

# PENN STATE BEHREND - SIGMA XI

***2014***

***TWENTY-THIRD ANNUAL***

***UNDERGRADUATE STUDENT RESEARCH***

***AND***

***CREATIVE ACCOMPLISHMENT CONFERENCE***

***ABSTRACT BOOK***

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Christopher Conklin (David Loker and John Roth), Penn State Behrend – Electrical

and Computer Engineering Technology

**WINNER -** [**An Experimental Approach to Optimizing an Optical Character Recognition System**](#Ewing)

Tyler Ewing (Xiaocong Fan), Penn State Behrend – Software Engineering

**WINNER - [The Effects of Blended Coconut Shell Fibers and COC on the Mechanical Properties](#Haney)**

**[of Polypropylene](#Haney)**  
Patrick Haney, Nathan Greene, and Matthew McGee (Alicyn Rhoades and Bradley Johnson), Penn State Behrend – Plastics Engineering Technology

[**Development of a Convective Heat Transfer Exercise**](#MyersN)

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

Technology

[**Pressure Drop across a Parallel-Plate Fin Heat Sink**](#MyersN2)

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

Technology

[**Using Machine Learning to Solve Nonogram Puzzles**](#Shafferman)

Shane Shafferman and Matthew Campbell (Wen-Li Wang), Penn State Behrend –

Software Engineering

[**Fabrication of Microscale Fuel Cell Electrodes**](#Whiteford)

Thomas Whiteford and Dan Doleiden (Adam Hollinger), Penn State Behrend –

Mechanical Engineering

#### MATHEMATICS AND PHYSICS

[**Jamming of Monodisperse Cylindrical Grains in Featureless Vertical Channels**](#Friedl)

Nicholas Friedl (G. William Baxter), Penn State Behrend – Physics

[**Another Way to Look at Sunflower Seeds – Mathematically!**](#Key2)  
Samantha Key (Daniel Galiffa), Penn State Behrend – Mathematics

**WINNER -** [**Continuous Density Gradient Centrifugation of Noble-Metal Nanoparticles**](#Peterson)

Wayne Peterson (Bruce Wittmershaus), Penn State Behrend – Physics

El**ectric Fields Affect on Fungi’s Growth Rate**

*(Contains proprietary information – no abstract included)*

Ethan Smith (G. William Baxter), Penn State Behrend – Physics

**Optimization of Luminescent Solar Concentrator’s Efficiency with a White**

**Background**

*(Contains proprietary information – no abstract included)*

Seth Weible (Bruce Wittmershaus), Penn State Behrend – Physics

#### PSYCHOLOGY I

[**Romantic Relationships and Monetary Discussions**](#Bell)

Nicole Bell, Natalie Corso, Breanna Foster, and Rachel Hido (Carol Wilson), Penn

State Behrend – Psychology

[**STEM vs STIM: An Outlook of Potential Danger**](#Bogart)

Sean Bogart and Natalie Corso (Margaret Burke and Melanie Hetzel-Riggin), Penn

State Behrend – Psychology

[**Jumping the Hurdles: Is Your Game Affecting Your Life?**](#Craig)

Alyssa Craig, Alison DeFurio, and Jacqueline Husted (Victoria Kazmerski), Penn State

Behrend – Psychology

[**VIZ Collaborative Project: Using Spatial Skills in the Real World**](#HarrisM2)

Megan Harris, Callie Keating, Grace Waldfogle, and Qiyang Li (Dawn Blasko and

Heather Lum), Penn State Behrend – Psychology

**RUNNER-UP -** [**Observation and Avoidance in the Valproic Acid (VPA) Model of Autism**](#Hernan)

Shelby Hernan (Jeffrey Cross), Allegheny College – Neuropsychology

[**The Effects of Confidence and Experience on Programming Code Efficiency and Readability**](#Huizar)

Peter Huizar, Jeffrey Knapp, and Thomas Batko (Heather Lum and Dawn Blasko), Penn

State Behrend – Computer Science

**WINNER -** [**Women in the Workplace: No Longer a Man’s World**](#Keating)

Callie Keating and Natalie Corso (Shariffah Sheik Dawood), Penn State Behrend –

Psychology

**WINNER -** [**Childhood Neglect as a Predictor of Violent Behavior**](#Luchette)

Jack Luchette (William McGuigan and Roxanne Atterholt), Penn State Shenango –

Human Development and Family Studies

[**The Effect of Familiar vs. Unfamiliar Music on Task Completion**](#Morrison)

Corvette Morrison (Melissa Heerboth), Mercyhurst University – Psychology

[**Effects of Critical Hype on Consumer Intentions**](#Squeglia)

M. Patrick Squeglia, Alicia Carroll, and Doug Kelly (Charisse Nixon), Penn State

Behrend – Psychology

#### PSYCHOLOGY II

**WINNER -** [**Is Sarcasm in the Workplace Funny? Depends on Who You Are**](#EdwardsE)

Erica Edwards, Alicia McAllister, Christie Leslie, and Robert Fogle (Victoria Kazmerski,

Dawn Blasko, and Shariffa Sheik Dawood), Penn State Behrend – Psychology

[**An Examination of Perceptual and Interactive Differences between a Live, Virtual, and Robotic Pet**](#Galeza)

Emily Galeza, Catherine Bertges, and Brianna Zaffino (Heather Lum), Penn State

Behrend – Psychology

**RUNNER-UP** - [**Attachment, Social Support, and Pain**](#HaversM)

Mary Havers, Meghan Nee, and Kaitlyn Matty (Carol Wilson), Penn State Behrend –

Psychology

[**Motivational Changes from High School to College: Perceptions vs. Actual Behaviors**](#Kamien)

Christina Kamien (Melissa Heerboth), Mercyhurst University – Psychology

[**Rape Myth Acceptance, Gender, and Perception of Blame**](#MarshK)

Katelyn Marsh, Danielle Carioto, Richard Greatbatch, Kasey Jerioski, John Moore,

Taylor Morris, and Jessica Stoker (Melanie Hetzel-Riggin), Penn State Behrend –

Psychology

[**Attachment Style and Stress-Motivated College Drinking Behavior**](#Matty)

Kaitlyn Matty and Katie Genberg (Victoria Kazmerski), Penn State Behrend –

Psychology

**WINNER -** [**Roles of Event History and Personality on Coping Responses to Stressful Situations**](#MooreJ)

John Moore and Katelyn Marsh (Melanie Hetzel-Riggin), Penn State Behrend –

Psychology

**RUNNER-UP -** [**Stress and the Use of Social Media: Influences of Personality and Age**](#Robertson)

Erica Robertson and Natalie Polana (Victoria Kazmerski), Penn State Behrend –

Psychology

[**Effect of Extraversion on Stress Reactivity**](#Wright)

Kristine Wright (Melissa Heerboth), Mercyhurst University – Psychology

## Oral Presentations

### BIOLOGY I

#### Transcriptional Analysis of Potatoes (Solanum tuberosum) Treated with 1,4 Dimethylnaphthalene (DMN)

Zachary Bauer and Rebecca Hyde (Michael Campbell), Penn State Behrend – Biology

DMN or 1,4-dimethylnaphthalene, is a commercially important product used as a sprout inhibitor in potatoes. It has uses as an alternative to Chlorpropham (CIPC), which disrupts the cell cycle and has possible negative health consequences. DMN is a natural product, however not much is known as to the mode of action. The goal of our research has been to determine possible target genes for DMN, and to show evidence that these genes are related to cell cycle. Tubers were treated in a 9 L, air-tight chamber with concentrations of DMN ranging between 19.5 umol/L of air, to 1625 umol/L of air. RNA was then extracted, and a cDNA library created. The DNA was sequenced and mapped to a reference genome from the Sol Genomics Network using the Galaxy suite of RNA-seq tools. The results showed that a family of plant genes known as WRKYs were probable targets for DMN action. WRKYs are DNA transcription proteins that contain the WRKY domain (WRKYGQK) followed by a zinc finger domain. There was a marked increase in expression following DMN treatment. The current hypothesis is that overexpression of WRKY genes leads to a decrease, and ultimate halting of the cell cycle.

#### The Role of Innexins in Wing Development of Drosophila melanogaster

Patricia Belle (Bradley Hersh), Allegheny College – Biology

Development involves cell communication and signaling to coordinate formation of tissues and organs. Juxtacrine signaling, direct communication between adjacent cells via gap junctions, has roles in several processes during development. Gap junctions in invertebrate animals are composed of innexin proteins that participate in cell communication and cell adhesion. The examination of innexins in development can provide further understanding of the regulation of development, especially in the evolution of new traits. Our study uses *Drosophila melanogaster* to determine the function of innexins in wing development. *Drosophila* wings vary in shape and color pattern among species, and little is known about the role of innexins in wing development. We hypothesize that innexins are necessary for proper wing development because previous studies indicate functional gap junctions in wing cells and all eight *Drosophila* innexingenes are expressed in the wing. We have knocked down each of the eight innexin genes individually by RNA interference, and examined the phenotypic effects on the wing. We will describe the phenotypic effects and gap junction activity in the wings of flies with reduced function of the innexin proteins. These results will identify which of the innexins play a key role in development of this structure.

#### Sequence and Analysis of the Novel Genome of the Unnamed Bacterial Endosymbiont in Puto Echinatus (Hemiptera: Putoidae)

Alexander Campbell (Matthew Gruwell), Penn State Behrend – Biology

The bacterial endosymbiont of the species of giant scale insect *Puto echinatus* is yet to be named, and its genome has never been sequenced. Its metabolic pathways are of interest in the study of coevolution of host-endosymbiont relationships as the endosymbiont synthesizes multiple metabolites for its host’s use. Acquired samples were sequenced using 318 PGM Ion Torrent technology and contigs were assembled using MIRA software on multiple computing clusters. Gene annotation led to elucidation of multiple synthesis pathways within the endosymbiont genome. The endosymbiont genome was further compared with related gamma proteobacterial endosymbionts to further elucidate the evolution of the genome and of biosynthesis pathways essential for the coexistence of the host-endosymbiont relationship.

#### Heart Regeneration in Zebrafish: Investigating the Effects of Polycyclic Aromatic Hydrocarbons (PAHs)

Elisa Russo (Kelly Grant), Gannon University – Biology

After sustaining injury, the cardiac muscle of the human heart has a limited ability to regenerate. In stark contrast, the zebrafish heart has the capability to regenerate heart muscle even after sustaining significant injury. Here we examine the effects of Polycyclic Aromatic Hydrocarbons (PAHs) on adult zebrafish heart regeneration after cryogenic induction of a myocardial infarction. We hypothesize that PAHs adversely affect heart regeneration because they have detrimental effects on heart development. Specifically, exposure to PAHs during development results in the failure to express particular transcription factors, including gata4; gata4 plays an important role in heart regeneration. While the molecular mechanisms are still unclear in humans, higher exposure to PAHs carries increased risk of heart and cardiovascular diseases, suggesting that these changes in gene expression may also be important for human heart health. PAHs are a concern in the Lake Erie region due to burning fossil fuels and the use of coal-based products, such as coke and tar. These significantly contribute to PAH release in the air and water. Studying the effects of PAHs by looking at myocardial regeneration could lead to a better understanding of how cardiac muscle regeneration occurs and uncover health effects resulting from PAH exposure.

#### Development of a Sequential Method to Adapt SH-SY5Y Cells to Low-Glucose Media for Manganese Exposure Studies

Hannah Smerker1 and Rohail Haider2 (Sarah Ewing1 and Thomas Corso2), 1Gannon University and 2Lake Erie College of Osteopathic Medicine – Biology

SH-SY5Y cells are a dopaminergic cell line used to study neurodegenerative diseases including Parkinson’s disease, a disease characterized by a loss of dopaminergic cells and dopamine signaling within the brain. Extracellular dopamine levels produced from SH-SY5Y cells decrease when exposed to manganese. Manganese may elicit these changes by altering dopamine metabolism. Growth of SH-SY5Y cells in high-glucose Dulbecco’s Modified Eagle Medium (DMEM) prevented us from discerning the levels of the toxic dopamine metabolite 3, 4-dihydroxyphenylacetylaldehyde. The objective of this experiment was to wean SH-SY5Y cells off of DMEM high-glucose media and measure their ability to adapt to DMEM low-glucose or Essential Minimal Eagle’s Media (EMEM) containing Ham’s F12 using a novel sequential method. The number of days between cell passages was recorded, and cell viability was determined at each passage using a trypan blue exclusion assay. SH-SY5Y cells were adapted successfully to EMEM/Ham’s F12 media, whereas SH-SY5Y cell proliferation slowed in DMEM low-glucose media. Ongoing studies are determining whether dopamine metabolites can be measured in EMEM/Ham’s F12 media. The sequential method may be a useful tool to adapt cell lines to new media, and EMEM/Ham’s F12 media may be a better media to study dopamine metabolism.

#### Assessing the Need for Regional Databases to Represent the Distribution of Mitochondrial Control Region Haplotypes of Domestic Dogs for Forensic Investigations

Amanda Spadaro (Kristen Webb), Allegheny College – Biology

Dog hair, a common type of biological evidence found at crime scenes, allows for limited identification of the donor when viewed under a microscope, leading forensic scientists to survey the more discriminatory mitochondrial DNA. Towards determining the value of a match found between a mitochondrial DNA sequence generated from crime scene evidence and a potential donor, the distribution of unique mitochondrial DNA sequences, or haplotypes, in the local population needs to be understood. Previous research has shown that a single database of haplotype diversity is appropriate for the continental United States, but it is unknown as to whether remote populations require different databases appropriate for their specific haplotype distributions. Here, we have surveyed the haplotype diversity of domestic dogs from Alaska and Hawaii towards assessing the appropriateness of evaluating these sequences using the continental United States’ database. The highly variable mitochondrial control region was sequenced from blood and tissue samples collected from dogs in Alaska and Hawaii, haplotypes were determined, and haplotype frequencies were compared to those of dogs residing in the continental United States. This research provides a probabilistic assessment of the validity of a mitochondrial DNA sequence match when potentially non-representative databases are utilized.

#### Characterization of UBX Binding of Cpr47Ee in the Drosophila melanogaster Haltere

Rachel Stegemann (Bradley Hersh), Allegheny College – Biochemistry

Hox genes are a highly conserved group of genes that encode transcription factors that regulate various direct and indirect target genes. These genes are essential for anterior to posterior patterning in all bilaterally symmetrical metazoans. Although the mechanism by which they choose their targets is not well understood, Hox proteins bind preferentially to a core DNA sequence of TAAT, which will occur approximately every 256 base pairs in an average genome. We have hypothesized that other DNA sequences, both upstream and downstream of this core site, increase specificity of Hox protein binding. In this experiment, we use the Hox protein Ultrabithorax (UBX) and one of its target binding sites, *Cpr47Ee edge,* to identify additional sequences important for Hox function*.* This direct UBX target contains two core TAAT sites, one of which is essential for proper expression. UBXIa protein was induced in BL21(DE3)pLysS *E. coli* bacteria and then purified on a Ni-NTA column. The purified protein was used in electromobility shift assays (EMSA) to determine binding affinity with wild-type and mutated sequences of the *Cpr47Ee edge* regulatory DNA.

#### The Influence of Innexin 2 Disruption on the Metastatic Spread in Drosophila melanogaster

Jennie Vorhauer (Bradley Hersh), Allegheny College – Biology

Metastasis is the spread of cancerous cells to non-adjacent tissues. Identifying the genetic mutations that allow metastasis may improve the general understanding of this process and allow preventative measures. In *Drosophila melanogaster* expression ofthe oncogene *RasV12* results in metastatic spread when coupled with mutations altering cell polarity and epithelial structure. We are examining the effect of altering gap junctions and polarized connections between cells on metastatic spread. *Drosophila* gap junctions are comprised of innexin subunits, encoded by eight different genes. Loss of the Inx2 subunit disrupts cell polarity in embryonic development; therefore, we hypothesize that loss of *inx2* gene function also will induce metastatic spread in conjunction with *RasV12* expression. To test the role of *inx2* in metastasis we have generated strains carrying *inx2* loss of function mutations, *RasV12*mutations, and expressing green fluorescent protein (GFP) to follow cell growth and spread. If loss of *inx2* function in conjunction with *RasV12* expression induces metastatic spread, it will manifest in the form of GFP marked cells throughout the body. We will share the results of these analyses in our talk.

### BIOLOGY II

#### Heterospecific Chemical Alarm Response of Girardia tigrina to Dugesia dorotocehpala

Jared Caroff (Simon Beeching), Slippery Rock University – Biology

A variety of aquatic organisms exhibit the ability to assess predation risk through the use of chemosensory cues from an injured conspecific or heterospecific. Wisenden and Millard (2000) showed that aquatic flatworms have the ability to use chemical cues from injured conspecifics to lower the risks of predation. In this study, the response of *Girardia tigrina* was tested when placed in a petri dish (filled with spring water) with 1.0 mL spring water mixed with a macerated heterospecific *Dugesia dorotocephala*. The experimental trial was compared to a control of an injection of only 1.0 mL water. The trials were run for ten minutes and recorded to observe whether *G. tigrina* showed avoidance of the macerated tissue of *D. dorotocephala*. It is expected that *G. tigrina* will show avoidance of the macerated heterospecific tissue due to released alarm chemicals from the injured heterospecific.

