

# PENN STATE BEHREND - SIGMA XI

***2013***

***TWENTY-SECOND ANNUAL***

***UNDERGRADUATE STUDENT RESEARCH***

***AND***

***CREATIVE ACCOMPLISHMENT CONFERENCE***

***ABSTRACT BOOK***

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*(Contains proprietary information – no abstract included)*

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Erin Witmer (Ronald Kelly), Penn State Schuylkill – Administration of Justice

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Matthew Campbell, George Gotsiridze, Shane Shafferman, and Robert Steiner (Matthew

White), Penn State Behrend – Game Development

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Joel King (Robert Weissbach), Penn State Behrend – Electrical Engineering

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Christopher Leasure and Daniel Gorajewski (Robert Edwards), Penn State Behrend – Mechanical Engineering

[**A Macro-View Controller for a Multilayer Geographical Information System**](#Pocratsky)David Pocratsky (Xiaocong Fan), Penn State Behrend – Software Engineering

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Brandt Ruszkiewicz1 (Antonio Mastroberardino2), Penn State Behrend, 1School of

Engineering and 2School of Science – Mechanical Engineering

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Pat Scullion and Pat Mannella (Jonathan Meckley), Penn State Behrend – Plastics

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Bryan Smith (Xiaocong Fan), Penn State Behrend – Software Engineering

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Carissa Stanko1 (Paul Ashcraft2), Penn State Behrend, 1School of Engineering and

2School of Science – Mechanical Engineering

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(Dawn Blasko and Heather Lum), Penn State Behrend – Psychology

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Michelle Evan (Dharma Jairam), Penn State Behrend – Psychology

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Kazmerski), Penn State Behrend – Psychology

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[Impact on Your Opinions?](#Shaffer)

Shannon Shaffer (Gerard Barron and Melissa Heerboth), Mercyhurst University –

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Alicia Carrol, Jessica Salley, and Lindsey Fuller (Carol Wilson), Penn State Behrend – Psychology

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**WINNER** - [**Sarcasm in the Workplace**](#Marsh)

Katey Marsh, Margaret Eimers, and Wei Wang (Victoria Kazmerski, Dawn Blasko,

and Sharifah Sheik Dawood), Penn State Behrend – Psychology

**RUNNER-UP -** [**Gender Stereotyping: How Group Compositions Influence the Judgment of Others**](#Robson)

Kristen Robson (Melissa Heerboth), Mercyhurst University – Psychology

[**Does Spirituality Lessen the Negative Effects of Anxiety on Cognitive Performance?**](#Vinion)

Sherrie Vinion and Will Dorsch (Victoria Kazmerski), Penn State Behrend –

Psychology

## Oral Presentations

### BIOLOGY: ECOLOGY

#### Detection of Alarm Substance Produced by Dugesia dorotocephala and Heterospecific Predation Detection with Dugesia tigrina

Stephanie Case and Shane Duda (Simon Beeching), Slippery Rock University - Biology

Aquatic organisms have evolved in a way that allows many of them to use injury-released chemical cues from conspecifics to detect predation. Animals responding to this type of risk factor have a higher probability of survival than animals that do not. Flatworms (P. Platyhelminthes), with their primitive ladder-type nervous system, are among the simplest animals known to respond to chemical cues. In this experiment, the flatworm *Dugesia dorotocephala* (black planaria), was studied in order to determine if this species responds to chemical cues from injured conspecifics. Using a macerated planaria as a stimulus, it was confirmed that black planaria will actively avoid an area of stimulus injection. In a second experiment, a heterospecific alarm cue, *Dugesia tigrina* (brown planaria), was introduced to black planaria to determine if chemical cues from a related species can elicit the avoidance response. This ability would indicate how these species may interact with one another and their environment. The results did not suggest that black planaria respond to the chemical cues of brown planaria. Further experimentation using brown planaria as subjects and black planaria as the stimulus may justify the outcome of this research.

#### A Census of the Bat Population on the Campus of Gannon University

Jenny Hess, Liz Rula, and Hannah Smerker (Steve Ropski), Gannon University – Biology

For the past three summers a census of the bat population has occurred on the Gannon University campus in Erie, Pennsylvania. The numbers for the first two years have held relatively steady, while this year’s data is currently being analyzed and will be compared to the previous two years during the presentation. White Nose Syndrome was first reported in 2006 in a cave in New York. The disease has killed an estimated 5.7 million bats in the eastern United States since then and has spread throughout Pennsylvania and into northeastern Ohio. This fungal infection has killed 95% of bats in some caves and may result in the listing of three bat species as endangered in Pennsylvania, including the little brown bat (*Myotis lucifugus*), the predominant bat on the Gannon campus. This study will compare yearly data by building, time of year, building side, and species composition to determine trends and whether White Nose Syndrome has affected the Gannon campus bats. A decrease in numbers may be partially responsible for an increase in West Nile Virus in the area. The results will also be used to place bat houses at appropriate locations to encourage bat presence on campus.

#### A Comparison of the Microfloras Found on House Wren and American Kestrel Eggs

Emily Hyde and Holly Pier (Beth Potter and Margaret Voss), Penn State Behrend, School of Science – Biology

It is generally accepted that avian eggs acquire a microflora during ovipositioning. The exact composition of the microflora is only beginning to be explored and is likely to vary amongst different species based on environmental parameters, nesting habitats, and incubation behavior. The goal of this study was to identify and compare the egg microflora of two local birds, house wrens and American kestrels. The nesting habitats and incubation behavior are different between these two birds. For instance, house wrens build their nests from twigs, grass, leaves, and feathers, while American kestrels use tree cavities and do not utilize any external materials. Both birds exhibit intermittent incubation; however, kestrels show a more pronounced asynchronicity in hatching. To determine the bacterial populations on the eggs of these birds, eggs were swabbed at different times throughout incubation, grown on nutrient agar, and identified based on sequencing of the 16S rRNA gene. The results show that house wren eggs are dominated by bacteria within *Pseudomonas*, *Stenotrophomonas*, and *Curtobacterium* genera. While bacteria within these genera can be found on kestrel eggs, these eggs were predominantly populated by bacteria within the *Staphylococcus*, *Enterobacter*, and *Arthrobacter* genera.

#### Water Fluoridation in Meadville, PA: How Film Can Help Accomplish This

Megan King (Caryl Waggett), Allegheny College – Environmental Studies

When it was discovered in the early to mid 1940s that there was a positive correlation between increased fluoride amounts in drinking water and better dental health of a population, there was a movement towards fluoridation of public water systems. As of 2010, 72.4% of the U.S. population consumed fluoridated drinking water. The topic of water fluoridation, however, has been a controversial topic. Water fluoridation challenges the public’s right to choice. Despite positive endorsements that water fluoridation has achieved, skepticism remains. In the 1960s, Meadville, Pennsylvania, had a very public fluoridation conversation, which ultimately ended in the public water supply not being fluoridated. Because of this lack of exposure to fluoride, the children in Meadville are placed at unnecessary risk. This risk comes from the lack of exposure to fluoridated water in combination with limited access to preventative dental care. In turn children’s oral health suffers. With access to fluoridated water, children of Meadville would face less pain correlated with their oral health. It is critical for Meadville community members to recognize what is at stake with regards to not providing families with fluoridated drinking water. It is critical to ask, how can the Meadville community best understand the benefits that would be gained via public water fluoridation. Ultimately, this question is answered in the form of a video.

#### The Active Ingredient in Antidepressants Acts Synergistically with Other Chemicals to Influence Levels of the Fecal Indicator Bacteria E. coli in Recreational Freshwaters

Surafel Mulugeta, Eric Clark, and Christina Vojtek (Steven A. Mauro), Mercyhurst University – Biology

Fluoxetine is the active ingredient in antidepressant drugs and has been shown to accumulate in recreational waters at levels that have the potential to negatively impact aquatic organisms including fish, algae, and crustaceans. However, the impact of fluoxetine on aquatic microbes remains poorly understood. In this study, we utilized ELISA, spectrophotometry, and microbial plating approaches to examine how fluoxetine influences *E. coli* levels in the recreational waters of Presque Isle State Park in Erie, Pennsylvania. Our results demonstrate that fluoxetine is present in these waters and can decrease *E. coli* levels through a DNA damage dependent pathway. Moreover, we found that fluoxetine can act synergistically with triclosan, a personal care product chemical also found in Presque Isle beach waters, to reduce *E. coli* concentration. Since *E. coli* is used as an indicator of freshwater quality, the presence of fluoxetine in aquatic ecosystems can influence how water management decisions are made.

#### Microbial Influence on the Persistence of Shiga Toxin Producing E. coli in Presque Isle Recreational Water

Hannah Opalko and Kyle Lindsay (Steven Mauro), Mercyhurst University – Biology

Shiga toxin producing *E. coli* (STEC) infects over 60,000 people in the United States annually, with symptoms ranging from mild diarrhea to death. Water has been identified as a major reservoir for the transmission of this bacterial pathogen. STEC has been detected in a number of aquatic ecosystems, including the beach waters of Presque Isle State Park. The presence of STEC in Presque Isle and other water sources is sporadic, and examination of factors that govern the emergence and persistence of STEC in water are lacking. In this study, we co-incubated STEC or non-STEC bacterial strains with grazing protists in Presque Isle beach water. Using quantitative PCR and microscopy approaches to identify microbes, we demonstrate that protists play an important role in removing STEC from an aquatic environment. However, we find that STEC strains are more resistant to protist grazing compared to non-STEC strains. Our results highlight the importance of the microcosm in modulating the persistence of bacterial pathogens in aquatic environments.

#### Microbial Hazards on Fresh Fruits and Vegetables: An Assessment of Produce Risk and Market Stereotypes

Adam Ryzinski, Lismari Reyes Munoz, and Megan Kelley (Davison Sangweme), Penn State Behrend – Biology

Our immune system is threatened daily by the foods we consume. The general lay person may fully comprehend the value of fresh fruits and vegetables as part of a healthy diet (i.e. raw vitamins and fiber), but there is little appreciation of potential microbial threats from these foods. Many do not consider the risks accumulated between farm and fork. Produce can be contaminated beginning with microbes in soil, progressing to harvesters, packers, transporters, stock boys, and storage. The general population bases cleanliness of produce on visual inspection and shop location and branding. This study focused on raising public awareness of the microbial risks posed by fresh produce, particularly ones consumed raw such as cherry tomatoes, grapes, and strawberries. Identical products from different markets broadly described as A) high-end grocery store B) mass transit grocery store, and C) well-known, corner-stand farmers’ market were procured and microbes grown from them using standard protocols. It was hypothesized that microbial abundance and variety would be lightest in market A, increased in market B, and highest in market C. Using standard laboratory protocols, all markets produced similar abundance of harmful bacteria such as *Escherechia coli*, MRSA, and *Enterobacter* *aerogenes*. Further research is currently being run to test the efficacy of different cleaning methods in reducing microbial loads.

#### Monitoring Hawaiian Spinner Dolphin Presence in Hawaiian Island Bays to Discern Seasonal and Diel Patterns of Behavior

Sara Schombert1 (Heather Heenehan2 and David Johnston2), 1Allegheny College, 2Duke University Marine -Lab – Marine Biology

Dolphins may have regular behaviors based on the season and time of day. Dolphin vocalizations may be recorded and analyzed to suggest behavior patterns and interpret them in the context of potential causes. For this project, spinner dolphin (*Stenella longirostris*) sounds were recorded in four Hawaiian Island resting bays. Audio data has been compiled and analyzed via spectrogram to determine at which time of day and during which parts of the year dolphins are most active. Photo identification will be used to complement audio data. Data (to date) indicate that dolphins tend to vocalize most frequently between the hours of 5:00 and 9:00 a.m. (Seasonal patterns are not yet available.) Information gained from this research contributes to a standing project called Spinner Dolphin Acoustic Population Parameters and Human Impacts Research Project (SAPPHIRE).

#### Effects of Arbuscular Mycorrhizal Fungi and Plant Growth Promoting Bacteria on Phytoremedial Activity in Helianthus Annuus in Lead-Polluted Soil

Sara Schombert (Catharina Coenen), Allegheny College – Biology

Lead pollution is prevalent in mining, industrial, and even residential areas. Phytoremediation is a method of using plants to remove pollutants, including heavy metals like lead, from soils. Certain fungi and bacteria which live on the roots of plants can help the plant to uptake a greater amount of pollutants. In this study, *Helianthus annuus* sunflowers were grown in the presence of 400 ppm lead (as PbNO3). The experiment was designed to investigate whether plants with arbuscular mycorrhizal fungi plus growth-promoting *Pseudomonas fluorescens* bacteria would take up more lead than plants with only one soil organism or neither. Plants with no soil organisms on the roots take up the least lead, but plants with one or both organisms on the roots take up similar amounts of lead. (Data have been produced but statistical analyses are still being run to discern trends.)

#### Evidence of Diet-Related Phenotypic Plasticity in the Pharyngeal Apparatus of Round Gobies (Neogobius melanostomus)

Matthew Shadle, Julie DeDionisio, and Noelle Blank (Greg Andraso), Gannon University – Biology

Round gobies (*Neogobius melanostomus*) shift their diet from arthropods to dreissenid mussels as they grow, and this diet shift is correlated with developmental changes in pharyngeal structures. Changes in the pharyngeal apparatus may cause gobies to switch from arthropod to dreissenid prey. Alternatively, the dietary switch may drive pharyngeal remodeling. To test the possibility of phenotypic plasticity (i.e. that diet influences pharyngeal morphology), we compared food habits and pharyngeal morphology of round gobies from two distinct populations: Presque Isle shipping channel (“dreissenid-rich” location) and Fairview gravel pit (“dreissenid-absent” location). If the pharyngeals are phenotypically plastic, we would expect to see less robust structures in round gobies from the gravel pit, compared to those from the shipping channel. Dreissenids were abundant in the shipping channel and composed nearly the entire diet of round gobies collected there. In contrast, dreissenids appeared to be absent in the gravel pit, and round gobies collected there contained a variety of arthropods along with some small gastropod mollusks. Analyses of the pharyngeals of fish from the two sites suggest differences in morphology that are consistent with phenotypic plasticity.

### BIOLOGY AND GENETICS

#### Genetic Influences on Posterior Lobe Development in Drosophila

Aaron Haag (Brad Hersh), Allegheny College – Biology

Studying developmental genes is important for understanding evolutionary adaptations between similar species. The posterior lobe, a projection on the lateral plate of the male genitalia of *Drosophila melanogaster,* provides us with a good model for understanding how these types of genes may have changed in evolutionary history. The only phenotypic difference between four closely related species of *Drosophila* is the posterior lobe, providing a novel difference to study. Posterior lobe shape appears to be affected by multiple quantitative trait loci (QTLs), each producing small alterations to the overall size and shape among species. We used RNAi knockdown of candidate genes to decrease expression levels specifically in the developing genital disc of flies and to determine the effect on lobe shape and size. We dissected the lobes and used morphometric analysis to understand how each gene affects the development of the posterior lobe. In addition, we used *in situ* hybridization to determine the expression patterns of these genes over a 16-hour window of pupal development.

#### Determining the Roles of Innexin 2 and 5 in the Drosophila melanogaster Immune System

Max Hennessy (Brad Hersh), Allegheny College – Biology

Gap junctions are direct physical connections between cells that are involved in a variety of processes such as signal propagation, electric impulse transduction, embryonic organization and morphogenesis, and immune response. A recent global RNAi screen identified two *Drosophila* gap junctions genes, innexin5 and innexin6, that impaired the host immune response to gram-negative bacterial infection when knocked down. Based on these results, we hypothesized that innexins would be present in the hemocytes and would be necessary for the proper immune response to bacterial infection. To test this hypothesis, we altered the expression levels of innexin2 and innexin5 specifically within the hemocytes. We then subjected the altered flies to infection with the gram-negative bacterium, *Serratia marcescens*, for 10 days. The survival rates of these flies were recorded daily and were compared to the survival rates of wild-type flies and the positive control, kenny.

#### Expression of Genes Involved in the Regulation of the Intrinsic Apoptotic Pathway in IRBP-/- Mus musculus

Linnea Homa (Christine Donmoyer), Allegheny College – Biology

Apoptosis, or programmed cell death, is a vital process for proper development of tissues, but can have detrimental effects in adult neuronal tissue. Mice deficient in interphotoreceptor retinoid-binding protein (IRBP-/-) experience photoreceptor apoptosis starting around 18 days after birth (P18), and by P30, 50% of their photoreceptors have died. The purpose of this study was to investigate whether two genes (pro-apoptotic, Bax, and anti-apoptotic, Bcl-2) are involved in retinal apoptosis in IRBP-/- mice. These genes are important regulators of photoreceptor cell death in mice overexpressing Bcl-2 and mice deficient for Bax. To investigate the role of these genes in 23-day-old (P23) IRBP-/- mouse retinas, relative gene expression was measured by quantitative PCR and compared with age-matched C57BL/6 (wild-type) mice (n=3). DNA fragments were observed on a 1.2% agarose gel at P15, P23, and P27. I hypothesized that there would be increased expression of Bax and decreased expression of Bcl-2 in the retinas of the IRBP-/- mice compared to wild-type mice. Results of this study showed that there was not a significant difference in expression between strains for either apoptotic gene, indicating that at P23, the two genes are not regulating this stage of apoptosis in the IRBP-/- mice.

#### Convergent Evolution of the Biosynthetic and Metabolic Pathways and Divergent Evolution of the Genomic Architecture of Two Distinct Scale Insect Endosymbionts Tremblaya princeps and Tremblaya phenacola

Joshua MacCready (Matthew Gruwell), Penn State Behrend – Biology

Mealybugs (Coccoidea: Pseudococcidae) are exclusively phloem-feeding scale insects that have developed an intracellular symbiosis with microorganisms to supplement their nutritionally deficient diet. Since the phloem sap is amino-acid poor, the mealybugs employ a unique endosymbiosis with its obligate internal bacteria. Genomic work on the symbionts of sap-feeding insects has clearly shown that essential amino acid production is the primary nutritional role of these intracellular bacteria. *Planococcus citri* is a member of the subfamily Pseudococcinae, where most members contain two nested obligate endosymbionts, the only known prokaryote-prokaryote intracellular symbiosis. The endosymbiotic host is the β-proteobacterium *Tremblaya princeps*. Living inside of it is the γ-proteobacterium, *Moranella endobia*. The fully sequenced genome of *Tremblaya princeps* is 138,927 BP in length, contains 160 genes and no functional tRNA synthetase genes. The genome of *Moranella* is 538,294 BP in length, contains 481 genes and provides translational machinery to *T. princeps*. *Phenacoccus madeirensis*, a close relative to *P. citri*, recently was determined to only contain the β-proteobacterium *Tremblaya phenacola*. Although, closely related to *Tremblaya princeps*, transmission electron microscopy has confirmed that *Tremblaya phenacola* does not have the internal or external influence of the second endosymbiont, *Moranella endobia*. The complete genome sequencing, assembly and annotation of *T. phenacola* has elucidated a rare case of metabolic and biosynthesis convergence while exhibiting an extreme divergence in genomic architecture between two distinct endosymbiont systems.

