEs and keen bio-monitoring of the Great Lake sediments. Since the manner in which the PBDEs enter the organism is primarily through ingestion, the authors intend to investigate their effects on glucose absorption by looking into the intestinal absorption of glucose and activity of Na+K+ ATPases in the basolateral membranes of rat small intestine. In some of our preliminary experiments, PBDE toxicity has brought about a significant decline in catalase activity in rats. The congeners chosen for this study are penta and deca BDEs.

#### Determining the Prevalence and Identity of Antibiotic Resistant Bacteria in Water Samples from Lake Erie and Presque Isle Bay

Thomas Russo1, Sean Fouse1, Krista Mershimer1, Gregory Delost1, and Jillian Rhoads1 (Troy Skwor1, 2 and Greg Andraso1), 1Gannon University, Morosky College of Health Professions and Sciences and 2Children’s Hospital Oakland Research Institute - Biology

The abundant use of broad-spectrum antibiotics in feedlots, their clinical overuse, and their improper disposal has aided bacterial resistance against multiple antibiotics. We investigated the percentage of antibiotic resistant bacteria in water collected from four sites: 1) an offshore site, 2) near the discharge of the city of Erie’s wastewater treatment facility, 3) near the mouth of Mill Creek, and 4) the South Pier. Samples were plated on MacConkey agar to select for gram negative bacteria. Antibiotic resistance was determined by culturing in the absence or presence of ampicillin (8 µg/ml), kanamycin (4 µg/ml) or tetracycline (2 µg/ml). Aquatic samples from all sites demonstrated > 60% ampicillin resistance and >10% kanamycin resistance. To characterize resistant strains of bacteria, isolated colony forming units (CFUs) were grown overnight at 30°C in tryptic soy broth (TSB) and a bacterial library was started by making glycerol stocks of the isolates. An electronic library of the bacteria was also created to differentiate isolates based on gram stain and colony morphology. Further characterization was performed using other physiological tests and confirmed with sequencing of the 16S ribosomal RNA gene. These data highlight the prevalence of antibiotic resistance in Lake Erie and further demonstrate bacterial strains carrying resistant phenotypes.

#### DNA Microarray Investigations of Gene Expression in Human Mammary Epithelial Cells

Laura Stevens, Ross Patrick, Lara Linden, Randall Schwager, Meredith Morgan, Coy Matthews, and John Fox (Arnold Sodergren and Durwood Ray), Grove City College - Molecular Biology

Gene expression patterns in human breast cancer MCF-7 cells and non-cancerous human mammary epithelial cells (HMEC) were investigated. DNA chips were tailored to examine mitochondrial gene expression in addition to products of nuclear genes. The human study reported here was performed in parallel with an analogous mouse study comparing NIH/3T3 cells with a tertiary metastatic tumor cell line derived previously in our laboratory from original ras-transformed NIH/3T3 cells. The human study using known cell lines was in part included to affirm reliability in our microarray technique. Only the human results will be reported here. To this end, attempts will be made to compare our results with data sets from other experiments with human epithelial cells reported online in Gene Expression Omnibus (GEO). We are especially interested in gene expression related to the “Warburg Effect” metabolism of cancer cells, the role of apoptosis in cancer, and the relationship of mitochondrial dysfunction to cancer.

#### The Effect of Antheridiogen Concentration on Conversion and Size of Male Gametophytes of Ceratopteris richardii

Tiffany Sturey (Mike Ganger), Gannon University, Morosky College of Health Professions and Sciences - Biology

*Ceratopteris richardii* spores can develop into either male or hermaphrodite gametophytes. Antheridiogen (ACE), a gibberellin-like hormone, produced by hermaphrodites, forces spores to develop as males and does not affect hermaphrodites. Subsequent removal of ACE can cause conversion of males to hermaphrodites. It has been shown that increased time spent in ACE increases the time to conversion from males to hermaphrodites. It is possible that a similar effect could be seen with increased concentration of ACE, where the time to conversion would be longer with higher concentrations of ACE. Spores were sown on media containing the following concentrations of ACE: 0x, 0.25x, 0.5x, 1x, 2x, and 3x. Spores were allowed to grow for approximately two weeks before the males were transplanted to media lacking ACE. Before being transplanted gametophyte size was measured. Gametophytes were then checked regularly for conversion. It was determined that the time at which 50% of males converted was the same regardless of ACE concentration. However, high concentrations of ACE appear to delay gametophyte growth. Therefore, it is hypothesized that ACE may influence gender by altering growth rates.

#### Do Pond Caddisflies Reap a Double Benefit from Detritus Processing?

Emily Thornton (Scott Wissinger), Allegheny College - Biology and Environmental Science

Detritivorous caddisflies play an important role in pond ecosystems by consuming conditioned detritus and excreting nutrients that can in turn be limiting to algal growth, which they also consume. There is a lack of research investigating the double benefit caddisflies might gain from detritus processing and their critical contribution to ecosystem function. This study tested the hypotheses that as caddisfly density increases, nutrient concentration in the water column increases, algal growth increases, and caddisfly consumption of algae (an alternative food source) increases. Results supported the hypothesis that as density increases, nutrient concentration (phosphorus) in the water column increases. Chlorophyll-*a* (an indicator of algal growth) concentrations also increased as caddisfly density increased. Evidence of increased algal consumption at high densities supported the hypothesis that caddisflies switch to an alternative food source in high-competition environments. The primary productivity spurred by nutrient release could also benefit other grazers or herbivores, contributing to the overall productivity of the ecosystem. In summary, it is possible that detritus consumption by caddisflies in lentic ecosystems results not only in a twofold nutritional benefit for the caddisfly population, but may lead to a bottom-up cascade through algal production.

#### Effects of Near Infrared Light on Human Epithelial and Primary Keratinocyte Cellular Proliferation

Cassandra Wasson1 and Matthew Ruston1 (Janis Eells2, Elisa Konieczko1, and Troy Skwor1, 3), 1Gannon University, Morosky College of Health Professions and Sciences, 2University of Wisconsin – Milwaukee, and 3Children’s Hospital Oakland Research Institute - Biology

Near infrared light (NIR) has multiple applications ranging from environmental purposes to providing a non-invasive method of assessing brain damage. Furthermore, medical applications of NIR have been associated with tissue healing and pain reduction, including therapy for osteoarthritis, sports injuries, burns, muscular degeneration, and fibromyalgia to name a few. Because of its diverse usage, we were curious what effects NIR had on cellular proliferation. Human cervical epithelial (HeLa) and primary epidermal keratinocyte cells were incubated in 24-well plates and stimulated by NIR at 4.0-7.68 J/cm2 for various amounts of time using a portable Quantum Warp 10A (Quantum Devices). At different time points cells were trypsinized and counted on a hemocytometer. After 48 and 72 hours, increased proliferative effects were demonstrated among both epithelial and keratinocyte cells though optimal NIR time exposure differed between cell lines. Additionally, this effect was visible only within a narrow range of NIR exposure at this light dose. Exposure to NIR also resulted in healthier looking cells with increased adherence compared to control cells. Together our results demonstrate NIR’s prolific effect on two different cell types, epidermal keratinocytes and epithelial cells. These data suggest a “healing” phenotype associated with NIR treatment further supporting its medicinal applications.

#### Expression and Isolation of Chlamydial Heat Shock Protein 60

Jess Zourelias1 (Troy Skwor1,2), 1Gannon University, Morosky College of Health and Professional Sciences and 2Children’s Hospital Oakland Research Institute - Biology

*Chlamydia trachomatis*, an obligate intracellular bacterium, is the leading cause of sexually transmitted diseases worldwide. Female infections are typically asymptomatic (70-90%) and failure to identify and properly treat could lead to persistent infections resulting in pelvic inflammatory disease, salpingitis, and ectopic pregnancy. Chlamydial heat shock protein 60 (cHSP60) is up-regulated during persistent infections and potentially linked to the devastating pathogenesis associated with persistent chlamydial infections. To further understand the role of cHSP60 during persistent infections, we cloned, expressed and isolated cHSP60. The open reading frame of cHSP60 was PCR amplified from *C. trachomatis* genomic DNA. It was further subcloned into the pGEX expression vector and transformed into *Escherichia coli* strain BL21(DE3). Protein expression of the GST fusion protein was optimized using varying IPTG concentrations, temperatures, and optical densities (OD). cHSP60 expression was achieved at five hours post-induction with an IPTG concentration of ­­­­­­­­­­­0.1mM at 37°C and an OD600nm of 0.6. Soluble lysates were obtained by sonication and SDS-PAGE analysis demonstrated GST-cHSP60 in the soluble fraction. Native cHSP60 was obtained by isolating GST-cHSP60 over a glutathione column with subsequent on-column digestion. Together, we have successfully isolated cHSP60 and will elucidate its role during immunopathogenesis associated with chlamydial upper reproductive tract infections.

### BUSINESS AND HISTORY

#### The Debate over the History of Modern Witchcraft

Nicolle Bittner (John Rossi), Penn State Behrend, School of Humanities and Social Sciences -History

Throughout the history of Modern Witchcraft, there has been a major debate over the origins of the religion itself. Some scholars believe that the religion has ancient roots and has remained intact over centuries of persecution. Others, however, believe that Modern Witchcraft is a contemporary phenomenon created by its father, Gerald Gardner with no ancient connections. The major debate over the origins is made more difficult by the fact that Gardner claims in his literature that the religion has ancient roots. These debates have created multiple versions of the origins and history of Modern Witchcraft that contradict one another, making the study and research of the true version difficult to find. Even with the existence of multiple versions of its history, Witchcraft has survived the debates and is a vibrate religion in America today.

#### Determinants of Property Crime Rates Across the United States

Jamie Bologna (Todd Nesbit), Penn State Behrend, Sam and Irene Black School of Business -Business Economics

Crime rates are essentially an assessment of safety in a specific area, thus understanding what makes them rise or fall will help make that area a more secure place to live. The causes of crime are generally described as being associated with the economy, location, and certain social issues. This paper explores how measurements of these three broad determinants affect the property crime rate. This data set applies only to property crime rate because it is the most reported type of crime. This allows the most accurate measure of crime rate given the limitations of the data. The results of this paper suggest that the most influential determinants of crime rate are the economic measurement of unemployment rate and the social measurement representing gender.

#### The Causes and Consequences of Government Growth: 1860 – 2010

Andrew Friedle (Todd Nesbit), Penn State Behrend, Sam and Irene Black School of Business - Economics

Government growth theories have traditionally been only able to explain disjointed portions of government growth over time. This is a direct result of previous growth theories excluding the institutional and ideological context within which government operates. Only with the creation of rent-seeking political groups at the end of the Civil War, the progressive movement of the early 1900s, and the promulgation of Keynesian Economics during the Great Depression were the institutions and ideologies conducive to sustained government growth created and institutionalized into the American political landscape and psyche. These institutions and ideologies contributed to the American Government’s sustained growth beginning in the latter half of the twenty-first century and continuing to present day; thus resulting not only in the continuing expansion of governmental powers but contributing to an ever weakening capitalistic society as political institutions slowly and deliberately replace the invisible hand which cements a capitalistic society together with that of government.

#### The Trent Affair and British Diplomacy: Potential Catalyst of War

Patrick Jenks (John Rossi), Penn State Behrend, School of Humanities and Social Sciences - History

The relations between Great Britain and the United States during the American Civil War were very anxious. The event that brought the United States and Great Britain the closest to war was the *Trent* Affair where an American ship boarded a British mail steamer and seized two confederate emissaries. This event was detrimental and caused much political chaos in Great Britain, a neutral nation, who saw this as an insult to the British flag. The outcries of the British population in newspapers only showed how offended Great Britain became. Communication between the two nations was frequent and effective, leading to an acceptable conclusion. It was the actions of calm ministers and cooler heads prevailing that alleviated this conflict. This event could have changed the landscape of the American Civil War and dragged the entire world into war.

#### Equal Pay for Equal Work

Kelly Lloyd (John Rossi), Penn State Behrend, School of Humanities and Social Sciences - History

During World War II, American women answered the United States government’s patriotic appeal and left their domestic sphere to fill the emptiness of the factories on the American home front, when millions of men were called overseas to fight. While working just as hard as any man, women in these factories were undermined and underpaid. Women’s rights advocates and their supporters responded by launching a fight for equal pay for equal work to correct this injustice. This study, based on a variety of primary and secondary sources, focuses on the successful “Todd Bill” in the state of New York and the United States Congress’ unsuccessful “Women’s Equal Pay Act of 1945." Although a number of states passed equal pay for equal work legislations in recognition of basic justice and women’s contribution to the war effort, it would take another generation for Congress to pass such a law.

#### Academic Research Today: Establishing a Collaborative Research Agenda in Supply Chain Management between Procurement, Marketing, Operations, and Information Technology

Joe Pazak (Diane Parente), Penn State Behrend, Sam and Irene Black School of Business - Supply Chain Management

The primary objective of this study was to explore opportunities in the procurement field using an interdisciplinary model linking opportunities in the purchasing/logistics, operations, information technology, and marketing fields. In order to identify potential opportunities in the area of study, major procurement journals were chosen based on relevance and rating. Information was gathered from these journals from January 2005 to December 2008. Keywords were utilized to identify relevant articles. The information gathered enabled the identification of research areas from each of the interdisciplinary areas. The results provided overlapping research areas which are now being concurrently, but not necessarily collaboratively, investigated. Further, this study identified areas that called for collaboration between each function and the purchasing field. Thus, the study identified a collaborative research agenda for procurement researchers.

#### What is the Relationship between the Elements of Empowerment of Women and Foreign Capital Inflows?

Eliska Repkova (Kenneth Louie), Penn State Behrend, Sam and Irene Black School of Business - Economics

This cross-sectional empirical analysis examined data for 109 developing countries in order to determine the relationship between foreign capital inflows and the empowerment of women as measured by employment and education. Specifically, this study aimed to find whether foreign direct investment, the presence of U.S. companies in a country, and official development assistance play a role of importance in the empowerment of women. The results showed that all three of these variables of interest in fact do have an impact on various measures of the empowerment of women.

#### The Influence of Deontological, Theological, and Virtue Ethics Consideration on Marketing Decision Making: The Cases of Recent Product Recalls

Akshat Srivastava (Pelin Bicen), Penn State Behrend, Sam and Irene Black School of Business - Marketing

 Much of the behavior cited as ethical exemplary case in the corporate world has captured our widespread attention. While analyzing these cases, principles provided by the ethical theories offer practical guidance to decision makers. Two of the most popular theories that guide firms in their ethical dilemmas are (1) deontological and (2) theological theory of ethics. Although these theories provide a guideline, it is also shown that they are incomplete. Further, marketing researchers recently proposed that the ethics of virtue is a relevant theory for improving the ethical decision making of managers. Different from deontological and theological ethics, virtue ethics enables organizations to develop their corporate cultures and embrace a code of ethics *not because it is demanded by laws and regulations but it is the right way to so.* Briefly, according to virtue ethics, *virtues that flourish in family life must be incorporated with societal life.*  In this study, we argue that we need all three theories in analyzing ethical dilemmas. Therefore, first, we discuss each theory and then provide a framework that can integrate them all. To explain how these theories provide a complete framework to aid marketing decision makers in their analyses, we will illustrate recent product recall cases. By doing so, we aim to show how theories of ethics as a whole could influence the marketing strategies used by companies.