#### Comparison of Age and Growth of the Round Goby (Neogobius melanostomus) from Lake Erie and a Small Invaded Pond

Rebecah Ford and Ashley Wimer, (Mike Ganger and Greg Andraso), Gannon University – Biology

The ability of the round goby (*Neogobius melanostomus*) to invade North American waters has received considerable attention. Given that dreissenid mussels (*Dreissena polymorpha* and *D. rostriformis bugensis*) are major food items for both endemic and invading round gobies, it is hypothesized that the potential for round gobies to expand their range might be limited to the range of dreissenid mussels. The objective of this study was to compare age and growth of round gobies from Presque Isle Bay, where dreissenid mussels are abundant, to a nearby invaded pond (Fairview Gravel Pit), where there is a lack of dreissenid mussels. Although the food habits of round gobies from the two sites differ, there appeared to be no differences between the two sites in terms of weight per unit body length. Age was determined through analyses of ground lapillar otoliths. Back calculation of length based on otolith size revealed no difference in growth in the first year between sites. Together, these results show that round gobies from the Gravel Pit site compare favorably to those from the Presque Isle site and suggest that the round goby may effectively colonize habitats in which their preferred prey of dreissenid mussels is not available.

#### Correlation of Body Size and Weight in Girardia tigrina and Dugesia dorotocephala: A Comparative Study

Brooke Henry (Simon Beeching), Slippery Rock University – Biology

This study will quantify the correlation between the average dorsal surface area and dry weight of *Girardia tigrina* and *Dugesia dorotocephala*. Both species are currently being investigated for their response to alarm substances using macerated individuals as chemical stimuli. Because planaria vary in size and shape, variation between individuals and species can result in significant variation in stimulus strength in experiments involving whole subject maceration. Once an average dorsal surface area is determined it will be correlated to tissue mass. The average tissue concentration used for behavioral tests will be estimated. Results will then be used to determine if there is a threshold at which *G. tigrina* or *D. dorotocephala* exhibit avoidance behavior, and to quantify stimulus preparation for future experiments on planaria avoidance behavior.

#### A Comparison of the Pharyngeal Morphology of Bluegills (Lepomis macrochirus) and Pumpkinseeds (Lepomis gibbosus) from Presque Isle Bay, Lake Erie

Nikhil Kanthala and Nikki McGaughey (Kelly Grant and Greg Andraso), Gannon University – Biology

The pharyngeal apparatus of fish consists of modified gill arches that are used to process food. Generally, adult bluegills (*Lepomis macrochirus*) prefer soft-bodied prey, whereas adult pumpkinseeds (*Lepomis gibbosus*) prey on mollusks. Pharyngeal morphology of adults reflects these dietary differences, with bluegills possessing relatively small pharyngeals with cardiform teeth, and pumpkinseeds possessing robust pharyngeals with molariform teeth. Although adult diets and pharyngeal morphology of the two species differ, less is known about how these traits compare early in life. The purpose of this study was to compare pharyngeal morphology of the two species at different ages. Bluegills and pumpkinseeds, 18-154 mm TL, were collected from Presque Isle Bay during the summers of 2012 and 2013. Lower pharyngeals, which are involved in crushing prey, were wider and grew faster in pumpkinseeds, compared to bluegills. Upper pharyngeals also differed between the two species, especially pharyngobranchial 3, which is also involved in crushing prey. Differences in pharyngeal morphology were apparent between the two species in individuals as small as 30 mm TL, suggesting that pharyngeals begin to diverge early in development. Future work will investigate food habits of fish used in this study and genetic mechanisms involved in differential pharyngeal growth in the two species.

#### Passage of Hard-Bodied Prey Live through the Gut of Round Gobies (Neogobius melanostomus)

Tyler Mack (Greg Andraso), Gannon University – Biology

The round goby (*Neogobius melanostomus*) is a Ponto-Caspian invader that preys heavily on dreissenid mussels (*Dreissena polymorpha* and *D. rostriformis bugensis*) in its native and invaded ranges. Efficient predation on mollusks by fish requires crushing of shells so that digestive enzymes can access soft tissue of the prey. The purpose of this experiment was to determine if dreissenids and other prey could survive passage through the digestive system of round gobies. *N. melanostomus* were collected from Presque Isle Bay and the Fairview Gravel Pit and placed individually into containers filled with dechlorinated, aerated tap water. After 24-48 hours, gobies were euthanized in MS-222 and feces were filtered from containers using plankton netting. Organisms recovered from feces were determined to be alive if they were observed moving under a stereomicroscope. Intact bivalves were also placed into neutral red solution, which stains the lysosomes of living cells. No dreissenids survived passage through the gut of *N. melanostomus*, and the majority of dreissenids were crushed. However, various numbers of fingernail clams, gastropods, ostracods, and copepods were recovered alive. These results suggest that *N. melanostomus* is highly adapted to feeding on dreissenids, but may be less well-adapted to feeding on other hard-bodied prey.

#### A Study of an Isolated Population of Shorthead Garter Snakes in Erie County, Pennsylvania

Jessica McDuff and Mark Lethaby (Steve Ropski), Gannon University – Biology

From May 2013 to July 2013, a mark recapture study was carried out on the shorthead garter snake, *Thamnophis brachystoma,* at a Shannon Road site in Erie, Pennsylvania. Sixty-two individual snakes were captured, four of which were recaptured individuals from a previous study by Mark Lethaby. Each adult snake was marked using a cauterizing tool and processed to obtain weight, snout to vent length, tail length, pre- and post-ocular scale counts, molt status, and anomalies. Cover boards from the previous study were the method of capture. Chi-square analysis was used to determine cover board preference within the study area, ratio of males to females, weights between males and females, and molt status synchronization.

#### A Quantitative Approach to Determining the Effectiveness of Agion Silver Technology on Door Handles

Rachel Mercaldo, Katelyn Melvin, Hasan Khan, Brenton Maloy, Paul Ruiz-Pelet, Nicole Kingston, Mike Knoll, Nesve Ozsoy, Andrew Renda, and Laura Wheeler (Beth Potter), Penn State Behrend – Biology

Agion silver technology is a relatively new product that is based on the antimicrobial effectiveness of silver and other elemental ions. The Agion zeolite carrier allows for the release of silver ions when in the presence of sodium, typically from the moisture on our hands. Silver ions have in turn been shown to have a multifactorial approach to killing bacteria. While laboratory testing has shown the effectiveness of this technology in a controlled environment, this study looks at that antimicrobial effectiveness in a real-world setting on the Penn State Erie campus. Twenty-five door handles were coated with the Agion silver product and were sampled along with twenty-five control doors for a six-week period during both fall and spring semesters for three years. Samples were plated on tryptic soy agar, mannitol salt agar, and MacConkey agar plates, and bacterial colony counts were analyzed. Initial analysis suggested that silver-coated doors experience less microbial growth. However, the results are varied and additional bacterial counts are necessary to understand the usefulness of the Agion product in the real-world environment.

#### Determining the Bacterial Diversity on the Surface of Purple Martin Egg

Kaitlin Pander,1 Sean Weaver,1 Dan Hoang,1 and Mary Sperry1 (Beth Potter1 and Robert Aeppli2), 1Penn State Behrend and 2Purple Martin Conservation Association, Tom Ridge Environmental Center – Biology

During ovipositioning, avian eggshells become susceptible to bacterial and fungal growth and studies have shown that these microorganisms are maintained on the eggshells throughout incubation. To decipher the role of these microorganisms on embryonic development, it is important to understand the microbial composition present on the eggshell surface. The few studies that have been published in this area suggest that the relationship between natural incubation behavior and the microflora of avian eggs does not conform to a single representative trend. Having already studied the microflora of House Wren and American Kestrel eggs, the objective of this study was to broaden this area of research by studying the Purple Martin. Purple Martins are alluring because they exhibit colonial nesting, which could impact the microflora composition. Bacterial swabs are currently being processed for identification. Colony growth on plates are counted and classified based on morphology, and DNA from each unique colony is isolated. The 16S rRNA gene is amplified via PCR and the products are then sequenced at the Genomic Core Facility at Penn State’s University Park campus. Last, results are identified based on BLAST and EzTaxon databases. Overall, the results can help discern the complex relationship between incubation and avian egg microflora.

#### Concentration Effects on the Heterospecific Alarm Substance Detection Produced by Girardia tigrina and Avoidance BehaviorAssessment in Dugesia dorotocephala

Kristyn Pristov (Simon Beeching), Slippery Rock University – Biology

The avoidance behavior promoted by the release of chemosensory alarm cues from a high concentration of injured heterospecific tissue from *Girardia tigrina* (brown planaria) was measured in *Dugesia dorotocephala* (black planaria). One acclimated black planaria was exposed to either one mL of spring water (control) or two macerated brown planaria in one mL of spring water (experimental). Black planaria are expected to exhibit avoidance behavior when exposed to the heterospecific injured tissue at a double concentration. Chemosensory alarm cues detected by black planaria may yield significant avoidance behavior when exposed to a double concentration of brown planaria due to a potential difference in the size of the species.

#### Chloride Concentrations in Presque Isle Bay

Peter Schuster (Pamela Silver), Penn State Behrend – Biology

Sodium chloride is used as a road deicer in Erie, Pennsylvania. Chloride (Cl-) is washed via storm sewers into Presque Isle Bay where it has the potential to cause ecological harm. Water overlying the sediments and sediments were sampled at eight shoreline sites (three along the bay side of Presque Isle State Park and five along the City of Erie) in June 2012 after a snow-free winter and May 2013 after a typical winter. At each site, conductivity was measured at 1-m intervals from the surface to the bottom with a Hydrolab. Sediments were centrifuged for 10 min to separate pore water from the sediment. Cl- concentration was measured in overlying water and pore water by the Hach titration method. Porewater Cl- concentrations were significantly higher at sites along the City of Erie (51,583.3 ± 10,008.1 mg/L [SE]) than along Presque Isle Park (6315.6 ± 16,905.6 mg/L) and differed significantly between years (2012: 23,710 ± 6,422 mg/L, 2013: 34,215 ± SE 12,384.9 mg/L). Cl- concentration in overlying water was significantly higher at sites along the City of Erie (54.1 ± 9.54 mg/L) than along Presque Isle Park (18.2 ± 0.6809 mg/L). Water-column conductivities also differed among sites and years.

### BUSINESS AND HUMANITIES

#### iPhones vs. Eye Doctors: What Attributes of Metropolitan Areas Attract People 25-29 and 65 and Over to Move There?

Sean Allen and Brittany Martinelli (Jim Kurre), Penn State Behrend – Business Economics

People are most mobile in their 20’s and after they retire. Why do these people relocate to certain areas? Do young adults crave a dense and vibrant city? Do old folks desire casinos and healthcare? Using the migration patterns between metropolitan areas of two age groups, 25-29 year olds and 65+ year olds, this study attempted to identify characteristics of a metropolitan area that attract young adults and/or retirees and entice them to move there. Linear regression models were used to determine the significance of twelve different variables to determine their impact on attracting each age group. Migration patterns were obtained from the U.S. Census Bureau for 360 Metropolitan Statistical Areas (MSAs) and were used as the dependent variable in the models. This study is important because it provides insightful information to policy makers in metropolitan areas on how to entice (or deter) various demographic groups into their areas. For younger people, why are your peers moving to certain cities? For the older generation, does the grey-haired demographic really fit the stereotype and care that much about casinos, golf courses and healthcare?

#### The Economic Entrapment of African - Americans in Fiction and Theory

Leanne Balster (Stephanie Martin and Ben Slote), Allegheny College – Economics/English

This paper analyzes the economic entrapment of African-Americans from both a literary and economic perspective. This interdisciplinary approach asks whether current academia understands the form and effect of discrimination in the workplace including what information may be missing. The economic analysis incorporates both Neoclassical Economics and Political Economy, analyzing the two schools of thought separately and in conjunction in their ability to model real-world observations presented by Chester Himes’s 1945 novel *If He Hollers Let Him Go*. While both models are expected for the majority to align with events depicted in the text, it is also anticipated that some circumstances cannot be fully explained by current theory.

#### What Makes a Product “Cool”?

Garrett Bowden and Ashley Snyder (Saad Andaleeb), Penn State Behrend – Marketing

An important dynamic considered during product selection is the idea of “coolness.” The purpose of this research was to analyze what makes a product to (specifically a cell phone) be perceived as “cool” for Generation Y (Millennials) belonging to the age range 18-27. Specifically, the study investigated whether there are any gender-specific determinants of what is considered “cool” by the Generation Y. The current literature was explored and feedback was obtained from our actual peers on their perceptions about cell phones using a survey which provided the data for the analysis. Responses were analyzed using SPSS software to obtain relevant insights. The results suggest the following: males look for multifunctionality and the ability to easily obtain and play games, while females look for a high camera quality and the social status obtained or associated with brand recognition of the phone. Generation Y is a huge market that is looking for the latest technology. Target this market and you will be in for a wild ride, a successful ride.

#### College-aged Consumers’ Perceptions of Social Media Marketing: The Story of Instagram

Rachel Latsko (Huan Chen), Penn State Behrend – Arts and Humanities

While a majority of literature exists analyzing companies’ strategic use of social media platforms such as Facebook (Chen & Deterding, 2013), and Twitter (i.e., Greer, & Ferguson; Zhao et al., 2011; Thoring, 2011), there is a research gap of existing literature on the social media platform Instagram—as well as consumers’ experiences and perceptions of Instagram. Therefore, this study explores how college students perceive, understand, and interpret the photo-uploading site known as Instagram, as well as application of the media and their receptivity to consumption intention, directly related to the marketing information. The theoretical perspective guiding the study is interpretative phenomenology, and 11 in-depth interviews were used to collect data. Specifically, the themes emerged regarding college-aged consumers’ understanding of Instagram are self-expression, leisure, and social interaction. For college-aged consumers to accept marketing information, marketers should consider marketing information that is image-centric, functions as an awareness builder and utilizes social-connection.

#### Social Media Usage and Satisfaction among Generation Y Paul Lukasik and George Kilbert (Syed Saad Andaleeb), Penn State Behrend – Marketing

This study was conducted to answer the question, “How are social media sites used by Generation Y (Millenials) and what variables affect their overall satisfaction?” The ultimate goal of the study was to understand better how social media sites can deliver improved customer satisfaction among the Millenials. Research was done to examine factors such as site convenience and layout, use of social media as a social tool, trust perceptions and security on social media sites, and how popularity among peers impacts satisfaction with a site. Surveys were taken of a representative sample of Penn State Behrend students. Third party organizations are offered a glimpse into the qualities that a social media site should have in order to achieve higher overall satisfaction among college students.

#### Patient Satisfaction from a Healthcare Employee Perspective: How Medical Workers Feel about Being Evaluated

Brittany Martinelli (Syed Saad Andaleeb), Penn State Behrend – Marketing

Being able to assess patient satisfaction is important to any healthcare institution. Healthcare workers need to know what makes patients satisfied, especially in a world of rising healthcare costs where patients are expecting better service for their money. But how do healthcare providers feel about being measured based on patient satisfaction? This study looks at how doctors, nurses, and hospital administrators feel about the use of the Press Ganey Survey, which provides patient satisfaction feedback to hospital administrators. Using grounded theory methodology, the hospital workers were asked a series of questions to gauge how they feel about being evaluated by the Press Ganey patient satisfaction survey. It was found that some hospital workers do not feel patient satisfaction scores should be included in their evaluation; instead they should be measured on quality of care given. Since the Press Ganey Survey does not specify exactly who the patient is evaluating, using this approach can be problematic, especially when the scores are used to reward employees through pay and benefits.

#### Social Media, Technology, and Their Effect on Student Productivity

Amanda Myers, Natasha Terensky, and Brittany Martinelli (John Fizel), Penn State Behrend – Economics

We plan to measure student productivity along with technological and social media use. The rise of social media and the use of technological aids for study have brought about a revolution in study habits that increase the tendency to task-switch. An example of task-switching would be the constant shifting of attention between homework, texting, and checking Facebook. Our hypothesis is that multitasking in such a way negatively affects student productivity. This issue carries over from the college dorm room to the office cubicle, affecting our future labor force and the overall performance of knowledge workers. Results will provide insight to help students better use technology and improve academic performance. The goal of this research is to find whether technology and social media use enhance or hinder academic performance and, in the long run, the productivity of our future knowledge workers.