#### The Toxic Effects of Flame Retardants: The Gene Expression Study in Elucidating Their Carcinogenicity

Alexandra Mastro, Ali Al-Dhumani, and Sajaad Al-Dhuman (Mary Vagula), Gannon University – Biology

Polybrominated Diphenyl Ethers (PBDEs) are flame-retardants widely used in many commercial products, including building materials, electronics, furnishings, motor vehicles, airplanes, plastics, polyurethane foams, and textiles. The specific toxic action is unclear, however it’s proven that PBDE’s can cause serious damage to the nervous, reproductive, and endocrine systems. In addition, the Environmental Protection Agency (EPA) has placed PBDEs as a class of possible carcinogens. Out of 209 possible congeners this study focused on BDE-209 and BDE-85.BDE209 is one of the most abundantly used flame-retardants worldwide and BDE-85 is one of the most toxic congeners of this class. Reports have shown increased tumor formation in animals exposed to large amounts of PBDE’s, however little information is available on these compound’s effects on cell division, apoptosis, and their link to cancer. This study is investigating the expression of genes involved in apoptosis, DNA repair, cell cycle regulation, and their role in cancer. The experiment targeted human umbilical vein endothelial cells to not only reveal the toxic effects of PBDE’s and their role in cancer, but also give new insights into how fetuses might be exposed to higher levels through mother’s circulations via damaged umbilical vein endothelial cells.

#### Biofilm Formation in Wild Type and Mutant Haemophilus ducreyi

Erin Nawrocki (Tricia Humphreys), Allegheny College – Microbiology

*Haemophilus ducreyi* is the etiological agent of chancroid, a sexually transmitted genital ulcer disease. Although biofilm formation has never been described in the species, *H. ducreyi* is known to form microcolonies, which are precursors in the formation of biofilms. This study demonstrates that increasing the concentration of fetal bovine serum in liquid cultures increases bacterial adherence. Confocal microscopy further reveals that *H. ducreyi* forms biofilm structures with a mean depth of 11.8 ± 3.1 μm. Isogenic mutants of the *flp* and *ftpA* genes in *H. ducreyi*, which encode fimbriae- and pili-like proteins, respectively, show significantly decreased adherence. Evidence also suggests a role for the CpxRA two-component regulatory system in biofilm formation in *H. ducreyi*, with a *cpxA* mutant showing, on average, 86% less adherence than thewild type. Finally, a substantial difference in biofilm formation is noted between the two classes of *H. ducreyi*. Class II *H. ducreyi*, which has a truncated LOS that is unable to be sialylated, is impaired in adherence and depth relative to class I. These data are indicative of biofilm formation via an *flp*- and *ftpA*-dependent mechanism in *H. ducreyi*. A role for sialylation of the LOS in biofilm organization is also possible.

#### Genetic Analysis of Deer Dispersal Patterns through Mitochondria DNA sequence

 Jedediah Seltzer, Alex Rankin, Daniel Ackerman, Bethany Lashbrook, and Erin Eperthener (Fred Brenner) Grove City College – Molecular Biology

The white tailed deer (*Odocoileus virginianus*) is the most abundant ungulate in the eastern United States and understanding deer dispersal patterns is important for managing this species, especially in urban environments. Previous studies suggest that male white-tailed deer are responsible for the genetic variation in the species. By sequencing the non-coding mitochondria displacement region (D-Loop), haplotypes were assembled from these sequences and the nucleotide diversity and Fst values of the sequences were calculated. Using haplotype and diversity measurements maternal lineage, phylogenic trees were constructed to determine local deer dispersal patterns. In this study, samples were obtained from the Dayton Ohio Metropark system, Mercer County Pennsylvania, and Presque Isle State Park in Erie, Pennsylvania. Each of these sampling regions represents unique habitats ranging from rural, agricultural settings to urban parks surrounded by high density housing. Current results suggest that deer dispersal is affected by habitat and surrounding land use. Haplotype mapping of 80 sequences produced 22 haplotypes within the three regions. Several haplotypes are present in multiple regions suggesting common ancestry. Preliminary results suggest that migration between deer from Mercer County, Pennsylvania, and in Dayton, Ohio, occurs at a higher rate than migration between Presque Isle and the surrounding area.

#### Treatment of Potato Tubers with the Varying Concentrations of Sprout Inhibitor 1,4-Dimethylmaphthalene (DMN) Alters Tissue Residue Levels

Leah Wolfe and Rebecca Hyde (Michael Campbell), Penn State Behrend – Biology

The potato (*Solanum tuberosum*) is one of the largest agricultural commodities in the world. Potato tubers are starchy modified stems that can be stored for relatively long periods due to the development of dormancy following harvest. When dormancy ceases, potato tubers sprout and starch breaks down into sugar through a process called sweetening. The loss of dormancy in stored potato tubers reduces edibility and commercial usefulness. Sprout inhibitors such as 1,4-dimethylnaphthalene (DMN) are used to treat stored and shipped potatoes, increasing storage life. Previous results have shown that cell division repression gene, KRP1, is induced by DMN. We hypothesize that part of the mechanism action for DMN is the induction of KRP1 expression. The main focus of this analysis was to ascertain the approximate minimal DMN residue concentration needed to induce KRP1. For two days, potatoes exposed to 0.33 uL, 0.83 uL, 1.67 uL, and 2.5 uL DMN per liter air at 22 °C show a steady incline. However, the concentrations over 3.33 uL DMN per liter air level off at 6-8 ppm. Seven-day, air-dry tubers show approximately a 50% decrease of residue on their skins. Experiments will be conducted to determine how long KRP1 stays elevated after receiving the DMN minimal dosage.

#### Isolation and Characterization of Indigenous Microorganisms from Cave Soil Cultivated in an Electromagnetic Field

Aziz Yousif1 and Jingyi Zhang1 (Francis Mulcahy2 and Om Singh1), University of Pittsburgh at Bradford – 2Chemistry and 1Biology

Microorganisms that prevail in rare-earth habitats have promising biotechnological implications due to their genomic stability and ability to grow under adverse environmental conditions. In an attempt to simulate such conditions, an electromagnetic field (EF) of 100 Gauss was employed to understand better the microbial growth and metabolic cascades controlling biochemical pathways. We hypothesized that the EF would biostimulate natural microbial flora (*i.e.* Bacteria and Fungi) of mineralized caves leading to bioconversion of products of commercial significance. Three microorganisms were isolated under the EF and identified and designated as *Streptomyces sp.* -EF1, *Arthrobacter sp.*-EF2, and *Bacillus sp.-*EF3using 16S rRNA sequencing. S*treptomyces sp.* -EF1 revealed a dark brown color on nutrient agar plates resembling melanin, an ultra-violet protectant and antioxidant. The presence of melanin was confirmed by the formation of a dark brown color on L-tyrosine supplemented nutrient agar plates and thin-layer chromatography (TLC) using synthetic melanin as a standard. The biostimulation of *Streptomyces* sp. -EF1 revealed increased levels of melanin formation in EF compared to the control (non-EF) samples in nutrient broth and other supplied carbon sources.

### BIOLOGY: Neuroscience

#### The role of Innexins in Hemocytes in Response to S. marcescens Infection of D. melanogaster

Korey Bartolomeo (Brad Hersh), Allegheny College – Biology

*Drosophila melanogaster* relies on a complex innate immune response that requires the coordination of various cells and tissues to ensure proper survival of the organism. One major mode of communication is through gap junctions, which are direct connections between cells. Gap junctions are present throughout the organism, including in the hemocytes (blood cells), which are the major component of the cellular branch of the innate immune response and aid in the defense against virtually all pathogens. While gap junctions clearly function in hemocytes during immune response, it is unknown which of the eight innexin subunits encoded in the fly genome are involved. Here we test the roles of innexin 4 and innexin 6 in immune function by exposing *D. melanogaster* with altered innexin expression levels in hemocytes to the gram-negative bacterium, *Serratia marcescens* and monitoring survival rates. We also performed quantitative RT-PCR to ensure fly lines had desired innexin expression levels in hemocytes. Finally, we observed male sterility in lines overexpressing innexin 4, and dissected and stained male germlines to investigate the cause.

#### Acquistion of Plasmid Mediated Beta-Lactam Resistance in Haemophilus ducreyi

Austin Becker (Tricia Humphreys and Ann Kleinschmidt), Allegheny College – Biology

With the rapid expansion of bacterial strains resistant to multiple types of antibiotics it is becoming necessary to understand the mechanisms that allow bacteria to resist antibiotic stress and to uncover the factors that contribute to the acquisition of antibiotic resistance as well. This study seeks to explore the source of beta-lactam resistance and contributing factors allowing acquisition of antibiotic resistance in *Haemophilus ducreyi* strain HD85-023233. Previous work suggests this strain has elevated expression of Cu,Zn superoxide dismutase, which may help promote antibiotic tolerance. This study reevaluated Cu,Zn superoxide dismutase as a potential antibiotic tolerance factor. Additionally this organism has plasmid DNA which is puzzling because *H. ducreyi* as a species is believed to not be capable of transformation. This study shows the resistance of strain HD85-023233 is due to a plasmid carrying a beta-lactamase gene and HD85-023233 has three defects in its competency genes. Additionally this study compares levels of Cu,Zn superoxide dismutase mRNA for HD85-023233 relative to susceptible strain. This study shows that transformation was an unlikely contributor to the acquisition of plasmid DNA encoding resistance genes in HD85-023233 and is part of an ongoing investigation analyzing Cu,Zn superoxide dismutase as a promising factor for antibiotic tolerance.

#### A Role for Auxin Efflux in Auxin-Induced Promoter Activation?

Dana D’Amico (Catharina Coenen), Allegheny College – Plant Science

Auxin is a developmentally crucial plant hormone whose diversity of function relies on patterns of polar auxin transport (PAT) through adjacent cells. PAT is mediated by PIN efflux carrier proteins, which localize in the plasma membrane via subcellular trafficking and thereby determine the directionality of auxin flow out of the cell. The PAT inhibitor N-1-naphthylphthalamic acid (NPA) interrupts auxin efflux from cells through disruption of efflux carrier function; at high doses, NPA also blocks PIN trafficking to the plasma membrane. In the presence of exogenously supplied auxin, NPA should lead to auxin accumulation within cells and hence increase auxin-induced gene expression. However, 100 μM NPA inhibits activation of the auxin-responsive *GH3* promoter in tobacco hypocotyls. Here, the activity of a *luciferase* reporter gene to characterize the minimum effective dose of NPA in inhibiting induction of the *GH3* promoter by various auxin concentrations was monitored. Persistence of NPA effects at NPA concentrations that do not disrupt membrane transport will indicate a role for cellular auxin efflux in the regulation of promoter activity. While the regulation of gene expression by efflux carriers is well established for glucose regulation of bacterial genes, precedence for such a mechanism in plant cells is currently lacking.

#### The Importance of Conspecific Tissue Extract Concentration and Multiple Sources on the Assessment of Predation Risk in the Aquatic Flatworm, Dugesia tigrina

Shane Duda and Stephanie Case (Simon Beeching), Slippery Rock University – Biology

Aquatic organisms frequently rely on chemosensory cues to assess predation risk. These cues, known as alarm substances, are chemicals contained in specialized cells. When ruptured, the cells release these chemicals, serving as a reliable indicator for the presence of an actively foraging predator. Planaria (Class Turbellaria: Order Tricladida) offer great advantages in studying chemosensory mediated behavior because they have a relatively simple nervous system. Black planaria (Dugesia dorotocephala) have been previously shown to exhibit avoidance of chemosensory cues released from injured conspecifics, and this response was recently confirmed. Subsequent experiments on brown planaria (Dugesia tigrina) were performed to determine if this species also responded to similar alarm cues. Results revealed that brown planaria significantly avoid risk areas containing alarm cues. Finally, injured conspecifics from brown planaria were introduced to black planaria to determine the effects of heterospecific alarm cues. No evidence that black planaria respond to heterospecific alarm cues from brown planaria was found. Modifying the concentration of the alarm cues may help determine if concentration effects are responsible for the negative results. The reciprocal introduction of black planaria to brown would similarly help determine if there is a relationship between these two species at all.

#### Auxin Effects on Root Exudation

Colleen Friel (Catharina Coenen), Allegheny College – Biochemistry

Plant root exudates are important for mediating rhizosphere plant-microbe interactions and constitute a significant fraction of global carbon transfer into soils. Despite this importance, the regulation of root exudation is poorly understood. To test the hypothesis that the plant hormone auxin, which regulates sugar flow in plants, also regulates root exudation, we are characterizing root exudates in tomato. Exudates from wild-type tomato root organ cultures were compared to those of the auxin-resistant mutant *diageotropica (dgt*) and the auxin-hypersensitive/hypertransporting mutant *polycotyledon* (*pct).*  Sugars in root exudates were identified and quantified by HPLC. Sugar profiles suggest that auxin stimulates the exudation of fructose and glucose, whereas it does not affect sucrose exudation. In the presence of exogenously supplied sucrose, root colonization by Pf-5, a strain of plant-protective bacteria that can grow on sucrose, did not differ between WT and *dgt* roots. However, Wayne1R, a strain that is unable to grow on sucrose, colonized *dgt* roots more poorly than wild-type roots. We are currently assessing bacterial colonization in axenically grown seedlings without supplemental sugar. Under these conditions, Pf5 also demonstrated poor colonization of *dgt* roots. In addition, we will be characterizing the secretion of organic acids in root organ cultures and in axenically grown plants.

#### Relative Expression of TRADD, ASK-1, AATF, and IRBP in IRBP-/- Mus musculus

Jessica Giles (Christy Donmoyer), Allegheny College – Biology

Degeneration of the retina occurs through a process known as apoptosis, which regulates cell death. IRBP, or interphotoreceptor retinoid-binding protein, is needed for normal development of photoreceptors. In an IRBP-deficient mouse, apoptosis occurs in the retina, with most cell death occurring at age 23 days, resulting in 50% photoreceptor death. The purpose of this study was to look at the relative gene expression of TRADD, ASK-1, AATF, and IRBP in the IRBP knockout (KO) mouse compared to an age-matched wild-type (WT) C57BL/6 mouse. The hypothesis was that the expression of the pro-apoptotic genes, TRADD and ASK-1, would be higher in the KO than in the WT. IRBP and AATF, an anti-apoptotic gene, would be lower in the KO compared to WT. qPCR was used on four samples of each strain to determine relative gene expression between strains with 18S as a reference gene. The results of this study showed that all genes had lower expression in KO than in WT, but statistical significance was not reached. The data suggest that pro-apoptotic genes TRADD and ASK-1 may not be involved in the apoptotic process at this age.

#### Impaired Olfactory Function Related to Age and Alzheimer’s Disease in Mice

Jocelyn Gruskiewicz (Lee Coates), Allegheny College – Neuroscience

Alzheimer’s disease is a progressive form of dementia that is the most common type of intellectual decline associated with the aging population. Although physicians have developed a battery of tests for diagnosing patients with probable Alzheimer’s disease, definite diagnosis can only be determined by a post-mortem autopsy. Additionally, by the time a diagnosis is confirmed, the disease has typically progressed far beyond any possibility of treatment. The objective of this study was to determine if olfactory function serves as a biomarker for Alzheimer’s disease and therefore could lead to earlier and more certain diagnoses. The study was performed using wild type and Alzheimer’s model (Apoe -/-) mice that were subjected to a hidden cookie test (blind placement of food in a testing arena). The mice were evaluated over a four-month period through weekly testing. The results to date indicate that Alzheimer’s model mice appear to demonstrate olfaction deficits earlier in life than wild type mice, possibly as early as two months of age. Additionally, the Alzheimer’s models continue to regress at a greater degree than wild types. These results suggest that olfaction performance across the lifespan may serve as a biomarker for the early onset of Alzheimer’s disease.

#### Auxin-Related Responses of Tomato Root Peroxidases to Colonization by Psuedomonas fluorescens Pf-5

Kayla Owens (Catharina Coenen), Allegheny College – Biology

Biocontrol bacteria protect plants from disease by out-competing pathogens and by stimulating plant defense responses. The regulation of plant responses to biocontrol strains is poorly understood. Here we test whether the plant hormone auxin and the bacterially produced antibiotic compound 2,4-diacetylphloroglucinol (DAPG) play a role in the activation of plant defense enzymes called peroxidases (POXs) by biocontrol bacteria in tomato. Seedling roots were inoculated with Pf-5, a known biocontrol strain of *Pseudomonas fluorescens*, a mutant strain, *phlD-,* of Pf-5 that does not produce DAPG, or mock-inoculated with a sterile potassium chloride solution. POXs were extracted from primary roots and lateral roots separately 5 days and 12 days post-inoculation and analyzed by native gel electrophoresis. Roots responded to inoculation with Pf-5 by time-dependent activation of POXs in both primary and lateral roots. Pf-5 stimulated WT root branching more than *phlD-*, but POX responses to both strains were similar. Analysis of root branching and POX responses in roots of and the auxin-insensitive tomato mutant *diageotropica* will assess whether responses to biocontrol bacteria and to DAPG are auxin-dependent. In summary, stimulation of peroxidase activity in tomato roots by the biocontrol strain Pf-5 is DAPG-independent but time-dependent.

#### Investigation of the Effects of Conus textile Venom on the BK Channel, hSlo1.1

Kelly Smith (Lauren French), Allegheny College – Biology

There are approximately 700 species of marine cone snails, each with unique venoms. The venom is composed of between 50 and 200 peptides known as conotoxins, and many of these function as highly selective neurotoxins. Studies have shown that conotoxins are capable of selectively potentiating or inhibiting ion channels, including large conductance calcium activated potassium ion channels (BK). These channels are directly associated with medical conditions such as hypertension and erectile dysfunction. The *hSlo1.1* channel is one of these channels, which can be found in the smooth arterial muscles that control vasodilation and vasoconstriction, and therefore manipulate blood pressure. Activation of the *hSlo1.1* channel leads to vasodilation and decreased blood pressure. Previous research at Allegheny College has shown that the crude venom from the marine cone snail, *Conus textile* contains a substance capable of potentiating the behavior of *hSlo1.1*. This study was performed to test fractionated samples of *C. textile* venom to identify the specific potentiating agent within the venom. This experiment used a *Xenopus laevis* oocyte model and subjected *hSlo1.1*-expressing cells to electrophysiological recordings (two-electrode voltage clamp), and bath application of venom samples.