#### Brain Drain of Behrend Graduates: How Much and Why?

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

This study explores the topic of brain drain, the migration of college graduates away from their home region. Specifically, it measures and attempts to explain the migration flows of Behrend graduates from Erie County. The sample includes 5,788 college graduates from 1999 to 2009. The analysis presents data on the amount of brain drain and brain gain occurring over the period. It also builds a bivariate regression model that estimates the probability that an individual graduate will contribute to brain drain based on specific attributes such as GPA, field of study, admission type, gender, and ethnicity.

### CHEMISTRY, GEOSCIENCES, AND PHYSICS

#### Creating a GIS Database of Penn State Erie, The Behrend College Campus

Robert Aeppli, Andrew Stauffer, and Michelle Wunderley (Anthony Foyle and Michael Naber), Penn State Behrend- School of Science - Geosciences

Penn State Erie, The Behrend College is a growing campus in need of more reliable ways to present the campus to students, faculty, staff, and visitors; as well as conduct its maintenance duties. The ultimate goal of this research project is to use the ARCGIS program to show specific attributes of the campus and identify problem areas. Using a Trimble GPS unit, data were collected during summer 2009; including features such as emergency call boxes, fire hydrants, and campus lighting. Other features such as building footprints, parking lots, and mowed grass areas were heads up digitized using ARCGIS. When analyzing the data, safety issues became apparent, and were considered vital to present findings to higher authorities. It was found that certain areas on the campus lack emergency call boxes in proximity to high traffic areas and other problems such as fire hydrant placement arose. Completion of this project will yield a database for the maintenance department. This database will allow maintenance to properly deal with issues in a timelier manner, by knowing the exact location of a problem.

#### Synthesis and Investigation of Photochromic Properties of Platinum(II) Complexes of Tridentate Schiff-Base Condensates

Danielle Chung (Alan Jircitano), Penn State Behrend, School of Science - Chemistry

The compound 2-Aminobenzaldehyde (oab) undergoes a variety of self-condensation reactions. Reaction with aqueous platinum(II) produces a dimeric Schiff-base condensate, [N-(2-aminobenzylidene)-anthranilaldehydato-O,N,N']chloroplatinium(II), or (Pt(AAA)Cl). The complex is unusual in that it is photochromic in coordinating solvents. In acetonitrile, for example, the solution is orange-red in the dark and purple when exposed to light. The coordinated aldehyde is displaced by the solvent in the dark and reattaches in the light. In this study, an analogous complex was synthesized with a phenolate trans to the coordinating aldehyde. N-(2-hydroxybenzylidene) anthranilaldehyde was synthesized via Schiff-base condensate of 2-aminobenzyl alcohol with salicylaldehyde followed by manganese(IV) oxide oxidation. Complexation with platinum(II) yields the resulting complex Pt(HAA)Cl, Figure II, which was characterized by FTIR and NMR. The photochromic reaction of the platinum(II) complex was investigated. It was expected that the *trans* effect of the platinum(II) plays a role. The coordinated phenolate is a weaker ligand toward platinum(II) compared with the deprotonated amine of the original complex; therefore, the opposing aldehyde bond should theoretically be stronger, thus making the reaction slower.

#### A Monte Carlo Simulation of Hydrogen Physisorption on Single Walled Carbon Nanotubes

Kyle Hart (Ronald Brown), Mercyhurst College - Chemistry

Although hydrogen has many advantages as an alternative fuel, there currently lacks a sufficient storage medium for hydrogen that maintains safety while simultaneously storing adequate amounts of hydrogen gas for use in fuel cells. A Monte Carlo simulation has been designed and run to investigate the feasibility of an array of carbon nanotubes as a storage medium. The simulation algorithm has been designed to determine the weight percent of hydrogen that will adsorb (via physisorption) within a carbon nanotube array as a function of tube size, separation, and geometry. The hydrogen-hydrogen and carbon-hydrogen interactions have been modeled using Lennard Jones and ‘exponential-6’ potentials, respectively. The simulation model is designed to first reproduce current physisorption simulation results, with the expectation of expanding insight into the effect of the conformation of the single-walled nanotube’s effect on sorption. The simulation algorithm and initial results will be presented here. The ultimate goal of the study is to design a material computationally that maximizes hydrogen storage capabilities in an effort to meet U.S. Department of Energy goals.

#### Preparation and X-Ray Structures of Novel Alkenyliodonium Salts with a Pyridine-N-Oxide Moiety

Samantha Kristufek (Michael Justik), Penn State Behrend, School of Science - Chemistry

Alkynyliodonium tosylates were treated with a ‘soft' nucleophile in the form of substituted pyridine *N*-oxides resulting in the formation of (*Z*)-2-phenyl-2-[(pyridinyl)oxy]-1-ethen-1-yl]phenyliodonium ditosylates derived from an apparent addition-protonation sequence. Thus, we have demonstrated the first isolable adduct of pyridine *N*-oxides with organoiodinanes, as well as the first examples of pyridinyl enol ethers. This remarkable structure has been fully characterized by single crystal X-ray diffraction revealing an intriguing square planar geometry about the iodine center. It may be possible to preserve this structural moiety in subsequent reactions. Unlike other soft nucleophiles, pyridine *N*-oxides prefer the addition-protonation pathway in their reaction with alkynyliodonium salts as opposed to 1,5-insertion or 1,2-rearrangement pathways previously observed for other nucleophiles.

#### Disturbing Large Unbounded Systems: A Simple Model of the Universe

Heather Wager (Paul Ashcraft), Penn State Behrend, School of Science - Physics

Matter distorts space, and space tells matter how to move. The purpose of my research is to model spatial distortions and to model a moving spatial distortion (such as the distortion mass imposes on space) on a semi-infinite surface. One (string) and two (membrane) dimensional models have been created of these instances. It is demonstrated that given two objects, moving relative to one another, that there is a speed limit on each object imposed by the geometry of space. The behavior of perturbations on an unbounded semi-infinite string is given special attention. The topology of space and time is discussed, and gravitational distortions of space (as well as distortions due to charge) are related to the behavior of disturbing a semi-infinite membrane and string.

### COMPUTER SCIENCE AND MATHEMATICS

#### Pattern Recognition on Handwritten Letters and Document Corpora by Using Diffusion Mapping

Richard Anderson and Jack Horst (Meng Su), Penn State Behrend, School of Science - Computer Science

This work includes two applications of a novel machine-learning method, diffusion geometry. The first application is to recognize the handwritten digits and the second application is to categorize the documents such as the WebPages according to their subjects. For handwritten letters, we created the data sets. Each letter was individually hand processed to a single 32x32 bitmap. These bitmaps, through processing code, were then pulled into Matlab and normalized between -1 to 1. Through the experiment, Diffusion Map produced a good visualization of the Handwritten Letters data, in which data points of same labels (i.e. represent one letter by one color) are well-grouped and separable. The diffusion map was then visualized on three dimensions. There were, as expected, a few similar-looking letters that were not very distant in their diffusion distances. For the majority of letters there was a very distinct gap in diffusion distance, which will allow for accurate letter recognition. For the second application, a C# program has been created to extract keywords from the WebPages such as documents on Wikipedia. Finally, a benchmark data set downloaded on-line was used to test the diffusion method for categorizing subjects.

#### Exploring the Evolution of Cooperative Behaviors in Multi-Robot Systems

Amanda Gentzel (C. David Shaffer), Westminster College - Computer Science

Recent research has explored the effectiveness of teams of autonomous robots in accomplishing a wide variety of tasks, but some level of cooperation and coordination between the robots is necessary for such teams to be truly useful. In this research, we used a variant of the traditional genetic algorithm to evolve teams of simulated robots to perform a task cooperatively. A discrete simulation was used and the ability of the simulated robots to accomplish the task was assessed.

#### Wii Remote Presentation Assistant

Bridget Gutting, Jason Hallenbeck, and Christopher Pekelnicky (Gary Walker and Ronald McCarty), Penn State Behrend, School of Science - Computer Science

The Wii Remote Presentation Assistant is a prototype sensor-based system that combines the functionality of a touch screen, a presentation remote, and a screen recorder. As sensors for monitor and control activities, the system uses 1) two Nintendo Wii Remotes, 2) an infrared pen and sensor bar, 3) a Bluetooth headset, and 4) a Bluetooth enabled computer with a Microsoft Windows operating system. The first Wii Remote is used as a sensor to enable users to navigate the Windows environment at a projector screen or liquid crystal display with an infrared pen, creating an effective touch screen system. Also, a second Wii Remote, with an infrared sensor bar, can be used to interact with the Windows environment as a wireless mouse. The Wii Remote Presentation Assistant’s capture mode records video from the screen and audio from a Bluetooth microphone.

#### Modeling Birth and Death Process with Orthogonal Polynomial Sequences

Joshua Learn (Daniel Galiffa), Penn State Behrend, School of Science - Biological Engineering

Orthogonal polynomial sequences (OPS) are very important and well-studied mathematical structures, which give rise to a wealth of mathematical theories that can also be utilized in numerous physical applications. In particular, OPS can be used to model the biological phenomena of the Birth and Death Process, i.e. a specific case of a discrete-time stationary Markov process in which the states represent the current size of a population and the transitions are limited to only births and deaths. In fact, a multitude of research has been conducted regarding how OPS, coupled with statistical theory and matrix analysis, can be used to model the Birth and Death Process. In this study, we first rigorously develop the mathematical theory involved in the model by calling upon various mathematical and biological resources. Then, we will extract a specific model from the development of the general theory and apply it to actual microcosmic and macrocosmic populations (e.g. a microbial population and a human population) and subsequently assess the nature and accuracy of the model.

#### Travel in Infinite Tree Space

Raul Montejo (Joseph Previte), Penn State Behrend, School of Science - Mathematics

This study researched travel on the cross-section of infinite binary trees. This topological space is made up of infinitely many identical two-dimensional faces which branch off at their edges. Traveling along this space, we can describe our path by recording in segments how long we travel on one face before we reach an edge. Traveling from a given starting point and at a given angle with respect to the closest edge, we generate a respective sequence of branch lengths. This sequence also effectively describes the way a point bounces off the walls of an enclosed two-dimensional space, the context of billiards. Starting with a version of the space made of pieced-together squares, we simulated travel using lines across the squares of graph paper. Our goal was to find a pattern that would allow us to predict the sequences of branch lengths given only a starting point and angle. Ultimately, I wrote a computer program in Maple that would accept an angle and return the sequence of branch lengths obtained if we started at that angle from a corner.

#### Developing Genetic Algorithms to Solve the Problem of Data Fitting and Curve Design

Stephen Rossi (John Bonomo), Westminster College - Computer Science

A genetic algorithm is a search technique, inspired by biological evolution, that evolves a set of possible solutions into an optimal one. The intent of this research is to use this process to find an optimal curve to fit a given set of data points, using a least-squares residual to measure the “fitness” of the curve. The question we sought to answer was: “Given a set of random functions, can we manipulate and evolve them into a function that accurately describes the data?” This research is unique in that it makes use of two genetic algorithms; one to find the best function, and a second that optimizes that function, whereas previous work deals only with the optimization of a function, not the building process. Once we can successfully find an optimal curve on a small interval, the ultimate goal was to be able to create a piecewise function by solving the overall problem on several small intervals and joining them together to form one continuous curve.

#### The Isomorphism between the Groups GL(3,2) and PSL(2,7)

Jose Sosa (Amos Ong), Penn State Behrend, School of Science - Mathematics

The two groups GL(3,2) and PSL(2,7) are known to have the same number of elements and with a big theorem that uses block design or one that uses the structures of simple group of order 168, it has been proven the two simple groups are isomorphic. However, we try to establish an isomorphism by understanding the generators of each group and finding a natural map of the generators of GL(3,2) to the generators of PSL(2,7).

#### BehrendMobile

Molly Thomas, Zachary Higgins, and Oleg Solovyanov (Kenneth Miller and Charles Burchard), Penn State Behrend, School of Science - Computer Science

The market for mobile applications has grown significantly over the last few years and the time for universities to jump on board is now. Our project, BehrendMobile, will create a tool for use by faculty members, staff, and students new to Penn State Behrend’s campus.  During a student’s first year on campus, inexperience with the University makes it difficult to find the way to various locations.  This mobile Behrend application will ease the transition. The student user will have the ability to access the Penn State Schedule of Courses, University Directory, and Penn State Calendars. This will allow the user to find his/her way while remaining aware of events happening on campus. The directions functionality will be calculated by the user’s preferences including handicapped accessibility. This program will be useful to those new students who are in need of a quick answer while on the go. We built our project for the Android® mobile phones and performed extensive research on mobile applications for Android® and Apple® devices. The results produced by this project were a great deal of experience in mobile Java development as well as a useful tool for Penn State Behrend.

#### Analysis of Red-Blue Hackenbush Arcs

Joseph Wright (Paul Olson), Penn State Behrend, School of Science - Mathematics

We investigated Red-Blue Hackenbush, a simple combinatorial game to explain how to play. The motivation came from the calculation of game values of a given position, which can quickly get unmanageable to compute with even a small number of pieces. Specifically we focused attention to the arc as a fundamental graph structure of this game and worked with them as binary sequences. Our investigation used a computer science perspective by considering a mapping of logic functions in the arcs to the surreal number value that is used to describe these games.

### ENGINEERING

#### FEA Simulation Technique for Coupled Field Analysis of Metal Forming under an Applied Direct Current

Jeffrey Beers (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

In today’s industry, the demand for metal alloys with high strength-to-weight properties has increased. Previous research has shown that applying electricity to a material during deformation, known as electrically assisted manufacturing (EAM), will improve the formability of most metals. When attempting to indentify the specific mechanisms that provoke changes in the mechanical properties of a metal, problems arise because the flow of electricity through a material produces resistive heating. However, previous studies have shown that changes within a metal cannot be entirely attributed to resistive heating. That being said, the research presented herein develops a finite element (FEA) model, using ANSYS®, to simulate the process of compressing Al 6061 under a high electric current in order to identify and isolate the thermal and electric effects on the mechanical properties of the material.

#### The Effects of Tensile Testing at High Temperatures Using Newly Designed Grips

Craig Herring and Josh Sabo (Fadi Abu-Farha), Penn State Behrend, School of Engineering - Mechanical Engineering

Lightweight materials can be used to reduce mass over conventional materials and therefore are commercially more effective for automotive manufacturers. Both magnesium and aluminum are known for being some of the lightest constructional metals and are commonly used in superplastic forming for automotive parts to reduce weight. In this work, magnesium AZ31-H24 and aluminum 5083 are superplastically formed under uniaxial tension using especially designed grips for high temperature testing. The results show the capability of the high temperature grips to capture smoother stress / strain curves from the tests at different constant strain rates. These new stress / strain curves are used to develop a better constitutive model that can describe the superplastic behavior of both alloys.