#### Evidence-Based Practices Effect on Recidivism

Patrick Payne (Stephanie Martin), Allegheny College – Economics

The motivation behind this paper is to research the social and economic implications of evidence-based practices (EBP’s) in prisons. Evidence-based practices are relatively new, but recent studies have shown them to be more effective than other policy options. This paper will look at ways to analyze whether or not EBP’s are able to effectively lower recidivism, lower the burden that the justice system places on states, and the potential for EBP’s to reduce the racial inequality in the current justice system.

### CHEMISTRY

#### Investigating the Electropolymerization of Ferriprotoporphyrin for Electrocatalytic Applications

Chris Alverson (Jason Bennett), Penn State Behrend – Chemistry

The ability to selectively detect H2S in vivo is important due to the fact that it is thought to play a role in several neurological disorders such as Alzheimer's disease, Parkinson’s, and stroke. Knowing more about the presence of H2S when these disorders are apparent could lead to better understanding and treatment of the diseases. Our group has been working on developing electropolymerized ferriprotoporphyrin (FePP) as a material capable of selectively oxidizing H2S over other gaseous molecules. The polymerization of FePP on platinum electrodes results in tiny pinholes. This is a major concern in the deposition as the pinholes allow each gas to interact with the platinum surface, limiting the selectivity caused by the FePP layer. The effect of the electrode surface and deposition technique on the polymerization of the FePP layer was studied. Scanning electron and atomic force microscopy were used to visually inspect the electrode surfaces. In addition to electrochemical and microscopic investigations, computational chemistry was used in order to understand the deposition on a molecular level and the formation of the pinholes. The computational chemistry was done using a Vienna ab-initio simulation package (VASP) with computing resources provided by the University at Buffalo.

#### The Characterization of Germanium Hydride Intermediates Using Matrix Isolation Infrared Spectroscopy

Christopher Bailey (Jay Amicangelo), Penn State Behrend – Chemistry

The goal of this project was the characterization and assignment of infrared absorption bands to short-lived reaction intermediates using a matrix isolation infrared spectrometer. Matrix isolation infrared spectroscopy uses an inert matrix such as argon at low temperatures to trap unstable molecules. This allows the characterization with infrared spectroscopy of reactive and unstable intermediates. The system being examined is the germanium hydride intermediates, GeHx with

x = 1, 2, or 3. These intermediates will be produced using a hydrogen resonance lamp photolysis source with mixtures of germane (GeH4) with argon. The generation source provides energy to the GeH4 molecule in the form of radiation. This promotes the molecule into an excited electronic state which can relax through fragmentation. The parent molecule/argon mixture was flowed past the hydrogen resonance lamp, which caused fragmentation of the germane, and the intermediates produced were then deposited on a CsI window at a temperature of 12 K. Identification of the reaction intermediates produced in an argon matrix was established with isotopic substitution experiments (GeD4), matrix annealing experiments, and matrix photolysis experiments using a mercury-xenon arc lamp (ultraviolet and visible radiation), as well as theoretical calculations using the Gaussian 03W computer program.

#### Can Caffeine Slow Down Sugar Release from Starch?

Marissa Brennan, Dylan Steele, Nicholas Esposito, and Vincent Calabrese (Arshad Khan), Penn State DuBois – Chemistry

α-Amylase is an enzyme, present in saliva and pancreatic secretions, and is responsible for the break-down of starch into glucose and other sugars. This study examined the interaction of caffeine with this enzyme, and observed a smaller amount of starch break-down, and hence, a smaller amount of sugar release when an increased amount of caffeine was added to the enzyme-starch solution. This finding may have important medical implications, especially for those who need to control the amount of blood sugar.

#### Exploration of the Reaction of Novel Alkynyliodonium Salts with Phenoxides

Nick Burton (Michael Justik), Penn State Behrend – Chemistry

Reactions that enable the formation of benzofuran, a valuable medicinal compound, are well known but do suffer from limitations of scope and environmental impact. Of interest to the present study is the reaction of phenoxide nucleophiles with alkynyliodonium salts to afford benzofurans. In this study, a novel alkynyliodonium salt was utilized to facilitate work-up as well as act as a recoverable and recyclable reagent. The goal was to explore the scope and utility of the reagent in the synthesis of benzofurans as well as explore the reaction mechanism. Specifically, in previous investigations in the laboratory, it was found that derivatives of the reagent bearing alkyl chains favored the production of novel (2*Z*)-1,2-di(4-methylphen-oxy)-2-alkenes. This pathway has not been previously observed in reactions of phenoxides with alkynyliodonium salts, nor is this structural feature yet recognized in the literature. This reactivity has never been seen previously and will have a large impact on the study of the reactions and mechanisms of alkynyliodonium salts in general.

#### Temperature Dependence of the O–H Stretching Peak of the Methanol-Benzene Complex in an Argon Matrix

Ian Campbell (Jay Amicangelo), Penn State Behrend – Chemistry

Co-depositions of methanol (CH3OH) and benzene (C6H6) were performed at 20 K in an argon matrix, and were analyzed via matrix isolation infrared spectroscopy. These two molecules, when deposited simultaneously, form a 1:1 CH3OH–C6H6 complex. Upon close examination, multiple peaks pertaining to the O–H stretch of the CH3OH–C6H6 complex were observed. By performing temperature-annealing experiments, ranging from 8 K to 35 K, spectra were obtained that suggest the multiple peaks are due to the internal rotation of the CH3OH molecule when it is part of the CH3OH–C6H6 complex. The temperature dependent nature of the infrared spectra of water (H2O) in an argon matrix was used to understand better the combination of the vibration of hydroxyl groups with the rotation of the molecule as a whole. The implied physical occurrence was a coalescence of the O–H stretch and the internal rotation of CH3OH yielding a set of rotational-vibrational peaks.

#### Development of a Designer Lignin Monomer

Lucas Doyle, Natalie Bukowski, and Hannah Irvin (Yimin Zhu), Penn State Altoona – Chemistry

Lignification is one of the major recalcitrant factors of cellulosic-biomass for various agricultural and industrial end-uses, such as lignocellulosic biofuels, ruminant digestibility, and paper and pulp making. The purpose of this research was to develop designer lignin monomers for interrogating lignification, which is crucial in devising effective approaches to reap the potential of sustainable bioenergy. Specifically, we have designed and synthesized a non-natural lignin monomer that bears a terminal alkyne. Importantly, this non-natural lignin monomer readily undergoes oxidative coupling and keeps the structural fidelity of lignification. We further demonstrated that this designer lignin monomer can be effectively incorporated into the lignin polymers under *in vitro* lignification conditions. Preliminary data also showed that the incorporation of this lignin monomer allows visualizing lignification *in vivo*. We anticipate the introduction of our designed lignin monomer will open a lot of opportunities for exploiting bioorthogonal chemistry in lignin chemistry and biology.

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

Jonathan Fifer (Martin Kociolek), Penn State Behrend – Chemistry

The use of ligands in metal-catalyzed reactions makes the area of ligand synthesis of great interest. Using research already reported in the lab, work examining a benzisoxazole 2-oxide incorporating a pyridine ring capable of coordinating metals will be reported. In order for the benzisoxazole 2-oxide to serve as a ligand, it must contain a second coordinating group. The first part of this research project, completed over the summer, developed a general synthesis of a ligand containing both a benzisoxazole 2-oxide group as well as a pyridine. The coordination properties were then examined. A typical procedure for forming the coordinating compounds matches a 1:1 mmol ratio of ligand to metal. The metal is suspended in a solution of THF, dichloromethane, or pentane followed by the addition of the ligand. Research in this area will give a better understanding of the limitations of *N*-oxide ligands and how they bind with different metals. These coordination compounds may then have potential as catalysts for a variety of organic reactions. Progress on research to synthesize a related bis-benzisoxazole 2-oxide with two coordinating N-oxide groups will also be presented.

#### Small Molecule Binding Studies on Globin Enzymes

Robert Fogle, III (Mary Grace Galinato), Penn State Behrend – Chemistry

Globin enzymes are a ubiquitous enzyme within the human body. Their most well-known function is the transport and storage of oxygen. These enzymes are also capable of binding molecules to their exterior protein structure as well as their catalytically active interior active site. In the first study, hypocrellin B was bound to the exterior of myoglobin to examine the nature of this binding. Hypocrellin B is a multicyclic compound with many potential medical applications, such as photodynamic therapy for the treatment of cancer. It was found through computational and experimental data that hypocrellin B has two docking sites on the exterior of myoglobin and that when these two molecules interact, they form a ground-state complex. In the second study, nitrite was bound to the interior active site of myoglobin. In order to study this binding and elucidate the kinetics for the reduction of nitrite to nitric oxide, myoglobin’s native heme was removed and a covalently modified porphyrin was inserted. Reconstituting myoglobin with mesoporphyrin, deuteroporphyrin, and diacetyldeuteroporphyrin, it was found that as electron density on the central iron atom within the porphyrin decreases, the reduction occurs at a slower rate and thus has a lower rate constant than a more electron-rich porphyrin.

#### Theoretical Study of Lone Pair – Pi Interactions between Dimethyl Sulfide and Aromatic Rings

Brian Harkins (Jay Amicangelo), Penn State Behrend – Chemistry

The weak intermolecular interaction between two molecules is generally known as a non-covalent interaction. A lone pair – pi interaction is a non-covalent interaction between a molecule with an electron rich atom with lone pairs and an aromatic ring with pi electrons. Dr. Amicangelo’s group has previously studied the lone pair – pi interactions between dimethyl ether, (CH3)2O, and substituted aromatic rings (C6H5X). The strength of the interactions between the lone pair electrons on oxygen and the pi electrons within the aromatic ring changes due to the electron-donating or electron-withdrawing effect of the functional group attached to the ring. A parallel study was undertaken to examine the strengths of lone pair – pi interactions for complexes of dimethyl sulfide, (CH3)2S, and substituted aromatic rings. The energies determined at different distances between the sulfur atom and the ring, with dimethyl sulfide in various conformations were calculated using theoretical quantum chemical calculations with the Gaussian 03W software program. The results of this study will be compared with the previous dimethyl ether – aromatic ring systems.

#### Computational Analysis of Adsorption to Carbon Nanotubes as a Function of Adsorbate and Local Environment

Amanda Harris (Ron Brown), Mercyhurst University – Chemistry

A computational analysis has been performed to investigate the adsorption of hydrogen, chlorine, and carboxylic acid to carbon nanotubes (CNTs). Models for CNTs have been designed and different patterns of adsorption, such as adsorption at adjacent sites versus lone sites, have been studied. Ab initio calculations at HF/STO-3G level of theory were performed on finite-sized models for zigzag nanotubes ranging in size from (4,0) to (8,0). These models of increasing length will be used and tested for convergence of adsorption energies. Adsorption energies were then calculated using the equation:

∆EAds= EProducts - [EReactants]

The adsorption energy will be determined as a function of nanotube size, adsorbate identity, and the local adsorption environment.

#### Characterization of a Methanol-Benzene Complex Using Matrix Isolation Infrared Spectroscopy

Joshua Wilkins (Jay Amicangelo), Penn State Behrend – Chemistry

After performing experimental depositions of methanol (CH3OH) with benzene (C6H6) in an argon matrix at a temperature of 20 K and obtaining an infrared spectrum, new infrared peaks were observed when co-deposited as compared to the individual depositions. These new peaks were assigned to vibrations of a 1:1 methanol-benzene complex (CH3OH–C6H6) in the argon matrix. Identification of the new peaks to those of the CH3OH–C6H6 complex were established by comparing the co-deposition spectra with the spectra of the individual molecules, by performing experiments with isotopic methanol (CD3OD) and isotopic benzene (C6D6), and by matrix annealing experiments (warming to 35 K and refreezing to 20 K). Theoretical quantum chemical calculations were also performed to obtain theoretical support for these spectral assignments and to indicate a structure of the complex. The optimized geometries of the complex were calculated and vibrational frequency analyses were performed for the optimized geometries. The calculations predict the vibrational frequencies in the CH3OH–C6H6 complex to be shifted with respect to the CH3OH and C6H6 molecules by similar magnitudes as to what is observed experimentally, lending support to the peak assignments.

### COMPUTER SCIENCE AND ENGINEERING I

#### Custom Hardware and Peripherals for User Experience (UX) Research in Games

Matthew Campbell (Matthew White), Penn State Behrend – Engineering

Current research on game users lacks a hardware perspective, largely due to barriers to entry. In a cross-disciplinary effort among Penn State Behrend students, a custom peripheral for testing the effects of screen size and ratio, matching user experience was developed in a separate research grant. The present study illustrates the results of one of many planned experiments using the new hardware. User experience was interrogated in the form of differences among accuracy, reaction time, and total time on task for the new hardware when compared against a control group (an *Xbox* *360* controller, the model upon which the new hardware was built). Results and the versatility of the hardware, including future studies, are discussed.

#### Remote Gait Data Collection with FSR’s

Luke Elliott(David Loker and John Roth), Penn State Behrend – Engineering

Current methods of collecting data on a human’s walk can be either immobile, expensive, or difficult to use. This project’s goal was to design a shoe-based sensor system where a microcontroller polls FSR’s and transmits these data via Bluetooth to an Android device. Because the system is entirely encased in a shoe, it is easily portable. Many people already own a smart device such as a tablet or smartphone, so they would not need to purchase one along with the sensor system. The current project is focusing on coding an app for Android devices only. The data being transmitted over Bluetooth means that after manufacture, the microcontroller and sensor system does not need to be physically accessed. This makes data access easier and eliminates the need for an access port. Signals from a smart device trigger the system to begin recording footstep data. After the data have been collected it transmits the detected voltages to a smart-device which decodes it into pressure data. For this purpose, the FSR’s pressure to resistance properties had to be characterized. The decoded pressure data can then be saved for later viewing. Since this device transmits to a smart device, it holds possibilities for people to monitor their own gait patterns for self-therapy and gait correction purposes. Users could also be capable of sending their stored gait data files to a doctor’s office for use in remote therapy or study. One possible remote study involves the connection between the gaits of diabetic patients and the sores that often develop on their feet.

#### Neuroph Studio Extensions for Westminster College Students

Jenna Huston (Terri Lenox), Westminster College – Computer Science

In this work the open source Neuroph Studio project was extended to include generation of cluster diagrams. In addition, the simulations and tutorial material in *Exercises in Rethinking Innateness: A Handbook for Connectionist Simulations* were adapted for Westminster College students using Neuroph Studio in their coursework. We will discuss the algorithms used to generate the cluster diagrams, integration into Neuroph Studio, and walk through one of the adapted exercises.

#### The Earth Mover's Distance in Diffusion Geometry

Tyler Simpson (Meng Su), Penn State Behrend – Computer Science

The purpose of this research was to combine the Earth Mover's Distance (EMD) algorithm with diffusion geometry, test this combination on high-dimensional (multi-variants) data, and compare its performance to the performance of the original algorithms—which use the L2 (Euclidean) distance—on the same data sets. First, we created a graphical user interface (GUI), which allows the user to compare the results and performance of two nonlinear dimensionality reduction algorithms side-by-side. Second, we modified the EMD algorithm to fit the format of our data sets (i.e. hamster, lungA, digits, etc). After that, we replaced the L2 distances with our modified EMD codes and transferred the modified algorithms into our GUI.We successfully ran our program on some small data sets. For large data sets, the algorithm terminated on all our computers, because the computers ran out of main memory. In general, we found that EMD can be applied in diffusion geometry. This combination worked well, but future research should use high-performance computer (HPC) systems to test the diffusion geometry-EMD combination on massive data sets.

#### An Automated System to Organize and Classify Penn State Degree Audits

Josh Steen and Trent Balta (Thomas Hemminger), Penn State Behrend – Computer Science and Software Engineering

The purpose of this research was to determine if it is possible develop a computer program that would be able to populate a Penn State recommended academic plan (RAP) for a given major based on the degree audit. This will use the JAVA language and the NetBeans IDE. In theory, the program would essentially “read in” the degree audit as one long string (long list of characters including spaces, punctuation, etc.), then using string manipulation would break the degree audit down so that it can be easily analyzed. With information taken from the audit, the program would clearly indicate the most important information for students, such as what courses have been taken and which ones are required for graduation. These data would then be mapped to the RAP, producing a visual representation of the degree audit. Secondary objectives of this project would be to incorporate the lists of technical electives for each program, which is not usually programmed into the typical degree audit, and to populate the prerequisite flowcharts used for most programs. The result of this work would be to make the complicated degree audit easier to understand in a visual representation.

#### Audio Visual Technician Toolkit Mobile Application

Bradley Steward (David Shaffer), Westminster College – Computer Information Systems

Audio Visual Student Technicians are plagued by an abundance of tools and no efficient way to transport them all and have them remain available and easy to use. The need remains for a portable application to encompass several of these tools to be created. Other applications address this need but on a technical level that is advanced beyond the knowledge of a student technician. This effort is in progress by the presenter. Brad Steward is both a Westminster College Audio Visual Services technician and a Computer Information Systems major and is in a unique position to make this occur. The presentation will include demonstration of the mobile application and several features including a sound meter and troubleshooting work flow.