### BUSINESS

#### Are Businesses Better Prepared Now? An Analysis of Business Impact from Terrorist Attacks

Courtney Boyle and John Mlakar (Sanjay Kumar), Penn State Behrend – Supply Chain Management

9/11 caused severe economic damage to businesses and world economy. It is commonly believed that the event made businesses aware of potential consequences from terrorist attacks. Since then, a lot of economic resources have gone into preventing and mitigating terrorist attacks. Governments of various countries have also invested resources. Have these investments paid returns? Are companies more resilient now? This research seeks to answer these questions. We measure the impact of terrorist attacks on a company by studying the stock market consequences. In general, terrorist attacks are expected to lower the stockholder wealth. However, better preparedness should help limit the losses. We empirically test this theory. Our analysis is based on a 300-attacks database compiled from RAND Corporation. These attacks were targeted on business interests and covered the period of 1991 to 2010. Historical stock information was collected from Yahoo and Google finance. The analysis indicates that terrorist attacks pre and post have very little difference. This is true for count as well as stock impact. Our results question the usefulness of investment in terrorism mitigation efforts and motivate ways to identify better methods to limit the financial impact of terrorist attacks.

#### Satisfaction Difference between On-Campus and Off-Campus Students at Penn State BehrendEmily Knepp and Michelle Tranter (Syed Saad Andaleeb), Penn State Behrend – Marketing

The purpose of this research was to explore satisfaction in students attending Penn State Behrend and to determine if there is a difference between the satisfaction of students living on campus and those residing off campus. To define satisfaction, we have looked at factors including class size, faculty qualifications, feelings of inclusion on the campus, campus atmosphere, and involvement in clubs and organizations. From these factors, we have compared results of those living on campus versus those living off campus. To collect data, a survey was designed and distributed to students at the college. Probability sampling, specifically cluster sampling, was used to ensure that every student had an equal opportunity of being selected to participate in the survey. After the data were collected, regression models were built through SPSS to analyze information. Results of these data will aid in gauging the level of satisfaction of students and be useful in improving or maintaining on-campus housing.

#### Global Manufacturing Competitiveness Index

Jinghua Liu (John Fizel), Penn State Behrend – Business Economics

This study aims to understand better the trends and forces in the highly competitive global manufacturing environment. These trends and forces may reshape the global economy in the future. Cost and availability of labor and materials, energy cost, finance, economic structure, physical infrastructure, talent-driven innovation, and healthcare system are important forces driving the future of manufacturing. Using regression analysis, these factors are examined and weighted to help properly understanding the impact of drivers in global manufacturing. These factors are then used to create an index to measure a nation’s manufacturing competitiveness by weighting factors in the study. The index can also be used to forecast manufacturing competitiveness in near future. Results of the study are compared with Deloitte’s Manufacturing Competitiveness Index, which is developed based on manufacturing executives’ rates on overall manufacturing competitiveness of 38 countries.

#### Optimizing Scheduling of Basketball Shootout Tournament at Penn State Behrend

Kai Lu (Ozgun Demirag), Penn State Behrend – Management

Every summer, Penn State Behrend hosts a basketball shootout tournament for high school girls’ teams. Scheduling this event requires matching the teams and assigning the games to the available facilities which is quite complicated due to very high number of possible assignments and various requests by the participating teams. Currently, scheduling is done manually by the Athletics Department and it is very time consuming. The goal of this research project was to automate this procedure and hence increase the efficiency of athletic resources. First, a comprehensive optimization model was developed that can be used to build a feasible schedule under many practical restrictions. Since scheduling problems are known to be “very hard to solve” in the related literature, a computational approach was followed. Specifically, the model was implemented and tested extensively with the help of specialized computer software. Overall, an extremely fast, flexible, and easy-to-use computer-based tool for scheduling this event was generated. The output includes detailed team and game assignments within the restrictions that the user specifies in the software. This tool allows the basketball department to perform scheduling in a very efficient manner and has been successful in generating alternative schedules for past years’ tournaments.

#### Satisfaction with Behrend – Differences in Gender

Brittany Martinelli and Aaron Morelli (Syed Saad Andaleeb), Penn State Behrend, School of Business – Marketing

Student attrition in institutions of higher education is a constant problem faced by many universities. Further explanation of what encourages female versus male students to maintain enrollment will help better guide administration to improve student life. The purpose of this research was to determine if there is a link between gender and overall satisfaction of students at Penn State Behrend. The majority of students at Behrend are either enrolled in the School of Engineering or the School of Business; both tend to have higher male enrollment. In the 2009-2010 school year 36.5% of graduates from Behrend were females and out of all the engineering majors graduating that year only 7.3% were female. Using data collected from more than 170 students, a multiple linear regression model was generated that accurately explained more than 47% of student satisfaction among all students. The research attempts to find the drivers of satisfaction for both males and females and to see if there is a difference in what satisfies each gender more with Behrend.

#### Supply Chain Disruptions and Stock Market Impact: An Analysis of Companies in China

Jess Scutella (Sanjay Kumar), Penn State Behrend – Supply Chain Management

Supply chain disruptions in the United States have a negative impact on stockholder wealth. Increasing globalization and open economies, however, motivate understanding of disruptions across borders. Attributing to differences in supply chains, cultures, government policies, and stock market operations mechanism, disruptions may have different consequences across countries. For this research, we chose to study disruptions and their stock market consequences in China. The importance of China is clear from its population, economic size, and global trade. China is also the biggest exporter to the United States. Businesses and investors across the world may benefit from this research. The analysis is based on a sample of 190 disruptions announcements by Chinese companies for the period 2002-2012. Besides exploring the direct impact of disruptions on stocks of companies that are traded in the Shanghai Stock Exchange, the effect of government ownership of the shares was explored. When faced with supply chain disruptions, Chinese stock market responded differently as compared to the U.S. stock market. The differences are primarily attributed to the communist government involvement in industries and cultural orientation of the country. The research broadens the understanding of supply chain disruptions.

### CHEMISTRY, MATHEMATICS, AND PHYSICS

#### Evidence for CNT as Catalysts for CNT Growth

Ali Al Dhumani and Sarah Lewis (Carl Hultman), Gannon University – Chemistry

Evidence will be presented that the growth of carbon nanotubes (CNT) on a nickel catalyst involves the presence of carbon nanotubes on the nickel surface. Synthesis of the CNT uses ethylene and hydrogen in a chemical vaporization (CVD) apparatus. The patterns of growth on the nickel surfaces suggest that the initiation of new CNT occurs at the point where previous CNT are attached at the nickel surface.

#### Partial Entrainment in Chains of Coupled-Phase Oscillators

Omar Benlamhidi (Joseph Previte), Penn State Behrend – Mathematics

A model of a chain of coupled-phase oscillators will be introduced. The notions of entrainment and synchrony will then be defined. The case where all oscillators limit to entrainment has been well studied. In this talk, solutions that exhibit two parts of the chain becoming entrained but not all of the oscillators are entrained will be investigated. Issues of stability will also be discussed and explored with regard to these solutions.

#### Investigating a Certain Set of Orthogonal Polynomials.

Zhichao Ge (Boon Wee Ong), Penn state Behrend – Mathematics

Given a natural number n, the series solutions of the differential equation

((1-x^2) y’)' + n (n+1) = 0 was looked at and some of them have polynomial solutions. By using (x^2-1) ^n and differentiating n times, we get the same solutions. For different parameters n, if we ensure that the leading coefficients were 1, we could also obtain the same set of polynomials using the Gram-Schmidt orthogonalization process if we start with the standard basis {1, x, x^2, x^3...}. Also we derive a generating function for this set of polynomials and two different formulae in sigma notation where the sums were taken to be running from k=0 to half of n. We proved rigorously how these different processes yield the same set of polynomials indexed by n."

#### Effects of Single-Walled Carbon Nanotube Isolation Methods on Optical Properties

Lucas Kubeldis, Erica Rider, and Jacob Slease (Lisa Nogaj), Gannon University – Chemistry

A single-walled carbon nanotube (SWNTs) can be thought of as a 2-D hexagonal mesh rolled into a hollow cylinder. SWNTs exhibit promising photoelectric properties due to this structure. Depending upon the radius, the length, and the respective angles at which the 2-D structures are hypothetically rolled, individual SWNTs exhibit a range of desirable optical properties. Unfortunately, alterations during processing such as breaks or additions of unwanted side groups can completely quash SWNT properties such as fluorescence. The team’s focus was is in preparing specific SWNTs from inhomogeneous SWNT samples and in determining the point at which processing-induced damages to SWNTs quench fluorescence. To this end, we developed the following process: CoMoCAT nanotubes were suspended in a solution of D2O/sodium cholate; this mixture was then mechanically homogenized, the SWNTs were ultrasonically dispersed, and, finally, the SWNTs were centrifuged to remove the remaining, unsuspended SWNTs. This procedure was repeated over a range of times and pulse-rates of sonication, and the resulting SWNT-containing supernatants were characterized by absorbance, fluorescence, and length measurements. Once known, the effect of these variables upon SWNT properties contributes to the development of more effective SWNT isolation procedures.

#### Partial Fraction and Spectral Decomposition

MoonSik Kong (Boon Wee Ong), Penn State Behrend, School of Science – Mathematics

There are many techniques for finding partial fraction decomposition of a rational function. In the project, I will study various ways to find the partial fraction. When we apply the partial fraction to the reciprocal of the characteristic polynomial of a square matrix, we do it a little differently than the typical partial fraction. With this, we can use a technique to find the spectral decomposition of an operator.

#### Steady Boundary Layer Slip Flow along with Heat and Mass Transfer over a Flat Porous Plate Embedded in a Porous Media

Alyssa Myers, Belen Veras-Alba, and Zach Fisher (Javed Siddique), Penn State York – Mathematics

In this model a forced convective flow, heat and mass transfer flow of an incompressible Newtonian fluid past a porous plate fixed in a Darcy type medium is considered. In addition to velocity and thermal slip conditions, a mass slip condition is being used that has not been addressed before. The similarity variables help in transforming the system into a system of nonlinear differential equations, which are solved numerically.

Results include the change in velocity, temperature, and mass transfer by changing suction and injection parameters. The effect of change in velocity and thermal slip parameters are also studied.

#### Theoretical Characterization of Wilcox Molecular Torsion Balances

Jennifer Pezdek (Jay Amicangelo), Penn State Behrend – Chemistry

Experimental folding ratios of methano- and ethano-bridged Wilcox molecular torsion balances were previously examined by Mark R. Ams and coworkers, studying both in and out conformations with isopropyl, t-butyl, phenyl and cyclohexyl groups. NMR characterization indicated negative free energies for all methano-bridge conformers and for the isopropyl and t-butyl ethano-bridge conformers, while positive free energies were obtained for the phenyl and cyclohexyl ethano-bridge conformers. Based on these interesting findings, a theoretical characterization study was undertaken to determine the relative energies of the in and out conformers employing quantum chemical calculations using the Gaussian 03W software program. Hartree-Fock (HF), density functional theory using the Becke three parameter hybrid functional (B3LYP), and second order Møller-Plesset perturbation theory (MP2) calculations were performed using the 6-31G(d) basis set to determine the energies of the geometrically optimized structures. Using the energies of the optimized structures, the energetics of the out to in conformation change was determined for each system studied.

#### The Effects of Strain on the Electronic Properties of Silicon CarbideFiona Steel (Blair Tuttle), Penn State Behrend – Physics

Silicon carbide is of interest in the production of high-voltage MOSFETS; this past year, the first one was introduced for commercial use. The purpose of this research was to examine the electronic properties of silicon carbide under strain, using density functional theory (DFT) and the Vienna Ab-Initio Simulation Package (VASP). One axis in the hexagonal plane of the 4H-SiC unit cell was strained to eight different values within +/-2% of the equilibrium lattice constant. In addition, the 4H-SiC unit cell was strained to match the lattice constants of AlN, testing the possible strain effects of using epitaxial growth on an AlN substrate. This talk will cover the resulting changes in effective electron mass and indirect band gap energies, as well as whether or not putting strain on SiC could cover the unwanted defect energies that occur near the CBM along 4H-SiC, SiO2 interfaces.

### COMPUTER SCIENCE AND ENGINEERING

#### Simulation of Plant Growth Using Genetic Algorithms

Peter Barber (John Bonomo), Westminster College – Computer Science

Genetic algorithms have seen widespread application in a variety of fields. The purpose of this project was to test the practicality and usefulness of implementing genetic algorithms in a simulation-type video game. The goals of the project were to create a simulation environment in which simple plant representations compete for resources and evolve according the results of genetic algorithms, and to design a video game in which the player is tasked with choosing the evolutionary design of a plant that would compete in such a simulation.

#### Casino Solitaire

Anthony Caratelli (John Bonomo), Westminster College – Computer Science

The goal of this project was to develop an algorithm for the game Klondike Solitaire with a set of Casino rules, that will maximize money gained per game. Using a Klondike game written in Java, analysis will be done of different strategies in an attempt to achieve this goal. Some of these strategies include: a basic random move priority system, use of heuristics developed from past research of this game, analysis of the deck order, and use of the probability of playable cards being uncovered. The use of these strategies alone and in conjunction with each other will be analyzed.

#### Class Capture

Jacob Cratsa (C. David Shaffer), Westminster College – Computer Science

Many tools have been developed for the purpose of recording lectures and keeping track of notes. A web-based application for use in the classroom setting called Class Capture was created. The main function was to combine typed notes from the student with an audio recording to make the notes act like bookmarks for the recording. This project was developed following Universal Design guidelines, when possible, so that as many students as possible could make use of it. Instead of being designed for individual use, Class Capture is meant to be used by the entire classroom and managed by the instructor.

#### Visualization Assessment and Training Website and Module Redesign Project

Peter Huizar and Shane Halse (Heather Lum and Dawn Blasko), Penn State Behrend – Computer Science

The Visualization Assessment and Training project works to understand and improve spatial skills. The website includes several modules meant to provide activities that challenge spatial visualization skills and provide feedback and learning. This fall, the VIZ team began the process of upgrading the site to the standards now in place at Penn State Behrend. This process included a redesign of the current site to a modern look that kept with Penn State’s policies on accessibility. After the site was formatted, the software developers took on the task of recreating the original models from ActionScript 3.0 to a Flash because it is platform independent. By the end of the semester, two modules were created (gradient working memory task and the Santa Barbara Sense of Direction scale), and the software team is currently working on transferring the information from Flash to the database on Penn State’s server. The overall goal of the VIZ redesign is to provide professors with a way to track and customize various visual activities and how their students perform. Additionally, the software team will begin the development of several other modules and work with the Psychology faculty to create a usable and customizable website.

#### Earing Elimination during 5083 Aluminum Alloy Cup Forming through Electric-Assisted Manufacturing

Stephen Lester (John Roth and Chetan Nikhare), Penn State Behrend – Mechanical Engineering

Recent research has shown that using electric current can improve the formability of a metal in contrast to formability without electricity. This method, electric-assisted manufacturing, allows for a maximum achievable strain within the metal as opposed to a non-electric-assisted manufacturing method. A side effect of planar anisotropy is the formation of earing defects, undulations in the metal that occur along the top edges of the formed cup. Aluminum 5083, an aluminum alloy in the automotive industry, is the desired metal to conduct experiments within this research. In this work, Aluminum 5083 alloy undergoes tests of both cup forming, and cup forming through electric-assisted manufacturing to measure the strain and observe the elimination of earing in each of these tests. The results show, with the proper methods, that electricity applied before and during the experiment can reduce earing defect formation and increased the strain of the Aluminum 5083 alloy.

#### The Effects of Pulsing Electrical Current on Spring-back for 5083 Aluminum Alloy Channels

Megan Lobdell, Stephen Lester, and Abram Pleta (Chetan Nikhare and John Roth), Penn State Behrend, School of Engineering – Mechanical Engineering

Currently in the automotive industry aluminum alloys would be a favored metal for stamping sheet metal into parts since it would improve gas mileage in cars that normally use more steel parts. Unfortunately, aluminum alloys often suffer from spring-back after being deformed. Along with altering the geometry generated after deformation, there are also differences in the amount of spring-back due to aluminum having planar anisotropy. This project will focus on a spring-back analysis of 5083 aluminum alloy when electric current is being applied during formation. To test the planar anisotropy of 5083 aluminum, the spring-back will be tested on metal strips cut 0, 45, and 90 degrees in relation to the metals' rolling direction. Test parameters include the current density, duration, and heating during the passing of the current.

#### Modification of Anisotropic Behavior of 5083 Aluminum Alloy Using Electric Current

Abram Pleta and Matthew Krugh (Chetan Nikhare and John T. Roth), Penn State Behrend – Mechanical Engineering

Sheet metal forming is the area responsible for the production of numerous parts for the aerospace and automotive industries. Due to the increase in more stringent environmental regulations, the demand for strong, lightweight, metal alloys has increased. In sheet metal forming, aluminum alloys, such as AA 5083, are preferred over higher density steels to manufacture lightweight parts. The in-plane anisotropic behavior of AA 5083 greatly reduces its formability requiring researchers to innovate new processing methods to manufacture the required parts. Previous researchers have found that the mechanical properties of metallic materials can be influenced by passing DC electric current through the workpiece, a process known as electrically assisted manufacturing (EAM). The research herein is focused on characterizing the in-plane anisotropic behavior and Lueder’s band formation of AA 5083, both with and without passing electric current through the samples while it is loaded in the uniaxial direction. Furthermore, the modification of Lueder’s banding in the material will also be investigated. The results show that anisotropic behavior can be significantly altered and even eliminated along with Lueder’s banding.

#### Improving upon Previous Movie Database Programs

Daniel Solomon (C. David Shaffer), Westminster College – Computer Science

There are many movie collection management programs available, but all of them lack certain management options or do not contain as much information on a movie as the user desires. The purpose of this project was to improve upon these features and add new ones. The user’s collection is kept in a SQLite Database, and the graphical user interface (GUI) allows users to easily make complex queries on their collection. A user can add to the collection by scanning a DVD barcode from a webcam, and the program acquires information on cast, crew, etc. from three Internet-based sources to add to the database. If a barcode refers to multiple movies (e.g. *Star Wars* Collection), the program acquires information on each movie in the set for better management, which none of the other programs featured. The program also allows users to “tag” movies with keywords to allow for other ways to search their collection. The biggest new feature added was the ability for a user to compare his/her collection with another user’s database, which shows what specific movies the two collections share. Also, a separate application was developed that accesses a user’s Netflix account and allows the user to easily manage his/her queues.