#### Experimental Study of Electrically Assisted Double Sided Incremental Forming

Andrew Iams and Justin Milner (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

This paper explores a new sheet metal forming process, electrically assisted double-sided incremental forming (EADSIF), which uses electric current to improve sheet metal’s formability and reduce springback. Previous studies have revealed that passing electric current though a metal during a deformation process can significantly improve the metals formability and greatly reduce springback. In EADSIF, these discoveries and the technology of the traditional double-sided incremental forming (DSIF) are combined. DSIF deforms sheet metal utilizing two forming tools, one above and one below the sheet. The EADSIF device passes electric current through these tools thus improving sheet metal formability and reducing springback. In this paper, an EADSIF device was designed and built. Two types of tests were conducted on Aluminum 5052-O specimens. The first test compared strain levels in specimens which were formed using EADSIF to specimens which were formed using DSIF. The second test, a shape retention test, compared final shapes of specimens formed using EADSIF to specimens which were formed using DSIF.

#### Multiplication by Addition of Complements

Adam Mariotti and Paul Morris (Chris Coulston and Vibhuti Dave), Penn State Behrend, School of Engineering - Computer Engineering

This research proposes an innovative technique to perform unsigned binary multiplication by generating the one’s complement of the operands. The foundation of the new algorithm lies in a technique that is commonly used to multiply decimal numbers close to 100 without relying on long multiplication. Similar concepts have been applied to binary multiplication to yield a multiplier architecture that computes the product of 2 N-bit numbers recursively in N stages with the size of the operands reduced by 1 bit in every stage. Architecture using digital building blocks for the implementation has been developed and simulation results verify the correctness of the method. The goal of this research was to clearly derive the method being utilized for the computation of the product and its translation to hardware. The technique is still in its developmental stages and explores a novel paradigm of multiplication whose performance is expected to improve by applying speed-up techniques at the micro-architecture level.

#### Cryogenically Treated Coated and Uncoated Round Ceramic Inserts for Face Milling Maneuvers

Justin Milner (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

In this work, WG-300, Al2O3 whisker-reinforced ceramic cutting inserts and WG-600, coated Al2O3 whisker-reinforced round ceramic cutting inserts were subjected to deep cryogenic temperatures at -170°C. Face milling maneuvers were conducted on AISI O1 hardened steel of 55 HRC, using both cryogenically treated and untreated ceramic inserts to conduct tool-life wear tests. These tests were run at five cutting speeds while measuring accumulated wear to establish changes due to the treatment. Also, surface finish of the workpieces and vibrations during machining were analyzed to further evaluate the effectiveness of cryogenically treating the ceramic tool inserts.

#### Design and Create Prototype of a Reusable Friction-Stir Welding Tool

Christopher Murosky and Mike Ragen (Fredrick Nitterright), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

Friction-stir welding (FSW) tools are not standardized and they cannot be purchased off-the-shelf from an industrial supplier. FSW tools are also quite often damaged or fractured during their use. It may take days if not weeks to have another FSW tool made or repaired. This research project will involve researching, designing, and building a prototype FSW tool that will allow the user to quickly change the welding tip so that it may take minutes instead of days to continue welding. The outcome of this project is to design an FSW tool that can be reusable with minimal downtime.

#### Application of Electric Current in Friction-Stir Welding

Matthew Pitschman (Jun Zhou and John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

Friction-stir welding (FSW) is a relatively new joining process and has many applications. In FSW, the friction between the tool pin and the material softens the material and allows the pin to stir the materials in two work pieces and join them together. This process allows the two work pieces to be joined without reaching the melting point of the material, thus a better weld. However, FSW welding of hard metals like titanium suffers with large mechanical energy consumption and low productivity and brokerage of tool pin often occurs as well. In this study, electric current is applied in FSW of Al6061 and its effect on energy consumption in FSW is examined. The results indicate that, with the aid of electric current, less energy is required for FSW process and welding speed can be increased as well, which indicates electrically enhanced FSW can improve productivity and is potentially suitable for joining a wider range of materials than conventional FSW. The effects of electric current on the heat transfer process in FSW and mechanical properties of welds are also studied.

#### Electrically Assisted Manufacturing Applied to Punching and Shearing Processes

Shane Sanders (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

Over the past several years, multiple studies have been conducted studying the effects of applying electricity to a material during the deformation process in various sheet metal applications, known as electrically assisted manufacturing (EAM). These processes include uniaxial tension, compression, three-dimensional channel formation, and deep drawing. The results of these previous studies have yielded favorable results, in that EAM has shown an increase the formability of most metals. However, there has yet to be any research conducted in regard to shearing operations. That being said, the research presented here is to apply the technique of EAM for punching. Due to its favorable strength-to-weight characteristics, the test specimens will be made of aluminum, as it is in high demand in both the automotive and aircraft industries. In order to perform the testing, a die must be designed and fabricated. Subsequently, the test specimens will be exposed to a double shear test with and without the application of electricity to evaluate the effects of EAM in regards to material behavior. Due to previous EAM studies showing favorable results, it is believed that the application of electricity to punching will also prove to be beneficial.

#### CMOS Grounding and ESD Robustness

Robert Scholz (Kathleen Muhonen), Penn State Behrend, School of Engineering - Electrical Engineering

Integrated circuits (ICs) are susceptible to electrostatic discharge (ESD) events. Therefore, in design and development, these ICs are tested with various pulses to determine robustness. One pulse is called the human metal model (HMM) and its waveform is characterized by a very fast rise time and a decay lasting on the order of 100 ns. From ESD testing a cellular chip, it was discovered that the IC that failed was not the one being stressed. The hypothesis is that the ESD travels through a common ground on the package to the other ICs. This experiment consists of taking 10 original parts and ESD stressing them with the HMM pulse. Ten additional parts were modified so that the ground of the IC that failed was separated from that of the IC being stressed. If the modified parts survive longer, then it is a clear indication that the ESD waveform is traveling through the ground and damaging a part not connected to the stressed pin. This will allow the manufacturer to redesign the part and isolate the grounds to raise the level of ESD protection on their product.

### PSYCHOLOGY AND COMMUNICATION ARTS

#### Media Violence and its Effects on Aggression and Empathy

Chuck Breter, Natalie Avery, Ashton Barnes, and Lindsey Gregg (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

In this study we investigated how media violence influences individuals’ aggressive behavior and empathetic responses. Past research suggests that various media outlets such as music, television, and video games elicit aggression and can decrease empathy. Other studies showed that people can have an innate ability to mimic what they see and that media violence elicits aggression in the short- and long-term. Little research has been done on media violence and empathy. Our results showed that those who watched the empathy videos rated higher on the basic empathy scale. There was also a significant interaction for empathy between scripted and non-scripted videos. Therefore, one is more likely to be empathetic while being exposed to a non-scripted emotional video.

#### Embodying Theories: Re-Presenting Cultural Memories of Identification Issues through Dance and Movement

Jessie Coven (Eleanor Weisman and Beth Watkins), Allegheny College - Communication Arts and Dance and Movement Studies

Identities are human characteristics that can sometimes be taken for granted. There are many ways that identities are created: they can be self-determined, externally assigned, and/or culturally established. Kenneth Burke’s theory about identification states that identities both set people apart and also bring us together. As a result, this can lead to scapegoating and victimization of individuals and groups of people. My presentation examines how identification issues and victims exist in cultural memories. Marita Sturken defines cultural memory as “memory that is shared outside the avenues of formal historical discourse yet is entangled with cultural products and imbued with cultural meaning.” After an event occurs, it can never be re-experienced in its original form, so the memory of it exists through re-presentations, interpretations of the ‘original’ event or re-enactments of it. Using identification theory and cultural memory theory, I explore how dance performances, including my own choreography, are active processes of transforming cultural memories of identification victimization.

#### Influence of Personality and Cell Phone Use on Driver Performance

Jesse Eisert, William Frackowiak, and Mark Hoke (Jennifer Trich Kremer and Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Previous research has established that using a cell phone while driving significantly impairs driving performance. Research has also shown that with the increase in number of cars on the roadways there has not been an increase in new roads, leading to congested roadways. This increase in congestion may be related to an increase in violent driving behaviors. Our research examined the relationship between driver aggression and driver performance. Driver aggression was measured using the Dula Dangerous Driving Index, Propensity for Angry Driving Scale, Interpersonal Behavior Survey Short Form, and the State-Trait Anger Expression Inventory -2. We used the videogame Gran Turismo 5 Prologue on the Playstation 3 to test for driving performance with lead vehicle. Our hypothesis is that angry/aggressive drivers will collide with the lead car more than non-angry/aggressive drivers.

#### The Effects of Media Exposure on Body Esteem and Self-Esteem in Male and Female College Students

Megan Flinchbaugh, Chelsea Gallagher, and Pam McGee (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Sociocultural pressures to achieve the idealistic body image are often displayed in media on a daily basis. Exposure to ideal images has been found to cause high risk factors in areas such as self-esteem and body esteem. The purpose of the present study was to examine the effects of media on body esteem and self-esteem among college students. Because there has been a paucity of work examining the effects of media on males, we also included males in our study. Participants were presented with ideal and overweight images and then asked to complete a series of surveys assessing body esteem and self-esteem. Based on previous work, we hypothesized that those who viewed ideal media images would be more likely to experience lower self-esteem and body esteem. Implications of these findings will be discussed using a social-cognitive framework.

#### The Effects of Interparental Conflict on Coping, Aggression, and Normative Beliefs on College Students

James Heubel, Alex Falvo, and Meghan Meader (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Interparental conflict is a common problem that affects children everyday. Witnessing verbal and physical interparental conflict places children at risk for behavior and emotional problems. In the current study 90 undergraduate students viewed videos of interparental conflict and answered surveys on coping, aggression, and normative beliefs. The purpose of this study was to evaluate the effects of interparental conflict on college- age students. We hypothesized that the participants who experienced the conflict vignettes would report less effective coping strategies, report more aggression, and tolerate more aggressive behavior. Preliminary results indicated that college students reported less effective coping strategies after witnessing the negative interparental conflict vignettes and non-conflict video. Implications and results will be discussed using the cognitive contextual framework.

#### Homosexual Candidates in Politics: A Comparison across Levels of Government

Dan Hido and Danielle Young (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Gay rights laws are a controversial issue in today’s society. Because the legislative branch of government is responsible for passing laws, it is vital that the gay population has equal voice in this process. The current study will examine college students’ attitudes toward a homosexual political candidate across three levels of government. This is a relevant issue because past research indicates that voters view issues differently based on the level of office they are voting for. Approximately 160-200 Penn State Behrend students will participate in the study from psychology and political science courses. The participants will read a vignette of a hypothetical political candidate, who will be either straight or rumored gay, and running for either federal, state, or local office. We expect that support for the homosexual candidate will increase from federal to state to local office. We also expect that women will show more support for the homosexual candidates. We will control for political knowledge and ideology. Implications of these results in politics and our current society will be discussed at length in the presentation.

#### The Effect of Music on Stress and Anxiety among College Students

Richard Hoag, Kelly Nowacinski, and Raine Raven (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Research suggests that first-year college students experience significant levels of stress associated with psychological and physical adjustment problems. The transition from high school to college can be very stressful and adjusting to college is marked by significant challenges in academic, social, and emotional adjustment. Students often respond to this stress with negative coping behaviors such as drinking, smoking, etc. The purpose of this study was to examine the modality of music as a possible coping strategy to reduce stress and anxiety. Based on previous work, we predicted that rock music would increase stress and have a negative effect on stress and anxiety and that hip hop, pop, and country music would decrease stress and have a positive effect on stress and anxiety. Results will be discussed to optimize student development.

#### Assessing the Significance of Close Relationships and How They Relate to Attachment Styles and Depression

Daniel Klanica and Audrey Burdick (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

The primary goal of this study was to predict college students’ current attachment style and depression level from three relationship contexts (peers, siblings, and parents). Self-report surveys were administered to measure college students’ attachment style, depression level, and dimensions of relationships with parents, siblings, and peers. Past work has suggested that positive parental and sibling attachment would lead to more secure attachment styles. We predicted that parent-child relationships and sibling relationships would be significant predictors for the participant’s current attachment style. We also expected that positive attachment styles would lead to lower levels of depression. Implications of these study results will be discussed using the emotional security theory.

#### Media Influences on College Students’ Perceptions of and Intent to Use Alcohol and Marijuana

Briana Newstrom, Kacie Scheuer, and Alyssa Osman (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

There has been little research on the effects of media on college students’ attitudes and intent to use alcohol and marijuana. The purpose of the following study was to measure the influences of media on college students’ perceptions of alcohol and marijuana and their intent to use these substances. Approximately 100 Penn State Behrend students participated in this study from psychology courses and were randomly assigned to two groups. Each group was given a media survey measuring the amount of media exposure. Participants then viewed four media clips: one group was shown substances portrayed negatively and the second group was shown substances portrayed positively. After viewing these media clips, the participants completed a Likert-scale survey assessing their attitudes toward alcohol and marijuana and their intent to use those substances. Based on past research, we expected participants’ attitudes towards alcohol and marijuana would vary as a function of media type (i.e. marijuana, alcohol). Implications of these data could improve anti-drug and alcohol campaigns for youth awareness.

#### Difference between Music Tempos on Accuracy in Task Completion

Ashley Stevens, Kyle Dorton, and Debra Workman (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Previous research has looked at whether the decibel level of music served as a distraction, but failed to provide a link between music tempo and one’s ability to complete a task. The purpose of the present research was to examine whether a difference existed between the accuracy of task completion while listening to either no music, slow, or fast tempo music. This study was interested in identifying whether music served as a distraction to participants. It was hypothesized that the control group, those who did not listen to music, would have better accuracy in completing tasks in both the slow and fast tempo groups. The second hypothesis was that the slow tempo group would have better accuracy than the fast tempo group in completing the tasks. The results showed no statistically significant differences between the three groups and that music tempo does not interfere with task accuracy.

#### The Effect of Media on College Students Prosocial Behavior

Jaclyn Stottlemyer and Kevin Jackson (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Past research has shown the effect of negative media on aggressive behaviors. However, there is a paucity of work examining the effect of prosocial media on prosocial behaviors. The few studies that do look at prosocial behavior focus only on the effect of video games and music. The primary goal of this study was to examine the effect of visual media on college students’ prosocial and aggressive behaviors. This study also tested for gender effects in participants’ willingness to help. Based on past work, we expected that the type of visual media would affect participants’ behavior, such that, those who viewed prosocial videos would behave in a more prosocial manner (e.g. being more willing to help someone) compared with those who viewed the aggressive videos. We also expected to find that males would be more likely to help the opposite sex. Results will be discussed using the General Aggression Model.