### ENGINEERING II

#### An Investigation of Lueder’s Bands on 5083 Aluminum Alloy

Donald Bissell (Chetan Nikhare), Penn State Behrend – Mechanical Engineering

Lueder’s Banding is a phenomenon that occurs in low-carbon steels and Aluminum-Manganese alloys when subjected to tensile stresses. This leaves the material with undesirable mechanical and cosmetic properties. Previous research has shown that Lueder’s Bands are caused by the pinning of dislocations by the interstitial atoms in the microstructure; this causes the stress in the material to fluctuate while strain increases. The purpose of this research was to find similarities in Al-Mg samples experiencing Lueder’s Banding and use this to predict when Leuder’s Banding would occur. To accomplish this, dog-bone samples of 5083 Aluminum Alloy were subjected to a tensile load and the stress-strain plots were obtained. These data were then compared and analyzed to find any similarities among samples.

#### Analyses of Electric Flow through AA5083 Pre-Strain Material Joseph Humphrey (Chetan Nikhare), Penn State Behrend – Mechanical Engineering

Competition in low-cost vehicle production as well as federal regulations on environmental issues, the automotive industry is forced to implement lighter and stronger material. One of the most commonly used materials is aluminum alloy AA5083, which is preferred due to its high strength to density ratio. Previous research within the group shows that this material exhibits anisotropy. This anisotropy brings many difficulties in forming this material to the desired quality. Some of the Electric-Assisted Manufacturing (EAM) experiments showed that passing high values of current eliminates anisotropy to some extent. However, it was also found that the value of current changes for same resistance on the welder for different orientations to roll direction for non-strained samples. Many times it is required to work with pre-strained material. This research is focused on determining the current densities and corresponding temperatures of AA5083 alloy along the rolling direction for 0%, 2%, 4%, and 6% pre-strain samples. The goal of this was to find the differences in current densities and temperature generation due to resistive heating for different pre-strained samples which would facilitate the designing of future research involving EAM for metal material.

#### A New Approach to Form Square Cup

Matthew Ihrig (Chetan Nikhare), Penn State Behrend – Mechanical Engineering

Cup forming is very popular method for decades to manufacture different deep-drawing sheet metal parts around us. Those include automotive bodies, beverage cans, kitchen utensils, drain systems, and many more. Cup forming is conventional drawing/forming process and one of the main categories in sheet-metal forming. In this forming process the sheet metal is placed between the die and blankholder and form the sheet by moving the solid punch. This is similar to stretch forming with the only difference being that the blankholder slides rather than being pinched when the punch applies the force to form it and allows the material to feed in to achieve higher cup depth (e.g., soda can). In this paper, a new approach to form square cup was discussed. This innovative idea provides the knowledge of forming square cup or pan from sheet metal by rotating the solid punch. Typical parameters for cup forming are the punch velocity and the friction coefficient which were studied with force displacement data. The strain and stress pattern and failure analysis with thickness gradient was investigated. Further, the results were compared with the traditional cup-forming method and differences were discussed in the paper.

#### Experimental and Numerical Analysis of Hole Expansion on AA5083 Aluminum

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

Recent research on steel alloys has shown that strain values and the hole expansion ratio can be found through hole expansion tests. The automotive industry utilizes hole expansion procedures for the production of certain parts. Due to increasing environmental regulations, new materials are being investigated to replace steel. Due to the high strength to density ratio, Aluminum Alloy (AA5083) will be investigated in hole expansion tests. Issues with this alloy result in fractures, which is detrimental to the industry. Specific experimentation of AA5083 will involve hole expansion testing, and will investigate the hole expansion ratio characteristic to AA5083. Stress and strain values will also be investigated. These tests will resemble those of the previous steel research, and results will be compared to AA5083.

#### Wear-Monitoring Tool Holder

Matt McCormick (John Roth, Stephen Strom, and David Loker), Penn State Behrend – Mechanical Engineering

This project is a continuation of the spring 2014 “Wear Monitoring Tool Holder” research project. The purpose of this research project was to study options for indicating tool wear and predicting tool failure in a vertical mill. Wear monitoring will prevent usage of tools that will produce parts outside of tolerance, damage to the part, damage to machinery, or operator injury. The anticipated outcome is to produce a system that will monitor the wear state of the tool, predict tool failure, indicate the gathered information and predictions to the operator, and make the information accessible across a network where the data can be accessed and processed remotely. The project will primarily focus on vibration analysis as a method for monitoring tool wear, but will also incorporate acoustic emission analysis as a secondary focus.

#### Effectiveness of a Thermal Protective Coating for Automotive Components Nathan Siebert (Russ Warley), Penn State Behrend – Mechanical Engineering

Automotive environments have radiant heat sources that can produce undesirable operating temperatures due to radiation from surrounding components. Some components in this kind of environment are made of rubber, which does not always operate effectively at high temperatures. One method to reduce the radiant heat transfer is to apply a coating to the surface of the components to reduce the thermal emissivity. Through current computer simulation, the thermal coating seems to be effective in reducing operating temperatures, but only experimental results will be able to truly measure its effectiveness. A simple test to check the effectiveness of a coating on a model component is therefore needed. A basic test geometry has been selected and is currently being optimized. After the geometry has been finalized, the next step will be to generate a design of experiment, the result of which will aid in the specification of test system components. The design of experiment will be conducted via computer simulation to yield theoretical results of the experimental apparatus. It is expected that later the same design of experiment or a subset of it will be physically conducted once the test rig is built. The physical testing is outside the scope of this research.

#### The Effects of How Different Strain Rates Change the E-Value on 5083-Aluminum Alloy Tensile Test

William Trozzo II (Chetan Nikhare), Penn State Behrend – Mechanical Engineering

The making of sheet metal is continuing to push the automotive industry to apply them in vehicle structural parts for better performances and improved crashworthiness. Aluminum alloys are becoming greatly favored over steel in automobiles for their good strength and better fuel economy, yet they have several challenges in the stamping of parts. Challenges include unpredictable fracture, planar anisotropy, and geometrical imperfection due to spring-back. Spring-back occurs in a deformed part after a load being released. This paper provides the observations made in the elastic recovery after each unloading and the dependence of the amount of strain on the elastic recovery for 5083-aluminum alloy. Young’s modulus is expected to decrease with an increase in plastic strain for some steel metals. Since planar anisotropy occurs in 5083-aluminum alloy, the elastic recovery will be examined in 0°, 45°, and 90° with respect to the rolling direction. The effect of directionality on elastic recovery will also be discussed.

### HISTORY

#### Reno at the Little Bighorn: The Making of a Scapegoat

Garrett Morgan (John Rossi), Penn State Behrend – History

The Battle of the Little Bighorn (June 25-26, 1876) shattered the confidence of an American public well-used to the success of Manifest Destiny. Taking stock of the crippling defeat the Lakota Sioux inflicted upon Lt. Col. George Armstrong Custer’s 7th Cavalry, many in the United States, reluctant to grant victory to a supposedly ‘savage’ culture, saw the debacle as resulting from the poor performance of Custer’s officers. Major Marcus A. Reno, Custer’s executive officer, was particularly charged in an Army Court of Inquiry with bringing about defeat through his failure to obey orders. While Reno indeed emerges from accounts of the engagement as an unsteady officer of limited competence, those who sought to condemn him as the principal author of defeat were more concerned with finding a scapegoat. In this consideration of the two so-called ‘Reno Fights’ at the Little Bighorn it will become evident that the charges leveled against Reno’s command decisions – the ostensible heart of the matter – do not stand up to careful scrutiny. Though tepidly exonerated by the court, the ad hominem attacks on the major’s character throughout the controversy carried such weight so as to sustain the popular assertion, however baseless, that the chief causes of the defeat remained a product of the actions (and inaction) of Marcus Reno.

#### Has America Learned its Lesson? Treatment of Modern Veterans Compared to Vietnam Veterans

Danielle Ropp (John Rossi), Penn State Behrend – History

The treatment that Vietnam veterans received upon their homecoming is one of the greatest travesties Americans committed on their fellow Americans. Vietnam veterans were largely disappointed in their, perceived, unceremonious reception, and saw a drastic decrease in the amount of actual benefits they expected to receive from the G.I Bill, especially in education and medical care. Because of this, many veterans came home and fell into drug abuse, homelessness, and struggled with disorders that the Department of Veterans Affairs was slow to recognize, such as PTSD and the detrimental effects of Agent Orange, causing many veterans to distrust the government. This research will examine the past, present, and future of veterans care and if veterans from more modern wars are treated better than those of Vietnam, and examine the lasting effects government distrust has had on veterans. Although modern war veterans are treated better, there are still things that need to be addressed. Specifically, there needs to be longer decompression programs, as well as a cause and cure for the Gulf War Illness. In looking into the future, the VA needs to address issues before they become social problems like they did for Vietnam veterans, to make sure the people who serve their country get what they deserve.

#### The Tragedy of The Somme and the WWI Tank

Julia Williams (John Rossi), Penn State Behrend – History

The purpose of the research was to examine the origins of the tank and the role that it played on the battle field and the home front during the First World War. The research was conducted through a primarily British lens and touches on the premiere of the tank during the Battle of the Somme in 1916. It also looks at both the inefficient and successful ways in which tanks were used during the rest of the conflict, how different leadership approaches contributed to this, and the “war of exhaustion” verses the “pro-technology” debate. It led to the conclusion that despite the reason for which it was created, the tank was severely underutilized. However, this was not surprising when one considers the prevalent attitudes of the time.

#### Rediscovering Petra: The Preconceptions, Motivations, and Impact of Nineteenth Century Visitors

Russell Winters (Leigh-Ann Bedal), Penn State Behrend ­­– History

The nineteenth century western adventurers that “rediscovered” Petra did so with little of the knowledge and none of the luxuries afforded to a modern visitor. These men had access to scant information regarding the city’s history, and were dependent on the second hand accounts of classical writers and vague biblical references. As such, their interpretation of Petra was colored with often misplaced biblical preconceptions and orientalist ideas. Their experience was additionally affected by the treacherous terrain surrounding the ruins and the often inhospitable locals. This presentation will examine the scant knowledge of Petra available to the West prior to J.L. Burckhardt’s rediscovery of the city in 1812, how this discovery was received and interpreted by contemporary Western society, and how the Petra depicted by nineteenth century adventurers and artists differs from the Petra that annually attracts thousands of tourists today. The individual adventurers and expeditions will also be briefly discussed in order to show how their motivations and preconceptions affected the way they perceived and subsequently depicted the ancient city. Additionally, the illustrations of these early visitors will be compared to modern photographs to demonstrate their accuracy and physical changes that have occurred in Petra over two centuries.

#### The Unique System and Lifestyle of Western Guerrilla Warfare during the United States Civil War

Kasey Zaspel (John Rossi and Joseph Beilein), Penn State Behrend – History

Recently, increased research has been undertaken to evaluate Pro-Confederate guerrillas and their legacy in Civil War. The goal of this study was to examine what guerrilla warfare was during this time period, the difference from regular standing armies, the guerrilla’s background and environment, and its effect on their style of combat. This research is necessary to reveal the diverse methods of fighting in the Civil War, the various motivations these men had for choosing to become a guerrilla, and the variance of Western culture when compared to the North and South. In order to answer the multitude of questions, both information and evidence were necessary to obtain from various primary and secondary sources. These sources, which included books, journals, correspondence, and newspapers, were an integral part to define the world of guerrilla warfare in the United States more than 150 years ago. The study yielded valid results of the men who would later become guerrillas being raised in a culture that endorsed violence and valued horses, marksmanship, and most of all, women, which influenced their choice to fight and the way they did battle with union forces. These Western guerrilla soldiers were a different breed of man during the Civil War.

### MATHEMATICS

#### The Importance of Scoring the First Goal in the NHL: Game Winner or Superstition

Samantha Key (Michael Rutter), Penn State Behrend – Mathematics

Before each National Hockey League (NHL) game on TV and Radio, there is talk about the importance of the scoring the first goal. Not only do commentators believe that scoring the first goal of the game improves a team’s chances of winning the game, it is also a superstition among NHL fans. On the NHL’s official website, there is “Game Summary” pages for 10 seasons worth of games, which is approximately 11,780 games worth of data. Assuming that the teams are competitive in each game, a goal is just as likely to be scored by either team. By using the time of the first goal scored, who scored it, and the final score of the game, I determined whether or not the scoring the first goal increases the probability of winning the game. This was done with statistical techniques such as linear regression and the statistical programming language R. Some results were unexpected. For example, when a team scores the first goal, at any moment during the first or second period, the probability of that team winning the game is the same, approximately 66%.The probability of winning the game after scoring first also varies from team to team and season to season, with values ranging from 40% to 90%.

#### A Cyclical Construction of Binary Error Correcting Codes

Phillip Kristufek (Paul Becker), Penn State Behrend – Mathematics

In this research, we pursued a few aspects of a rather difficult problem in coding theory. Extremal self-dual codes of length 24 and 48 have been discovered. However, researchers have been searching for a code of length 72 for almost 30 years. Recent progress involving automorphisms of self-dual codes may lead to the construction, or definite elimination, of the elusive code of length 72. This research will refine a particular automorphism based construction method. We experimented with this construction method for self-dual codes of moderate length. This may allow for the methods eventual application to codes of length 72. Specifically, we consider block substitutions of small circulant matrices into generating matrices for known extremal codes. We will demonstrate a simple substitution which extends the known Hamming Code of length 8 to the known Golay code of length 24. We have also successfully constructed the self-dual and doubly even codes of length 36. The presentation will be accessible to the general audience, as we will discuss the basic concepts and definitions of algebraic coding theory.

#### An Invitation to the Jacobi Polynomials

Matthew Lachesky (Daniel Galiffa), Penn State Behrend – Mathematics

In this talk, we intend to stimulate interest in orthogonal polynomials and special functions by discussing how to rigorously develop several elegant relations involving variations of the Jacobi polynomials. Each of the relations we cover are important unto themselves, and to complete them, several fundamentally important special functions and formulas are needed, e.g., the Gamma and Beta function, which are discussed. Furthermore, the results also require many standard manipulations and techniques that are essential in the field. Therefore, we intend for this talk to function as an excellent ‘invitation’ into this field.

#### MHD Boundary Layer Slip Flow of Power Law Fluid and Heat Transfer over a Flat Plate

Marisa Madsen1 and Jacob Hirschhorn1 (Javed Siddique1 and Antonio Mastroberardino2) 1Penn State York and 2Penn State Behrend – Mathematics

In this model we consider a magnetohydrodynamic (MHD) boundary layer flow of power law fluid and heat transfer with slip boundary conditions at the boundary presented. We use similarity transformations to transform the partial differential equation (PDE) to an ordinary differential equation (ODE) and the resulting system of ODEs is solved numerically. Velocity and temperature profiles within the boundary layer are presented. We will also present the effect of changing the magnetic and slip parameters.

#### Do Vertex Replacement Rules Generate Post Critically Finite Self-Similar Sets?

Thomas Tuberson (Michelle Previte), Penn State Behrend – Mathematics

Since their discovery by Mandelbrot in 1975, fractals have captured the imaginations of mathematicians and non-mathematicians alike. These structures have an intrinsic self-similar property and infinite complexity that can be observed as one arbitrarily magnifies them. It has been shown that vertex replacement rules can be applied to generate fractals. In this research, we attempt to associate vertex replacement rules with a class of objects that is related to fractals. These objects are called post critically finite self-similar sets (or pcf self-similar sets, for short). In particular, we wish to show that vertex replacement rules generate not only fractals but also pcf self-similar sets. This presentation will illustrate how the famous fractal known as the Sierpinski Triangle is a pcf self-similar set that can be generated by a vertex replacement rule.

#### Optimal Control Dynamics of Radiotherapy in Tumor Growth Models

Robert Volkin (Antonio Mastroberardino), Penn State Behrend – Mathematics

Tumor growth, like many other natural phenomena, is modeled mathematically by systems of nonlinear ordinary differential equations. Treatment protocols are then introduced through optimal control theory. Qualitative and numerical analysis of these systems provides crucial information with respect to optimization of treatments within given constraints. The primary focus of this research will be to examine and simulate optimal control models of treatment for tumors to help elucidate the underlying dynamics of the key interactions within the system, as well as clearly articulate the concepts therein such that those without formal training or background in these areas can comprehend them.