#### Creating Adaptive Characters in Interactive Fiction through the Use of a Genetic Algorithm

Ryen Wilkins (C. David Shaffer), Westminster College – Computer Science

Interactive Fiction (IF) is a story and game medium in which the goal is to provide an enjoyable reading and interactive experience for the user or player. A part of this goal can be creating interesting Non-Player Characters (NPCs) that the player will interact with throughout the story in various forms and/or developing challenging puzzles for the player to solve. The use of a genetic algorithm to evaluate an NPC’s performance against the player in some game through test cases and then use that evaluation to improve the NPC’s later performance can create dynamic and adaptive characters. The creation of characters like this can allow the user to feel like the world is reacting to what they are doing, rather than remaining static, and could increase enjoyment and investment. This work explored the implementation and application of genetic algorithms in the TADS 3 IF system.  The implementation was a translation of an existing Java genetic algorithm framework to the prototype-based programming language used by TADS. Three adaptive game applications were developed using this framework and integrated into an IF story.

### HISTORY AND WOMEN’S STUDIES

#### Spit it Out: Women Rejecting Animal Products and Feminism Serving Veganism

Ava Carvour (Barbara Shaw), Allegheny College – Women’s Studies

Women predominantly populate the current Vegan movement, and reject animal products in order to critique patriarchal structures of power outside of food production. This paper considers why and how food—and meat in particular—is selected as a medium of female dissent. Through analysis of the vegan-feminist scholarship of Marti Kheel and Carol A. Adams, I analyze veganism’s explicit disavowal of patriarchal systems such as rape culture and gendered violence. The incorporation of veganism into feminism offers its practitioners an opportunity to embrace a physical protest that intervenes in traditional gender roles—women serve and men eat—while bringing cultural visibility to both movements and destabilizing entrenched power relations. I argue that feminist-veganism prompts Women’s Studies to recognize the relationship between power and food, and its practice as a vital instrument of social transformation.

#### Commodification of the Uterus

Kyrsten Craig (Barbara Shaw), Allegheny College – Women’s Studies

The commodification of race and sex is not a new development in the United States; legalized for four centuries, the slave trade helped found American economy through ideals of mercantilism, creating clear racialized class distinctions by defining the “othered” body as a product for white consumption. Understanding these historical ties is crucial to comprehending current oppressions of minorities through birth control measures.  This paper argues that the American birth control movement of the 20th century was tied to eugenics and scientific racism, a cultural extension of formalized slavery, stripping minority women of their personhood, commodifying their bodies, and I contest that we must understand these historical processes as cornerstones of U.S. capitalism.

#### Angel in the House: Fingersmith, Class, Femininity, and Victorian Sexuality

Sara Rhodes (Catherine Bae), Penn State Behrend – History

Using the novel *Fingersmith*, the public and private faces of the two female protagonists, Maud Lilly and Sue Trinder, are evaluated in the context of the era the book is set, examining the intersection of class and gender expectations for both and how each represents both the apex and antithesis of their perceived class, and how their actual class is reflected in their characters. This is done through a combination of primary sources, including etiquette guides for young women of the upper classes during the early Victorian era and the type of Victorian pornographic material referenced in the book itself, as well as secondary theoretical texts that will include *The History of Sexuality* by Michel Foucault and *Madwoman in the Attic* by Sandra Gilbert and Susan Gubar, as well as *Love in the Time of Victoria*, a closer examination of the love and sex lives of the Victorian laity.

#### The Military Blunders of the War of 1812

Ryan Richards, Garrick Dickson, and Tyler Payne (John Rossi), Penn State Behrend – History

One key aspect of the War of 1812 is the how unprepared the United States was to fight a conflict it initiated. The failed 1812 and 1813 invasions of Canada illustrate how poorly prepared the U.S. Army was. They also showed that the top U.S. Army leadership was completely incompetent. One example of the gross incompetence of general officers and the Army’s lack of preparedness was the western invasion of Canada under the direction of General William Hull and its defeat by a much smaller force. Bad generals, of course, were the consequence of poor civilian leadership. President James Madison and Secretary of War William Eustis did not adequately prepare for a war against one of the strongest empires in the world. Madison and Eustis both decided not to strengthen the infrastructure of the United States to allow logistical problems to be less of a pain, build up the regular army to be actually on war footing, and neglected to advance several mid-ranking officers that would have been far better commanders than Hull or Armstrong. These mid-ranking officers would be the saving grace of the U.S. Army, but only after the old men were weeded out from severe losses.

#### Fifty Shades of Hearsay: An Exposé

Samantha Voss (Barbara Shaw and Emily Yochim), Allegheny College – Women’s Studies

The first installment of the *Fifty Shades of Grey trilogy* has become a worldwide phenomenon, selling over 65 million copies in 37 countries. The success of the novel suggests EL James has struck a cultural g-spot…so to speak. For too long the subject of women’s sexuality has been silenced; caught in a perpetual system of dismissal, shame, and confinement. The cultural debate over whether or not the popularity of the trilogy signals a step backward or forward in the fight for gender equality is insignificant compared to the meaning real women are making of the novels. Interviews conducted with two women who fit the trilogy’s perceived demographic to cite specific examples of the way in which individual women negotiate between their own sexuality and cultural representations of what sexuality *is* or *should be* will be used. By placing these women’s voices at the center of the analysis, it appears that the success of *Fifty Shades* represents a transformation in western culture’s perception of female sexuality.

### PSYCHOLOGY 1

#### How to Encourage Service Learning: Intrinsic, Extrinsic, and Neutral Motivators

Amanda Becker, Geran Lorraine, and Racheal Sporcic (Dawn Blasko), Penn State Behrend – Psychology

In service learning, students are asked to integrate what they are learning in the classroom with problem solving in the community. However, some students may resist completing service because they see it as both irrelevant and inconvenient. The costs to them in time and effort seem stronger than the benefits to their education. The current study focused on the use of service learning in two general education classes; cross-cultural psychology and environmental science. Students completed a pre-class and post-class survey to determine their attitudes toward working in the community. In addition, measures of empathy were included. Early in the semester, the students were presented with three service activities appropriate for the goals of that class. These three service activities were framed by intrinsic, extrinsic, or neutral motivating statements. Students also wrote reflections of their experiences throughout the semester to see if their attitudes changed over time. We expect to find a relationship between pre-test empathy and pre-test service learning.

#### How Influential is the Pressure of a Peer in Academic Cheating?

Crystal Conklin, Callie Keating, Ashanae Walker, and Rebecca Morrison (Dawn Blasko), Penn State Behrend – Psychology

This study was developed to examine the effect of peer pressure on academic dishonesty in college students. To examine this relationship, participants were asked to complete a trivia task in which they were instructed to communicate with the other participant through Google chat messaging. In the first attempt of the trivia task, participants were told to collaborate with their partner. During the second attempt, participants were told to complete the task independently. Unbeknownst to the participant, their counterpart was actually a confederate experimenter who, during the second portion of the trivia task, tried to get the participant to cheat by instigating them into sharing information. The participants who responded to this instigation were labeled as either passive cheaters or active cheaters. The researchers were interested in whether there would be a difference in the likelihood of cheating between the experimental and control conditions. The preliminary research has shown that the situational factor of peer pressure is a significant predictor of academic dishonesty.

#### “Sticks and Stones Can Break Your Bones…”

Kimberly Cook, Alyson Eagle and Jennifer Slane (Charisse Nixon), Penn State Behrend – Psychology

The first purpose of the current study was to examine the relationship between peer mistreatment, positive and negative emotions, and school connectedness as they relate to the reduction of students’ trauma levels. Children, adolescents, and college students were surveyed. Based on past research, it was expected that students with strong school connection and less negative affect would experience less trauma and experience decreased peer mistreatment behaviors. The second purpose was to identify effective strategies used to address peer mistreatment (both quantitative and qualitative) across grade level and gender. The final purpose of the study was to apply the research findings in local school settings.

#### Does Loving Lassie Mean You Are More Empathetic?

Maurina Grandinetti, Julie Williams, and Lindsey Fuller (Dawn Blasko), Penn State Behrend – Psychology

Perceptions of the treatment of animals vary greatly across individuals. For this reason, abusive behaviors are not easily defined. The current study examines the attitudes of college students towards animal abuse when they are exposed to anthropomorphic language. Anthropomorphism is referred to as the attribution of human characteristics to animals. Within the present study, participants read narratives told from either the first person (animal perspective) or third person (narrator perspective) and completed several questions pertaining to how the participant feels about the characters in the story, the situation the animal is in, and what they think will happen to the animal in the future. Finally, participants rate a series of surveys that measure empathy, attitudes towards animals, attachment towards animals, and anthropomorphism. It is anticipated that individuals who score higher on empathy and anthropomorphism will be more likely to rate the situation portrayed in the story as more abusive. Implications of this research study are intended to change the way in which people view the treatment of animals. If people are able to perceive animals as capable of experiencing human emotions and pain, than people will be less likely to treat animals with malice.

#### A Preliminary Evaluation of a Vocal Conditioned Generalized Reinforcer

Maria Helton (Jonathan Ivy), Mercyhurst University – Psychology

The effect of a vocal conditioned generalized reinforcer (V-SRG) on the frequency of the target behavior was evaluated using a single-case withdrawal design. Two typically developing first grade students participated. During baseline, data were collected based on the number of math problems completed during a 10-minute session. Following a condition in which the V-SRG was paired with back-up reinforcer, the participants entered the intervention phase. The initial results suggest that for each of the participants, math problem completion was significantly higher in the intervention phase. Once the intervention was removed, math problem completion returned to the original baseline level for each of the participants. The V-SRG seemed to have a desirable effect on the target behavior.

#### The Relationship between Narcissism, Self-Esteem, Social Physique Anxiety and Multiple Dimensions of Exercise

Katherine Hoffman and Michael Fiscus (Victoria Kazmerski), Penn State Behrend – Psychology

Exercise is a reputable behavior and being seen as an exerciser makes positive impressions on others. Considering society’s focus on physical attractiveness, this concern may dissuade individuals from physical activity if they are concerned about a negative assessment when presenting their bodies. The present study investigated the effects of narcissism, self-esteem, and social physique anxiety on multiple aspects of exercise. We hypothesized that individuals who score higher on a narcissism scale would exercise longer and more frequently. Additionally, we hypothesized that individuals who score lower on a self-esteem inventory would exercise less frequently and for less time. Last, we hypothesized that individuals who score higher on a social physique anxiety measure would exercise less frequently and for less time. Methods of measurement included The Narcissism Personality Inventor, The Social Physique Anxiety Scale, The Multidimensional Self-Esteem Inventory, and an exercise survey created by the researchers. Statistical analysis concluded that there was a significant relationship between the participants’ self-reported levels of narcissism and frequency of exercise. In addition, there was a significant relationship between the participants’ self-reported levels of narcissism and duration of exercise. The results of this study emphasize the importance of narcissism on an individual’s exercise behavior.

#### Offensive or Motivating? The Influence of Cursing in the Military

Anne Lawrence and Michelle Evan (Dawn Blasko), Penn State Behrend – Psychology

Within the last few years information has been uncovered about sexual assault cases within the U.S. Military. The majority of these cases have been about the abuse of women in the military, particularly at the U.S. Air Force Academy. In this study the participants read 32 different short scenarios. In each short scenario the Commander will speak to a soldier, either male or female. In all the scenarios the Commander will insult the soldier. Half of these scenarios will be read in the perspective of the speaker, while the remainder are read in the perspective of the listener. After the participants read each scenario they will answer three questions on motivation and offensiveness. The researchers analyzed data collected from the participants and found that the participants were less motivated and more insulted when they were reading in the listener perspective. The researchers also discovered that the participants felt more motivated and less insulted when they were reading in the speakers perspective.

#### The Influence of Film Music on Character Empathy and Plot Foreshadowing

Kaitlyn Swanseger and Kayla Hoover (Victoria Kazmerski), Penn State Behrend – Psychology

Cinema underscoring has been shown to have a significant impact on how an audience can relate to film characters. This study investigated how the presence of background music in horror/thriller film influenced a person’s empathetic feelings toward the main character and the facilitation of plot comprehension and foreshadowing. Participants completed two empathy questionnaires and were then presented with a scene from the film *The Orphanage* in which audio and visual stimuli were either present or absent. They answered questions on character empathy and plot comprehension. Results indicated that the presentation of film music with congruent visual stimuli increases a person’s empathetic feelings toward a film character and also aids in a person’s ability to comprehend the film’s plot. This supports the significance of simple audiovisual pairing with emotive effects of music and accurate plot comprehension. These results reveal continued importance of congruent musical soundtracks in film production, as well as, significant implications for cinema personnel and future film production.

### PSYCHOLOGY II

#### The Relationship between Bullying and Exercise Motivation

Erica Anderson and Yun Park (Victoria Kazmerski), Penn State Behrend – Psychology

Being bullied during adolescence and poor exercise habits are both serious problems in American society. A recent survey reported that 82% of peer emotional victimization occurred during school contexts. Considering the great portion of an adolescent’s life spent at school, this statistic is rather unsettling and suggests adolescents are at an increased risk to be victimized frequently. This study investigated a relationship between being bullied during adolescence and exercise motivation. We assessed participants’ degree of bullying experience and how they regulate exercise motivation. We hypothesized that those who have experienced more bullying would show more self-determination for exercise motivation. We predicted females would be less motivated to exercise if bullied in the past compared to males. As predicted, there was a significant negative relationship between bullying experiences and exercise motivation. However, no substantial gender difference was found between motivation regulation styles. Exercise plays a vital role in weight management and those who are overweight tend to experience peer victimization (being bullied) more frequently.

#### Predicting College Adjustment: Religion and Narcissism

Abigail Dudzic, Paige Robertson, and Racquel Wright (Victoria Kazmerski), Penn State Behrend – Psychology

Research in recent years has taken an interest in the factors that assist students in making a healthy transition into college life. According to recent studies, students who are more religious have protective factors that can aid in a positive adjustment experience. In contrast, narcissistic personality traits may lead to a negative adjustment. College adjustment, narcissism, and religiosity were assessed using three different surveys. We hypothesized that there would be a strong, negative relationship between the traits of narcissistic and religious students and that religious traits would be a better predictor of adjustment in college students. The analysis revealed a moderate, positive correlation between Institutional Attachment of the SACQ, the NPI total and the Self Sufficiency subscale of the Narcissistic Personality Inventory (NPI). Attachment was also positively correlated with Authority and the IRM total. Upon running a stepwise regression three significant models for Attachment and NPI subscales were found. Authority was the only significant individual predictor of attachment, and age was the only significant predictor for Social Adjustment. These data show that some facets of trait narcissism, such as authority and self-sufficiency are beneficial in the shift from life at home to life on a college campus.

#### Our Spatial World

Megan Harris, Miri Ohashi, Bilge Erdem, and Christina Ayers (Dawn Blasko and Heather Lum), Penn State Behrend – Psychology

Spatial skills are essential to many professions including those involving the fields of math, science, and engineering. Women tend to score lower than men in these fundamental skills; they also tend to be underrepresented in the fields mentioned. Research has shown, however, that spatial skills can be improved upon with training. Our Spatial World, a spatial visualization training program conducted by Penn State Behrend, strives to offset some of the individual differences between men and women in this area. It is our goal to increase the number of women entering these fields of study. Each summer, a group of minority and female high school students are given the opportunity to participate in the Our Spatial World program via Minority College Experience/Women in Science and Engineering (MCE/WISE). The program involves a pre-test, four training sessions, and a post-test. The training sessions focus on isometric and orthographic drawing representations, flat patterns and mental rotation. Each training session involves a lecture portion, practice via computer programs and sketching, and finally a game that highlights specific spatial and mapping skills. Overall, participants have shown improvements in spatial skills from pre-test to post-test. Participants have also reported greater confidence in their abilities and increased interest in these areas of study.

#### Life in the Fast Lane: The Effects of Music on Aggressive Driving

Megan Morrow, Lynzie Black, and Sean Bogart (Dawn Blasko), Penn State Behrend – Psychology

Previous research has focused on the issue of the influence of video games on mood and behavior. The current study investigates whether of the type of music listened to while playing a PC racing game would influence an individual’s aggression level. Participants were assigned to one of three music conditions: aggressive music, non-aggressive music, or a control condition of white noise. Participants were asked to complete 15 minutes of a PC racing game. They were then asked to complete an implicit measure of aggressive behavior, asking participants to add hot sauce to chili given to a confederate player. Aggressive thoughts were measured with a word completion task. The results of this study should help to understand the impact of type of music on people’s ability to navigate while driving. In addition, we expect that aggressive music would be more likely to prime people’s aggressive instincts.

#### Pill Popping for Performance: Changing Attitudes towards Psychostimulants

Meghan Nee, Natalie Corso, and Christina Anthony (Dawn Blasko), Penn State Behrend – Psychology

The prevalence of psychostimulants, such as Adderall, has been growing among college campuses. They are often misused in academic settings since they are believed to increase focus and attention. However, students may not recognize the serious risks of taking drugs like Adderall – both physically and legally. In order to assess attitudes towards Adderall and attempt to increase behavior change, we exposed students to a Public Service Announcement (PSA) which included a narrative, informational, or neutral video. PSAs may highlight the dangers inherent in unprescribed use of stimulants. The results suggested that PSAs may be effective in reducing the positive views of study drugs and more work needs to be completed to determine the way to frame the most powerful message. Students rarely think about the possible side effects of psychostimulants and the dangers of growing tolerance and dependence.

#### Personality and Contagion: Can Negative Imagery Affect Food Risk Perception?Adam Ryzinski, Marc Bethune, and Jamal Sharif (Dawn Blasko), Penn State Behrend – Psychology

Recent research has shown that certain personality types correlate with behavioral tendencies such as disgust and obsessive-compulsive disorder (OCD). The purpose of the present experiment was to examine the effects of specific imagery on perceptions of food risk. Participants were given a set of risk questions then asked to assess a group of photographs for quality. They were randomly assigned to view images in a control (neutral images), negative (neutral/ negative images), or disgust condition (neutral/ disgust images). Questionnaires on personality, OCD, and disgust were also collected. The images evoked a change in participants’ risk perception, while personality traits factored in perception. The results showed an interaction between imagery priming and time, such that those who were shown disgust and negative images were more likely to support less risky food options. Personality types as well as OCD and disgust sensitivities were shown to be predictors of initial risk assessment selections.