#### The 40 Developmental Asset Framework and College Students: Factors that Generate Growth

Krista Temonoff and Katherine Legler (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Recent research suggests that the 40 Developmental Asset Framework proposed by Search-Institute is an effective way to assess protective factors in youth. The purpose of the present research was to identify the attitudes and behaviors and developmental assets in college students, in an attempt to demonstrate new tactics that universities can utilize to improve healthy development across the lifespan. In addition to measuring college student’s developmental assets, participants were also assessed for depression, risky behaviors, and aggression. This is a relevant issue because past research shows that the more developmental assets a youth has the less likely they are to partake in risky behaviors. Approximately 150 undergraduate students participated in this study. The design of the present study was correlational in nature. Based on past work, we hypothesized that college students with more developmental assets would be less likely to partake in risky behaviors and score higher on depression and aggression. Implications of these findings will be discussed targeting specific university efforts to increase developmental assets among the college population.

#### VIZ Outreach: Reaching around the World

Danielle Young, Kristin Stranahan, and Kara Sementilli (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

The VIZ (Visualization Assessment Training) project is an interdisciplinary research project to develop tools that train and assess spatial skills. As part of this project, a new game was developed to improve way-finding abilities. Way-finding ability involves the use of cardinal directions and landmark navigation. The game involved using a map to find ribbons around the campus that were each worth a certain point value. The game was first tested in the Math Options Summer Camp for girls. The full VIZ curriculum was implemented in the Our Spatial World (OSW) outreach program for high school juniors. In Our Spatial World, students used the VIZ Web site and weekly training sessions to improve their spatial skills. Spatial performance data were collected pre and post from OSW and a comparison group who did not complete the training. Each of the four sessions included lecture, workbook, and software training. The last half hour of each session participants played a spatial game including our way-finding task. Results show that OSW participants improved at a greater rate than students who did not complete the training.

## POSTER PRESENTATION ABSTRACTS

### BIOLOGY I

#### The Effects of Macrophyte Tannins on the Epiphytic Macroinvertebrate Assemblages in Sandy Lake, Pennsylvania

Julianne Baron (Milton Ostrofsky), Allegheny College - Biology

Submersed aquatic plants with a high surface-to-biomass ratio generally support increased macroinvertebrate colonization because there is more surface area to colonize. Many aquatic plants also contain defensive compounds (phenolics, alkaloids, etc.) that deter herbivory by macroinvertebrates. In these plants macroinvertebrate colonization is limited. Eurasian Watermilfoil (EWM), *Myriophyllum spicatum*, is an invasive aquatic plant species that has both structurally complex architecture, and high concentrations of defensive chemicals. It is therefore relevant to ask in this case whether plant structure or defensive chemistry is the deciding factor in macroinvertebrate colonization. This study examined the communities of macroinvertebrates on five species of aquatic plants in Sandy Lake and found that there was no significant difference in macroinvertebrate density, biomass, or species richness between EWM and the other macrophytes. *EWM* contained significantly higher levels of defensive compounds but these were not correlated to any measure of macroinvertebrate community composition.

#### The Effects of Road Salt on Leaf Litter Decomposition in Bayfront Connector Wetlands

Jesse Boorman-Padgett and Travis Turkalj (Pamela Silver), Penn State Behrend, School of Science - Biology

Road salt (NaCl) is used to lower the freezing point of water and create safer driving conditions in snowy climates. However, this salt can end up in wetlands and interfere with the osmoregulation of freshwater organisms. Leaf litter decomposition is an important ecosystem function and a good indication of ecosystem health. A leaf pack study using *Typha* was conducted during fall 2009 in three artificially created roadside wetlands. Wetland R3 receives salty runoff, T3 receives salt spray, and T1 receives only freshwater. Large and small mesh size bags were used to determine the effects of macroinvertebrates on decomposition rates. The litterbags were collected at weeks 1, 2, 4, and 6. Mean decomposition rates measured as percent initial mass remaining were 93.78 ± 4.47, 92.48 ± 5.67, and 95.88 ± 4.62 on day 42 in T3, R3, and T1, respectively. Mean decomposition rates were 95.93 ± 2.55 and 95.08 ± 1.01 respectively in large and small mesh bags. Regression analysis indicated no difference between the decomposition rates among the wetlands or between the mesh sizes.

#### The Population Biology of the Spotted Salamander, Ambystoma maculatum, Inhabiting Penn State Erie Wetlands

Paul Crawford and Ashley Kingston (Carley Gwin), Penn State Behrend, School of Science - Biology

The spotted salamander, *Ambystoma maculatum*, is one of the many organisms that inhabit the campus of Penn State Erie, The Behrend College. Habitat degradation as a result of development and construction may have negative effects on many of these organisms; the extinction of one species may have disastrous effects on numerous other organisms. Pit fall traps were set at pond 4 located next to the athletic fields and the recently constructed Bayfront Connector to collect spotted salamanders as they migrate to their natal ponds to breed. This study will determine if spatial migration patterns have been affected over time. The salamanders will be massed, sexed, and their length recorded, and the temperature and amount of precipitation each day will be recorded. In last year’s study, the timing of migration and the number of migrants were significantly influenced by weather conditions. Migration began on March 18 with the capture of one spotted salamander, but the first large number of migrants was observed on March 19.

#### Do Fish and Macroinvertebrate Indices of Biotic Integrity Provide Concordant Evaluations of Stream Health in the French Creek Watershed?

Emily Fogoros (Scott Wissinger), Allegheny College - Biology and Environmental Science

Fish and macroinvertebrates are commonly used in biomonitoring to evaluate anthropogenic impacts on stream ecosystems.  The purpose of this study was to determine if the PA Department of Environmental Protection’s (DEP) benthic macroinvertebrate biomonitoring indices (BIBI) and locally adapted fish biotic indices (FIBI) make concordant predictions about the effects of land use on the health of second order tributaries in the French Creek watershed (northwestern Pennsylvania). I chose streams scoring at the high and low end of the FIBI from a pool of over 40 streams, and calculated BIBIs with DEP protocol. BIBI values more closely corresponded to current land use than did FIBI scores for the same streams.  One explanation for the better correspondence of invertebrate vs. fish communities to current land use is that invertebrates can more rapidly recolonize across drainage divides.  In general, forest cover and riparian intactness have increased over the past half century throughout the French Creek watershed.  It is possible that much of the variation in the FIBI data results from legacy effects and relatively slow recolonization dynamics of fish compared to macroinvertebrates. My results are consistent with other studies that suggest concordance is often limited between invertebrate and fish biomonitoring data.

#### Soil Microbial Diversity and Crop Productivity during the Conversion of Agricultural Soils from Conventional to Organic Fertilization

Erika Kerlin and Juli Xounhavong (Marlene Cross), Mercyhurst College - Biology

Methods of crop fertilization may have a great impact on both crop productivity and soil microbial diversity. Studies have suggested that chemical fertilizers decrease levels of microbial diversity. A study was carried out comparing the effects of the addition of organic material, the addition of chemical-based conventional fertilizers, the addition of algae-based fertilizers, and the use of cover crops. Identical crops, green beans and corn, were grown in a randomized complete block design using the fertilizers described above. The produce was harvested and crop productivity was measured using fresh and dry weight for green beans and fresh weight for corn. Productivity was highest in the compost-amended plots. Microbial abundance and functional diversity were measured by plate counting and using Biolog EcoPlates, which tests bacterial ability to utilize different substrates. From the EcoPlate data, the Average Well Color Development (AWCD) and the Shannon Diversity Index were calculated. By comparing the plate counts, AWCD and Shannon Diversity Index for all soil treatment types, microbial diversity was assessed and related to crop productivity.

#### Effects of Passive Treatment for Acid Mine Drainage on Epilithic Community Productivity in Streams

Lee Layton (Dean DeNicola), Slippery Rock University, College of Health, Environment, and Science - Biology

The Slippery Rock Creek watershed has been severely impacted by acid mine drainage (AMD) for more than a century, predominantly from coal mining in a 70 km2 area at the headwaters. Since 1995, restoration of the headwaters has focused on land reclamation and construction of 12 passive treatment systems (e.g., anoxic limestone drains and vertical flow systems). Metabolism of epilithic communities was measured in spring, summer, and fall 2009 by changes in dissolved oxygen in recirculating chambers at four sites in the headwaters; a heavily impacted site above all treatment, a site downstream of all treatment, and two unimpacted reference streams (small and large). Mean gross productivity for the three seasons was 5.3, 40.2, 48.6 and 214.5 mg O2 m-2 h-1 at the respective sites. The chlorophyll *a*/phaeophytin and GPP/CR ratios were both lower for AMD-impacted sites than reference sites, indicating more stressed communities. The results suggest that AMD drastically reduces the productive capacity of epilithic communities but that passive treatment systems have the potential to reduce impacts, which should benefit higher trophic levels.

#### Extraction and Purification of DNA from Nitrogen-Fixing Bacteria in Organic and Chemical Soils Using Real-Time Polymerase Chain Reaction

Cerissa Lynch (Marlene Cross) Mercyhurst College - Biology

Chemical fertilizers have been the choice of many farmers for a long time but now with a growing global awareness of the problems associated with chemical fertilizers, more farmers are turning toward organic options. Soil with a healthy microbial population, which includes nitrogen-fixing bacteria, may support crop growth without the input of nitrogen fertilizers. The purpose of this study was to quantify the nitrogen-fixing bacteria found in organically treated soil as compared to chemically treated soil. Eighteen plots were treated with six different fertilizer treatments arranged in a randomized complete block design. DNA was extracted from each plot after the growing season. Nitrogen-fixing bacteria were quantified by amplification of the nitrogenase gene with real-time polymerase chain reaction. It was predicted that the soil from chemically fertilized plots would contain fewer nitrogen-fixing bacteria. In the process of trying to quantify the nitrogenase gene, a simple method of extracting and quantifying DNA from soil was developed. This method may provide future scientists a more efficient technique to extract and purify DNA from environmental samples.

#### Algae-Fertilizer from Wastewater as Possible Cause of Metal Contamination in Crops

Cara McLeod (J. Michael Campbell),Mercyhurst College - Biology

Cadmium, lead and nickel are known to have toxic effects on humans. Research has shown that algae is known to uptake heavy metals. In my research I explore the transfer of heavy metals from wastewater to algae to crops of beans and corn. I compared the metal concentrations in bean and corn crops grown in a plot with algae chips (mainly composed of cyanobacteria) to crops grown in a plot with chemical fertilizer. I dry ashed and dissolved the samples in acid and then passed each through a Flame Atomic Absorption Spectrum, which read each sample in ppm. After conversions, the results indicate the lowest amount of all three metals in the corn, higher amounts in beans, and highest levels in the algae chips. There is evidence of transfer of metals from the wastewater to the algae; however, the transfer from the algae to the plants is unclear, since there were similar amounts of metals in plants grown in both the algae plots and the fertilizer plots.

#### Identification of Bacterial Isolates from Eggs of Three Native American Songbirds

Chris Mosebach, Nick Kniseley, and Amy Caroline (Beth Potter and Margaret Voss), Penn State Behrend, School of Science - Biology

A bird nest is a complex structure used for the laying, hatching, and growing of avian offspring. The nests are constructed from a variety of materials including twigs, dirt, fur, and plant material. Consequently, the nests provide an environment for the growth of microbial communities which can be transferred to newly laid eggs. Through previous research it has been found that avian eggshells harbor bacterial microbes only shortly after being laid. Under ambient conditions these bacteria can multiply, penetrate the egg shell, and affect the viability of un-hatched eggs. In this experiment bacteria appearing on the eggs of black-capped chickadees (*Parus atricapillus*), house wrens (*Troglodytes aedon*), and American robins (*Turdus migratorius*) will be identified. The results of this experiment will provide insight into the microbial communities that inhabit the eggs of these birds, and increase our understanding of the effects microbial communities can have on avian egg viability.

#### Application of the First Steps of Koch’s Postulates in Identifying the Etiologic Agent of a Skin Lesion Found on a White Perch, Morone americana, from Presque Isle Bay

Jillian Rhoads1 and Gregory Delost1 (Greg Andraso1 and Troy Skwor1,2), 1Gannon University , Morosky College of Health and Professional Sciences and 2Children’s Hospital Oakland Research Institute - Biology

According to a 2009 USEPA statistic, Great Lakes commercial and sport fishing generates over $4 billion in revenue annually. Fishing provides thousands of jobs in the Great Lakes states and is a main contributor to the success of the economy. Diseases affecting Great Lakes fish populations are therefore of great concern because of their possible impact. A critical component of limiting the spread of any disease is determining its etiologic agent. In this case study, we investigated bacteria found in skin lesions and healthy skin of a white perch, *Morone americana*, collected from Presque Isle Bay. To identify the etiologic agent, samples from skin lesions were plated on tryptic soy agar. The majority of colonies presented as gram negative, catalase positive coccobacilli, all of which are characteristic of pseudomonads and aeromonads. This corresponds with previous research associating both genera with fish diseases. Glucose fermentation and oxidase tests were performed to further differentiate specimens and DNA sequencing of the 16S rRNA gene confirmed genus and species. Our findings identified *Aeromonas* and *Pseudomonas* strains colonizing the wound, with *Aeromonas* more prevalent. Skin microbiota from uninfected areas presented with different bacterial communities, suggesting *Aeromonas* and/or *Pseudomonas* as the etiologic agents.

#### Mitochondrial DNA Comparisons of Spotted Salamander Populations at Penn State Erie, The Behrend College

Marcie Ryhal and Kristi Gdanetz (Carley Gwin), Penn State Behrend, School of Science - Biology

The Penn State Behrend campus is home to a large population of *Ambystoma maculatum* (spotted salamander), which has been a concern for over 15 years due to the construction of the Bayfront Connector, Knowledge Park, and development of athletic facilities on or near the campus wetlands. Isolation procedures and PCR amplification were used to isolate mtDNA from spotted salamander embryos. The isolated mtDNA will be sequenced at University Park and the sequences compared to look for a divergence. The original divergence of the *A. maculatum* population was found in the Knowledge Park population, which was a specific segment of mtDNA located between the genes coding for Threonine and Proline transfer RNA, specifically at position 7. The deletion found in the prior study indicated that the two populations were at least partially reproductively isolated. Research will be continued to test the mtDNA from both the Knowledge Park population and the athletic fields’ population to determine whether the divergence still exists.

#### Microbial Ecology of Freshwater Turtles

David Stull Jr. (Margaret Voss and Jeanette Schnars) Penn State Behrend, School of Science - Biology

Female freshwater turtles go to great lengths to ensure that their offspring will survive; selecting a nesting ground they deem appropriate and burying their eggs. It has also been hypothesized that developing turtle eggs receive help from a microscopic force, bacteria. Over the summer, bacterial samples were taken from a female snapping turtle and various soil samples from Presque Isle State Park. The samples were isolated, by means of the streak plate technique and individually plated. Turtle bacteria will be plated against soil bacteria in order to identify if bacterial resistance exists within the turtle bacteria.