### PSYCHOLOGY I

#### Deception Detection: Investigating Individual Differences

Erica Edwards, Christina Ayers, and Sarah Craig (Victoria Kazmerski), Penn State Behrend – Psychology

Lies are a part of our everyday lives. A spark of interest has been ignited in the study of deception detection. The ability to detect deception is an overall essential survival tool. People use facial expressions to detect deception, which would allow a person to react quickly to those who are being deceitful. We hypothesized that psychology majors and female participants are significantly better at detecting deception than the general student population. Participants were given scenarios involving either deceitful or truthful scenarios. Participants were asked to rate the scenario in terms of truthfulness on the Likert scale. Looking at deceptive cues through our scenarios, the Reading the Mind in the Eyes test, the MAB-II, the Mini-markers, and a demographics sheet, we are taking in to consideration individual differences on detecting deception. From these findings, the general population may be able to build on their detecting deception skills.

#### The Effects of Spatial Working Memory Training on Visual Attention

Megan Harris (Victoria Kazmerski), Penn State Behrend – Psychology

Previous research has indicated that there is a link between spatial working memory (SWM) and visual attention (VA). Several dual-task paradigms have revealed that SWM and VA tasks require the same limited capacity neuronal networks within the brain. When combined, these tasks create a mental load which causes an inhibitory effect on accuracy and reaction time. It is unclear, however, how SWM training affects VA. Does training in one area overlap into the next? The current study investigated this question. It was hypothesized that pre-to post-test visual search reaction times would be significantly faster for those who received SWM training than for those who did not receive the training. Surveys were distributed to gather information regarding attention capacity, gaming experience, and gaming preference. It was also hypothesized that experienced gamers and those with greater attentional capacities would show greater improvements in reaction times from pre- to post-test within and between the groups. The results of this study will contribute to the body of research that has been conducted concerning the relationship between SWM and VA. This could aid in the development of serious games.

#### Homophobia in Relation to Spirituality and Religiosity

Mary Havers, Tyler Gibson, and Emily Loker (Charisse Nixon), Penn State Behrend – Psychology

To date, there has been a paucity of information regarding the relationship between spirituality and homophobia. Researchers previously have directed their efforts towards looking into religiosity's correlation instead. The differences between religiosity and spirituality led us to believe that spirituality would have a significantly different relationship with homophobia than that of religiosity. It was also determined that Right-Wing Authoritarianism was a significant contributing factor towards higher levels of homophobia. In this study, we identified the differences between spirituality and religiosity, and analyzed each individual correlation with homophobia, while controlling for Right-Wing Authoritarianism levels. We discerned the relationship between those variables because research has not, to date, focused on the spiritual dimensions of homophobic prejudice. There were no direct associations between Extrinsic Religiosity and homophobia attitudes. Intrinsic Religiosity portrayed a trend towards higher levels of homophobic prejudice. Those higher in spirituality portrayed a trend towards a weaker relationship with homophobic prejudice. Right-Wing Authoritarianism showed a higher correlation with homophobia.

#### Is Media an Agent of Fear? A Glance at the Effect of Media in Our Culture

John Moore, Steve Dickson, and Dakota Schultz (Victoria Kazmerski), Penn State Behrend – Psychology

Previous research suggests that media can be a source of anxiety and phobias from the transition from childhood to adulthood. This study assessed the level of fear and anxiety caused by the media, and how the news as a media source can give fear and panic a sense of credibility. Participants were asked to complete a series of self-report questionnaires assessing the amount of news/media they intake. Next, they were exposed to anxiety-provoking stimuli taken from the news. Participants were also assessed for personality type as a covariate, and afterwards were assessed for a change in their level of negative affect. The “cultivation theory” states that the more a person watches television, the more they believe that is how the real world is like. From this theory we hypothesized that individuals who consume more news would have higher levels of anxiety. We hypothesized that individuals who are more neurotic would also have higher levels of negative affect. These results may shed light on our societies’ worldview which seems to be based in sensationalistic panic. These findings could alleviate general anxiety and fear of crime in our culture.

#### The Effects of Cyberbullying vs. Traditional Bullying on Distress Levels and Definition

Kayla Pelczar, Elizabeth Kremer, and Irma Velic (Charisse Nixon), Penn State Behrend – Psychology

Bullying is considered present when negative actions are repeated over time to one or more persons. In this study, two different forms of bullying will be identified: traditional bullying and cyberbullying. There are many similarities between both forms of bullying, when looking at the characteristics of the bully and the victim in a bullying situation. For instance, bullies tend to show high emotionality and low self-control. On the other hand, victims manifest problems of low self-esteem, loneliness, depression, social anxiety, and school phobias. Traditional bullying has been studied quite extensively and seems to exhibit negative effects for all of the children in the traditional bullying situations. Cyberbullying is a relatively a new concept and will need to be studied further in order to see its full effects. This study will attempt to determine the current definition of bullying and the distress levels associated with this form of aggression.

#### Effects of Media on Thoughts & Behaviors

Michael Rebman, Jordan Lyon, and William Shelstad (Charisse Nixon), Penn State Behrend – Psychology

Past research has suggested that violent media had an effect on aggressive responses, both implicit and explicit; however, there has been some conflict. Additionally, the majority of past research has only examined the effects of one type of media on aggression while neglecting others, such as print media. This study investigates which form of violent media, print, video, or song, elicits the most implicit and explicit aggression. Participants were randomly assigned to one of three violent media conditions and then two measures of implicit aggression and one survey of explicit aggression. Implicit aggression was assessed through the State Hostility Scale and a Word Completion Task. Explicit aggression was assessed using the Hot Sauce Paradigm. We expect that violent visual media will elicit the strongest aggressive thoughts and behaviors compared to the print and violent music. Results showed that media type can influence aggressive thoughts but not aggressive behaviors. The results of this study should help understand the differing types of media effects on explicit and implicit aggressive behaviors.

### PSYCHOLOGY II

#### Occupational Therapists’ Treatments for PTSD Symptoms

Michelle Beck (Melanie Hetzel-Riggin), Penn State Behrend – Kinesiology

Occupational therapists play an important role in the treatment of patients with Post-Traumatic Stress Disorder (PTSD). They use an array of techniques that are conducted in multiple different environments to help treat patients that have been diagnosed with PTSD (Helfrich et al., 2010). These techniques cover all of the stages of trauma, including pre-traumatic risk factors, treatment during a traumatic event, and post-traumatic treatment practices. A comprehensive review of research was conducted on occupational therapists’ use of different treatments with their trauma patients. This review thoroughly examines the most effective ways in which occupational therapists can treat symptoms of PTSD and make day-to-day living easier for these clients. Some of the most effective treatment methods discovered were physical treatments such as sensory-enhanced yoga (Stoller et al., 2012), and mental or psychological treatments such as trauma-focused cognitive behavioral therapy (Roberts et al., 2010) and animal-assisted therapy (Gregg, 2012). Something to study in the future includes a deeper examination of genetic influences on PTSD (Chang et al., 2012). Members of other helping professions such as physical therapists and psychologists can also benefit from the findings of this research by considering these effective treatments as they work with PTSD patients.

#### Stress in Relation to College Performance

Cassandra Bramblett, Christie Leslie, and Alicia McAllister (Victoria Kazmerski), Penn State Behrend – Psychology

Stress is present in everyday life, an excess of which can lead to depression and anxiety disorders. Many college students choose to deal with their stressors with detrimental coping methods such as alcohol and avoidance. In this research we observed the effects of different coping methods used by undergraduate students in response to stress. One of the main aspects we wanted to observe was the presence of gender differences. The research induced stress in participants through a stressful situation. Also assessed were the participant’s heart rate and blood pressure to determine if the test caused physiological stress to the participant. The participants were then asked to use one of three types of coping methods or a control condition. The coping methods tested were music, humor, relaxation, and a control condition. The participants were also instructed to complete various measures on stress and coping. We hoped to identify the most effective coping method by gender and overall in relation to stress. We expect to find a main effect of gender and coping method. Identification of the most effective coping methods would allow for students to deal better with stressful situations.

#### Empathy, Forgiveness, Self-Esteem and Stress: How Do These Traits Work as Mediating Factors in Levels Related to the Trauma and Adjustment of Bullying Victims at the College Level?

Chelsea Chase, Kayla Cochran, and Kara Steele (Charisse Nixon), Penn State Behrend –Psychology

The purpose of this study was to discover what mediating factors play a role in either positive or negative adjustment of students who are dealing with trauma from bullying at the college level. The mediating factors investigated are trauma, stress levels, forgiveness, empathy, and self-esteem. The SACQ will also be used in order to measure adjustment. Prior research has focused more on personality than mediating factors on adjustment. It was hypothesized that college students who rate higher in empathy and forgiveness will have more positive adjustment and lower trauma levels. Also hypothesized was that subjects who have been victimized and have higher self-esteem will have more positive adjustment and lower trauma levels. The third hypothesis is people who have been victimized and display lower levels of self-esteem and higher stress levels, will have less positive adjustment and higher trauma levels. Forgiveness, empathy, self-esteem, and stress will be partial mediators on adjustment and trauma levels with stress being negative. Since there hasn’t been a lot of research done on this, we are unsure of how self-esteem levels will mediate adjustment. The findings of this study may help people discover ways to enhance positive adjustment. The participants in this study were 58 Behrend undergraduate students. The results determined that the most significant protective factors were found to be forgiveness, perspective taking (empathy), perceived stress, and self-esteem. For the most part, our results were consistent with our hypotheses.

#### Involvement and College Students’ Stress: Finding the Sweet Spot

Margaret Eimers, Tony Gahagen, and Vidhya Venkataraman (Charisse Nixon), Penn State Behrend – Psychology

The purpose of the current study was to identify the optimal levels and types of group involvement to maximize positive college adjustment and minimize related stress levels in college students based on Astin’s Student Involvement Theory. The primary research question was to identify how much student involvement, stress, coping strategies, and group attachment style were predictors of college adjustment as defined by the four subscales of The Student Adaptation to College Questionnaire: Academic Adjustment, Social Adjustment, Personal Emotional Adjustment, and Goal Commitment /Institutional Attachment. Also predicted was that the type of involvement, physically active (sports) or social (non-active), may have impacted college adjustment. Participants completed the Social Group Attachment Scale, the Coping Strategies Inventory, a demographics questionnaire, the Perceived Stress Scale, and the Student Adaptation to College Questionnaire. Results revealed that stress and social group attachment were significant predictors of personal emotional adjustment. Stress was the only significant predictor of goal commitment /institutional attachment, and involvement was the only significant predictor of academic adjustment. We found no significant difference between participants involved in physically active (sports) and those in non-physically active groups.

#### An Analysis of Personality Differences between Human-Pet Interactions Maurina Grandinetti, Christina Anthony, Catie Bertges, Brianna Zaffino, and Emily Galeza (Heather Lum), Penn State Behrend – Psychology

The advancement of technology has made an immense impact on our society today, explicitly using games as a teaching and training tool. For this study, researchers examined the interactive differences between a game-based pet, a live pet, and robotic pet training scenario. Participants were randomly assigned to one of the three conditions and asked to interact with the entity in two different scenarios; free play and specific training commands. Researchers measured the length of time it took for the participants to master each command as well as their perceived workload frustration levels. Pet experience, animal attitudes, anthropomorphic tendencies, personality traits, and other variables were measured. The result of this research focuses on comparing individual differences which can contribute to or hinder learning and interaction whether in a live-, robotic-, or game-based scenario. This has important implications for the domain of pet training as well as human-animal and human-technology interactions as a whole.

#### The Effect of Attachment, Coping Strategies, and Self-Identity on Peer and Romantic Relationship Quality

Kayla Kedzior, Jillian Robertson, and Danial Zonna (Charisse Nixon), Penn State Behrend – Psychology

The goal of this study was to examine the relationship between coping strategies, self-identity, and attachment to identify the strongest predictor of peer and romantic relationship quality. All participants were exposed to twenty-two predictors of relationship quality, but if the participants had experienced a romantic relationship at any point in their life they were exposed to two additional predictors. We found that college students who reported feelings of secure attachment via having low anxiety and avoidant scores on the ECR-R measure reported high satisfaction in their romantic relationships. We also found that the more an individual communicated with their mother, the more satisfaction they felt with their peers. Knowing what influences relationship quality could lead to more satisfying relationships.

#### Stress, Is the Bark Bigger Than the Bite?

Katelyn Marsh and Catherine Bertges (Victoria Kazmerski and Heather Lum), Penn State Behrend – Psychology

Stress has been shown to cause both short- and long-term negative health effects in people. Previous psychological studies have found that animals, such as dogs, can assist in the reduction of stress. In this study, we looked to see if dogs can actually help to reduce the feelings of stress in humans after a stressful incident has occurred. Stress was measured by self-reported measures and physiological responses, including heart rate and blood pressure. The participants completed the questionnaires, a stressful task of logic questions, and then one of three coping conditions. The three conditions in our study were: interacting with a dog after the task, building shapes with blocks while the researcher was present to converse, and building shapes with blocks alone. Their physiological responses were recorded intermittently throughout. We hypothesized that those college students who interacted with a dog after a stressful event would show less physiological signs of stress. By better understanding stress reduction mechanisms, colleges can help students cope more positively. For example, colleges can implement programs encouraging interactions between college students and dogs. Learning stress reduction techniques in college may have long-term implications in the reduction of cardiovascular diseases.

## Poster Presentations

### BIOLOGY I

#### A Comparison of Class I and II Haemophilus ducreyi Phagocytic Resistance

Stephanie Blystone (Tricia Humphreys), Allegheny College – Biology

*Haemophilus ducreyi*, a gram-negative coccobacillus and strictly human pathogen that causes the genital ulcer disease chancroid, remain extracellular throughout infection and surviveby resisting phagocytosis. Among *H. ducreyi* virulence factors, the LspA1, LspA2, and LspB proteins comprise a two-partner secretion system that has been shown to be necessary for *H. ducreyi* to inhibit phagocytosis by immune cells. Recent literature suggests that *lspA2* gene structure differences may exist between the two existing classes of *H. ducreyi* (Class I and II). This study aimed to investigate the adherence, uptake, and intracellular survival of Class II *H. ducreyi* in the human-macrophage-like cell line, U-937. In addition, this study was intended to compare *lspA1* and *lspB* from both classes of *H. ducreyi*. The *lspB* gene has been amplified by PCR and detected in both classes. The results of this study may demonstrate additional differences between the classes or may indicate that phagocytic resistance is equally efficient in both classes.

#### Molecular Phylogenetic Analysis of Novel Non-Sexually Transmitted Strains of Haemophilus ducreyi

Jordan Gaston (Tricia Humphreys), Allegheny College – Biochemistry

*Haemophilus ducreyi* is the etiologic agent of the sexually transmitted infection chancroid. While once considered clonal, recent reports indicate the two classes of *H. ducreyi* may be disparate enough for complete species divergence. Limited numbers of existing studies indicate ulcerative dermal infections on legs caused by *H. ducreyi* originating from non-sexual contact. This investigation was conducted to understand the phylogenetic relationships between these leg ulcer strains and previously described strains. Twelve genes from four leg ulcer strains were sequenced and compared to known *H. ducreyi* sequence data. The sequences for *pal*, *wecA* and *murC, dltA, 16s rRNA, lspA2, hgbA,* and *MOMP* contained little significant sequence variation. For *ncaA*, there were 332 informative sites, only two of which differentiate the leg ulcer strains from 35000HP(I). For *dsrA*, the leg ulcer strains were identical to each other except in two areas, a repeat region in which two of the strains were missing repeats and another lone nucleotide. The leg ulcer *dsrA* sequences differed 40-41bp from the 35000HP(I). Sequence data from *ompA2* contained a trimeric insertion and two insertions downstream. DNA sequence data indicate that the leg ulcer strains more closely resemble class I strains.

#### The Soil Bacterium Lysinibacillus xylanilyticus Blocks Induction and Improves Spore Germination in the Homosporous Fern Ceratopteris richardii

Haley Hallowell and Nicole McAllister (Mike Ganger and Sarah Ewing), Gannon University – Biology

Sex determination in *Ceratopteris richardii* is strongly affected by a pheromone called antheridiogen. Antheridiogen is secreted by hermaphrodites and biases individuals to develop as males, while its absence leads to hermaphrodite development. Though the sex-determination system in *C. richardii* is well studied, such research occurs in sterile environments that lack the microbial complexity of soil. Soil bacteria are known to communicate and respond to plant roots through chemical signals leading us to ask whether soil bacteria could alter this sex-determination system. Soil bacteria were isolated from fern roots. One of these, *Lysinibacillus xylanilyticus*, was selected for further study. Approximately 300 fern spores were sown onto five agar plates containing 0, 15, or 23.5 CFUs / ml. After three weeks, 4,378 *C. richardii* gametophytes were characterized as male, hermaphrodite, ungerminated, or newly germinated. *C. richardii* gametophytes in both concentrations of *L. xylanilyticus* were more likely to be hermaphrodites than in control plates. Additionally, *C. richardii* spores germinated at higher rates in the bacteria-containing plates. Future research seeks to understand the mechanism by which gametophyte gender is affected in the presence of bacteria.