#### We Are Never Ever Getting Back Together: The Influence of Power Distance on Relationship Status

Samantha Vasy, Rachel Mueller, and Peter Brower (Dawn Blasko), Penn State Behrend – Psychology

The relationship between sex role stereotypes and reactions to breakups were measured in this study. Previous research has been done on relationships and gender differences, although no research has been done in areas examining an onlooker’s perspective of a relationship. In particular we wanted to examine the perceptions of breakups and whether or not gender societal stereotypes influenced the reactions of the participant to relationship scenarios. Participants were asked to read four scenarios of a relationship, two in which the male was dominant, two in which the female was dominant. This was varied by level of income and who initiated the argument. Participants were asked to fill out the BEM sex role inventory and Attitudes of Women Scale. BEM measures masculinity, femininity and gender roles, and the Attitudes of Women Scale, reflects pro-feminist attitude, or a traditional, conservative attitude toward women. The opinions of the participants were analyzed in this study as well as their scores on the BEM sex role inventory and the Attitudes of Women Scale.

#### Phylogeny and the Monty Hall Dilemma: A Comparative Approach to Probability Matching

Matthew Yaw (Melissa Heerboth), Mercyhurst University – Psychology

Humans often engage in suboptimal behavior when faced with the Monty Hall Dilemma (MHD). The present literature review aims to establish the need for further animal research in order to aid in understanding this behavior. The current comparative research into the MHD will be linked with a brief historical account of the evolution of probability learning, and specifically to the research philosophy and laboratory results of M.E. Bitterman. This review seeks to demonstrate two things. The first is that Bitterman’s approach to probability learning can be applied to the present day research into suboptimal choice behavior as seen in the MHD. The second is that, in keeping with Bitterman’s desire for a greater establishment of probability learning along the phylogenic scale, the gibbon (*Hylobate*) would make a prime candidate for comparison to humans, due to taxonomic classification and certain neuroanatomical structures.

## Poster Presentations

### BIOLOGY

#### Presque Isle Coastal Erosion throughout the Fall Season

Leora Cantolina (Anthony Foyle and Michael Naber), Penn State Behrend – Geoscience

Presque Isle, which is important to the Erie economy as a tourism attraction, has been modified by engineers for more than a century in order to keep it stable. Beach nourishment is needed every year and allows selected beaches and terminal Gull Point to expand via accretion. With sand costing over $30/cu yd, beach nourishment costs a significant amount of money on a yearly basis. The purpose of this experiment was to measure how much erosion and accretion and net beach change occurred over the course of a typical fall season. GPS and ArcGIS 10.1 software were used to map seasonal shoreline positions during early fall and early winter of 2012 to identify where (and how much) areal erosion and accretion occurred. The results produced data that showed accretion on the up-drift side of the tombolos that are formed due to the breakwaters. Conversely, erosion mostly occurred down drift of the breakwaters. Overall, there were more areas of accretion than erosion. While the net areal change for the season was 8,201.298 m2 of erosion and 13,826.549 m2 of accretion?

#### Rain Garden Design on Penn State Behrend Campus

Collin Deering (Ann Quinn), Penn State Behrend – Biology

A rain garden is a planted depression used to allow rainwater runoff to be absorbed into the soil slowly while avoiding erosion and water pollution. A series of these rain gardens will be constructed around the Penn State Behrend Campus in summer 2013 which will be used to control the average rainfall for a 10-year storm in Erie, Pennsylvania. The size of the rain gardens will be 10' x 10' long and 1' deep. A variety of native plants have been selected that will thrive in wet/moist conditions and will only need to be weeded for the first year. There will also be a rain garden created in a sunny/wet urban environment with specific plants that can tolerate high sunlight and spontaneous wet conditions which will retain water longer from urban runoff sources. This is a cost efficient way of slowing down and reducing storm water. The garden sites will be selected based upon student data collection and be maintained by students throughout the duration of the project. This will demonstrate how best management practices (BMP) will have a positive impact on the environment and how effective rain gardens can be in water retention systems and water management.

#### Pigment Composition of Nuptial Coloration in Turtles

Jonathan Drumheller and Kyle Learn (John Steffen), Penn State Behrend – Biology

Animals use a variety of pigment classes to color their integument. Two main classes of pigments animals use are carotenoids and drosopterins. Carotenoids and drosopterins both color the integument red, orange and yellow, but carotenoids are of interest to biologists a) because the animal must ultimately obtain them by eating plant matter or by eating herbivores which consume the plant matter and b) because they have been shown to have a wide variety of health benefits (including free-radical scavenging). As a result, carotenoid-based integument color indicates something about the bearer’s physiological fitness that can be used by others to assess the individual as a potential mate or rival. Drosopterin-based color expression, on the other hand, appears to be under genetic control and potentially reveals genetic-based information about the bearer’s fitness. Many species of North American turtles have carapaces, plastrons and body color patches that are red, orange, and yellow in color. We used pigment extraction chemistry along with absorption spectrometry to determine the pigmentary basis to shell color in two common North American turtles (red-eared slider, *Trachemys scripta* and midland painted turtle, *Chrysemys picta*). The color of the top fractions from extracted pigments were sometimes yellow (and indicated carotenoid pigments), and the color of the bottom fractions were sometimes red (and indicated drosopterins). Moreover, absorption spectrometry of the top fraction yielded absorption maxima at 446 and 470 nm. These two findings are evidence that carotenoids (e.g. lutein-a polar xanthophyll, as well as astaxanthin-non-polar carotenoid) as well as drosopterins are responsible for the red, orange and yellow colors in these two turtles. Turtles can now be added to the growing list of animals that use carotenoids to color their integument and future research should investigate the behavioral and physiological roles they serve in turtles.

#### Use of Color in Dragonflies

Zachary Duda (John Steffen), Penn State Behrend – Biology

Many animals are capable of seeing ultra-violet (UV) light and use UV wavelength reflectance of their integument to communicate information about sex and mate quality. Blue dasher dragonflies (*Pachydiplax longipennis*) are common insects in the Great Lakes region, and previous research shows they are capable of seeing UV, as well short, medium, and long wavelengths of light. The objective of this study was to determine if UV reflectance plays a role in the communication of male blue dashers. Eighteen male blue dashers were euthanized and used as experimental and control models in a social behavior experiment. Experimental models had the UV reflectance of their abdomens reduced with the application of odorless sunscreen while control models had water applied to their abdomens. The experimental and control model males were then placed in locations where there were abundant live male blue dashers, and the aggressive behavior of the live male blue dashers to the experimental and control male models were timed and quantified. Aggression was measured by recording the frequency of approaches and attacks by dragonfly passersby toward males without sunscreen application relative to males with sunscreen application. The average amount of time passed before for the first attack on the experimental male models was significantly less than on the control group. This suggests that UV reflectance in male blue dashers may function as a signal for species recognition or male fighting ability. Future research should compare these findings with male blue dasher behavior shown to male models who have had their UV reflectance increased to test further ideas about the role that UV reflectance plays in male-male communication.

#### Effects of Chronic CO2 Exposure on Olfactory Receptor Response to CO2

Jeff Fleming (Lee Coates), Allegheny College – Biology/Neuroscience

As atmospheric CO2 levels continue to rise due to the global warming process, it remains unknown how animals will respond to these environmental changes. The goal of this study was to investigate how olfactory receptor responses in mice are affected by chronic CO2 exposure. Mice were raised in environments containing CO2 concentrations of 0.5% and 1.0%, similar to the global levels predicted to be reached within the next 100 years by numerous climate change models. Olfactory receptor responses to CO2 and other odorants were measured using electro-olfactogram (EOG) recording, which records the summated responses of a small population of olfactory receptor neurons. Results show that higher concentrations of atmospheric CO2 caused an inhibition of olfactory receptor responses to CO2 and an increase in sensitivity to odorant stimulation. These results imply that increased global CO2 levels may negatively affect the olfactory function of mice and other animals by altering olfactory receptor neuron responses to CO2 and other odorants.

#### The Relationship between Stomach pH and Lead Concentration Found in Bone Matter and Feathers of Some Raptor Species

Katrina Gazsi(Milt Ostrofsky and Ron Mumme),Allegheny College – Biology

Approximately 10% of all birds of prey admitted to Tamarack Wildlife Rehabilitation Center exhibit signs of lead poisoning from ingesting lead shot in carrion. Approximately 25% of the admitted vultures, 10% of hawks, and only rarely owls exhibit signs of lead poisoning. Two hypotheses might explain these differences. The first is that vultures are more likely to ingest carrion thereby ingesting more lead. The second hypothesis is that vultures are known to have a lower stomach pH than hawks or owls suggesting ingested lead can be mobilized by stomach acid and distributed throughout the body causing detrimental effects. Solubility of lead shot were determined across a range of pH, data showed an inverse relationship that as pH increased the amount of lead dissolved in solution decreased. To determine the lead body burden in birds, the humeri of three vultures, 11 hawks, and four owls were measured and used as a representative sample. Data showed that vultures had an average lead amount of 20.75 μg/g of bone, hawks had an average of 3.59 μg/g of bone, and owls had an average of 3.01 μg/g of bone.

#### Tracking the Bacterial Diversity on Individual House Wren Eggs

Dan Hoang, Mary Sperry, Adam Mobley, Bryan Bailey, and Sean Weaver (Beth Potter and Margaret Voss) Penn State Behrend – Biology

While avian incubation has been shown to be integral for embryonic development by regulating temperature, humidity, and gas exchange, recent studies suggest that it is also important for the maintenance of a microflora on eggs that provides protection against pathogenic microorganisms. To begin to understand the bacteria that comprise this microflora, our lab has previously identified culturable bacteria on the surface of house wren eggs. While this previous study identified a variety of 46 different species within 21 genera and three phyla, individual eggs were not tracked. The current study aims to track individual eggs within multiple nests throughout the incubation period and by doing so reveal specific bacterial species that are important for hatching success and those that are detrimental to hatching. This is a novel experiment and is the first attempt at deciphering the impact of the egg microflora on embryonic development.

#### First Report of the Invasive, Predatory Cladoceran Cercopagis pengoi in Presque Isle Bay

Matt Legerski (Mike Ganger and Greg Andraso), Gannon University – Biology

*Cercopagis pengoi* is a predatory cladoceran native to the Ponto-Caspian and a recent invader of the Great Lakes. It has been reported in Lake Erie, but not in Presque Isle Bay (PIB). *Cercopagis* is identified by a long caudal spine that ends in a distinctive fish hook shape. Sampling was conducted at five sites in PIB on four dates in summer 2012. Samples were collected with a Wisconsin sampler towed horizontally at known depths then fixed in sucrose-formalin. Images of *Cercopagis* were digitized and several measurements (body length, spine length, number of barb pairs, and number of offspring) were recorded for each female. *Cercopagis* were collected on one date at one site. Three-barbed individuals had significantly more offspring and larger bodies than two-barbed individuals. There was no relationship between body length and spine length for two-barbed individuals. It was not possible to compare body length and spine length for three-barbed individuals due to broken tails. This is the first report of *Cercopagis* in PIB, where individuals were larger than those from their native range. Future work on *Cercopagis* in PIB and other sites in Lake Erie may provide insight into phenotypic plasticity in this species.

#### Advancing the Ethic and Science of Sustainability at Penn State Erie - The Behrend College

Ibraheem Radhi (Ann Quinn), Penn State Behrend – Biology

One of the primary goals of Penn State Behrend is to educate students and make them the future leaders. A wide variety of courses from across the University are eligible for inclusion in the new sustainability leadership minor; this allows students to select classes from both their major requirements and their general education electives. The minor courses and the required immersive experience provide students with fundamental tools for leadership, and allow students to develop the knowledge, skills, and attitudes required to become viable leaders in their respective fields. The objectives of this research are to get Penn State Behrend fully integrated into the new minor by adding close to 50 classes into this system using the STARS (Sustainability Tracking Assessment and Rating System) survey as required by Penn State. In addition, I will aid in publicizing and encouraging Behrend students to obtain the Sustainable Leadership Minor. This research will increase the awareness that sustainability leadership is truly interdisciplinary and can be obtained by any student in the University, which will help move the minor forward at the college.

### BIOCHEMISTRY I

#### Biosynthesis and Toxicity of Gold and Silver Nanoparticles from Cave MicroorganismsNicholas Choy, Jingyi Zhang, and Jonathan Franks (Om Singh), University of Pittsburgh at Bradford – Biology

Nanoscale materials have emerged as novel antimicrobial agents owing to the unique chemical and physical properties. Bio-nanotechnology offers eco-friendly processes for the synthesis of stable nanoparticles. It is hypothesized that the microorganisms from rare earth habitat will reveal unusual properties of biotechnological implications. The nutrient broth enriched soil, collected from Shenandoah National Park Cave, Virginia, samples revealed a total of 18 colonies on nutrient agar plates. The microbial colonies were purified and screened for biosynthesis of extracellular gold (Au) and silver (Ag) nanoparticles (NPs) in liquid culture. Two microorganisms, LC3 and LC4, revealed extracellular biosynthesis of Au and Ag NPs. Both Au and Ag NPs were characterized on a UV-Vis spectrophotometer and imaged by SEM and TEM for size determination. The antibacterial activity of both NP types was tested against 20 pathogenic microorganisms. The Ag NPs revealed greater zone of pathogenic inhibition then the Au NPs. We predict that the stable Ag NPs will have value in antibacterial therapeutics. The soil microcosm used for *ex-situ* toxicity assessment of Ag NPs retained most colony types and numbers compared to the control experiments at various temperatures (4°C, 22°C, 37°C, 45°C) and pH (2, 4, 6, 8, 10)

#### Indentifying the Conus striatus Venom Component that Inhibits the Cav3.2 Channel

Jaclyn DeCoursey (Lauren French), Allegheny College – Neuroscience

The *Conus* genus of marine snails uses venom that contains a cocktail of peptides (called conotoxins) that target specific ion channels to incapacitate their prey. Due to their high affinities for their targets, conotoxins are useful tools in research and have clinical applications as well. The T-type calcium channel, Cav3.2, is known to be involved in childhood absence epilepsy and prostate cancer cell proliferation. Mutations in this channel can lead to increased calcium influx and influence the development of these disorders. Previous research determined that *C. striatus* venom inhibits the Cav3.2 channel. The active component has been narrowed down from hundreds of possibilities to a single peak by means of mass spectrometry and repeated neurophysiological testing. As our biochemist collaborator conducts procedures to concentrate the sample, I have continued testing venom samples to confirm inhibitory action, with the goal of ultimately identifying the component chemically. *Xenopus laevis* oocytes were injected with Cav3.2 RNA and healthy oocytes that expressed the channel were exposed to fractionated venom. The effects of the venom on the current were analyzed using two-electrode voltage clamp (TEVC) techniques. The results of this study could have pharmacological implications in drug developments for disorders related to the Cav3.2 channel.

#### Inactivation of Pathogens Using Sanitizing Substances Produced by Radiant Catalytic Ionization

Victoria Filbert, Shane Goller, and Mackenzie Mustin (William Mackay, David Fulford, and Craig Steele), Edinboro University – Biology

New sanitizing technologies have emerged in recent years and are being widely used in a multitude of places to provide better decontamination of contact surfaces. Ozone and hydrogen peroxide, generated by Radiant Catalytic Ionization (RCI), have countless applications for reducing the number of bacteria present on a surface. The focus of this study was the inactivation of *Escherichia coli* and *Staphylococcus aureus* introduced on the tips of sterile cotton swabs by RCI. Our results indicate a 90% killing of bacteria with a 20-minute exposure to RCI.

#### Pleurotus ostreatus: Mycoremediator of E. coli

Justin Giel (Rich Bowden), Allegheny College – Environmental Science

Fecal coliforms are a poorly managed byproduct of industrial agriculture. *E. coli* is particularly harmful when it enters watersheds from agricultural sites and can lead to adverse human health effects. The edible species of fungus, *P. ostreatus*, is able to paralyze *E. coli* bacteria and digest their cells from the inside. Small-scale “bunker spawn” experiments were conducted where an *E. coli* solution was filtered through four test units. This experiment compared two growth media (woodchips and sawdust), and two containing units (burlap and plastic mesh) to find which has the highest *E. coli* removal rates once inoculated with *P. ostreatus* mycelium. Exposure time was manipulated to represent different surface flow conditions. Inoculated burlap and woodchips showed the highest rate of *E. coli* removal for each exposure time. *E. coli* removal rates increased with exposure time. The results could aid restoration ecologists in developing the most efficient “bunker spawn” barriers between agricultural point sources of fecal coliforms and nearby bodies of water. These mycological barriers could be placed in areas where runoff collects and pools. They could also be placed within constructed wetlands where manure runoff could be channeled before entering surrounding streams.

#### Harmful Microbial Detections on Fomites: Fruits and Vegetables from Local Summer Farmers’ Markets vs. Two Grocery Store Chains

Megan Kelly and Adam Ryzinski (Davison Sangweme), Penn State Behrend – Microbiology

Ever wondered what microbes could possibly be living on the fruits and vegetables at the local grocery store or farmers’ market? Every day our immune systems take a beating from our day-to-day activities, such as ingesting raw fruits and vegetables with little or no washing. These foods are normally perceived as a healthy part of our diets, and indeed they are but how safe are they? People never think of the behind the scenes part of food production. There are multiple factors that play into the production, transportation, and storage of fruits and vegetables. The produce is also handled by the staff and customers while on shelves. The purpose of this research was to explore the abundance and variety of microbes on raw farm produce, and to educate people on the risks of infection. This study involved the purchase of different types of fruits and vegetables (such as grapes, peaches, tomatoes, etc.) from three different produce suppliers (A: high end grocery store, B: mass transit store, C: corner-stand farmers’ market) for the assessment of microbial quality. Swabs were used to collect microbes that were then grown on media plates (Trypticase Soy Agar, MacConkey Agar, and Mannitol Salt Agar). This standardized procedure allowed comparison of the relative abundance and range of microbes on same products from different markets. It also helped investigate the presence of potential pathogens such as *Escherichia coli,* Methicillin-resistant *Staphylococcus aureus* (MRSA)*,* or other fecal contaminants.