### BIOLOGY II

#### Effect of Relaxin and Estradiol on mRNA Expression of RXFP1 in Human Keratinocytes

Anthony Firetto and Matthew Ruston (Sarah Ewing and Elisa Konieczko), Gannon University, Morosky College of Health Professions and Sciences - Biology

Relaxin (RLN2) is a polypeptide hormone discovered and known for its roles in the reproductive system. More recently, members of the insulin/relaxin peptide family are increasingly shown to function elsewhere; they are now known to function in the cardiovascular system, collagen remodeling, wound healing, fibrosis prevention, and cancer progression. The recent discovery of the RLN2 receptor, RXFP1, and its expression on diverse cell types further suggests relaxin’s role as a pleiotropic factor. Preliminary studies showed RXFP1 is expressed in human keratinocytes. However, the ability of relaxin or other signaling hormones to alter RXFP1 gene expression in these cells is unknown. The purpose of this study was to examine the effects of relaxin and estradiol treatment on RXFP1 mRNA expression in human keratinocytes grown in culture. Total RNA from untreated or treated keratinocytes was collected, quantified, and examined for quality using denaturing agarose gel electrophoresis. Samples were subjected to reverse transcription and the resulting complementary DNA was used to conduct real-time polymerase chain reaction (PCR) using fluorescent probes designed against the RXFP1 gene. Our results further our understanding of the expression of RXFP1 in human keratinocytes and allow us to ask novel questions related to the role of relaxin signaling in these cells.

#### Peptidoglycan Analysis in Two Classes of Haemophilus ducreyi

Blair Gleeson (Tricia Humphreys), Allegheny College - Biology

*Haemophilus ducreyi* is the bacterium responsible for the genital ulcer disease, chancroid. Based on analysis of outer membrane proteins, specifically DsrA, two classes of *H. ducreyi* have been identified. It is unknown whether the structure and composition of peptidoglycan (bacterial cell wall) differs between class I and class II of *H. ducreyi*. Peptidoglycan is the target of some antibiotics, including vancomycin. *H. ducreyi* is a gram negative bacterium and should therefore not be susceptible to the mechanisms of vancomycin. Some strains from class II, however, are sensitive to the antibiotic suggesting possible structural differences between the peptidoglycan of class I and class II strains. Polymerase chain reaction (PCR) was used to amplify *murC*, a gene involved in the synthesis of peptidoglycan, in ten strains of *H. ducreyi* from both class I and class II. Because PCR revealed the presence of *murC* in both class I and class II strains, gene sequencing is needed to analyze the level of homology of the *murC* gene between the two classes.

#### The Sprout Inhibitors Chlorpropham and 1,4-dimethylnaphthalene Result in Transcriptional Profiles in Potato

Alyssa Gleichsner and Roxanne Alsbury (Michael Campbell), Penn State Behrend, School of Science - Biology

Sprout management of potatoes is crucial to industry’s ability to provide consumers with safe, high-quality products. Sprouting produces the toxin solanine and the development of sweetening in the potatoes, creating products that are unfit for consumption. Sprout inhibition is accomplished by using the synthetic compound Chlorpropham (CIPC) and the natural compound, 1,4-dimethylnaphthalene (DMN). CIPC inhibits sprouting by disrupting microtubule structure and function. The mechanism of action for DMN is unknown, but has been suggested to function through the prolongation of the dormant state. To test this, the effects of DMN and CIPC on abscisic acid (ABA) content and the gene expression levels within potato meristem tissue were compared. Results from ABA analysis indicate that levels after treatment with either inhibitor where the same as those found in untreated nondormant tissue. This indicates that neither treatment elevates ABA levels as a means to repress sprouting. A TIGR potato cDNA microarray was used to demonstrate variation in gene expression caused by each treatment. Significant differences were located in transcript profiles that dealt with dormant tissue. This suggests that the mechanisms-of-action of CIPC and DMN are distinct from one another and that neither function through the prolongation of the normal dormant state.

#### Gene Expression Analysis of Stilbene Synthase in Grapevine Resulting from Biotic Pathogen Attack

Moriah Johngrass and Abraham Kibbey (Christopher Gee), Penn State Behrend, School of Science - Biology

Phytoalexins are small antimicrobial compounds whose production is elicited by attack of biotropic pathogens. Developing an assay to be able to quantify expression of stilbene synthase, an enzyme involved in phytoalexin production, was the focus of this study. This assay will be used to investigate the effects of powdery and downy mildews infection on Concord grapevines grown in a vineyard setting. Using vineyard-collected samples for gene expression work is not common practice, and surely needs modification of common practice techniques. To accomplish this goal, total RNA from leaf discs infected with either downy or powdery mildew, discs adjacent to lesions and discs from adjacent, uninfected leaves was extracted using the RiboPure RNA extraction kit (Ambion, Inc.). The extracted RNA will serve as a template for quantitative-PCR after reverse transcriptase using the 2-step qPCR/Sybr Green kit (New England Biolabs). Conducting these experiments on tissue from the vineyard will expand the understanding of how this important pathway is regulated in the viticultural environment.

#### Elucidating the Expression Patterns of C/EBPα in Zebrafish Embryos

Noelle Lawrence1 (Sarah Ewing1 and James Warren Jr.2), 1Gannon University, Morosky College of Health Professions and Sciences and 2Penn State Behrend, School of Science - Biology

It was projected for the year 2009 that over 500,000 individuals will die of cancer in the United States alone. The complete understanding of cancer on a cellular and molecular level can aid in treatment and prevention. CCAAT/enhancer binding proteins (such as C/EBPα and C/EBPβ) regulate gene expression and diverse cellular processes, such as differentiation, survival, and proliferation. Loss of these controls can lead to a wide range of diseases, including cancer. Zebrafish (*Danio rerio)* embryos are utilized as a model due to their homology with humans and because they are inexpensive and easy to maintain. The purpose of our study was to examine the expression pattern of C/EBPα in zebrafish embryos in order to 1) establish the zebrafish model as a means to study C/EBPα expression and 2) elucidate the expression pattern of C/EBPα in embryonic tissues. An antisense RNA probe was created using the C/EBPα gene sequence and was directed against C/EBPα mRNA. The probe was then used to conduct *in situ* hybridization with whole embryos. The results of these experiments establish zebrafish as a model system to study C/EBPα and will allow us to examine C/EBPα expression in response to cellular stress in future studies.

### BIOLOGY III

#### Escherichia coli Increases the Number of Hermaphrodites in the Gender Labile Fern, Ceratopteris richardii

Jeremy Alfieri1 (Mike Ganger1 andTroy Skwor1,2), 1Gannon University, Morosky College of Health Professions and Sciences, 2Children’s Hospital Oakland Research Institute - Biology

*Ceratopteris richardii* (C-Fern) gender is influenced by the activity of two hormones: a gibberellin-like hormone, antheridiogen (ACE), and abscisic acid (ABA). ACE is produced by hermaphrodites and causes undifferentiated spores to develop as males while hermaphrodite-produced ABA counters the effects of ACE in the hermaphrodites themselves. *Escherichia coli* and other bacteria are known to produce hormones similar to gibberellins and ABA. Therefore the objective of this experiment was to determine if *E. coli* could affect gender determination in C-Fern. To test this hypothesis, approximately 150 C-Fern spores were sown onto nutrient agar plates containing whole *E. coli*, filtered *E. coli* supernatants (100%, 50%, and 10%), or media alone. After three weeks, C-Fern spores developed into gametophytes and the percentage of hermaphrodites in the culture was determined. Our data showed a significantly higher frequency of hermaphrodites in C-Fern cultures grown in the presence of *E. coli* compared to the control. The higher frequency of hermaphrodites was determined to be bacterial-cell dependent since *E. coli* supernatants did not significantly alter hermaphroditic frequency. These data suggest a cross-talk between *E. coli* and C-Fern that can alter the gender-determining mechanism in C-Fern.

#### Antilisterial Efficacy and Lack of Genotoxic Potential of Listeria monocytogenes Specific Bacteriophages

Danielle Barton1 (William Mackay1, Christopher Sommers2, and Kathleen Rajkoswki2), 1Edinboro University of Pennsylvania and 2U.S. Department of Agriculture - Biology

*Listeria monocytogenes*, a psychrotrophic food-borne pathogen, is an occasional post-process contaminant on foods. In this study, the use of a commercial bacteriophage product was evaluated for the ability to inactivate *L. monocytogenes* inoculated (104-105 CFU/cm2) onto raw catfish. Spray application of bacteriophage (107 PFU/cm2) resulted in a 2 log reduction of *L. monocytogenes* on raw catfish stored for six days at 10oC. Published studies on the safety of bacteriophage products using *in vitro* genotoxicity assays are extremely limited. The bacteriophage preparation did not induce mutations in the bacterial mutagenicity tests or 6-thioguanine resistant mutants in human TK6 lymphoblasts, either with or without exogenous metabolic activation. No induction of micronuclei (chromosome fragmentation) was observed in human TK6 lymphoblasts following exposure to bacteriophage, either with or without exogenous metabolic activation.

#### The Effects of Environmental Enrichment on the Inflexible Behaviors of Autism

Kristin Blankemeyer and Ashley Adamson (Rodney Clark), Allegheny College - Neuroscience

Autism is a complex disorder of the nervous system, characterized by lifelong problems with social interaction, impaired ability to communicate, and patterns of repetitive behavior and restricted interests. Out of these three domains, relatively few studies have been dedicated to researching restricted and ritualistic behavior. The purpose of this study was to examine the effects of the environment on the ability to accomplish a reversal learning task, using an animal model of autism. Twelve Sprague-Dawley rats were prenatally exposed to sodium valproate (VPA), and another twelve rats were prenatally exposed to saline. For each exposure group, half of the rats were housed in standard laboratory cages and the other half inhabited enriched environments, with various novel objects introduced twice weekly. All rats were trained until they acquired the behavior of turning down the right-arm of a T-maze to receive a food reinforcer. The reversal learning task occurred when the food reinforcer was placed down the left-arm of the T-maze. Latency and number of errors were recorded for each rat. It is expected that the effects of environmental enrichment will override the effects of VPA, causing the environmentally enriched VPA rats to perform more quickly and accurately than saline-exposed rats housed in standard cages.

#### Perinatal and Postnatal Changes in Volume of the Vomeronasal Neuroepithelium in the Mongolian Gerbil (Meriones unguiculatus)

Amanda Bruening and Jeffrey Reese (Timothy Smith [Physical Therapy] and Susan Rehorek), Slippery Rock University, College of Health, Environment and Science - Biology

Mongolian gerbils (*Meriones unguicultaus*) have families which range between two to seventeen animals. These rodents exhibit pair bonding, and there are some reports of promiscuous mating. The rate of sexual maturation is thought to be based on group dominance. The large males mark their territory by a ventrally located sebaceous scent gland that is size dependent. The vomeronasal organ is a sensory organ whose neuroepithelium may play a role in detecting these subtle chemical cues. In this study, the volume of the neuroepithelium of the vomeronasal organ (VNNE) was measured in adult and perinatal gerbils (n = 4) from serial histological slides. Unlike the studies done on the naked mole rat (*Heterocephalus glaber*) our data indicate the Mongolian gerbil has significant growth of the VNNE from birth to adulthood. This growth rate is on par with what is reported to date for most other rodents but still lesser of a magnitude compared to that of the rat. Overall, results suggest a prominent VNNE is present postnatally from birth in this species. Whether its sensory neurons detect chemicals present in the secretions of the sebaceous scent glands of this mammal should be the focus of future study.

#### Development of the Nasolacrimal Duct in the Rabbit (Oryctolagus cuniculus)

Jennifer Caprez (Timothy Smith [Physical Therapy] and Susan Rehorek), Slippery Rock University, College of Health, Environment and Science - Biology

In most tetrapod vertebrates, the orbital and nasal areas are distinct regions, separated by bone.  This partition is traversed by the nasolacrimal duct (NLD), which drains orbital fluid into the nose.  However, the origin of this duct, both in terms of phylogeny and ontogeny, is poorly understood.  In this study, we examined the development of the NLD in the rabbit.   The NLD develops during the end of the middle third of the gestation period (day 19).  At this stage, the NLD is an integumentary structure, forming first in the orbit and then extending toward the nose. In the 21-day and 27-day fetuses, the NLD is complete, connecting the orbit to the nostril, and its route through the nasal cavity follows the contours of the surrounding bone as the nasal cavity expands. In the adult, the NLD and the nasal cavity are elongate and relatively straighter.  In some mammals, the inception of the NLD occurs earlier (in the early stages of the first third of the gestation period).  In reptiles and humans, the development of the NLD, though still relatively early in ontogeny, follows a different path, originating from the nasal region and growing toward the orbital region.

#### The Effects of Long-Term Exposure of Aspartame and High Fat Diets on Adult Female Sprague-Dawly Rats

Samantha Ford (Rodney Clark), Allegheny College - Neuroscience

Alzheimer’s disease is recognized as one of the most rapidly expanding health concerns in America. Current research suggests that almost half of the population will develop this neurological disease after the age of 85. However, those who come from low economic standing are most likely to develop this disease. Those with poor income are less likely to achieve higher levels of education and people who have a low level of education are more inclined to lead unhealthy lifestyles. Diet patterns that seemed to coincide with Alzheimer’s disease consisted of very few fruits, a lot of meats, butter, cream, high-fat dairy products, and refined sugars. The goal of the present study was to determine if memory loss increases when the amounts of refined sugar and fat increase in a rat’s diet. The study was a 3 x 2 factorial in which diet was varied (aspartame diet, fatty diet, and balanced diet), and which directional signal was shown (circle card indicated right and lined card indicated left), The participants were exposed to their diets for at least three weeks. We believe that our results will show an increase in percent error for rats undergoing the aspartame and high fat treatment.

#### Behavioral Dependence on Ketamine

Zachary Grey(Rodney Clark), Allegheny College - Neuroscience

Rats were trained on a fixed interval schedule of water presentation for 10 minutes of 10, 20 and 30 seconds. Ketamine at doses of 1.0, 3.0, 5.6, and 10.0 mg/kg were injected 10 minutes prior to the start of the experimental session. In order to determine the existence of a behavioral dependence syndrome, rats were exposed to Ketamine chronically for 10 days. Chronic dosing was then terminated and behavior was observed. Behavioral dependence was observed when the behavior was disrupted following termination of the chronic drug exposure.

#### The Nasolacrimal Bony Canal in the Rabbit (Oryctolagus cuniculus)

Jessica Johnson (Timothy Smith [Physical Therapy] and Susan Rehorek), Slippery Rock University, College of Health, Environment and Science – Biology

The nasal and orbital regions of most tetrapod vertebrates are separated by a partition, which is usually bony. The lacrimal bone is part of this partition and it is pierced by the nasolacrimal duct (NLD) which drains orbital fluid into the nasal cavity. However, the extent of the association between the NLD and the lacrimal bone is poorly understood. In this study, we examined the structure of the bony canal for the NLD in rabbits, specifically examining a late term fetus (histologically) and an adult skull. We observed a well-developed bony canal for the NLD, which ran diagonally (superiorly from the orbit to the floor of the middle third of the nasal cavity). This canal was formed by both the lacrimal (as a long inferior spike) and maxillary bones. The rabbit exhibits yet another variation in the capsular support of the NLD. The dik dik (Artiodactyla) also possesses a long bony canal, but in this case the lacrimal appears to form the caudal portion of the bony canal. A short bony canal exists in humans (formed by the lacrimal bone) and there is no bony canal in lizards (the NLD is a a subepithelial structure in the nasal cavity).