#### Changes in Residue Levels in Potatoes Treated with Varying Concentrations of the Sprout Inhibitor 1,4-dimethylnapthalene

Rebecca Hyde, Olivia D’Annibale, and Zachary Bauer (Michael Campbell) Penn State Behrend – Biology

Potatoes are the third largest agricultural crop in the world. Sprout control is critical for storage, and applications of sprout inhibitors have been used to maintain storage life of tubers. Fogging harvested potatoes with the compound Chlorpropham (CIPC) is the most common method to prevent sprouting. However, because CIPC disrupts microtubules there is some concern regarding its impact on human health. The compound 1,4-dimethylnapthalene (DMN), originally isolated from dormant potato tubers, has been recently used as a sprout control agent in stored tubers. The mode of action for DMN is unknown. The goal of this research is to identify the exposure limits necessary to induce a sprout response in potato tubers and to determine the genetics responses associated with DMN treatments. Nondormant potato tubers were treated in a 9 L air tight chamber with concentrations of DMN ranging from 19.5 µmol/L to 1625 µmol/L. Potato periderm and meristems were harvested after two days of DMN application and after five days of air-dry time. Harvested meristems were frozen in liquid nitrogen and used for RNA-seq analysis and periderm plugs were analyzed for DMN residue. The average periderm residue levels for DMN ranged from 0.1 to 4.2 ppm depending on the level of exposure. This work establishes a method of treatment for potato tubers that results in a predictive amount of DMN residue and tuber surfaces.

#### Accurate Identification of Artemisia vulgaris via DNA Barcoding

Michael Jaskolka1 (Michael Campbell1 and Jack Williams2), 1Penn State Behrend and 2Mercyhurst University – Biology

The essential oils of *Artemisia vulgaris* (common wormwood) have been extensively studied worldwide, however, there has been a lack of analysis of *A. vulgaris* populations in the United States. The chemotypic identification of *A. vulgaris* is important because the variation in the essential oils produced may influence the medicinal use of the plant. Previous research has provided a chemotypic analysis of what was morphologically identified as *A. vulgaris*. Due the difficulty in accurately identifying a plant species through morphological features, we proposed using DNA bardcoding to provide a definite identify of the plant in question. To perform DNA barcoding on the purified plant tissue, a DNA fingerprint was created by sequencing the genes matK and rbcL. These fingerprinting genes were selected for this experiment because they have proven themselves effective enough to be considered as two of the core DNA barcodes for land plants. This is due to their universality, their high level of discrimination, and the high quality bidirectional sequences that they provide. In essence, they are universal genes that are present in almost all plants and the high quality sequences they provide ensure that the data obtained will be accurate. With the use of the barcode genes matK and rbcL, we were able to accurately identify the plant samples to be *A. vulgaris* and established that the chemotypes detected were derived from the same species.

#### Hermaphrodite Gametophytes of the Fern Ceratopteris richardii Express CRKNOX1, CRKNOX2, and CRKNOX3 Genes

Julia Leix (Mike Ganger and Sarah Ewing), Gannon University – Biology

The knotted-like homeobox (KNOX) genes are members of a gene family that encode homeodomain proteins that bind to DNA and regulate gene transcription. In land plants there are two families of KNOX genes: Class 1 (KNOX1) and Class 2 (KNOX2). KNOX1 genes are thought to regulate sporophytic meristem genes, while KNOX2 genes are thought to have evolved to suppress the gametophyte developmental program in favor of the sporophyte. The homosporous fern *Ceratopteris richardii* is a model system for understanding plant physiology and development. Like other ferns, the gametophytes of *C. richardii* are free-living and larger than the gametophytes of the flowering plants, and therefore easier to work with. *C. richardii* is known to express at least three KNOX genes in the sporophyte: *CRKNOX1*, *CRKNOX2,* and *CRKNOX3*. In order to determine whether *C. richardii* hermaphroditic gametophytes express these CRKNOX genes, RNA was extracted from samples of hermaphrodites, exposed to DNase, and converted to cDNA. qPCR was used to assess relative expression of the three CRKNOX genes. Contrary to published results, *C. richardii* hermaphroditic gametophytes express *CRKNOX1*, *CRKNOX2*, and *CRKNOX3*.

#### Inactivation of Listeria through the Use of Radiant Catalytic Ions on the Surfaces of Food and Swabs

­Joseph Mannozzi (William Mackay, David Fulford, and Craig Steele), Edinboro University – Biology

The United States Department of Agriculture has estimated the costs associated with *Listeria* foodborne illnesses to be between $61.7 and $64.8 million a year. The areas impacted include fruits and vegetables, meats, seafood, poultry, baking, canning, and dairy industries. Reducing pathogens and additional microbial contamination on food contact surfaces will improve the quality and shelf life of many food products. New sanitizing technologies have emerged in recent to decontaminate contact surfaces better. Historically, both ozone- and peroxide-based technologies have been used as disinfectants in numerous applications. The use of ozone is now considered to be an organic form of treatment to disinfect food contact surfaces. Radiant Catalytic Ion (RCI) technology has been widely accepted within the food processing industry during recent years. This study focused on the potential use of oxidative gases, including ozone and peroxide, generated by an RCI photocell for the inactivation of *Listeria*, introduced on the tips of sterile cotton swabs, and a number of fruits. Our results indicate a 90% killing of bacteria with a 90-minute exposure to RCI, demonstrating that the low level of oxidative gases produced by RCI has the potential to be an effective surface disinfectant tool for use in food processing.

#### Adherence to Lactobacillus Affects Growth Abilities of Haemophilus ducreyi

Allison Palmer (Tricia Humphreys), Allegheny College – Biology

*Haemophilus ducreyi* is the causative agent of the genital ulcer disease chancroid. Chancroid can co-infect with human immunodeficiency virus. Chancroid affects both sexes, but is more common in men. *Lactobacillus* is a bacteria found in the human normal flora. It has a higher prevalence in women. This research hypothesizes that *Lactobacillus* is interacting with *H. ducreyi* and reducing chancroid’s incidence in women. *Lactobacillus* species and *H. ducreyi* were grown in various assays to see if they interacted. To test the effect on growth, they were co-cultured in BHI broth for 24 hours. The second method is an interference assay, adding one bacteria to the others preset environment. This would show an effect of one previous bacterial culture on the growth of the other. The co-culture assays have resulted in equal growth of both types of bacteria. The interference assay has yielded inconclusive results. One test resulted in *H. ducreyi* growing only when added after the *Lactobacillus*. When the *Lactobacillus* was added second, only the *Lactobacillus* grew. In other tests, *H. ducreyi* grew in both situations. As of now, the results are inconclusive, but more experimentation could reveal whether *Lactobacillus* may prevent chancroid in women.

#### Interaction of Haemophilus ducreyi and Group B Streptococcus using Autoinducer-2

Tashina Robinson (Tricia Humphreys), Allegheny College – Biology

Quorum-sensing is the regulation of gene expression in regard to changes in cell density using small, diffusible signal molecules called autoinducers. Autoinducer-2 (AI-2) allows for interspecies communication between bacteria. *Haemophilus ducreyi*, the causative agent of the sexually transmitted infection chancroid, and Group B Streptococcus (GBS), a vaginal microflora found in approximately 1/3 of women, evidently produce AI-2. The male-to-female ratio of chancroid is as high as 25:1. Thus, factors that may influence *H. ducreyi*’s sex disparity are worth examining. Due to AI-2 production, this research hypothesizes that GBS would positively influence *H. ducreyi*’s growth. I performed a series of contact-independent assays using GBS and *H. ducreyi* culturesupernatant. No consistently statistically significant difference in growth was found for any supernatant dilution (0.20%-25%) compared to the control for individual time points or the exponential phase of the growth curve. Interestingly, the contact-dependent co-culture assays revealed that *H. ducreyi* cannot grow in the presence of GBS. Several combinations of factors *in vivo* such as vaginal pH, presence of other bacteria, and temperature, may influence pathogenicity. However, the bacteria must be communicating in some form, and these results underscore the importance of studying bacterial interactions.

#### Apple Scab Isolates from Regional Orchards that Contain G143A Mutations Conferring Resistance to the Strobilurin Class Fungicides

Benjamin Swonger1, Sarah Erichson1, and Michael Fiend1 (Christopher Gee1 and Kari Peter2), 1Penn State Behrend and 2Department of Plant Pathology and Environmental Microbiology, Penn State University – Biology

Apple scab (*Venturia inequalis*) presents a significant problem for apple growers throughout the growing season. Control of scab is carried out with combinations of chemical pesticide applications, presenting the potential for the development of resistance in the pathogen population. For fungicides with a single mode of action, the potential for resistance in a pathogen population is very high. This potential for resistance has been observed in the strobilurin class of fungicides (FRAC group 11). This project aims to ascertain the levels of strobilurin resistance in apple scab isolates collected from orchards in Ohio, Pennsylvania, and Maryland using CAPS-PCR RFLP to quantify the single nucleotide polymorphism (SNP) responsible for a glycine to alanine mutation (G143A) known to confer a qualitative level of resistance in fungal pathogens. The data show a large percentage of the collected samples contain the mutant SNP, suggesting an overall high level of strobilurin resistance in the sampled locations. This suggests the potential that strobilurins will lose effectiveness throughout this region.

#### Screening of Extremophiles for Biosynthesis of Cobalt Nanoparticles

Jamie VanAlstine and Erik Beeler (Om Singh), University of Pittsburgh at Bradford – Biology

Nanoscale materials have emerged with unique chemical and physical properties. Cobalt nanoparticles have been implied in medical sensors, biomedicine as a contrast enhancement agent for magnetic resonance imaging (MRI), site specific drug delivery agent for cancer therapies, including coatings, plastics, nanofibers, and high-performance magnetic recording materials. Bio-nanotechnology offers eco-friendly processes for the synthesis of stable nanoparticles (NPs). Extremophiles are organisms that survive under hostile environments, used for their value-added products of biomedical and commercial significances. We hypothesized that the variety of extremophiles would bioreduce the metallic ions into NPs. A variety of twenty-nine extremophiles, e.g. Ultra-violet radiation resistant, psychrophiles, and microorganisms from cave soil were screened for Cobalt-NP formation on nutrient agar plates and broth supplemented with 2 mM cobalt nitrate. The appearance of color changes in plates was observed, while the color change in broth was scanned at 400-700nm using UV-Vis spectrophotometer. Further, characterization of Co-NPs was performed using dark field microscopy. Among twenty-nine extremophiles, a cold-resistant organism OVC5 revealed formation of pink color on NA agar plates in addition to broth. The absorption maxima of broth was revealed at 500 nm representing formation of Co-NP.

#### Inactivation of Pathogens on the Surfaces of Sterile Swabs, Fruits, and Vegetables Using Sanitizing Substances Produced by Radiant Catalytic Ionization

Jordanna Wallace (William Mackay, David Fulford, and Craig Steele), Edinboro University – Biology

Foodborne illness outbreaks linked to fresh produce are common and dangerous. The United States Department of Agriculture has estimated the costs associated with foodborne illnesses to be between $2.3 billion and $4.6 billion a year. The main areas impacted include fruits and vegetables, meats, seafood, and poultry. Reducing pathogens and microbial contamination on food surfaces improves their quality and shelf life. Both ozone- and peroxide-based technologies have been used as disinfectants in numerous applications. Radiant Catalytic Ionization (RCI) technology is thought to be safe to humans and its use is now considered to be an organic form of treatment to disinfect food surfaces. Ozone and hydrogen peroxide, generated by RCI, have potential for reducing numbers of bacteria. This study has focused on the potential use of these oxidative gases for the inactivation of *Escherichia coli* and  *Salmonella* *typhimurium* introduced on the tips of sterile cotton swabs, apples, spinach, cucumbers, and cantaloupe. Our results indicate a 99.9% killing of bacteria with a 90-minute exposure to RCI, demonstrating that the low level of oxidative gases produced by RCI has the potential to be an effective surface disinfectant tool for use in food processing.

### BIOLOGY II

#### Mapping the Incidence Pattern of Some Ailments and Autoimmune Diseases among Young Adults from Pennsylvania

Weam Altaher, Amber Morrison, and Alexandra Mastro (Mary Vagula), Gannon University – Biology

This report presents the incidence pattern of six prevalent conditions and autoimmune diseases, namely: myopia, asthma, hyperopia, depression, acid reflux disease, and eczema in young adults who are currently living in Erie, Pennsylvania. Autoimmune diseases are due to abnormal immune response to normal healthy tissue and the destruction seen in these diseases is due to autoantibodies formed against self. According to recent National Institutes of Health data, 23.5 million Americans suffer from autoimmune diseases. Many of these conditions which were once very rare have become more prevalent. The objective of this study was to track the incidence of these conditions among young adults and compare with the state’s and nation’s average values. The impetus for this study is the gradual increase in the incidence of these diseases. The research method employed was a survey administered to 171 young adults whose responses to a two-page questionnaire formed the raw data. Analysis of the data revealed that 51.5% of the population had myopia, 14.6% hyperopia, 18.7% asthma, 8.8% acid reflux, 7.02% eczema, and 6.43% depression. The results will be discussed in the light of national and state averages and will be compared to 2013 data obtained from the same place.

#### Differential Enzyme Coatings Affect Microelectrode Array Measurements of Choline

Kathleen Corello, Nikhil Kanthala, and Rushi Patel (Catherine Mattinson), Gannon University – Biology

The striatum is an area of the brain that is essential for motor functions and spatial memory. Previous studies have shown that cholinergic interneurons are critically involved in neurotransmission in the striatum, and thus may play a role in neuropathologies such as Parkinson's disease. To measure choline in the striatum, we will use microelectrode array (MEA) technology. MEA technology features platinum recording sites that can be coated with the enzyme choline oxidase to generate H2O2 from choline. H2O2 serves as a reporter molecule that can be measured and quantified to allow for real-time measurements of choline both in vitro and in vivo. In preparation for in vivo experiments, we examined the effects of varying the amount of enzyme coated onto the platinum recording sites in order to enhance the signal strength of the MEAs. Data revealed that three coats of enzyme resulted in optimal selectivity for and sensitivity to choline during in vitro calibrations (average selectivity of 1940:1; average limit of detection of 400 nM). These data will be used to guide our enzyme coating protocol for subsequent experiments. We anticipate that our future experiments will help elucidate an understanding of the role of cholinergic signaling within the striatum.

#### Preparation of Alginate/Chitosan Fibers for Biomedical Applications

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Alginate/chitosan fibers were produced using a wet spinning technique. Alginate was spun into a coagulation bath of chitosan dissolved in acetic acid. The dry mechanical properties of the fibers were tested using a strain-controlled dynamic material analyzer. The fibers were loaded with sulfathiazole, an antimicrobial drug. Drug release rates as well as bacterial growth inhibition were studied. It was found that higher molecular weights of chitosan yielded the strongest fibers. Fibers loaded with sulfathiazole showed excellent inhibition of *E. coli* after an incubation time of 24 hours at 37°C. The results of this research suggest that alginate/chitosan fibers have a great potential for medical applications.

#### An Exploration of ANI1 Expression in Hermaphrodite Gametophytes of the Fern Ceratopteris richardii

Julia Girouard and Kara Norman (Mike Ganger and Sarah Ewing), Gannon University – Biology

In the fern *Ceratopteris richardii*, gametophyte gender is influenced by a pheromone called antheridiogen produced by hermaphrodites. With antheridiogen, spores develop as males. Without antheridiogen, hermaphrodites develop to contain a notch meristem, peripheral antheridia, and central archegonia. Though the gene *ANI1* is expressed during male development and is thought to be important for male determination, we demonstrate comparable expression in mature hermaphrodites. To determine the spatial expression of *ANI1* in hermaphrodites and whether antheridiogen is sufficient for *ANI1* expression, the edges of three-week old hermaphrodites were severed from the central archegonia and notch meristem. Cut pieces were kept with hermaphrodites. After four days, a parallel set of hermaphrodites were cut to separate edges from the central portion. RNA was extracted from each group of treated gametophytes, exposed to DNase, and reverse transcribed to cDNA. *ANI1* expression in each treatment was determined using qPCR. Center portions of hermaphrodites exhibited 93x higher *ANI1* expression than edge pieces. Edge pieces separated from center portions for four days exhibited 240x higher *ANI1* expression than edge pieces separated from center portions just prior to RNA isolation. *ANI1* expression varies spatially within hermaphrodites and its expression is induced in edges severed from hermaphrodites.