#### Determining the Antimicrobial Effectiveness of Agion Silver Technology on Door Handles across the Penn State Behrend Campus

Marcelo Lob, Emily Schmitt, and Rachel Mercaldo (Beth Potter), Penn State Behrend – Biology

Agion antimicrobial solutions are relatively new, effective, and natural ways to control microbial growth. Through recent technological developments, scientists have been able to incorporate silver ions in a zeolite carrier. Unique to this material is the ability to provide a three-dimensional mechanism to release silver ions. These ions are generally activated by sodium ions and moisture present on skin cells, allowing the silver ions to only be released upon contact. The antimicrobial effectiveness has been studied in a controlled laboratory setting, but the novelty of our study is that effectiveness will be viewed from a ‘real life’ perspective. In the study, 50 door handles (25 silver-coated/25 control) within four different buildings located on the Penn State Behrend campus were processed over a six-week period in both the fall and spring semesters. Bacterial samples were taken to determine the total bacterial counts and handles were also analyzed to determine the amount of silver released. Initial analysis of the data suggest that the silver-coated doors consistently had lower counts than controls but bacterial amounts varied considerably from week to week in the experimental and control groups. Overall, it is anticipated that this study will provide a deeper insight into the broad-scale use of Agion silver technology for bacterial control.

#### Isolation of a Diverse Group of Soil Bacteria for Future Use in Studying their Effect on Gender Determination in Ceratopteris richardii

Nicole McAllister and Jasmine Shinko (Michael Ganger and Sarah Ewing), Gannon University – Biology

*Ceratopteris richardii* develop as either hermaphrodite or male; spores initially develop as hermaphrodites that produce a pheromone, antheridiogen. Antheridiogen signals nearby spores to develop as males through a process called induction. Previous studies showed that when *C. richardii* was grown with a K12 strain of *Escherichia coli*, induction was blocked, resulting in a bias toward hermaphrodite development (unpublished data). To demonstrate the broader ability of bacteria to elicit this effect on gender determination, a diverse, relevant population of bacteria must be identified for further study. Thus, bacteria were collected and isolated from the soil surrounding ferns from the local environment in an attempt to identify this group of diverse bacteria. Nine bacterial isolates were cultured overnight and used to isolate DNA for amplification of the 16S rRNA gene using gene-specific primers and polymerase chain reaction (PCR). The PCR products were verified using agarose gel electrophoresis and purified for sequencing analysis. Sequence data were collected and analyzed using EZTaxon. The following bacteria families were identified: *Enterobacteriaceae*, *Bacillaceae*, *Pseudomonadaceae*, *Plancoccaceae*, and *Aeromonadaceae*. For some isolates we were also able to identify the genus. Future studies will use these diverse isolates to determine whether or not each affects gender determination in *C. richardii.*

#### Anatomical Basis to UV Reflectance in Brown Anole Dewlaps

Jay Patel (John Steffen), Penn State Behrend – Biology

Many animals use ultra-violet (UV) reflectance of their integument to deliver information about mate quality and reproductive status**.** The anatomical basis to UV reflectance is known for several birds, but very little is known about how aspects of integument anatomy generate UV reflectance in reptiles. We used reflectance spectrometry to objectively quantify UV reflectance in the dewlaps (i.e., throat fans) of male and female brown anoles (a common lizard of the southeastern United States). We then performed Scanning Electron Microscopy (SEM) research on the same dewlaps and measured average number and area of scales to determine if these aspects of scale structure explain sexual differences in UV dewlap color. We found that scale size and number differed between sexes in brown anoles, but this difference did not significantly correlate with aspects of UV reflectance. Future research should focus on histological and ultrastructural differences in dewlap anatomy between male and female brown anoles.

#### Biogeochemical Cycling and Decomposition along White-tailed Deer (Odocoileus virginianus) Trails

Kelsey Ream (Richard Bowden), Allegheny College – Biology and Environmental Science

White-tailed deer create extensive trail systems as they move through forests, often using convenient trails regularly. Because deer spend a greater proportion of their time on these trails, it is likely that they have a “fertilizer” effect due to the greater amounts of feces and urine deposited. I incubated sugar maple (*Acer saccharum*), red oak (*Quercus rubra*), and mixed litter with varying amounts of O*docoileus virginianus* fecal deposits for 90 days at 25 ⁰C. I also collected soil samples both on and off *O. virginianus* trails at three forest locations in northwestern Pennsylvania and extracted them for ammonium and nitrate, however, the results were not yet available at the time of submission of this abstract. Litter decomposition rate varied slightly significantly between tree species (*df* = 2, *F* = 3.15, *p* = 0.0529) but not between fecal deposit treatments (*df* = 2, *F* = 1.372, *p* = 0.265). Fecal deposits decomposed slightly significantly quicker as weight of the total deposit increased (*df* = 1, *F* = 3.1, *p* = 0.0859), but not between tree species (*df* = 2, *F* = 0.309, *p* = 0.737). So far, these results indicate that there is not a strong interaction between white-tailed deer fecal deposits and litter in a laboratory environment, but do exclude the effect of the deer’s physical presence.

#### Analysis of -carotene Production by Gordonia sp.-SD4 Isolated from Cave Soil

Jingyi Zhang1 and Aziz Yousif1 (Francis Mulcahy2 and Om Singh1), University of Pittsburgh at Bradford –
Biology1 and Chemistry2

Synthetic coloring of food and their possible consequences on human health has increased the demand of natural pigments. The -carotene is widely used as color additive in food industry, and is approved as a Generally Recognized as Safe (GRAS) substance (21CFR184.1245) by the FDA. We hypothesized that the microorganisms found under rare earth habitats would reveal products of commercial significance. The nutrient broth (NB) enriched cave soil samples revealed total of 20 colonies on nutrient agar (NA) plates designated as SD1-SD20. Colonies that revealed red, pink and yellow color were purified by the single cell isolation method, and identified using 16S rRNA sequencing. One of the pink colonies, SD4 revealed 99.28% similarity to *Gordonia* sp. at the Ribosomal Database Project (release 10) and EzTaxon version 2.1 databases. The intracellular red coloration *Gordonia* sp. SD-4 was extracted by acetone, and identified by Thin-Layer Chromatography (TLC). The Rf value of standard -carotene corresponded to one of the eight bands observed on the TLC chromatogram. The absorbance of the extract was measured at 436 nm, and concentration of -carotene was calculated using the Beer-Lambert Law. Among various carbon sources supplied to *Gordonia* Sp.-SD4, glucose and dextrose resulted in the highest production of -carotene.

### BIOCHEMISTRY II AND GENETICS

#### Complete Genome Sequence and Annotation of the P-endosymbiont of Puto echinatus and Phylogenetic Support for the Swapping of Symbionts between Evolutionarily Distinct Hosts

Zachary Duda and Joshua MacCready (Matthew Gruwell), Penn State Behrend – Biology

Scale insects (Coccoidea: Putoidae) contain obligate mutualistic bacteria housed within specialized cells known as bacteriocytes. These mutualistic bacteria provide essential amino acids not found within the phloem sap diet of the insect. Obligate endosymbionts are referred to as primary (P-endosymbionts), because they are essential for the survival of the insect. Endosymbionts of the insect genus *Puto* (family: Putoidae) have not yet been identified and were therefore targeted for genetic analysis. The bacteriocyte of the insect *Puto echinatus* was isolated from the mid-gut and sequenced using Ion Torrent. Sequencing generated 2.8M reads which were quality checked, trimmed and assembled (de novo) using Geneious from Biomatters LTD. Assembly generated 12 contigs which were joined using chromosome walking and Sanger sequencing. Genes were predicted using Glimmer V3 and annotations were performed using NCBI Blast of the translated Opening Reading Frame (ORF). Multigene phylogenetic analysis was performed and suggests that symbiont swapping has occurred between evolutionarily distant insect hosts, from the tsetse fly to scale insects, as well as between more closely related hosts.

#### Species Identification of Plants Using the Fingerprinting Genes matK and rbcL

Michael Jaskolka (Michael Campbell), Penn State Behrend – Biology

Species identification of plants can be challenging if only limited tissues are available. Recent investigation of chiral constituents present in the essential oils of plants can be accomplished with small amounts of leaf tissue. Recent developments in molecular DNA barcodes can assign species identity to plant tissues when limited material is present. In this study we utilize DNA barcoding to determine species on leaf samples from *Artemisia vulgaris* L. and *Gymnocladus diocicus* to coupling essential oil analysis plant taxonomy. With the use of the PowerPlant DNA Isolation kit we were able to extract genome DNA from the plants leaf tissue. Using sequencing of PCR amplification products for the genes matK and rbcL we have established a method to identify plant tissues to the species level. The obtained genomes were sequenced using GenBank’s BLAST program as reference. The data obtained from the BLAST program confirmed the identity of the plants in question.

#### Genome Annotation of Moranella endobia and Comparison to Tremblaya phenacola

Nicole Joseph (Matthew Gruwell), Penn State Behrend – Biology

The objective of this research was to annotate the genome of a species of endosymbiotic bacteria, *Moranella endobia*, that live within *Tremblaya phenacola,* another species of endosymbiotic bacteria. The significance of this research is that these bacteria are endosymbionts of mealybugs which are very common pest insects that destroy plants. The relationship between the two endosymbionts is one unlike any other that has been discovered because the genes of one function by using the genes of the other. Also, most genes are extremely similar. The research presented shows genetic data from *M. endobia* and its comparison to parts of the previously annotated genome of *T. phenacola*. The data presented only begin to describe the evolutionary relationship between the two endosymbiotic bacteria in detail. However, this research does provide a better understanding of how these two endosymbionts would have evolved over time.

#### Development of the Xenopus laevis Oocyte Expression Model for Studies on Ion Channel Trafficking

Dylan McCreary (Lauren French), Allegheny College – Neuroscience

Ion channels are transmembrane proteins which regulate ionic balance in all cells. They are especially important in neurons, in which their precise regulation causes the electrical changes responsible for neuronal activity. The transport of ion channels to and from the cell membrane is termed “channel trafficking.” Examination of trafficking has been traditionally performed using human embryonic kidney (HEK) 293 cells. HEK293 cells can be difficult to examine electrophysiologically, however, due to their small size and short longevity in culture. *Xenopus laevis* oocytes have been used for decades as an expression model to study ion channels electrophysiologically. This ongoing research is aiming to establish the *X. laevis* oocyte model for use in examining channel trafficking, specifically of the large conductance, voltage- and Ca2+-gated K+ channel (BK), by the accessory subunit β4. This would provide a powerful means to combine trafficking studies with a well-established model for studying electrophysiological properties. RNA for the channel tagged with a fluorescent protein was injected into oocytes. A two-electrode voltage clamp was used to confirm expression of the channel, and variations of fluorescent microscopy methods were attempted to determine the optimum method of study.

#### ANI1 Expression is Influenced by Antheridiogen and Abscisic Acid during Conversion in Ceratopteris richardii

Hannah Smith and Julia Girouard (Mike Ganger and Sarah Ewing), Gannon University – Biology

In the fern *Ceratopteris richardii*, gender is influenced by a pheromone called antheridiogen. In the presence of antheridiogen, spores tend to develop as males. Hermaphrodites develop in the absence of antheridiogen and are the source of antheridiogen. The gene *ANI1* is expressed during male development and has been implicated as a gene important for male determination. Males require the continued presence of antheridiogen to remain male, but will convert to hermaphrodites with its removal. Exogenous abscisic acid (ABA) can delay or, at higher concentrations, even block conversion (unpublished data). An experiment was undertaken to determine whether *ANI1* expression changes in a predictable manner during conversion. Three-week old males were transferred to media lacking antheridiogen; transferred to media containing only 50 μM ABA; or kept with hermaphrodites. After three days, RNA was extracted from males, exposed to DNase, and converted to cDNA. qRT-PCR was used to determine if *ANI1* expression changed in response to treatment. *ANI1* expression remained high in males transferred to media containing ABA, but dropped significantly in males transferred to media lacking antheridiogen. These results suggest that *ANI1* is not only important for male development, but also for the maintenance of the male phenotype.

#### The Effects of Knocking down MLO Gene Expression in Vitis vinifera on Regulation of Susceptibility to Powdery Mildew

Todd Thorniley, Garrett Fiscus, and Zachery Duda (Christopher Gee), Penn State Behrend – Biology

Research has shown that the MLO gene family in grapevine (*Vitis vinifera*) play a role in powdery mildew (PM) susceptibility, which has previously been observed in other important plants. We used four Mlo knockdown mutants (single gene disruptions: 129, 18a, four gene disruption: M35, empty vector control: M38) of Chardonnay grapes to study this role. Of the three functional knockdowns, mutant 129 showed an apparent increase in susceptibility when compared to the control (M38), and the other mutant (18a) demonstrated a weak loss of susceptibility. M35 showed a strong loss of susceptibility, suggesting an additive effect with this type of resistance. Full genome expression of the four mutants was measured following challenge with PM using the NimbleGen Vitis genome microarray. Significant differences in gene expression were observed for several genes known to be involved in pathogen interactions, suggesting a broader regulatory role for Mlo. These patterns were confirmed using targeted real-time PCR assays for genes shown in previous studies to be differentially regulated during PM attack. The most interesting observation from the real-time PCR studies was a constitutive up-regulation of several pathogen-related and other genes involved in well-characterized disease defense pathways in M35. Taken together, this sheds light on the molecular basis for the increased resistance observed in mutants that have decreased Mlo expression.

#### The Effects of Polyamines on the Class II Haemophilus ducreyi strain HMC112

Jennie Vorhauer1 (Laura Lee Magnelli2 and Tricia Humphreys1), Allegheny College1 and Drexel University2 – Biology

The pathogen *Haemophilus ducreyi* causes the human-specific sexually-transmitted disease Chancroid. Chancroid results in ulcer formation and facilitates the transmission of other sexually transmitted infections (STI). The normal flora bacteria *Gardnerella vaginalis* produces polyamines that may influence the growth of *H. ducreyi*, though an excess of *G. vaginalis* results in the genital disease Bacterial Vaginosis which is a female specific disease caused by an imbalance of the genital tract’s normal microflora. The class I *H. ducreyi* strain 35000HP was exposed to the polyamine by-products of *G. vaginalis*. Inhibition of growth was observed in the presence of spermine, spermidine, and L-arginine monohydride. Of these three, polyamines, spermine, and spermidine showed the most dramatic inhibition of growth and were therefore selected for tests with the class II strain HMC112. Tests on HMC112 using spermine and spermidine displayed inhibition of growth in a similar pattern to that observed in 35000HP. The information gathered as to the inhibitory effects of polyamines on *H. ducreyi* may eventually be used to develop treatments for the disease Chancroid.

#### Development of a Screening Protocol to Assess the Potential for a Gender-Bending Effect of Soil Bacteria on Ceratopteris richardii

Doug Youngdahl (Mike Ganger and Sarah Ewing), Gannon University – Biology

Gender determination in the fern *Ceratopteris richardii* is determined by a pheromone called antheridiogen. Antheridiogen is produced by hermaphrodites and it biases individuals to develop as males, a process called induction. Its absence leads to hermaphrodite development. Previous studies have shown that the K12 strain of *Escherichia coli* can block induction (unpublished data). We are interested in developing a protocol to determine the nature and extent of any effect of soil bacteria on gender determination. Soil bacteria were collected from ferns and isolated. One isolate, a pseudomonad, was introduced into fern media alone and to media containing *C. richardii*. Fern media was also established with *C. richardii* spores only. After three weeks, media from these three groups was frozen and thawed to release the liquid portion of the agar. This crude aqueous extract was autoclaved, pH balanced, and used to establish three treatments: bacteria extract, *C. richardii* extract, and bacteria with *C. richardii* extract. *C. richardii* spores were grown in the presence of each extract for three weeks before determining the percentage of hermaphrodites in each treatment. Autoclaved pseudomonad extract blocked induction in *C. richardii* and the extract component influencing induction persists through autoclaving.

### CHEMISTRY AND PHYSICS

#### Novel Benzisoxazole 2-Oxides as Metal-Coordinating Ligands

Jonathan Fifer (Martin Kociolek) Penn State Behrend – Chemistry

The wide use of ligands in metal-catalyzed reactions makes the area of ligand synthesis of great interest. This developed the idea to identify a benzisoxazole 2-oxide capable of coordinating metals. Using general synthetic methods already reported in our lab, the initial work focused on synthesizing a benzisoxazole 2-oxide capable of coordinating metals. The general synthesis of the ligand is straight forward and is analogous to other reported compounds. The first part of the research project involved the synthesis of a ketone containing a pyridine ring by using a Fries rearrangement. This ketone can then be converted to the corresponding oxime and cyclized with iodobenzene diacetate or NCS to give the benzisoxazole 2-oxide. Once the ligands have been synthesized, attempts to coordinate with a variety of metals will be investigated. If coordination compounds can be successfully synthesized, their potential to catalyze a variety of organic reactions will be examined.

#### A Computational Analysis of Hydrogen and Carboxylic Acid Adsorption to Carbon Nanotubes

Amanda Harris (Ron Brown), Mercyhurst University – Chemistry

The energies of carbon nanotube models were calculated to investigate the chemisorption of several small adsorbates. Initial calculations were performed to determine and compare the energy per carbon on clean nanotube models. Models of nanotubes with armchair and zigzag geometries of increasing size and lengths were designed and molecular mechanics (MM2) geometry optimizations, and energy calculations were performed. Hydrogen atoms were then added to completely cover each nanotube model and the optimum geometries and energies of the hydrogen-covered models were calculated. Results showed that the energies per carbon atom and the energies per hydrogen added to be dependent on nanotube radius. As the radius of the tubes increased, energies per carbon of the nanotubes decreased, while energies per carbon of hydrogen-covered nanotubes increased with radius. In addition to hydrogen, carboxylic acid groups were also added to (4,0) zigzag nanotubes models. The carboxylic acids were added in a variety of arrangements and optimum geometries and energies were determined. Calculations provided energies per carboxylic acid added as a function of the adsorption arrangement and nanotube geometry.

#### Efforts towards Synthesizing Diversely Functionalized Enamides via Cycloadditions with Allenamide Dienophiles

Jennifer Hoobler and Alyssa Blake (Amy Danowitz), Mercyhurst University – Chemistry

Enamides are a commonly encountered functional group. They are present in a variety of natural products, including salicylinalamides which have anti-cancer activity. Additionally, enamides are synthetically useful as they provide easy routes into a wide array of protected amines. This work focuses on synthesizing variously substituted enamides via cycloaddition reactions using phosphorimidate-derived allenamides as dienophiles. There are a few reports of forming enamides via cycloadditions with allenamide dienophiles; however, the general scope and utility of these reactions has not been fully probed. Efforts toward optimizing these reactions has thus far focused on changing the times, temperature, and solvents used. Additional efforts will involve changing the diene functionality, as well as testing these reactions with more sterically hindered allenamides. Eventually, it is predicted that this chemistry can be used to synthesize heavily and diversely functionalized enamides in high yields and few synthetic steps.