#### Some Effects of Paternal NMDA Exposure on the Behavior of Rats

Eric Roginek, Lauren Strawser, Adam Lessard, Carlos Lopez, Megan Atkinson, Julian Gradnigo, David MacAdam, Pete Ondish, and Darryl Overton(Rodney Clark), Allegheny College - Neuroscience

Two adult male Sprague-Dawley rats were exposed to chronic NMDA treatment for 45 days. Additional adult male rats were given chronic saline and not exposed to NMDA. Following the 45-day regime, rats were bred with drug-naive females. The operant behavior of the offspring was then examined. All rat pups were subsequently examined under Inter response Time Greater than *t* (IRT>*t*) schedules of water presentation. Three different parameters were then evaluated (3, 6, and 9 second values of *t*). Acqusition of scheduled-controlled behavior was then assessed in the two groups.

#### Preliminary Protocol for Non-Invasive Detection of Trichinella spiralis in Porcine Blood Serum

Crystal Sasinoski (Matthew Foradori), Edinboro University of Pennsylvania - Biology

*Trichinella spiralis* is a nematode that causes trichinosis in people who eat raw or undercooked pork. This nematode has a large economical and medical impact in the United States, making the development of a method for early detection of the parasite very important. Currently, the detection for this parasite is by post-mortem inspection of meat. We have proposed a less invasive method of detecting *T. spiralis* by extracting blood samples from living mammals. This method, unlike the current one, would allow for detection of the worm prior to slaughter. If positive for *T. spirals*, precautionary steps could to be taken so as not to contaminate work areas or other meat. This method would diminish the likelihood of trichinosis in humans by keeping the infected pigs out of the processing facility, reducing the risk of contamination, and ultimately, human consumption. We are in the preliminary stages of developing a protocol for this method.

### BIOCHEMISTRY

#### A Coimmunoprecipitation Approach to Identifying N-glycan-Dependent Sorting Machinery in Polarized Epithelial Cells

Jacob Bernstein (Beth Potter), Penn State Behrend, School of Science - Biology

Polarized epithelial cells are unique in that they possess two distinct membrane subdomains, the apical and basolateral. Maintenance of the apical and basolateral domains is controlled by the selective trafficking of proteins through the biosynthetic and endocytic pathway to each domain based on inherent sorting signals. N-glycosylation has been implicated as one of several apical sorting signals. However, the mechanism by which N-glycans mediate delivery to the apical surface is unknown. Two mechanisms have been proposed. One mechanism proposes that N-glycans mediate a specific conformation which is selectively trafficked to the apical surface, such as the inclusion into lipid rafts and/or oligomerization. The second mechanism proposes that N-glycans bind to a specific receptor that mediates delivery to the apical surface. Previous research with endolyn, suggests that apical delivery of this protein is independent of lipid rafts because endolyn has been shown to require the terminal processing of a subset of its N-glycans. Additional preliminary evidence suggests that oligomerization is not required for trafficking of this protein to the apical surface. Thus, the goal of this study is to identify receptor candidates for endolyn using an *in vivo* coimmunoprecipitation approach.

#### Cross-Linking Cellulase for Post-Enzymatic Recovery

Jillian Bona (Lisa Unico, Naod Kebede, and Paul Edwards), Edinboro University of Pennsylvania, School of Science, Management and Technology - Biochemistry

Cellulase is an enzyme that can hydrolyze cellulose polymers to produce free glucose which can then be fermented to produce ethanol. Cellulase is commercially available from Worthington Biochemical.  Unfortunately, it is expensive and, with current methods, is difficult to recover after its use.  The main purpose of this study is to find a way to easily recover the enzyme, making it more cost effective to produce cellulosic ethanol.  This can be accomplished by attaching it to a solid material by a process called cross-linking.  To date, an assay of enzyme activity has been established and chemical screening for the selection of an appropriate cross-linking agent is under way. Thermo Pierce sells four heterobifunctional cross-linking agents that covalently bond the sulfhydryl of a cysteine to the cross-linker and the cross-linker covalently to the carbohydrate in Sephadex chromatography media. These cross-linking agents require an available cysteine on the protein. To test the appropriateness of these cross-linkers, DTNB reactivity with cellulase was assessed. DTNB reacts specifically with reduced sulfhydryls in cysteine residues. DTNB reactivity indicated there are no available cysteines in cellulase. Lysine reactivities will be assessed by acetylation in future experiments.

#### Synthesis of Novel Flavonoid Benzisoxazole-N-oxides

William Boylan III (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

Flavanones and flavones (collectively referred to as flavonoids) are phenol derivatives, which have been found to possess antioxidant and free radical scavenging activity in foods. Flavonoids are a widely distributed group of polyphenolic compounds with health-related properties, which are based in their antioxidant activity. This research focuses on the synthesis of novel flavone and flavanone-based compounds. Structural modifications in this study center around the incorporation of a benzisoxazole-*N*-oxide ring into the parent flavonoid structure. It has been demonstrated that this benzisoxazole-*N*-oxide ring can be synthesized from 2-hydroxyphenyl ketones by first converting them to the corresponding oximes and then treating with iodobenzene diacetate. Because flavonoids contain an analogous 2-hydroxyphenyl ketone moiety, it was thought that incorporation of this ring structure could provide some potentially useful flavonoid derivatives. Using this methodology as a guide, similar reactions were used to modify the structure of known flavonoid antioxidants in order change or even enhance their antioxidant properties. Initial work into the development of synthetic methods for the synthesis and modification of the parent flavone and flavanone ring systems will be presented. In addition, application of this methodology to naturally occurring flavonoids such as naringenin, isosakuranetin, luteolin, and tangeritin will be discussed.

#### Head Space Solid Phase Microextraction (HS-SPME) Gas Chromatography Mass Spectroscopy (GCMS) Analysis of Volatile Components of Garlic

Jessica Clemente, (Jack Williams and Candace Chambers), Mercyhurst College - Biochemistry

We present preliminary results in our on-going studies of nutraceuticals found in garlic. We are conducting studies to determine the presence of known nutraceuticals in a variety of types of garlic and quantify the amounts of known nutraceuticals. Analysis of garlic samples was performed using Gas Chromatography Mass Spectroscopy (Hewlett Packard 5890 Series II *Plus* Gas Chromatograph, equipped with a Hewlett Packard 5972 Mass-Selector Detector). Conditions for extraction and desorption where optimized for garlic samples to ensure maximum component concentration. Different garlic samples were compared with respect to the amount and identity of the analytes present. Preliminary results show that there appears to be significant differences in the volatile compounds present in commercial organic, homegrown organic, and elephant garlic.

#### COPD and the Search for Serum Biomarkers: Luminex Assay Results for Leptin and Four Human Growth Factors

Sean Kellner1 (Yingze Zhang2 and Frank Sciurba2), 1Grove City College and 2University of Pittsburgh Medical Center, Department of Pulmonary, Allergy, and Critical Care Medicine - Biology

Chronic obstructive pulmonary disease (COPD) is a heterogeneous disease with airway obstructive and emphysema components. Currently, COPD is measured most readily by PFTs, however serum biomarker profiles are being evaluated as candidate measures to better characterize COPD. A multi-analyte bead-based Luminex assay system was used to measure the levels of leptin, EGF, VEGF, FGF, and G-CSF, respectively in serum samples from 80 COPD patients. The observed concentrations detected by this flow cytometry-based system were subjected to statistical testing. The null hypothesis was that clinical variables—particularly FEV1, FEV1pp, FEV1/FVC, DLCO, and DLCOpp—would not correlate to the observed concentrations of the analytes. From multiple regression analysis, FEV1/FVC, smoking status, gender, FEV1pp, and especially FEV1/FVC predicted the observed concentration of leptin (r2 = 0.569, p<.001, F = 13.844). Leptin is an adipose-derived hormone that regulates appetite and metabolism. Leptin deficiency relates to obesity. Interestingly, leptin in the alveoli induces surfactant expression in type II pneumocytes of fetal rats. If relatively lower levels of leptin do not contribute to the pathogenesis or progression of pulmonary disease here, it may be that the comorbidity and interplay between obesity and pulmonary disease is the reason for lower levels of leptin coinciding with lower FEV1/FVC.

#### Transduction Pathways for Olfactory CO2 Detection in Mice

Jessica Kenemuth and Allison Hensler (E. Lee Coates), Allegheny College - Neuroscience/Biology

Physiological concentrations of CO2 (less than the 4-5% CO2 in expired air) have been shown to stimulate a small subset of olfactory receptor neurons allowing mice and rats to “smell” low concentration of CO2. The second messenger cAMP is known to play a role in the detection of typical odorants while recent studies indicate that cGMP and the enzyme carbonic anhydrase (CA) are important for the detection of CO2. The objective of this study was to investigate the transduction pathway for CO2 detection by recording electro-olfactograms (EOGs) in response to CO2 and odorants before and after topical application of L-cis-diltiazem, which inhibits cGMP activated Ca++ channels or niflumic acid, which inhibits Ca++ activated Cl- channels. We found that application of L-cis-diltiazem attenuated the EOG response to CO2 to a greater extent than the EOG response to odorants, indicating that cGMP activated Ca++ channels are important in the CO2 transduction pathway but do not play a role in typical odorant transduction pathways. Niflumic acid application attenuated the EOG responses to both CO2 and odorants, indicating that Ca++ activated Cl- channels may play a role in sensing CO2 as well as typical odorants. The results of these experiments provide further support for a unique olfactory transduction pathway for the detection of CO2 in mice.

#### Investigation of Polybrominated Diphenyl Ethers in Feline Blood Samples via Gas Chromatography Electron Capture and Mass Spectrometry

Eve Klajbor (Clinton Jones), Mercyhurst College - Biochemistry/Analytical Chemistry

Polybrominated diphenyl ethers (PBDEs) are organic pollutants utilized in fire-retardants, functioning to modify household materials, including upholstery and carpeting. With proximity to living organisms, PBDEs may threaten household residents’ health through their gradual accumulation in the body. Once present, certain PBDE isomers imitate thyroid hormones, and potentially contribute to the onset of thyroid disease. Indoor domestic felines typically have a higher rate of thyroid cancer compared to their outdoor counterparts, possibly due to daily exposure to PBDEs. These pets may be the sentinels for disease rates in humans when exposed to similar daily surroundings. The purpose of this research was to analyze blood samples of indoor domestic cats, ranging in age and health, for the presence of PBDE isomers. Blood samples will be chemically extracted to allow for detection of PBDEs in the plasma when separated through a gas chromatograph coupled with an electron capture detector and mass spectrometer. The resulting data will be correlated with the relative health and age of the tested household felines. In hypothesis, the older specimen plasma samples may contain higher levels of PBDEs compared to samples from younger felines due to a longer exposure to the indoor environment.

#### Investigation of Vanadium Pentoxide as a Possible Electrocatalyst for an Amperometeric Hydrogen Sulfide Biosensor

James Pander (Jason Bennett), Penn State Behrend, School of Science - Chemistry

Gasotransmitters, such as nitric oxide (NO), carbon monoxide (CO), hydrogen sulfide (H2S) are known to participate in numerous biological processes linked to several neurological diseases. An important aspect of studying biological processes is detecting the presence of these gasotranmitters *in vivo*. There have been a number of recent studies concerning electrochemical detection of NO, but recently interest in CO and H2S has raised the issue of sensor selectivity between these molecules. Selectively detecting one gas in the presence of the others is difficult due to the similar molecular properties of the gasotransmitters, such as membrane permeability, and because of slow oxidation kinetics. Vanadium oxide catalysts have been shown to catalyze the oxidation of hydrogen sulfide in industrial and environmental applications. Therefore, this research investigates the potential of electrodeposited V2O5 catalysts to impart sensor selectivity by selectively oxidizing H2S via improved oxidation kinetics over NO and CO. The long-term goal of this project is the development of an electrochemical sensor that can be used for real-time detection of H2S in biological media to advance our understanding of the physiological role of the gas molecule and its interactions with other gasotransmitters

#### Quantum Chemical Conformational Analysis of Pangamic Acid

Jonathan Sibert (Candee Chambers), Mercyhurst College - Biochemistry

We present relative free energies and equilibrium structures for a series of conformations of pangamic acid. Our calculations are based on *ab initio* gas-phase electronic structure calculations of the geometries using Møller-Plesset second-order (MP2) perturbation theory with a 6-31G basis set. Seven minimum energy conformations of pangamic acid are discussed, and the reasons for their relative energy differences are suggested.

#### The Effects of Matrine on the Proliferation of Cancer Cells vs Non-Cancer Cells

Jessalee Wantz, Nicole Cifra, and John Fox (Durwood Ray), Grove City College - Biology

The purpose of the study was to determine the conditions of matrine concentration and time of treatment required to inhibit growth of cancer and normal cells. Matrine, the main active component of the dried roots of *Sophora flavescens*, holds many medical applications, including cancer treatment. The metastatic mouse lung cell line, T4-PA and normal NIH swiss mouse cells were grown and treated with matrine at concentrations ranging between 0 and 1.5 mg/ml. Cell counts were recorded daily, over the course of three-six days, using gridded plates and photographs of six predetermined 2 mm square sections of each plate. An average percent change in cell number from each individual grid was then calculated. Results from this method revealed that matrine significantly and reproducibly inhibits both Swiss mouse cells and mouse T4-PA cells in a dose dependent manner, and matrine inhibits growth of T4-PA cells to a greater degree. Normal mouse cells recover more effectively than the cancer cells following removal of matrine. This treatment may further enhance the killing of tumor cells relative to the killing of normal cells. Studies are underway to include microarray analysis of mRNA from matrine-treated cells to determine which genes matrine significantly affects.

#### Nano/Micropatterning the Surfaces of Biodegradable Polycaprolactone

Malissa Whitney (Ping Furlan), University of Pittsburgh at Titusville - Chemistry

Polycaprolactone (PCL), a biodegradable polyester, has received a great deal of attention for its multipurpose applications such as a drug delivery device, adhesion barrier, or scaffold for tissue engineering. Precise surface geometrical morphologies with features at nano/micro scales have been shown to be essential for these applications. Surface patterning techniques based on solvent-cast approach are commonly used for this purpose. This research demonstrates two methods that reduce the use of organic solvents and utilize inexpensive and readily available materials to fabricate desired patterns on PCL surfaces. An atomic force microscope (AFM) was used to image and characterize these surfaces.