#### Health Hazards of Radio-Wave Frequency Radiation on Gene Expression during Early Embryonic Development Using Zebra Fish

Ryan Harkless and Muntather Al-Quraishi (Mary Vagula),Gannon University – Biology

It is imperative that the effects of exposure to radio-wave frequency (RF) radiation on living organisms be well understood. In particular, it is critical to understand any effects that RF radiation may have during embryonic development. Zebra fish (*Danio rerio*) have been studied extensively, and their value a model organism is well established. This study will observe the effects of RF radiation emitted from a cellular telephone on the embryonic development of zebra fish. The expression of the gene *shha* which is key to the early development of the fish will be examined; this gene has homologs in humans as well as in model organisms. Additionally, several biomarkers indicative of cell stress will be examined; including lactate dehydrogenase, superoxide dismutase, and lipid peroxidation. The goal of this study was to provide data on the expression of this gene during early embryonic development in *D. rerio* and any effects that cell phone radiation has on its expression or on the three listed biomarkers.

#### Zymogram Profiles of Select Digestive Fluid from Several Populations of Argiope aurantia

Brandi Hobbs (Matthew Foradori), Edinboro University – Biology

Digestive fluid from the gut of spiders is a rich source of proteolytic enzymes, which serve to digest macromolecules extraorally, before they are taken in as nutrients. Previous research has demonstrated the ability of these enzymes to cleave many basement membrane proteins, including collagen and fibrin, a major component of the fibrin clot in humans. This research has focused on cataloging these proteolytic enzymes through SDS-PAGE zymography. Digestive fluid was collected manually from several separate geographic populations of *Argiope aurantia*, the black and yellow garden spider. Proteolytic enzyme profiles were generated from the digestive fluid of each spider to determine the intensity and molecular weight of each. The results indicate that there is variation within and between the garden spiders from different collection locations.

#### Development and Optimization of an Inverse PCR Method to Identify Unknown Regions Flanking the Known ANI1 cDNA Sequence

Nicole McAllister (Sarah Ewing and Mike Ganger), Gannon University – Biology

Changes in expression of the antheridiogen induced *1* (*ANI1)* gene play a key role in sex determination of *Ceratopteris richardii* gametophytes and are important throughout the male gametophyte’s lifespan. The *ANI1* full-length cDNA sequence is known; however, no information is currently available regarding the genomic gene sequence, preventing further study of the regulationof *ANI1* gene expression. The purpose of this study was to develop and optimize a method to identify the DNA sequences of regions flanking the *ANI1* coding sequence, including upstream regulatory promoter elements, and to identify any associated intronic sequences. Genomic DNA was isolated from *C. richardii* gametophyte tissue. Isolated DNA was digested using EcoR1, a restriction enzyme that does not cut the known *ANI1* cDNA sequence. Cut DNA was circularized using T4 DNA ligase. Primers were designed to conduct inverse PCR, amplifying unknown regions that flank the known *ANI1* cDNA sequence. Further optimization of the protocol is needed to address low concentrations of genomic DNA and the presence of multiple amplicons following inverse PCR. Ongoing studies will use pooled DNA samples, explore parallel restriction enzyme digestions, utilize new inverse PCR primers, and perform nested PCR to potentially eliminate the production of multiple PCR products.

#### The Effects of Omega-3 Fatty Acids on Spontaneously Hypertensive Stroke Prone Rats

Maria Miranda and Amelia Redding (Jeff Cross), Allegheny College - Neuroscience

The Stroke Prone Spontaneously Hypertensive Rat (SHRSP) model has been used widely by many researchers investigating high blood pressure, stroke, and heart disease. One of the best ways to avoid heart disease is to eat a diet rich in Omega-3 fatty acids. Omega-3 fatty acids found in fish oil (FO) help lower triglycerides, which are fats located in the blood, lower blood pressure, reduce the risk of blood clots, improve the health of arteries, remove the amount of plaque, and serve to maintain the function of the nervous system. The effect of FO administration via gavage (0.4% body weight) was investigated in young male SHRSP rats. Animals in this study were fed FO every day for 0, 3, 6 or 9 weeks. SHRSPs with the longer regimen of FO had significantly lower systolic blood pressure and shorter escape latency in the Morris Navigation Task, which suggests that hypertension can lead to diseased blood vessels and can impair learning and memory processes. Evans blue staining was more evident in animals with the shortest regiment of FO and were more vulnerable to leaks in the blood brain barrier as a result.

#### Spider Digestive Fluid is a Novel Source of the Enzyme, Phospholipase A2

Christopher Olsen (Matthew Foradori), Edinboro University – Biology

The enzyme, phospholipase A2 (PLA2), has been found to promote inflammation by helping the initiation of the arachidonic acid pathway in mammals. As a component found in snake, bee, and spider venom, it has been demonstrated to cause cellular injury. The primary objective of this project was to search for the presence of PLA2 in a new source, spider digestive fluid. Digestive fluid was readily collected from *Argiope aurantia,* the black and yellow gardenspider, in capillary tubes and frozen until use. The presence of PLA2 was detected by mixing 2 µl of digestive fluid with a synthetic phosphocholine, and Ellman’s reagent Tris-buffered saline, pH 7.4. If hydrolysis of the phospholipid occurred in the second position, ultimately, a free thiolate would be generated causing a colorimetric change. The results were apparent before spectroscopy as the samples had changed color. Subsequent UV-Visible spectroscopy confirmed the presence of PLA2. A standard was also performed using a PLA2 isolated from rattlesnake venom. The significance of this research is that it indentifies a new source in which PLA2s can be found.

#### Elucidating the Effects of Manganese on Human Dopaminergic Cell Viability

Renee Petrucci1 and Seth Morrisroe1 (Sarah Ewing1 and Thomas Corso2), 1Gannon University and 2Lake Erie College of Osteopathic Medicine – Biology

Although manganese is an essential trace metal, chronic exposure to large amounts can be detrimental to human health because of its ability to accumulate in cells located in the basal ganglia of the brain. Manganese accumulation results in mitochondrial dysfunction, oxidative stress, protein aggregation, and in severe cases, development of a Parkinsonism-like disease called manganism. The purpose of this research is to measure dopaminergic cell viability in response to acute and chronic exposure to manganese. SH-SY5Y cells, a human dopaminergic cell line, were treated with manganese for either 48 hours or seven days. Treated cells were collected, mixed 1:1 with trypan blue, and analyzed using an automated cell counter to determine the percent of viable cells. Parallel studies are exploring the use of the CytoTox-ONETM Homogeneous Membrane Integrity Assay to measure dopaminergic cell viability in the presence of manganese. Initial studies were designed to determine whether the presence of manganese interferes with the chemistry or fluorescence of the CytoTox-ONETM Assay. The results of these studies will determine the usability of the CytoTox-ONETM Assay to measure cell viability in the presence of manganese, and describe the effects of acute or chronic exposure to manganese on dopaminergic cell viability.

#### The Role of Innexins 2, 4, and 5 and Vinnexins Q1 and D in Drosophila melanogaster

Kelsey Sadlek (Bradley Hersh), Allegheny College – Biochemistry

Innexins are transmembrane proteins that comprise gap junctions, communication channels between cells, in *Drosophila melanogaster* and are speculated to play a vital role in the organism’s cellular immune response. When the insect is invaded by the parasitoid wasp, cells comprising the hemolymph initiate a cellular immune response that signals the cells to surround and neutralize the invader in a process called encapsulation. This cellular immuneresponse is sometimes compromised by the wasp’s weapon of choice: a mutualistic polydnavirus that disrupts host immunity. This virus contains vinnexins, viral homologs of innexins.Vinnexins Q1 and D form functional gap junctions with lepidopteran innexin 2, suggesting direct physical interactions might alter the immune response. In addition, innexin 2 and innexin 4 are important for *Drosophila* organogenesis during the larval stage, which is when the organism is most likely to be affected by the polydnavirus. Innexin 5 is important for immune response to bacteria, though this mechanism has yet to be fully understood. Using the UAS-GAL4 expression system in *D. melanogaster*, we performed a series of RNAi knock-outs of these innexins to elucidate their role in encapsulation. In addition, we used the yeast-2-hybrid method to investigate specific interactions between these innexins and vinnexins.

#### Characterization of Ameiurus nebulosus Populations with Squamous Cell Carcinoma

Jason Sargent (Sara Turner), Mercyhurst University – Biology

The incidence of squamous cell carcinomas in parts of the Lake Erie region are significantly higher than those in surrounding regions. Decades of fish sampling to monitor tumors in brown bullheads in Lake Erie have not yet successfully identified the cause of external tumors in this sentinel species, and the unresolved issue remains a stumbling-block in delisting Great Lakes Areas of Concern. The cause of these squamous cell carcinoma tumors are unknown, but could be caused by several environmental stressors, toxins/pollutants, or infection. The goal of this research was to examine the genetic components of brown bullheads in the region to determine if there is a genetic component to the increased incidence. We plan to examine both neutral and non-neutral molecular markers in *A. nebulosus* populations with and without skin tumors in order to assess the difference in genetic diversity and sequence variability between these two groups.

#### Relative Expression of CMADS2, CMADS3, and CMADS6 in the Fern Ceratopteris richardii

Shivali Singh (Mike Ganger and Sarah Ewing), Gannon University – Biology

MADS box-genes are a family of transcriptional regulators in eukaryotic development. In plants, MADS genes are involved in processes throughout the plant life cycle, including both gametophyte and sporophyte stages. In the model system *Ceratopteris richardii*, a homosporous fern, a small set of MADS genes including *CMADS2*, *CMADS3* and *CMADS6* have been shown to be expressed. Here we develop a technique for determining the relative expression of *CMADS2*, *CMADS3* and *CMADS6* in hermaphrodite and male gametophytes as well as sporophyte tissue using RT-qPCR. RNA was isolated from three-week old hermaphrodite and male gametophytes, exposed to DNase, and converted to cDNA. RNA was also isolated and processed from the initial leaves produced by young sporophytes. Primers were designed to recognize each unique member of the CMADS gene family. Sequence analysis verified that the amplicon produced was the same for each CMADS gene in hermaphrodite, male, and sporophyte tissue, but distinct for each CMADS gene. *CMADS2*, *CMADS2* and *CMADS6* are expressed in hermaphrodites, males, and sporophytes, though at different levels.

#### Altered Lengths of Dendrites in Motor Cortex Neurons of Valproic Acid Autism Model in Sprague-Dawley Rats

Samantha Skobel (Jeffrey Cross) Allegheny College – Neuroscience

The Valproic Acid (VPA) model of Autism in rats, created by the prenatal exposure to VPA, has neurological and behavioral consequences. In this study, neuronal morphological characteristics, such as length, width, height, and end distance, of apical dendrites in the M1 and M2 areas of the motor cortex were compared in the VPA model (N=5) and control male Sprague-Dawley Rats (N=5). Post-perfusion, brains were sectioned with a microtome and stained with a Golgi-Cox method in order to make neurons and other non-neuronal cells visible. Dendrite morphologies were examined and several different characteristics were measured with microscopy software. It was determined that the dendrites in the M1 and M2 areas were found to have significantly greater apical dendrite length and height in VPA subjects compared to controls. Width and end distance measurements of dendritic processes were not significantly different between VPA and control.

#### Use of Chloral Hydrate Modified Golgi-Cox Stain on Astrocytes in a Pilocarpine Model of Epilepsy

Samantha Skobel (Jeffrey Cross), Allegheny College – Neuroscience

Golgi-Cox stains are useful in the analysis of neural cell morphologies. A modification of the traditional Golgi-Cox stain was performed by the addition of Chloral Hydrate to allow improved visualization of astrocytes and astrocytic end-feet. Pilocarpine (PC)(160mg/kg) was used to induce seizures in two groups of Sprague-Dawley rats; controls, and rats treated prenatally with Valproic Acid (VPA)(376mg/kg) on the 12.5 day of gestation, creating a rat model of Autism. In each of these groups, there were four subgroups of seizure lengths (0, 1, 12 and 24 hours) before euthanasia procedure and perfusion of rats. Differences in astrocytic damage were evident between VPA and control animals and those receiving PC-induced seizures as evident in microscopic analysis of Golgi-Cox stained tissue.

#### Does Manganese Auto-Oxidize Dopamine in the Absence of SH-SY5Y Cells?

Brian Sohl1 (Sarah Ewing1 and Thomas Corso2) 1Gannon University and 2Lake Erie College of Osteopathic Medicine – Biology

Manganese, an essential trace metal in all living organisms, is required for cellular metabolism and brain function. However, manganese can accumulate in the brain following prolonged exposure to high levels. In excess, manganese elicits neurotoxic effects that can lead to neurodegeneration. Previous studies in our lab demonstrated that extracellular levels of the monoamine neurotransmitters dopamine, serotonin, and 5-hydroxyindole acetic acid produced from SH-SY5Y dopaminergic cells decreased significantly in response to manganese. Although several hypotheses could explain these results, studies have shown that auto-oxidation of dopamine by manganese can occur, resulting in neurotoxicity. The purpose of this research was to explore whether manganese auto-oxidizes dopamine in the absence of SH-SY5Y cells through a non-enzymatic mechanism. Dopamine was incubated in the absence and presence of 200 uM manganese for 48 hours. Samples were diluted 1:4 in perchloric acid containing an internal standard, 3,4-dihydroxybenzylamine hydrobromide. Twenty microliters of diluted samples were subjected to high performance liquid chromatography (HPLC) with electrochemical detection to determine relative levels of dopamine and its metabolites. Preliminary results suggest dopamine levels decrease in the presence of manganese. Thus, decreased extracellular levels of dopamine surrounding SH-SY5Y cells treated with manganese may, in part, be attributable to a non-enzymatic mechanism involving auto-oxidation.

#### Genetic Perturbation of Folate Metabolism in Zebrafish through Morpholino Knockdowns

Samantha Storti (James Warren), Penn State Behrend – Biology

Folic acid is water soluble B vitamin. Folic acid deficiencies have been linked to a variety of developmental and adult onset disorders in humans. Our laboratory has used zebrafish to model the effects of folate metabolism on embryonic development. Different concentrations of homocysteine, an intermediate in folate metabolism, have been used to pharmacologically perturb the development of zebrafish embryos. The treated embryos expressed phenotypes with abnormal pigmentation, circulation defects, and trunk deformities such as neural tube defects. In this study, we are trying to determine which of these phenotypes can be linked to specific folate enzyme genes by selectively knocking down gene expression with morpholino oligonucleotides. Rhodamine Dextran, a fluorescent vital dye, has been used to work up the injection technique. Once the technique has been perfected, a specifically designed morpholino against the methionine synthase gene will be used for knockdown of folate metabolism to observe the related abnormal phenotypes.

#### Hypothalamic Innervation of the Mediodorsal and Ventral Anterior Thalamic Nuclei in the Macaque Monkey

Sabrina Tavella (Darlene Melchitzky), Mercyhurst University – Biology

The mediodorsal (MD) and the magnocellular subdivision of the ventral anterior (VAmc) are thalamic nuclei that are interconnected with the prefrontal and premotor cortices, respectively. Previous studies have shown that each of these nuclei receive distinct projections from subcortical structures like the periaqueductal gray and substantia nigra (Erikson et al., 2004). Additionally, the VAmc receives input primarily from the basal ganglia, and has efferent projections to the supplementary motor area (Swenson, 2006). This study used retrograde tracing to investigate whether the pattern of input from the hypothalamus to these two nuclei would differ. Initial analyses revealed labeled cells in numerous hypothalamic nuclei after injection in the MD and VAmc. Both injections resulted in a large number of retrogradely labeled cells in the lateral hypothalamus. However, the MD had a higher percentage of cells in the dorsal hypothalamus, whereas the VAmc displayed numerous neurons in the mammillary bodies. Last, structures surrounding the hypothalamus, like the substantia innominata, also contained labeled neurons. These findings indicate that although both the MD and VAmc receive input from the same subset of hypothalamic nuclei, the proportion and pattern of these hypothalamic projections differ.

### BIOLOGY III

#### The Effects of Road Salt on the Biodiversity of Bacterial Populations in Three Constructed Wetlands

Joshua Armstrong and Jennifer Williams (Michael Campbell and Pamela Silver), Penn State Behrend – Biology

Road salt is an effective way to control the amount of snow and ice on the road, but it may affect ecosystems adversely. We began to test the effect of road salt on bacterial biodiversity by observing the change in abundance of halophilic bacteria. We collected sediment samples from three wetlands that received different amounts of road salt runoff. Wetland R2 had an average salinity of 0.14 ppt, R3 had an average salinity of 0.27 ppt and T3 had an average salinity of 1.59 ppt. We exposed the sediment from T3 to a salinity gradient in the lab (0-25 mg/L at 5 mg/L increments). Treated and untreated soil samples from each wetland incubated at 4°C for one week. DNA was extracted from all soil samples using a MO-BIO PowerSoil DNA Isolation Kit. Purity of isolated DNA was confirmed by amplification of 16s rDNA. Five of eight samples amplified successfully, suggesting the presence of inhibitors in some samples. We plan to sequence the amplified rDNA from all samples to ascertain the bacteria community diversity. We hypothesize that there will be more halophilic species in the saltier samples. We think this research will provide a better understanding of how bacterial diversity changes with salinity.