#### Impact of Defect Sites on Single-Walled Carbon Nanotube Fluorescence

Jacob Slease, Erica Rider, and Lucas Kubeldis (Lisa Nogaj), Gannon University – Chemistry

A single-walled carbon nanotube (SWNT) is a cylinder of carbon atoms bonded in a hexagonal pattern. Dating back to their discovery in the early 1990s, chemists have been amazed by the remarkable strength and unique optical properties they exhibit. One area where SWNTs could be of practical use is the biomedical imaging sector. SWNTs produce stable fluorescence in the near-infrared, and could be used as biosensors that act as biological labels and could be used as a diagnostic tool. SWNTs form aggregated bundles, making harsh ultrasonic processing necessary to obtain isolated samples for such applications. Our research looks to understand better how this necessary damage to SWNTs truly affects their fluorescence. We created a library of SWNT samples and systematically damaged the SWNT sidewalls using a sonicator. In doing so, we created a data bank of SWNTs based on how long they were sonicated as well as at what power intensity they were sonicated. From there, we characterized the SWNTs based on absorbance, fluorescence, and length. We will report our findings regarding how the processing affects the optical properties of the carbon nanotubes, especially fluorescence.

#### Drifter Buoy Sensor Package

Josiah Tyte (G. William Baxter), Penn State Behrend – Physics

We are designing an inexpensive micro-controller-based sensor package for the National Oceanic and Atmospheric Administration, U.S Office of Naval Research, and the National Science Foundation drifter buoys. These simple buoys, costing less than $500, have an on-board GPS transmitter that relays the buoy’s position to a satellite every hour. They are built and released by school groups and research teams on the Great Lakes as well as Atlantic and Pacific coasts. From the position data, oceanographers and geologists can determine and study the surface water currents that move the buoy. Our sensor package will use an Arduino micro-controller and sensors to measure water and air temperatures, atmospheric pressure, and wave height and period. The measurements will be stored on an on-board SD card. We intend to keep the cost of the sensor package under $100 and provide full simple instructions to encourage groups to add one to their buoy. Since the buoy reports its position hourly, the SD card and its data can be retrieved every few months providing researchers with a wealth of new data.

### EDUCATION AND SOCIAL SCIENCE

#### Passport to a Healthier You: A Pilot Intervention Program to Prevent Childhood Obesity in Crawford County

Ashley Baronner (Dr. Caryl Waggett), Allegheny College – Environmental Health

Childhood obesity has tripled among children ages 6-12. Crawford County, Pennsylvania, lies in a rural area where healthy foods and regular exercise are limited mainly due to access and cost. Through community collaboration, the program “Passport to a Healthier You” addressed the need to provide access to healthy foods and regular activities to children. This study asked: “Can a goal-oriented, incentive-based program improve community and family knowledge, attitudes, and behaviors regarding nutrition and physical activity?” Free activities were offered in two modalities related to nutrition and physical activity. Operating for three months in Spring 2012, “Passport” enrolled 91 children representing 54 families. Each family completed pre- and post-surveys. Families and children were to attend at least 12 different events to obtain the stamps required in their “passport” book. Successful participants benefited from the program through positive, self-reported changes in knowledge, attitudes, and behaviors. This research provided further support for family-based, community-supported health education. Additional long-term programs similar to this might be able to determine long-term effects on reducing childhood obesity not only in terms of knowledge, attitudes, and behaviors but also in terms of experiencing a reduction in body mass index (BMI) and other obesity indicators in children.

#### Lot Lizards

Jesselyn Heaps (Ronald Kelly), Penn State Schuylkill – Administration of Justice

“Lot Lizards,” what are they? What do they do? “Lot Lizards” are an unknown population of female prostitutes who “work” trucks stops to survive. The issue with such a population is that it is constantly increasing and more frequently, females are turning to prostitution specifically becoming “lot lizards” to earn a living or extra money. The increase of “lot lizards” is a huge issue because it enables opportunities for serious criminal acts to occur such as drug deals, drug use, rapes, homicide etc. Due to the increase in the existence of lot lizards and their underground nature this future research is going to examine the different roles of lot lizards in order to create different typologies. By conducting such research it will enable people to understand what drives these lot lizards to engage in such deviant behavior and to develop an understanding of this unknown population. By conducting such future research people will not only gain an understanding of this unknown population but will be able to contribute in helping disable the rapid growth of “lot lizards.”

#### Exploratory Study on Targeting Women in Sports Market: Nike Case

Melissa Hess (Pelin Bicen), Penn State Behrend – Marketing

The portrayal of woman in society is ever changing. Women are in the process of becoming more independent, self-reliant, financially strong, confident, social, and competitive, both in their personal and professional lives. Due to their buying power, many companies have started showing interest in this market. The current study investigates the sports industry and reviews companies’ potential market segmentation and targeting strategies in regards to females. Case analysis will be conducted as an exploratory research design, analyzing Nike, a leading sports company, and explore their Nike Women marketing and branding strategies through secondary sources and interviews with Nike executives. This study will have managerial implications for companies’ female market segmentation and targeting strategies.

#### Implications and Emergence of Inclusion in the German Education System

Krisandra Livingston (Jayne Leh), Penn State Berks – Elementary Education

Inclusion represents the philosophy that students with disabilities should be integrated into the regular education classrooms with their nondisabled peers. Although the inclusion model is widely accepted across America, there are countries worldwide where inclusion has not yet been implemented. The purpose of this thesis is to compare the emerging special education system in Germany to the American system by evaluating one pilot program in Germany to determine the program’s potential success. The inclusion pilot program for disabled children is taking place in a school in Melsungen, Germany. The program is part of an initiative by the German government to implement inclusion eventually across the country. The purpose of the pilot program is to determine the amount of time and resources needed to include students with disabilities successfully into a regular classroom. To evaluate the German program, this thesis first provides a comprehensive review and critical analysis of research and literature concerning the issue of inclusion. The factors that contributed to the movement to educate students in inclusive classrooms in America, the concepts of least restrictive environment, and inclusive classrooms. Finally, this thesis analyzes the German inclusion program and offers recommendations for the future of the German special education system

#### Penn State Behrend Energy Management Team 2013 Energy Challenge

Paul Lukasik, Lydia Maharg, Stephen Galdo, and Franchesca Fee (Ann Quinn), Penn State Behrend – Sustainability

The Energy Star Portfolio was initiated at Penn State Behrend in spring 2010. Progress was noted at Smith Chapel during the Spring 2012 Semester. The Portfolio offers a proven strategy for superior energy management with tools to calculate key metrics such as electricity, gas, and water use. This semester, spring 2013, the team has also been using the Campus Conservation National website to assist in tracking, analyzing, and presenting the data. The project expansion has focused on the first-year residence halls during the 2012-2013 academic year. This will comply with the Penn State Energy Conservation Policy (AD 64) to help control the energy consumption in order to achieve financial and environmental performance goals. The policy is in response to a request for a $375,000 reduction in the utility budget for Penn State campuses. It is also a part of the University’s strategy to reach its greenhouse gas reduction target of 17.5% by 2012. Our team has the full support of Housing and Food Services, Residence Life, and Maintenance and Operations. All groups are compliant and eager to work together to reduce energy consumption on campus. Our results have shown there is a correlation between increasing energy awareness and reducing energy consumption.

#### The Impact of Stress on Drug Indulgence in College Students

Matthew Morgan (Ronald Kelly), Penn State Schuylkill – Administration of Justice

The purpose of this study was to understand the relationship between stress-factors that college life presents and drug use in order to cope. Various theoretical perspectives are examined in this analysis. Social Learning Theory suggests that that peer influence reduces the stigma that would prevent one from engaging in drug use in a less liberal setting. Differential Association states that an individual will engage in a criminal activity when the balance of definitions for law breaking exceeds those for law abiding, which may explain how the desire for stress alleviation can overpower the desire to avoid the intake of a prohibited substance. The data for this study were collected through a survey taken by college students, predominantly those who attend Penn State Schuylkill. The study attempts to determine the extent to which those who engage in recreation drug use are influenced by elevated stress levels due to academic problems or an unsatisfactory level of overall wellness. This study considers personal factors that may prove significant in how such coping methods are established.

#### Thermoelectric Cooler Activity for K-12 Outreach

Nathan Myers (Robert Edwards), Penn State Behrend – Mechanical Engineering Technology

Penn State Behrend currently holds a K-12 Outreach program to involve and inform high school and middle school students in engineering activities. The purpose of this research was to develop a hands-on activity for the students to demonstrate the use of thermoelectric coolers. The research involved grasping an understanding on how thermoelectric coolers work and how they are assembled and used in real-world situations. The first step was to generate top down assembly models of each thermoelectric cooler. After models were completed, they were then taken apart and assembly procedures were created to allow students to understand how they are assembled. After assembly procedures were created, test procedures were created to give students a hands-on activity to complete to give them an understanding of the devices. Finally an educational poster was created.

#### Systemic Lupus Erythematosus (SLE): Disparity Gap and use of Social Networks

Chloé Nuñez (Caryl Waggett), Allegheny College - Environmental Science

Recent research has shown that systemic lupus erythematosus (SLE) is three times more prevalent in African-American women and two times more prevalent in Latina and Asian-American women. Research has shown that minority patients with SLE tend to be diagnosed later than Caucasian counterparts and are less likely to adhere to physicians’ recommendations and guidance. The purpose of this research study was to determine if/how social media networks can be used to bridge the health disparity gap faced by minority patients with SLE. This study posits that minority patients with SLE may feel more comfortable receiving medical support from online resources than through direct medical supervision, and if so, may have higher compliance with symptomatic treatment specifically in relation to patient-physician interaction. A survey evaluating patient-physician interactions and comfort with requesting and receiving medical advice and guidance in person and online has been administered via Facebook and Twitter, in both Spanish and English, to active websites related to lupus. Data analysis is ongoing and will be completed by mid-March.

#### The Development of Lesson Plans that Introduce Simple Computers to Primary and Secondary School Students

Daniel Ryder (Melanie Ford), Penn State Behrend – Computer Engineering

This undergraduate research project was designed to develop modules that established and advanced the concepts of simple computers for students in grades K-12. The emphasis was to design fun teaching methods and activities that provided new hands-on activities with lesson plans that teach the basic components of a simple computer, how these components work together, and what can be made from these components. The lessons also included some fundamental ideas of computer programming. The lessons explore basic computer concepts and their components through the use of an off-the-shelf product called PicoCrickets. These lessons can be combined to be suitable for students of different grades and age levels. The Engineering K-12 Outreach Center will be using these lessons to help students learn about different computing and engineering careers.

#### Northeastern Pennsylvania Massage Parlors: A Front for Human Trafficking?

Erin Witmer (Ronald Kelly), Penn State Schuylkill-Administration of Justice

Human trafficking has become one of the fastest growing areas of criminal activity. At any given time worldwide, there are 12.3 million victims of forced labor and commercial sexual exploitation, otherwise known as human trafficking. Recently, in 2005, more than 150 victims were identified during an investigation on sex trafficking in Harrisburg, Pennsylvania, known as “Precious Cargo.” The purpose of the present study was to investigate the raids of massage parlors in northeastern Pennsylvania. The study will examine the women arrested and look for similar characteristics to identify whether or not they are victims of human trafficking, not criminals. The seven counties investigated were Berks, Bucks, Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, and Schuylkill. The characteristics from each woman will then be used to correlate Routine Activities Theory. These results will be useful to the public to help prevent further victims of human trafficking and incorporate additional preventative policies and organizations to help current and previous victims by developing a checklist for current investigators to make sure they are asking the appropriate questions when interrogating during a raid.

### ENGINEERING

#### Cellular Phone Control Application as an Undergraduate Research ProjectJames Bimber and Garrett LoVerde (Robert Weissbach), Penn State Behrend – Electrical and Computer Engineering Technology

Finding new innovative ways to solve problems with cellphones can help improve both productivity and efficiency. This is especially true in the case of control devices. The costs associated with the purchase or design of a single purpose control device could be reduced through the use of a cell phone. The programmability and widespread use of today’s cellphones give them great potential to be used as multipurpose control devices. This undergraduate research project demonstrates such concepts by using a smart phone to control the rotational speed of a DC motor. Specifically, the project involves the development of a real-time method to control a device in a way that is accessible to the public and relatively easy to implement in industry or an academic setting. A smart phone application was created using a graphical user interface (GUI) to represent the controls of a motor and to display relative motor speed. The smart phone was programmed to interpret input from the GUI and output commands wirelessly. An embedded control system receives the wireless signals from the smart phone and interprets those signals and creates a PWM signal that is proportional to motor speed.

#### Campus Tour Model

Matthew Campbell, George Gotsiridze, Shane Shafferman, and Robert Steiner (Matthew White), Penn State Behrend – Game Development

The Campus Tour Model will be an opportunity to demonstrate the Game Program’s abilities and future potential by utilizing the new tools provided by Autodesk. Autodesk has provided software such as 3ds Max and Maya for use by Behrend students. The programs will give a medium for creating industry standard models in a variety of applications. Creating models of the campus buildings utilizing these applications will provide the school with a virtual render that can be used to showcase the campus to prospective students. The virtual model can be a valuable tool for those who are unable to physically visit the campus and can view the entire campus from home.

#### Development and Testing of Deterministic Model for a Stochastic Wind Simulator

Joel King (Robert Weissbach), Penn State Behrend – Electrical Engineering

In previous research, a stochastic model to generate synthetic wind data has been developed. This model incorporates the use of a Markov chain to randomly assign wind speeds at particular points in time based on a prior wind speed. Such a model can be useful for estimating the amount of energy storage required at an off-grid residence. One issue with developing such a model is verifying that the model produces credible results. In this project, a deterministic set of wind data will be created which will be used to test the model. The idea behind this is that the theoretical results of what the model should produce are known beforehand, and these results will be compared with the experimental results of what the model actually produces. This ensures that the produced results are accurate, and provides a determination of the credibility of the model. The deterministic set of data can also be used in different models for validation. This project will involve the use of MATLAB software to run simulations, produce results, and analyze the results.

#### Effects of a Sudden Expansion in a Circular Duct with Air Flow

Christopher Leasure and Daniel Gorajewski (Robert Edwards), Penn State Behrend – Mechanical Engineering

An experiment was performed to investigate the relationship between a pressure drop and velocity profile for the flow of air through a sudden expansion in a circular duct. The data collected during the experiment were used to address a common misconception about the use of the Bernoulli equation in calculating pressures throughout a piping system. The experiment was conducted using a custom-built device which was used to investigate the effects of losses caused by a sudden expansion. Data were collected for two different sudden changes in cross-sectional area. The collected data were then compared to the calculated values of the Bernoulli equation to find discrepancies. The experiment demonstrated a significant and measurable pressure loss in the circular duct. The discrepancy is attributed to frictional losses around the sudden expansion which caused a pressure drop that is not accounted for in the Bernoulli equation.

#### Macro-View Controller for A Multilayer Geographical Information SystemDavid Pocratsky (Xiaocong Fan), Penn State Behrend – Software Engineering

A geographical information system (GIS) uses various types of data, such as roads, elevations, locations of special sites, etc. and assembles and processes the data to present patterns or trends. This research is a continuation of a past research project which developed a system that had a database and server hosting geographic and special data which could be viewed using a commercial GIS viewer, such as uDig. This research builds on this project by addressing the need for certain features on the client side. A standalone client was developed with customized user interface elements. A mini-map feature was developed which allows the user to click somewhere on a micro-sized image of the whole area which would result in the main screen displaying that location. A zoom tool was also developed which allows a user to mouse over a location to show a zoomed image in a smaller window without changing the overall zoom level.

#### Homotopy Analysis Method Applied to Stagnation Flow towards a Stretching Cylinder

Brandt Ruszkiewicz1 (Antonio Mastroberardino2), Penn State Behrend, School of Engineering1 and School of Science2 – Mechanical Engineering

In fluid mechanics, nonlinear partial differential equations are used to describe viscous fluid flow. In various problems, these equations are reduced to nonlinear ordinary differential equations after a similarity transformation. Similarity solutions are not only important for describing physically relevant aspects of a problem but also in validating the accuracy of numerical solutions to the complete set of partial differential equations. In this presentation, we investigate the nonlinear boundary value problem (BVP) that is derived from a similarity transformation of the Navier-Stokes equations governing fluid flow towards a stretching permeable cylinder. We obtain analytical solutions using the Homotopy Analysis Method (HAM) and compare our results with numerical solutions.

#### Deformation from Ejection for Autodesk Moldflow

Pat Scullion and Pat Mannella (Jonathan Meckley), Penn State Behrend – Plastics Engineering

A simulation verification study was performed to understand how plastic parts can deform during the ejection stage of an injection molding process. Deformation of the final product such as visual and mechanical issues, occur from improper processing settings. One Factor At a Time (OFAT) testing was performed on two different plastic materials, one semi-crystalline and one amorphous, in two separate mold geometries. Extra emphasis was put on an additional OFAT study of how an increase in the draft angle of the mold geometry affects the ejection force, and therefore the final product. The purpose of this research was to determine processing parameters that are most influential on the ejection process. Cooling time was the most influential process variable.

#### A Lightweight Multilayered GIS for Network-Centric Warfare

Bryan Smith (Xiaocong Fan), Penn State Behrend – Software Engineering

The purpose of the present research was to explore the possibility of developing a lightweight multi-layered GIS system that would be able to act as a subsystem for a larger network-centric warfare system. This system can be used to capture, store, analyze, manage, and present geographic data in the form of maps, points, roads, and other features to users. Network-centric warfare seeks to use the capturing and sharing of this information to use better decision-making abilities to gain an advantage in combat situations. The results of the research show that it is possible to store and load path points into a database, display these data points to the user, display multiple layers of information stacked upon each other, and navigate around the map. This system has many possible application domains in addition to network-centric warfare.