### CHEMISTRY

#### A Novel Synthesis of Flavylium Cations and 2H-Chromenes

Azelin Benson (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

Anthocyanins, which are naturally occurring antioxidant flavylium cation derivates are often expensive to obtain and available only in small quantities. While several syntheses exist for the flavylium compounds, they are often problematic, suffering from poor yields. A related class of oxygen heterocycles is the 2H-chromenes. Compounds containing the chromene ring structure include anti-depressants, antivirals, and antioxidants. New methods for the synthesis of both these classes of molecules are highly desirable. Flavanones, which share a similar structure to both chromenes and flavylium compounds, are considerably more abundant and easier to synthesize. As a result, the focus of this research is to develop new methods for the synthesis of these two classes of compounds from the more readily available flavanones. Our continuing research is investigating the use of Bamford-Stevens reaction as the key step in this transformation. The flavanones are first converted to their corresponding tosylhydrazones, which upon treatment with base can eliminate to give the 2H-chromene structures. This structure can then undergo further oxidation to give the flavylium cation. The results of the development of this new synthetic methodology for the parent flavylium and 2H-chromene ring structure will be presented.

#### Head Space Solid Phase Microextraction (HS-SPME) Gas Chromatography Mass Spectroscopy (GCMS) Analysis of Confectionary Volatiles

Chi Bui (Jack Williams), Mercyhurst College - Chemistry

The purpose of this research was to analyze the volatile components of confectionaries from a number of different countries. Formulations for confectionaries are in general proprietary. Considering the number of countries that may be involved in confectionary preparation, and the fact that international industry standards may vary significantly, the exact composition of the volatiles of a confectionary is of interest. This research represents the first step in the formation of a “Fingerprint Gas Chromatography Database” for confectionary volatile identification. Volatiles where extracted using the technique of head space solid phase microextraction (HS-SPME). Separation of the analytes was performed using Gas Chromatography (HP5890 Series II *Plus* Gas Chromatograph). The mass spectra of each analyte was obtained using an HP 5972 Mass-Selector Detector. Comparison of the mass spectra of analytes with those present in the National Institute of Standards Library (using probability-based matching) enabled positive identification.

#### Synthesis, Characterization, and Study of Molecules for Use in Organic Light Emitting Diodes

Rachel Edwards (Caroline Pharr), Mercyhurst College - Chemistry

Organic light emitting diodes (OLEDs) are devices that utilize a thin layer of organic molecules to produce light in the visible region. These molecules emit light when excited by energy, such as electricity. Red, green, and blue light are needed to give a device a full-color display. OLED technology encompasses a broad range of applications which include general lighting, display lighting, traffic lighting, and most recently, televisions. OLED displays are beneficial because they use less power and produce a sharper image than currently used technologies. Red and green light emitting molecules with sufficient lifetimes and stability have been synthesized, while blue light-emitting molecules lack the same lifetime and stability. Our research therefore focuses on the synthesis of more stable blue light emitting molecules with prolonged lifetimes. The parent molecule consists of three subunit molecules: 4-bromodiphenylacetylene, 2,7-dibromocarbazole, and 1-(2`,3`,4`,5`-tetraphenyl)phenyl-4-bromobenzene (dendron). Current work involves borylating the dendron in order to link it to the carbazole through a Suzuki coupling reaction. Upon synthesis of the parent molecule, its photophysical and electronic properties, as well as its stability can be studied. Future efforts will be geared towards the synthesis and characterization of derivatives of the parent molecule.

#### Synthesis of Novel Benzisoxazole-N-oxides

Olivia Hoermann (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

Heterocyclic *N*-oxides are a diverse and important group of molecules. One particular class of these compunds that has not received much attention is the benzisoxazole-*N*-oxides. Herein, we would like to report our continuing investigations into the synthesis and properties of these interesting heterocycles. Previous work in our research group uncovered the novel synthesis of benzisoxazole-*N*-oxides from 2-hyroxyphenyl ketones. This reaction was shown to be applicable to a series of substituted 2-hydroxyphenyl ketones, the results of which will be presented, with the scope and limitations of this reaction being discussed. As part of that investigation, a number of novel benzisoxazole-*N*-oxides that could have potential as metal coordinating ligands, were proposed. To date, benzisoxazole-*N*-oxides have never been used as coordinating ligands in metal complexes. With a previous synthesis of benzisoxazole-*N*-oxides having been established, we are continuing our investigations into synthesis of benzisoxazole-*N*-oxides with potential as metal coordinating ligands. Of particular interest are compounds that incorporate the benzisoxazole-*N*-oxide as well as an additional coordinating group such as phenol, imidazole, pyridine, or pyrrole. The synthesis and attempted coordination of these novel ligands to a variety of metals will be discussed.

#### Optimization of Dye Loading in Thin Films of Zeolite Crystals

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

Zeolites are a class of microporous host materials that are commonly used in both household and industrial applications. In host-guest chemistry, the zeolite microcavity is filled with a guest molecule. The host-guest composite material often exhibits unique properties not observed in either of the original materials. This project focused on optimizing the loading of a merocyanine dye guest molecule into the pores of thin zeolite films to develop nonlinear optical properties in the material. Merocyanine dye is small enough to easily fit into the zeolite pores and, like all dyes, it interacts with light, making it ideally suited for developing new optical materials. Thin films were investigated to determine if the individual zeolite pores could be unidirectionally aligned. Controlling pore alignment in zeolite thin films, and thus dye alignment within the pores, allows optimization of the film’s optical properties. The ZSM-5 thin films used in this project were grown on a template of silicalite crystals bonded together with a boehmite filler material. The uniformity and structure of the crystal films were evaluated by scanning electron microscopy (SEM) and x-ray crystallography. The level of dye loading was characterized by solid state UV/Vis spectroscopy and fluorescence spectroscopy.

#### Study of Bucky Ball-Toluene Complex in Presence of UV Light

Jason Renninger, Terri Gardner, and Gabrielle Brennan (Arshad Khan), Penn State DuBois - Chemistry

Bucky-ball (BB, C60) and bucky-ball derivatives have been extensively studied for their medical and industrial applications. BB almost instantly forms a purple complex in the presence of toluene which at room temperature remains purple and does not show any change. However, when the purple solution is irradiated with UV light for two weeks, it changes to a yellow complex. Our earlier experimental and computational studies on a similar BB-benzene complex suggests that the purple complex is presumably due to vertically oriented toluene molecules attached to a BB molecule, and the yellow complex is due to horizontally oriented toluene molecules.

#### Computational Analysis of Surface Carbon Energetics as a Function of Carbon Nanotube Size and Geometry

Andrew Rusnak (Ron Brown) Mercyhurst College - Theoretical Chemistry

The energetic stability of SWNT (single-walled carbon nanotube) surface carbon atoms was investigated by performing *ab initio* calculations on nanotube models. Full optimizations at the B3LYP/6-31G(d,p) level were performed in order to determine the energy per carbon atom as a function of varying SWNT size and geometry. The models were designed to simulate the armchair and zigzag nanotube geometries. The (3,3) to (6,6) armchair nanotubes and the (5,0) to (9,0) zigzag tubes were modeled. The cross-sectional radii of these tubes vary from 2.12 Å to 4.41 Å. A model of a graphene sheet, effectively a tube of infinite cross-sectional radius, was also included. The results were compared as a function of tube size and geometry. It was found that as the radius is increased the surface carbons become more stable. These results provide a benchmark for the atomistic study of chemical adsorption to carbon nanotubes walls.

#### Synthesis and Characterization of a Larger Neutral Macrocycle for Transition and Lanthanide(III) Metal Complexes

David Sarge (Alan Jircitano), Penn State Behrend, School of Science - Chemistry

Neutral macrocyclic compounds in the presence of transition metal are well known to form highly stable macrocycle metal complexes. Increasing the size of the macrocyclic compound can potentially allow larger lanthanide metals to produce lanthanide complexes. Lanthanides are highly paramagnetic, making macrocycle lanthanide complexes good candidates for contrast agents for magnetic resonance imaging (MRI). The objective of this research was to design a larger neutral complex to accommodate lanthanide(III) metal ions where previous studies had failed. The ligand is synthesized by Schiff-base self-condensation with three equivalents of 8-amino-2-quinolinealdehyde. The initial step is synthesis of 8-nitroquinaldine by Doebener-Miller reaction of 1-nitroaniline and 2-butenal. The aromatic methyl is brominated and hydrolyzed giving 8-nitroquinoline carboxylate. The nitro and carboxylate groups are reduced to amino and alcohol respectively. The alcohol is then oxidized to 8-amino-2-quinolinealdehyde. Progress toward the synthesis and characterization of the ligand precursor and the formation of a lanthanide complex will be presented.

#### Synthesis and Structural Characterization of Photochromic Platinum(II) Complexes

Kathleen Yungwirth (Alan Jircitano), Penn State Behrend, School of Science - Chemistry

Reaction of 2-aminobenzaldehyde with platinum(II) in water produces a coordination compound, [N-(2-aminobenzylidene)anthranilaldehydato-O,N,N’]chloroplatinum(II), Pt(AAA)Cl. This compound has been found to be photochromic. In acetonitrile, the solution is orange-red in the dark and purple when exposed to light. The coordinated aldehyde is displaced by the solvent in the dark and reattaches in the light. In this study, an analogous complex was synthesized with a phenolate trans to the coordinating aldehyde in order to more fully understand the mechanism of the photochromic reaction. N-(2-hydroxy-benzylidene)anthranilaldehyde was made by manganese(IV) oxide oxidation of the Schiff-base condensate of salicylaldehyde with 2-aminobenzyl alcohol. The dark purple complex, [N-(2-hydroxybenzylidene)anthranilaldehydato-O,N,O’]chloroplatinium(II), Pt(HAA)Cl, was formed from the direct combination of the ligand with dichloro(1,8-cyclooctadiene)platinum(II) in organic solvents. The ligand was characterized by IR and NMR and the photochromic reaction of the platinum (II) complexes is being investigated. The *trans* effect of platinum(II) plays a role in the rate of the photochromic reaction. The coordinated phenolate is a weaker ligand toward platinum(II) compared with the deprotonated amine of the original complex. The opposite bond (aldehyde) is stronger, making the photochromic reaction slower.

### COMPUTER SCIENCE, MATHEMATICS, AND PHYSICS

#### Wii Remote Presentation Assistant

Bridget Gutting, Jason Hallenbeck, and Christopher Pekelnicky (Gary Walker, Ronald McCarty), Penn State Behrend, School of Science - Computer Science

The Wii Remote Presentation Assistant is a prototype sensor-based system that combines the functionality of a touch screen, a presentation remote, and a screen recorder. As sensors for monitor and control activities, the system uses 1) two Nintendo Wii Remotes, 2) an infrared pen and sensor bar, 3) a Bluetooth headset, and 4) a Bluetooth enabled computer with a Microsoft Windows operating system. The first Wii Remote is used as a sensor to enable users to navigate the Windows environment at a projector screen or liquid crystal display with an infrared pen, creating an effective touch screen system. Also, a second Wii Remote, with an infrared sensor bar, can be used to interact with the Windows environment as a wireless mouse. The Wii Remote Presentation Assistant’s capture mode records video from the screen and audio from a Bluetooth microphone.

#### Annular Stagnation Flow on a Moving Cylinder

Geoffrey Sanko (Antonio Mastroberardino), Penn State Behrend, School of Science - Mathematics

In various industrial applications, fluid is injected from a fixed outer cylindrical casing onto an inner moving cylindrical rod. This scenario is particularly important in pressure-lubricated bearings. Using a similarity transformation, the Navier–Stokes equations that govern this type of flow reduce to a fourth order nonlinear boundary value problem (BVP). In this presentation, we provide an analytical solution to this ordinary differential equation using the homotopy analysis method. We compare this solution to a numerical solution obtained using MATLAB.

#### BehrendMobile

Molly Thomas, Zachary Higgins, and Oleg Solovyanov (Kenneth Miller and Charles Burchard), Penn State Behrend, School of Science - Computer Science

The market for mobile applications has grown significantly over the last few years and the time for universities to jump on board is now. Our project, BehrendMobile, will create a tool for use by faculty members, staff, and students new to Penn State Behrend’s campus.  During a student’s first year on campus, inexperience with the University makes it difficult to find the way to various locations.  This mobile Behrend application will ease the transition. The student user will have the ability to access the Penn State Schedule of Courses, University Directory, and Penn State Calendars. This will allow the user to find his/her way while remaining aware of events happening on campus. The directions functionality will be calculated by the user’s preferences including handicapped accessibility. This program will be useful to those new students who are in need of a quick answer while on the go. We built our project for the Android® mobile phones and performed extensive research on mobile applications for Android® and Apple® devices. The results produced by this project were a great deal of experience in mobile Java development as well as a useful tool for Penn State Behrend.

### ENGINEERING

#### Research Concerning the Resistance on a Sailboat Rudder

Beth Bimber (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

A sailboat’s rudder and an airplane’s wing closely copy each other in function, suggesting that the optimal shape for an airplane wing should be similar to the shape of a sailboat rudder. This research will focus on creating a computer model of an airplane wing and running simulations dealing with drag. The collected data will then be compared with actual data from an airplane wing to see if the model is accurate. The airplane wing model will then be changed into the similar sailboat rudder model, where the effects of the taper and aspect ratios on a rudder shape can then be analyzed. From this new data, the most drag resistant sailboat rudder shape can be created.

#### Pressure Sensitive UI Control

David Carley (Chris Coulston) Penn State Behrend, School of Engineering - Computer Engineering  
  
Microsoft Pressure Sensitive Keyboard (MSPSK) is demonstrated as a primary system interface; the MSPSK is a prototype keyboard developed at Microsoft Research that operates by receiving a pressure value for each key based on the user's force applied during the key press. This project extends the demonstration at ACM UIST 2009 for removing the mouse as a primary input device with the MSPSK for cursor control, window movement, and resizing. The user's input space is tiered with an abstraction hierarchy to correlate the pressure value to the depth of system control. Normal typing displays as text, a medium keystroke activates a user defined command or script, and hard typing activates applications and user defined system calls.  Continuous data is obtained and is used in contextual situations activated by certain gestures or chorded commands.  Localized input to the home keys provides features often controlled by an external mouse through mappings in the home key position for cursor functionality.  Keys are normalized in software to provide the user with an impression of linear response from the action of a key press; this is one solution to avoid the non-linear scaling of resistance from the MSPSK transimpedance sensing configuration.

#### Three Phase Motor Control Utilizing FPGA Implementations

David Carley1,  Matt Cantrell1, and Mark Gates2 (Vibhuti Davé1, Chris Coulston1 and Thomas Hemminger2), Penn State Behrend, School of Engineering - 1Computer Engineering and 2Electrical Engineering

A closed loop control for the drive of a synchronous AC three phase motor is demonstrated.  In the present embodiment, a Xilinx Spartan 6 FPGA is utilized as the control system.  The control system is composed of a direct digital synthesis (DDS) waveform generator, with a back electromotive force (emf) sensing stage for actual motor performance.  Fourier analysis of the back emf signal from the motor is taken for compensation based on actual motor performance.  Fail safe shutdown of the motor is included to halt movement upon sensing of a threshold in the motor frequency.