#### Amount of Wire Necessary to Construct a Single Story Ranch Style House

Carissa Stanko1 (Paul Ashcraft2), Penn State Behrend, School of Engineering1 and School of Science2 – Mechanical Engineering

Currently the only way to estimate the amount of wire needed to wire a newly constructed house is to use a blueprint, draw the wiring scheme, and then use the wiring scheme to compute the length of wire in the house. The purpose of this research was to develop a formula that can be used to easily calculate the amount of wire needed when constructing a single story ranch house. The formula has only two inputs, square footage of the house and the number of ceiling lights to be installed; the formula also has the flexibility to include or exclude an attached garage, laundry room, and central air conditioning. The formula has a +/- 20% error which is in most cases not enough of an error to change the number of rolls of wire needed if using 250-foot rolls of wire. It was not possible to verify the results with an actual blueprint but the results are logical.

### PSYCHOLOGY I

#### Perspective Taking in our VIZual World

Bilge Erdem, Miri Ohashi, Megan Harris, Callie Keating, and Christine Winkelbauer (Dawn Blasko and Heather Lum), Penn State Behrend – Psychology

VIZ is an interdisciplinary project focused on assessing and training spatial skills crucial to our everyday lives, such as spatial memory and wayfinding. In the current study we investigated whether an individual’s level of spatial-skill development predicted his/her ability to learn from an on-line training game. Games that also teach, serious games, can be very beneficial as students may be more motivated to play and then learn the material almost accidently. However, many of these games involved navigating in a virtual world an area of spatial intelligence not always highly developed. Participants were asked to complete a mental rotation task, and a water level task. They played a game twice in which they had to plan a community to prevent the damage caused by a tsunami (*StopDisasters.cm).* We found that those who had better spatial skills did tend to perform better on the game. The effects were strongest the second time they played the game, at a point when a mental map of the virtual world had already begun to be formed. Our final goal was to add a new spatial working memory task to the VIZ website which we believe would be an important predictor of performance.

#### Ethnographic Investigation of Residential Treatment Facility for Child Trauma Victims

Michelle Evan (Dharma Jairam), Penn State Behrend – Psychology

Of U.S. children, 26% experience trauma before the age of four. Trauma victims often turn to residential treatment facilities for treatment. Staff at these facilities undergo intensive training on empirically-based treatments and are at the front lines in administering care based on these trainings. The research question that guided this study is what occurs at these facilities after the trainings, when the staff members are actually on the job? This study was an ethnographic investigation designed to highlight staff behaviors and determine if those behaviors are aligned with treatment objectives. A member of the research team conducted observations and intensive interviews of six staff members at a residential facility for child trauma victims. Data were analyzed as outlined by Agar (1996). Results indicated that staff engaged in positive behaviors aligned with treatment recommendations, including, reset time, safety goals, and facilitating exercise. However, staff also engaged in negative behaviors that countered treatment recommendations, including: ignoring children, disparaging comments, teasing, denying family contact. Continual education of treatment and more frequent supervision is needed. Additional suggestions and implications are discussed.

#### Environmental Conditions Relationship to Academic Achievement and Attitudes

Katherine Hoffman, Abigail Dudzic, Ashley Turner, and Kimberly Cook (Victoria Kazmerski), Penn State Behrend – Psychology

Students who are in a “green school” are surrounded on a daily basis by environmentally friendly features. The environment is designed to enhance their learning experience. For the past several years we have been studying students at a “green school.” We found that the students at the “green school” have higher test scores on material related to the green features of the school whether taught in a lesson or not. We found that the students who were not exposed to the older building reported less positive attitudes about the newer building, but were still positive about the building. Middle school students learned science content based informally through building signage. We also found that the students in J.S. Wilson have strong school connectedness compared to surrounding schools as the school’s green theme provides a sense of bonding for the students. Results demonstrate environment does impact students learning directly and indirectly.

#### Embodied Metaphor and Interference: Comprehension vs. Confusion

Christie Leslie, Rob Fogle, Bryan Fleeson, Kayleigh Adamson, Ashley Kerr, Erica Edwards, and Alicia McAllister (Victoria Kazmerski and Dawn Blasko), Penn State Behrend – Psychology

Many metaphors have conceptual roots that are perceptually embodied (e.g., the pool party was a hoot) but little is known about how this influences our moment-to-moment understanding. Our goal was to understand better the nature of embodied metaphors. In the current study, we examined whether metaphor comprehension was inhibited when participants completed a separate task (e.g., judging a beep as high or low). We examined how this interference would inhibit processing of motor or auditory metaphors. Literal control sentences were also included for comparison. The data showed that reading time did increase for the metaphor conditions compared to the literal. The results showed that the perception of embodied metaphors happens quickly and interference primarily affects the more controlled, slower process of interpretation.

#### College Students Acceptance of People with Disabilities

Holli LeVan, Katherine Pope, and Sheila Ziems (Victoria Kazmerski), Penn State Behrend – Psychology

With many schools now implementing inclusion programs for students with disabilities it is important to see how accepted these students will be. The purpose of this study was to examine the relationship between personality traits, prior exposure, and college students’ acceptance of people with disabilities. Prior studies have not researched the correlation between personality traits, prior exposure and acceptance of people with disabilities in college students. We hypothesized that people who are high in openness and agreeableness would have a higher acceptance rate of people with disabilities. We predicted that individuals high in consciousness would have slightly higher levels of acceptance than those who scored high in extraversion and narcissism. Also, we hypothesized that those with prior exposure would be more accepting regardless of personality trait. We found statistically a significant bias. Bias was defined as the difference in opinions the participants had when looking at pictures of disabled and non-disabled individuals. There were statistically significant correlations between personality types and acceptance levels. This research can help in gauging how well inclusion programs will work when implemented into schools.

#### Effect of Animal Bias and Behaviors on the Desirability of Dogs

Kymberly McClellan and Nicole Nau (Victoria Kazmerski) Penn State Behrend – Psychology

How dogs are perceived based on stereotypes impacts how potential owners determine their desirability. The significance of this study was to get an idea of why specific types of dogs are returned and reside in shelters longer than others. Participants aged 18-35 recruited via Penn State SONA system were assessed on animal bias based on hypothetical behavior. Participants were shown pictures of three breeds of dogs (Labrador retrievers – associated with positive qualities, pit bulls – associated with negative qualities, and poodles which were used as neutral fillers) paired with a scenario featuring desirable or undesirable behaviors, or for the poodles, neutral behaviors. The desirability of each dog was then rated. Participants also completed the Animal Attitudes scale and the Implicit Association Test. Between-subjects ANOVAs revealed main effects of scenario types, interactions between breed type, desirability, coat color, and the AAS. Participants’ pre-conceived attitudes of animals and past experiences as well as the animals’ characteristics such as size, age, and sex could explain these findings. Further research could raise awareness and benefit the adoption process.

#### Exploring the Black Dog Syndrome: How Perceptions of Animals are Influenced by Subconscious PrejudiceNicole Nau and Kymberly McClellan (Heather C. Lum), Penn State Behrend – Psychology

The “Black Dog” syndrome is a phenomenon in which darker colored dogs and cats are seen as less desirable, less adoptable, and is more likely to be euthanized. The significance of this study was to examine how perceptions of dogs and cats may be influenced by their color and how the subconscious prejudice that humans may have for each other may contribute to this perception. A total of 65 participants were included in the study. Participants were shown pictures of dogs and cats of varying colors and breeds and answered questions related to perceived attributes of the animal. Participants also responded to an Implicit Association Task used to gauge their underlying prejudice toward Caucasian and African-American humans and then completed a series of scales measuring personality characteristics and attitudes towards animals. Separate 2x3x5 mixed ANOVAs revealed main effects on IAT score for the attribute of aggressiveness. Post-hoc analysis revealed that individuals with an automatic preference for Caucasians rated the black dog as most aggressive and the yellow as least aggressive. The results of this study indicate that people who have subconscious prejudice towards humans also hold these prejudices against dogs and cats. Further research could raise awareness and benefit the adoption process.

#### The Frequency of Mands and Disguised Mands in Children Ages 2-5Jessica Repasz (Rodney Clark), Allegheny College – Psychology

To date there has been little evidence of research conducted on disguised mands (an indirect verbal request, question or demand). However there is considerable research on mands. A mand is commonly defined as a verbal request, question or demand typically as result of need of something including but not limited to attention, objects, actions and other more complex events which is then reinforced by the outcome, technically defined as: a verbal operant whose form is determined by a prior motivative variable. Gender differences in development could alter the form of verbal operant used. Using classroom observations of 2 year olds, 3 year olds and 4/5 year olds, this study assessed differences in verbal behavior based on gender of the speaker and listener during daily verbal exchange among peers. Gender of both the speaker and the listener was recorded along with style of verbal operant (mand or disguised mand). It was hypothesized that females will vary using both mands and disguised mands depending on the listener, whereas males will more consistently use mands despite whom they communicated to. Results, if significant, could reveal a new emphasis for study within the field of verbal behavior.

#### Embodied Cognition and Weight Perception: Does Stress on Your Body Have an Impact on Your Opinions?

Shannon Shaffer (Gerard Barron and Melissa Heerboth), Mercyhurst University – Psychology

Recent studies have shown that the weight of a clipboard can influence how you rate currency. The purpose of this study was to determine whether the weight of the clipboard would influence how participants rate photographs of males, females, and objects. Participants were shown a series of photographs of both people and objects and asked to record how much they thought the person or item in the picture weighed while holding either a light clipboard or holding a clipboard that weighed approximately 1 pound more than the light clipboard. They were then shown the photographs of the people again and asked to rate them on a scale from 1 to 10, with 1 being their perception that the individual was extremely underweight and 10 being extremely overweight. In addition, we also wanted to study if the participant’s body mass index (BMI) would influence their results as well. It was determined that there was no effect for which clipboard the participants held when it came to their recording the weight of the person or object. However, there was a significant effect between the participants BMI and their recordings of the weight of the pictures in the first series of photographs.

### PSYCHOLOGY II

#### Communicating across Cultures: Studying Abroad in South Africa

Preston Barrett, Andrew Beck, Ashley Kerr and Joslyn Mesing (Victoria Kazmerski and Dawn Blasko), Penn State Behrend – Psychology

Summer 2012, students and professors from Penn State Behrend ventured across the world to South Africa. While there, the group was immersed in South African culture. Most notably, the group attended an international psychology conference in Cape Town, where many of our group presented their research alongside some of the world’s greatest scholars. We also learned more about the country by visiting historical landmarks of the cape including the Cape of Good Hope, and Robben Island, where Nelson Mandela was imprisoned during the apartheid era. We stayed in Soweto and took a bicycle tour of the township where we experienced Zulu food and dance. Finally, we took a Safari in Kruger National Park where we experienced firsthand the natural world of the African savanna. These experiences exposed us to the tremendous economic divide that was the legacy of apartheid and to the struggles of the modern South Africa, Overall, the this study abroad experience encouraged us to critically analyze our own cultural attitudes and to develop more cross-cultural sensitivity in our future careers.

#### Attachment and Pain Memory

Alicia Carrol, Jessica Salley, and Lindsey Fuller (Carol Wilson), Penn State Behrend – Psychology

Literature suggests that attachment-working models can distort memory in a model-congruent fashion. Studies have researched attachment and the memory of the emotional pain of conflict, but not physical pain. Our two-part study is testing the hypothesis that attachment-working models can influence immediate and remembered pain. Females currently in a romantic relationship are being subjected to an acute pain procedure using a tourniquet while being primed with an image of their romantic partner or a stranger. It is expected that more anxiously attached individuals will report greater pain immediately and recall will have become more negative. It is also expected that more avoidant individuals will report less pain immediately and recall pain as less negative. This could show that anxious attachment could pose vulnerability when coping with and remembering physical pain. The female’s romantic partner is also being primed during part one with either a support or nonsupport condition to test whether or not support influences responses to an accident scenario. After reading the hypothetical scenario, participants are asked to rate a series of questions regarding expectations of their injuries and coping abilities.

#### Which is the Best Predictor of Aggressive Behavior: Gender, Self-esteem, or Narcissism?

Susan Dombrowski, Alex Kindle, and Heather Custard (Victoria Kazmerski), Penn State Behrend – Psychology

Why individuals are aggressive is an unresolved issue. There are many variables that could be predictors of aggression, but three really seem to stand out: gender, self-esteem levels, and narcissism. This research study asked the question, which is the best predictor? Participants filled out surveys to measure their self-esteem, narcissism levels, and aggression and also reported how they would react in different scenarios to test further their aggression levels. Overall, it was expected that narcissism levels would be the best predictor of aggressive behaviors. It was also expected that students with low self-esteem would show more aggressive behaviors than those with high self-esteem and that males would show more aggressive behaviors than females. Our results showed that some aspects of narcissism and aggression were related, but self-esteem was a better predictor of all aspects of aggression. These results could have practical implications for better understanding what makes people act aggressively.

#### The Effect of Music and Conversation on Driving

Bryan Fleeson and Ashley Turner (Victoria Kazmerski), Penn State Behrend – Psychology

Listening to music and engaging in conversation with passengers are two of the most common distractions people expose themselves to while driving. Studies have shown that music can play a major role in driving behavior and can even alter a person’s mood. One study found that high-tempo music leads to increased speed and more red-light violations during a simulated driving task. Another study found that music competes for one’s available cognitive resources resulting in a high mental load and processing demand while driving. The purpose of this study was to determine how music and working memory load impact driving behavior. It was hypothesized that participants would drive the fastest and make the most errors when listening to high-tempo music with conversation, and the slowest and make the least amount of errors without the presence of music or conversation. A main effect was found between conversation conditions for errors. We also found significant, positive correlations between speed and errors made for each of the conversation conditions.

#### An Examination of Perceptual and Interactive Differences between a Live and Virtual Pet Training ScenarioMaurina Grandinetti and Nicole Nau (Heather Lum) Penn State Behrend – Psychology

The research field of game-mediated learning has exploded over the past decade as technology has allowed for greater engagement, interaction, and learning potential. They have been used to teach traditional subjects such as math, training in the military, and more recently, promote healthy behaviors. Researchers intend to expand this to the domain of training, specifically dog training. The goal of this study was to examine the perceptual, cognitive, and interactive differences between a live pet training scenario and a game-based system. Researchers will measure the length of time it takes for the participants to master each command as well as their perceived workload and frustration levels. Their level of pet-training experience, gender, and other measures will be used as individual differences variables in relation to the performance measures. The results of this research should shed light on the differences as well as similarities between live interaction and a game-mediated environment. This has important implications for learning external from the domain of pet training. We can determine how individual differences can contribute to or hinder learning and interaction whether in a live or game scenario.

#### Money, Memory, and Romantic RelationshipsEmily Loker and Christine Harding (Carol Wilson), Penn State Behrend – Psychology

Prior research shows that people primed with money prefer more physical distance between themselves and others, are less helpful, and are less interpersonally sensitive. In this study, we tested whether people with certain personality traits were less susceptible to the ill effects of money. Sixty-five individuals were randomly assigned to either a control or money-primed condition. We predicted that personality variables would play a significant role in how susceptible an individual would be to such effects. We expected to find that individuals primed with money would be more inclined to focus on the self, in being less helpful to a stranger, less accurate in deciphering others’ emotional expressions, and report less desire to work with someone on an interactive task; although, they would overall work longer. However, individuals with certain personality traits (e.g., secure attachment, communal orientation) were indicated as being less likely to demonstrate these monetary-based effects relative to those who were characterized by opposite tendencies (e.g., avoidant attachment, exchange orientation). Those primed with money performed longer on the anagram task, had more negative expectations and enjoyment of interaction activity.

#### Sarcasm in the Workplace

Katey Marsh, Margaret Eimers, and Wei Wang (Victoria Kazmerski, Dawn Blasko and Sharifah Sheik Dawood) Penn State Behrend – Psychology

Generally, sarcasm expresses criticism in a more socially acceptable manner because it often has a component of humor. According to speech-act theory (Austin, 1962; Kreuz & Glucksberg, 1989) understanding sarcasm involves the listener drawing a distinction between the literal meaning of the sentence and the intent of the speaker. However, work relationships may affect how people interpret hidden meanings and sarcasm (Pexman, 2004). For example, a chef hearing a sarcastic remark about his new recipe failing from his colleague can be interpreted differently than the same remark from his boss. Such differing levels of closeness within relationships lead to diverse interpretations of hidden meanings, which can in turn negatively or positively affect relationships. To test this, participants read scenarios which ended with sarcastic or literal remarks. The scenarios featured either a boss/worker or two colleagues. Participants rated the remarks as sarcastic, humorous, or insulting. They also completed a cultural dimension scale (power distance, uncertainty avoidance, masculinity, collectivism, Confucian work dynamics), an empathy scale, and a sarcasm self-report scale. We predicted that participants would perceive sarcasm differently from colleagues and bosses. Future research will look at cultural differences with respect to power-level perceptions.

#### Gender Stereotyping: How Group Compositions Influence the Judgment of Others

Kristen Robson (Melissa Heerboth), Mercyhurst University – Psychology

Gender stereotyping has been widely studied. There is research to suggest that the gender of the observer, as well as the gender of the observed influence how that person will be perceived. Previous research also suggests that the task, or environment, of the observed also contributes to how that person will be perceived. However, there is little research on the observers’ environmental influences. Therefore, this study aims to learn more about how the observers’ environment influences the judgment of another person. More precisely, how the different gender compositions of groups perceive others and ultimately make decisions. In order to test how groups make decisions, there were three different group compositions; all male, all female, and mixed gender. These groups’ responses to a resource allocation task in which they had to distribute scholarship funding across six different participants, three males and three females, were then compared to see if there was any difference in the final decisions, or monetary distribution, between the three different group compositions.

#### Does Spirituality Lessen the Negative Effects of Anxiety on Cognitive Performance?

Sherrie Vinion and Will Dorsch (Victoria Kazmerski), Penn State Behrend – Psychology

Multiple studies have shown the negative effects of anxiety. The stress of deadlines, tests, and greater workloads in college can cause anxiety. This study examined whether or not anxiety had any detrimental effects on cognitive performance, and, if so, did spiritual well-being buffer any of those effects. Penn State college students were randomly assigned to a high or low anxiety condition. They completed surveys and an n-back memory test. Although anxiety level itself did not have a significant effect on scores, there was a positive correlation between the different levels of memory tasks and anxiety for both time and accuracy. Individuals who scored higher on the Emotional Well-Being subscale of spiritual well-being scored more accurately on the less difficult level of the memory task. There was also an increase in anxiety scores from pre-memory tasks and post-memory tasks. These results suggest that the anticipation of greater levels of difficulty caused an increase in participants’ anxiety as indicated by these scores. Having a belief in God, or other Deity, can serve as a protective factor against anxiety and allow one to feel a sense of purpose far more important than the temporary stress.