#### Solar Energy Simulation for use in Energy Storage Systems

Jason Cheers (Robert Weissbach), Penn State Behrend, School of Engineering - Electrical and Computer Engineering Technology

The purpose of this experiment is to analyze actual measured solar energy data to estimate and simulate patterns in solar energy over the course of a year. The analysis has been carried out using two different methodologies. The first methodology uses a cumulative probability density function using random values to determine solar energy. The second methodology employs a state transition matrix that uses the prior energy value to determine the next energy value. The first technique produced solar energy patterns that closely resembled the measured data, proving that the technique is a viable option for simulation. The state transition matrix was a promising technique (having been used successfully in the generation of wind simulations), but due to the low number of data points in the measured data, it did not produce accurate results. The conclusions for the progress made so far are to use the cumulative probability density technique and work towards integrating it with wind power simulations for energy storage requirements.

#### Heat Transfer Analysis Using Electrical Analogies and Software Application

Dane Clark (Bob Edwards), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

Heat Transfer analysis is a complex process that can be represented through many medians. The typical equations of heat transfer analysis can be rather complex and tough to understand; however, these equations can be broken into pieces. This is where the relationship between Fourier’s Law and Ohms Law becomes evident. This project looks at one- and two-dimensional heat transfer through parts such as heat sinks. Using the thermal resistance equations one can create a circuitry model of the complex structure. Once this model is designed it can be analyzed in electrical programs such as Orcad. This project looks at not only the ambiguity of the equations, but the software relating the two methods. ANSYS analysis was used to represent the Fourier’s Equation and Orcad was used for the resistance circuit analysis. This creates the ability to relate heat transfer to different groups of engineers, specifically mechanical and electrical. This comparison shows the different way to model heat transfer problems, along with the accuracy and simplicity of the analysis.

#### Condition Monitoring for Round Ceramic Inserts Using Acceleration Data

William Kilmer and Justin Milner (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

In order to automate machining operations it is necessary to develop a robust tool condition monitoring technique that can monitor round ceramic inserts. Round inserts are becoming increasingly more popular than square inserts for milling operations where sharp corners are not needed, such as face milling and deep pocketing maneuvers. In addition, ceramic inserts have a tendency to chip, which may lead to workpiece damage or catastrophic failure of the tool. Therefore, a monitoring technique must be able to track the wear of the insert and chipping that may occur during machining operations. In this paper, a tool-monitoring strategy for round ceramic inserts is presented based on the Fourier transform and statistical analysis, using a low-cost piezoelectric triaxial accelerometer. To ensure reliability of this technique, tool wear life tests were conducted at various cutting speeds and using coated and uncoated ceramic inserts.

#### Improved Calibration Technique for Very-Fast Transmission Line Pulsing

Gerardo Ruiz (Kathleen Muhonen), Penn State Behrend, School of Engineering - Electrical Engineering

Very-Fast Transmission Line Pulsing is currently being used for the design and development of on-chip circuits to protect against electrostatic discharge (ESD) events. This technique uses fast pulses of 5 ns or less to mimic certain characteristics of those ESD events. With any measurement system, a calibration process is needed to extract information at the location of the device under test. During calibration and measurements, high speed oscilloscopes are used to measure the incident voltage, the reflected voltage, and the current pulses. The present calibration techniques capture both pulses at the same time and are subject to the resolution of the channel setting on the oscilloscope. The new calibration technique adjusts the heights of these pulses external to the oscilloscope to allow a smaller gain setting to be used on each channel. This captures the data in a “magnified” fashion and makes better use of the eight bits of resolution capability of the oscilloscope. Statistical analysis confirms that noise reduction is possible. Resulting I-V characteristics for a simple resistor are compared using the old and new techniques to visually display the noise reduction of the new technique.

#### The Effects of Geometric Imbalances in Multi-Head Extrusion Blow Molding Tooling

Trevor Sepich and Jessica Patz (Jonathan Meckley), Penn State Behrend, School of Engineering - Plastics Engineering Technology

Using a six-drop multihead extrusion manifold design common to the industry, samples of parasin flows will be taken and weighed. This is all done to analyze the geometric imbalances inside of a multihead extrusion manifold. The results will then be compared to flow results from Polyflow extrusion simulation software. The goal of this is to understand the flow imbalances and if flow simulation software can be used to compensate for them before any money is spent cutting steel.

#### Parametric Effects of DC Current Application on Friction Welding of 6061 Aluminum

Derek Suen (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

Friction welding is a process that has steadily improved in efficiency, but remained essentially unchanged. Materials are able to be joined with great speed and quality, but high axial forces necessitate the use of bulky machinery. Electrical current flow through metals has been shown to increase material ductility and formability. It is surmised that the increased plasticity that is affected through this application will provide reduced axial force for a weld with similar mechanical properties to a weld without current application. The effect of DC on an in-process direct-drive friction weld event will be studied. Baseline welds of 6061 Aluminum rods will be processed at a series of conditions. Current at varying densities will then be passed through identical samples during the heating, then forging phases of welding, and the effects of varying process parameters through the same series of conditions will be studied. These parameters will include the standard welding variables of surface velocity, heating and forging pressure, as well as current density. Axial force and weld temperature data will be compared to non-electric runs. Current measurement will provide results concerning energy requirements. Material strength testing will give an overview of the mechanical effects of parameter modulation.

#### Transmissibility of IEEE 802.15.1 – Compliant Radio in Machining Enclosures in Industrial Environments

Derek Suen1 (Richard Sowles2, David Loker1, and Kathleen Muhonen1), 2HEIDENHAIN Corporation and 1Penn State Behrend, School of Engineering - Mechanical Engineering

Wireless sensors used in plant floor environments have been studied for obstruction and multipath propagation effects on signal quality. The trend towards wireless industrial data networks motivates this study, which explores the use of IEEE 802.15.1 radio in machine and welding shops when the equipment is in operation. Previous studies have investigated the use of a wireless sensor embedded in a rotating tool holder to monitor tool life. In order to obtain information furthering enclosure design and correct shop floor placement, a Roving Networks RN-41 Class 1 Bluetooth 2.1 module will be placed in a sealed, non-shielded container within several CNC machining enclosures, at varying table position and height. An exterior module will receive data from the enclosed unit, and will also vary its position in 3-space. Bit Error Rate and Received Signal Strength will be measured, and the effects of spatial obstruction and multipath propagation will be analyzed. An Agilent 8563E spectrum analyzer equipped with an Aaronia HyperLOG 7060 EMC antenna will repeat measurements at all points to provide EMI channel characterization and a redundant source of signal power data for comparison.

### HISTORY AND PHILOSOPHY

#### Organized Crime, Al Capone, and Their Impact on Society

Mary Halpainy (John Rossi), Penn State Behrend, School of Humanities and Social Sciences - History

Al Capone was one important symbol of the Roaring Twenties with its glamorous criminal bootleggers.  Capone and other gangsters, as newspaper and journal articles of the time show, were very public criminals.  For over a decade, as Capone's history shows, he was able to conduct his operations with impunity.  My research shows why Capone, and various other members of organized crime were able to escape conviction for their many crimes and instead were convicted on federal income tax charges, instead of the more nefarious crimes that they committed.

#### Family Values and Relationships across Cultures

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Perspectives on family responsibilities differ from culture to culture. For example, many Western philosophers argue that grown children do not “owe” their parents anything in return for the costs involved in raising them. By contrast, it is not uncommon among non-Western cultures to believe that grown children have filial obligations to their parents. My research examines the extent to which familial responsibilities are culture-specific. I argue that the appearance of disagreement between cultures on this issue is misleading. First, certain goals and responsibilities seem to be so central to parenting as to be universal; different cultures may accept different parenting practices but parents seem to share some common goals, such as creating responsible, self-sufficient persons. Second, I argue that Western philosophers who deny that children have filial obligations are correct but that this perspective is also found in non-Western cultures. To make these arguments, I draw on my own experiences as someone who spent considerable portions of his childhood in India, Britain, and the United States and who was exposed to multiple cultures’ beliefs about parenting.

### PSYCHOLOGY

#### Investigating True and False Confessions in Regard to Interpersonal versus Extrapersonal Influences in Criminal Interviews

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Previous research has shown that participants are more likely to give false confessions when criminal interview techniques such as minimization (i.e. making a suspect’s crime seem less serious) are paired with a deal (i.e. an opportunity to confess in return for an avoidance of more serious punishment). However, there is no research literature on whether the likelihood to give a false confession could be influenced by the interpersonal pressure to confess before an accomplice. This study will seek to add to the literature by studying whether participants’ rate of false confessions can be influenced by this form of interpersonal pressure when compared to the type of pressure brought about by the extra personal influence to confess before a crime is reported to an authority figure. The current study had participants placed in situations where they could be considered ‘guilty’ or ‘innocent’; and they were accused of the “crime “of collaborating on problems with a confederate they were told to do by themselves. The experimenter then tried to elicit a confession while also using additional methods (i.e. minimization and deal). The rate of both true and false confessions will be compared and results and implications for criminal interview techniques will be discussed.

#### Gender and Relational Aggression Influences on Sarcastic Prosody

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Sarcasm is a commonly used form of communication, in which there are consequences of not being able to understand the multiple meanings of the sarcastic statement. In previous work, those high in relational aggression (RA) showed different patterns of ERPs when reading scenarios where close friends used sarcasm. In the current study, ERPs were recorded while participants listened to words spoken in either a sarcastic or sincerely prosody. Participant sex and self-reported RA were both predicative of responses. The sarcastic prosody took longer to judge than the sincere. Women tended to be more accurate overall than men. Those with higher scores on a self-reported measure of RA showed overall higher accuracy to sarcastic prosody. However, this difference was carried primarily by the men since men with low RA showed relatively poor performance in comparison to high. For women both high and low RA individuals showed high accuracy. The patterns of ERPs suggested that sex differences emerged in the earlier bins and differences in relational aggression emerged much later from 800-1200 ms post stimulus onset.

#### Spatial Skills: The 3D World of Possibilities

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Interdisciplinary teams of psychology and engineering students joined forces to improve spatial skills in students. Spatial reasoning is a critical cognitive component of engineering graphics, and unfortunately students come into college with widely varying skill levels. Previously developed games were used with college students intending to major in engineering that were enrolled in the first-year graphics course. The college students participated in a 1 credit supplemental course focusing on spatial skill development. At the beginning of the class, the students completed a series of spatial tasks, including mental rotation and the water level task. During the class, they completed visualization software, workbook problems, and hands-on spatial games. The students were retested at the end of class, and comparisons of pre-test and post-test scores were analyzed. In a second project we examined the influence of stereotype threat on mental rotation. We compared spatial performance with either a male or female experimenter. Participants were either given directions that explained that men are better than women or that women are better then men at mental rotation. We hypothesized that when women are in the presence of a positive female role model, they will be buffered against the adverse effects of stereotype threat.

#### The Effects of Stress on College Athletes

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Students experience stress on different levels, whether it be in academics, sports, or in the social scene. The newfound responsibility for college students’ lifestyle, work ethic, resource use, and choices of social partners in addition to academic demands is well managed by some and staggering to others. Approximately 200-250 Penn State Erie students participated in the study. The purpose of this study was to evaluate the effects of stress on college athletes versus non-college athletes. We hypothesized that participation in a college athletic sport induces stress levels in college students compared to non-participants. We also predicted that other stressors in college, such as family life, social activity, schoolwork, and employment play a role in increasing stress levels. Results of this study regarding effective ways to manage high levels of stress will help further the knowledge of college student athletes and coaches regarding managing high levels of stress. An additional benefit of this study is to bring awareness to the college community regarding the levels of stress in college athletes.

#### Stereotyping in Vocal and Electronic Communication

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Stereotypes are pervasive in social interaction. Electronic communication, a form of socialization, is growing rapidly throughout the world and little research has been conducted on its overall effects. Thus, we investigated stereotypes using electronic communication and vocal communication to see if there was any significant difference. We used a computer-based survey and a verbal survey along with picture identification methods to elicit stereotypes in order to see where they are more prevalent in one condition or the other. We found that there was no significant difference between the two conditions, but female stereotypes were rated higher in strength than male stereotypes. The increasing use of technological forms of communication may have the potential to increase stereotyping. We hope to educate people of this upward trend, therefore reducing the negative impact of stereotyping.

#### Buttressing Categorization, Refuting Differences of Interference

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Current research in this field indicates a marked decrement in performance on recall tests for forward, reversed, and foreign speech. However, studies on recall of intermittent native speech, such as bad reception on a cell phone call, are conspicuously absent. The design of this study was a 2 x 3 mixed factorial. Each participant was given both categorized and non-categorized word lists to memorize, while each participant was randomly selected to be in a continuous, intermittent, or control group with regard to nature of interference. A categorical effect was found, with categorized words remembered better. However, no significant difference was found between the continuous, intermittent, and control sound conditions. The results reinforce past research findings concerning auditory distraction research in that any sound is disruptive to focal tasks.

#### Developmental Differences in Mathematical Learning Aided by Embodiment through Gesture

Janice Jerome, Leyna Grove, and Danielle Wilson (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Math education is an important part of American education; however, American children seem to be falling short of their foreign peers. This study will investigate how gesture affects math performance. Participants will be exposed to pre- and post-testing with a math lesson in between containing one of three conditions: gesturing, no gesture, and partial gesture. It is anticipated that students in the gesturing condition will show the greatest improvement on performance.

#### Personality and Morality: What’s the Connection?

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This study examined the connection between participants’ moral judgment type and their personality. We tested to see if there is a connection not only with personality and morality type, but if moral judgment types are associated with certain personality types. This was done using the Big Five theory of personality traits, specifically using the 40 question “Mini-Marker” and a series of moral dilemmas, along with a detailed demographic questionnaire. We hypothesized that individuals with similar moral judgments would share certain personality characteristics. Though the results did not support our hypothesis, the data suggested that participants who chose a higher number of self-serving moral judgments and those who chose more answers absent of moral judgment scored lower on agreeableness.

#### Youth Voice Project

Abby Zehe, Janice Jerome, Danielle Wilson, Jacyln Stottlemyer, Katie Van Epps, Tom Weir, and James Heubel (Charisse Nixon), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Bullying and harassment are the most common and potentially most dangerous forms of school violence. Bullying is a social process that involves a victim, bully, and bystanders who all are responsible for the outcome. Bystanders, or other peers, are able to have a significant impact on the act of bullying. The bystanders have the power to intervene, therefore stopping the bullying from occurring. Social support has been found to reduce the negative effects of bullying. A large-scale survey has been designed and administered to help find the most effective strategy. Once all of the data are collected it will be analyzed using descriptive and inferential statistics. Preliminary results indicate that victimized students benefit from bystander strategies that access support (e.g., talked to my friend, told a teacher) and not from bystander strategies that highlight direct confrontation (e.g., told them to stop). Results from the survey will find the most useful strategy to reduce effects of bullying.