#### Opportunities for Brook Trout Restoration in the Conneaut and Cussewago Subwatersheds of French Creek

J. Mark Burkhart (Scott Wissinger), Allegheny College – Environmental Science

Deforestation during the late 19th and early 20th centuries reduced and even extirpated many native brook trout (*Salvelinus fontinalis*) populations in northwestern Pennsylvania. Forest cover has increased over the past century and brook trout have returned to some, but not all, of their native streams in the region. The goal of this project was to identify tributaries of two of the western-most subwatersheds (Conneaut and Cussewago Creek) in the French Creek watershed that do not have, but could, support brook trout. These subwatersheds are isolated by dams that block dispersal of non-native brown trout (*Salmo trutta*), which compete interspecifically with brook trout. Five criteria were assessed at each candidate stream: maximum summer temperature, minimum summer dissolved oxygen, fine sediment loading, fish community composition, and macroinvertebrate prey composition. Land use, stream habitat, and water quality were also evaluated. These variables were then compared to the literature and reference sites where trout currently exist in the French Creek watershed. The results suggest that there are several tributaries in the Conneaut subwatershed that are likely candidates for restoring brook trout populations, whether as part of the Trout in the Classroom program or other reintroduction efforts to return this species to its native range.

#### Detecting Invasive Species in the Feces of Predatory Fish

Brian Fuller, Tyler Watson, and Ellen Butts (Gregory Andraso and Kelly Grant)

Gannon University – Biology

The ecology of Lake Erie is disrupted by non-native species, such as the tubenose goby (*Proterorhinus semilunaris*), recently discovered in Presque Isle Bay. Its impacts on the food web are relatively unstudied; we are interested in discovering what fish prey upon the tubenose goby. To extend the utility of our study, we included another invasive species, the round goby (*Neogobious melanostomus*), even though predation on it is better studied. Our goal was to specifically detect the DNA of these invasive species in the feces of predatory fish. This approach offers advantages compared to traditional gut content analysis; it allows us to examine many more samples without sacrificing the fish. For this assay to be successful, we must be able to specifically identify DNA from tubenose and round gobies. Initially, we optimized primers to specifically amplify segments of cytochrome oxidase I (COI) from tubenose and round gobies. We tested the specificity of our primers against a panel of DNA purified from different fish species. Currently, we are testing the accuracy and effectiveness of our primers when used with DNA from fecal extracts. Our results will allow us to determine whether the predator recently consumed either tubenose or round goby.

#### Preliminary Report of a Survey of Arthropods on Grove City College Campus

Jonathan Fung and Anna Giesmann (Stephen Jenkins), Grove City College – Biology

The goal of this study was to make an assessment of soil arthropod populations found in the leaf litter of a wooded area on the campus of Grove City College. Samples from three sites in the woods were collected three times each fall semester and three times each spring semester starting in September 2012. Macroinvertebrates were extracted from each sample using a Berlese funnel apparatus, then sorted taxonomically and counted. Seed mites (Acari: Oribatidae) were the most abundant (over 3,000 specimens) and widespread (present in 100% of samples) taxon in the total collection. Average density of all invertebrates during the study period varied between the three sampling sites, with site 2 having a significantly higher average density than site 3. The lowest density (57 invertebrates/m2) was observed at site 3 in February 2013, and the highest density (48,085 invertebrates/m2) was observed at site 2 in October 2013. Simpson’s diversity indices were calculated for each sample. Site 2 had the highest average diversity and site 3 had the lowest average site diversity. Continued study may establish the role of environmental changes to the abundance and diversity of the macroinvertebrates at each site.

#### A Small Mammal Population Census of the Habitat Islands at the Tom Ridge Environmental Center at Presque Isle State Park, Erie Pennsylvania

Jenny Hess and Dave Alexander (Steve Ropski), Gannon University – Biology

The principal objective of this research was to obtain a diverse sample of the mammal population using the habitats created in the parking lot of the Tom Ridge Environmental Center. There are ten islands throughout the parking lot containing native plant species. Sixty-five small and large Sherman box traps were evenly distributed throughout the ten islands and baited using peanut butter and oatmeal. The traps were checked and re-baited every morning. Animals were marked using non-toxic paint and then released. This process spanned the time period of three weeks from August 22 to September 12. The majority of animals found were mostly male *Peromyscus leucopus* (white footed mice). This project is the beginning of an ongoing study that will collect data from the winter, spring, and summer for comparison. This research will provide valuable information regarding whether these habitat islands can successfully be used as natural mammal habitats.

#### How Does the Use of Agion Silver Technology Change the Bacterial Flora Found on Door Handles?

Hasan Khan, Paul Ruiz-Pelet, Brent Maloy, Nesve Ozsoy, Andrew Renda, Laura Wheeler, Mike Knoll, Nicole Kingston, and Katelyn Melvin (Beth Potter), Penn State Behrend – Biology

Silver has been used as an antimicrobial agent throughout history. Agion technology is one of the newest strategies in using silver. This technology encases silver ions within a zeolite carrier that can be incorporated into a variety of materials. In this study, the zeolite carriers have been incorporated into a clear coating that has been used on door handles across the Penn State Erie campus. Upon contact, the sodium ions from the moisture in our hands will exchange with the silver ions, allowing them to interact with bacteria that were also left behind. In our study we have a total of fifty doors within four building on campus; 25 doors are silver-coated and the other 25 are non-coated. These doors have been sampled for the past three years for a six-week period in both the fall and spring semesters. Quantitative analysis has shown that bacteria still grow on the silver-coated door handles and we believe that these populations are most likely different than on the non-coated doors. To determine the identity of these bacteria, we are using culture-dependent techniques and sequencing the 16S rRNA gene.

#### Riparian or Watershed? Relative Effects of Land Use on Stream-Biological Integrity

Kirsten Ressel (Scott Wissinger and Matthew Venesky), Allegheny College – Environmental Science

Researchers have debated the relative effects of watershed versus riparian land use on ecosystem health. Understanding the relative importance of multiple land-use scales can contribute to effective conservation strategies. The purpose of this study was to quantify the relative impact of watershed versus riparian land use on stream-biological integrity. I compared the impacts of potential stressors and land use at multiple scales on fish indices of biotic integrity (FIBIs) across the French Creek watershed in Pennsylvania. I examined fish communities on a subwatershed and geospatial scale to determine if the same FIBI metrics could be used throughout the watershed. I expected there would be a threshold at which riparian forest cover could not protect a low-forested watershed. Neither riparian nor watershed forest cover was correlated with FIBI score. There were no subwatershed differences in fish richness suggesting that the FIBI does not need to be altered for sites further from the mainstem. An amended FIBI that used O/E normalized richness metrics based on reference sites explained the effects of watershed size on species richness better than the original FIBI and demonstrated that species diversity varies with size regardless of spatial location in the watershed.

#### Microbial Effectiveness of Common Washing Techniques on Produce: Is Quality Equal to Pathogenic Quantity?

Adam Ryzinski**,** Megan Kelly, and Michelle Saaverda (Davison Sangweme), Penn State Behrend – Biology

According to the Centers for Disease Control and Prevention, every year 1 in 5 Americans get food poisoning, more than 128,000 are hospitalized, and causes more than 3,000 deaths (CDC, 2010). Outbreaks of food poisoning have been of local concern. In the last year, Dole, Wegmans, and Kroger were among companies that issued recalls related to possible pathogenic contamination (*Listeria, Escherichia coli* O157: H7 were cited). The effects of contamination range from the inability to absorb nutrients, dehydration, abnormal bowel movements, or not being able to digest food properly. The CDC urges hygiene and sanitation to ensure food safety. The research tested three common cleaning methods, examining effect on the produce’s microflora, specifically testing for coliforms as well as MRSA. Produce is bought at one location and served as its own control in order to compare effectiveness of cleaning treatment. Control sample was collected by cotton swab before being washed in either water, vinegar, or FIT solution, followed by another swab. The samples were plated on an array of media to compare and quantify. By comparing samples before they were washed to the washed samples of all three cleaning methods can show which cleaning method is most effective for public use.

#### Effects of Nitrogen-Fixing Bacteria on Radish Plant Growth

Ashley Smith (Denise Piechnik and Om Singh), University of Pittsburgh at Bradford – Biology

Nitrogen-fixing microorganisms have been used to grow plants and potentially replace fertilizers in some cases. Nitrogen-fixing bacteria can stimulate growth of plants by converting the nitrogen into a usable form and increase plant biomass and organ size. We hypothesize that a variety of radiation-resistant extremophiles would reveal nitrogen-fixation ability in soil. Nine strains of UV radiation-resistant extremophiles were grown in nutrient broth medium for 48 hrs (OD600 2.5). Radish plants (0.10 mm) were grown in autoclaved soil, autoclaved soil with each bacteria strain, and autoclaved soil with vegetable fertilizer (OsmocoteTM). The controls were grown in un-autoclaved soil. The leaf area and above ground dry b­­iomass were measured 24 days after the microbial treatment. Plant stems from all treatments were oven-dried at 150oF for one week, and then weighed to the nearest thousandth gram. Treatment with two extremophiles, UVR4 and YLP, showed comparable increase in plant biomass (262%) and leaf area (1,172%) over the control (un-autoclaved soil). However, the response from the extremophiles was not different from the autoclaved and the fertilizer treatments. This study demonstrates the nitrogen-fixing abilities of extremophiles, which may have potential to serve as a nitrogen-based fertilizer alternative.

#### Isolation of Biomethane Producing Aerobic Microorganisms from Manure and Swamp

Anello Sorci, Matthew Muroski, and Nashwan Jabri (Om Singh), University of Pittsburgh-Bradford – Biology

Due to the burden of current demand and overprice, the replacement of fossil fuel with a renewable, and less expensive source of energy has become a major research focus in recent years. Methane is produced as a byproduct of the anaerobic digestion of manure and other wastes creating an inexpensive and sustainable source of energy. We hypothesized that a variety of microorganisms present in manure and swamps will show potential for biomethane production. Microorganisms were isolated from the manure and swamp samples collected from local farms and swamps. The nutrient broth enriched manure and swamp soil samples revealed eight different colonies, designated as MM1, 2, 4, and 6 and MS8, 10, 12, and 13 that were maintained on nutrient agar plates. The microbial colonies were purified using the single cell isolation method and screened for biosynthesis of biomethane in a home-designed bioreactor. The growth curve of all isolates revealed typical LESD curve at 22 and 37oC. The organisms were not able to thrive at higher temperatures (45-55oC), revealing their mesophilic appearances. Four colonies, MM1, MM4, MM6, and MS8 revealed a substantial amount (10 – 20 ml/ day) of biomethane production at 37oC using manure as substrate.16S rRNA and exploration of lignocellulosic substrates for biomethane production would further reveal the potential of natural isolates.

#### Influence of Land Use on Phosphorus Export

Adrianna Stolarski (Milton Ostrofsky), Allegheny College – Biology

During high flow events, more runoff enters first order streams from agricultural and forested environments. Land use alters the soil ecosystem and thus alters the amount and type of nutrients exported from the system. Eutrophication is a major concern for aquatic communities; phosphorus is a limiting nutrient, whose influx into streams alters aquatic communities. Using total phosphorus and particulate forms (specifically the stable mineral form of apatite) to determine the effects of land use on nutrient export, we looked at eight watersheds of first order streams. Of four agricultural and four forested dominated watersheds, the particulate seston of the agricultural was 3.97 times that of the particulate seston from forested watersheds. Total phosphorus exported was on average 3.17 times higher in agricultural watersheds. As a percentage of particulate matter there was more apatite in the forested samples than the agricultural watersheds, but was dwarfed by the amount of particulate material flowing through sheet flow and streams.

#### Microbial Mitigation from Grey Water using Biosynthesized Silver-Nanoparticles

Jingyi Zhang and Patrick Asinger (Om Singh), University of Pittsburgh at Bradford – Biology

Grey water (GW) is the recyclable wastewater that includes water from hand basins, showers, and other household items, but excludes streams from toilets. The occurrence of enteric and opportunistic pathogens makes it unfavorable to reuse. In nanotechnology, silver nanoparticles (Ag-NPs) have been recognized with germicidal activities. We hypothesized that biosynthesized Ag-NPs will remediate occurrence of pathogenic microorganisms present in GW. The biosynthesized Ag-NPs from radiation resistant microorganism *Enterobacter* sp. strain UVP3 were impregnated onto absorbent filter paper (AFP) and polyester fibers (AF), and immobilized onto agarose and agar gels. The Ag-NP matrices were bedded to 10 cm3 in 50 cm glass columns. Locally collected GW was subjected for the presence of pathogens using 16S rRNA gene sequencing, and filtered through Ag-NPs bedded columns along with controls in parallel. Colony Forming Units (CFU) and 16S rRNA gene sequencing further determined the total microbial count and types of microorganisms, respectively. A total of nine enteric and opportunistic pathogens were identified in untreated GW. NPs impregnated on AFP reveled >99.9% elimination of pathogens with undetectable leaching of Ag-NPs in filtrate. The columns bedded with agarose and agar gels were less effective eliminating 85% of pathogens from GW with noticeable leaching of NPs in filtrate.

### BUSINESS, COMMUNICATION, AND HISTORY

#### Changes in Movie Product Placement

Preston Barrett and Andrew Beck (Huan Chen), Penn State Behrend – Communication

Product placement, the act of using entertainment mediums to indirectly or directly advertise products or services, is a growing trend. While product placement has been studied in regard to the impact it has on product sales, the trend of product placement in movies has not been studied in recent years. A content analysis was conducted of product placement in American commercial movies. Twenty popular films containing product placement were analyzed. The results showed that product placement is very prevalent within American movies. Placement is often utilized in a manner that is congruent to the scene and involves interaction with a leading character. The most commonly placed products in American films are automobiles, followed by electronics and entertainment. Product placement offers many opportunities to marketers by exposing brands and products successfully to the audience. Additionally, by exposing viewers in a way that is entertaining or non-direct, viewers will be more likely to be open to these advertising efforts.

#### Gesta Miserorum

Douglas Nuhfer, Garrett Morgan, and Danielle Ropp (Glenn Kumhera), Penn State Behrend – History

In order to show what life was like in 11th-century Europe, Dr. Glenn Kumhera’s HIST 406W class created *Gesta Miserorum (Deeds of the Ill-Fated)* to play out all aspects of what life was like in, and what values were important to 11th-century Europe. The game places the player firmly within the political, social, and religious milieu of the early High Middle Ages. As the player navigates the board, they collect relics, attempt to survive Acts of God, navigate through the aspects of courtship, have children, duel with fellow players, go on the First Crusade, and die often, just as life was like in the 11th century. If playing as a nobleman is not interesting enough for some, players can play on a team with a nobleman and bishop to symbolize the partnership common of the era. The first player to successfully make it to the end of the map gets to eternalize their fame by controlling the chronicles created about their character, and the other losing characters. (Design by the spring 2013 class of HIST 406W)

#### “Is it Worth It?” Studying Women’s Social and Wage Differences between Attending a Private College versus a Public University

Rachel Verno (Stephanie Martin), Allegheny College – Economics

The cost of higher education has continued to increase over the last decade. Therefore making a choice between colleges is an imperative process. The main focus of this paper was to study how the rates of return to higher education for females differ based on whether they attended a private or public form of higher education. The study will incorporate a regression modeled on classical economic literature focusing on returns to education. The regression will look beyond wages being the primary rate of return and include satisfaction proxies. My hypothesis is that returns to private education will be favorable in terms of satisfaction but similar to public education in terms of wages.

#### The Role of Social Media in Enhancing a Patient-Centered Approach to Health Care Delivery

Kourtney Walsh (Mary Beth Pinto), Penn State Behrend – Marketing

Research has shown that more people are turning to the Internet and social media to look for health information. According to the Social Media Report (Nielsen, 2011), “social networks and blogs reached nearly 80 percent of active U.S. Internet users and represent the majority of Americans’ time online.” A critical paradigm for the nation’s health care delivery has been the adoption and expansion of Patient-Centered Medicine (PCM). Interest in the topic dates back to the late 1960s and has continued over the last 50-plus years. This research reports on an empirical study that investigated the relationship between attitude toward and use of social media, Patient-Centered Medicine (PCM), and patient satisfaction with healthcare delivery. Data were collected from a large, urban-based pediatric office in the northeast. The sample consisted of 234 respondents, who were considered “e-patients”– i.e., patients with access to the Internet who go online for health information. The results show there is a powerful link between PCM and overall patient satisfaction. In addition, attitude toward social media is positively correlated with PCM and patient satisfaction.

### CHEMISTRY

#### Obtaining Absorption Spectra Using a Regular Commercial Fluorimeter with Modified Sample Stage or a Cuvette with Special Geometry

Kaitlin Bocian, Bryan Theriot, and Edward Culbertson (Qun Gu), Edinboro University – Chemistry

The excitation spectrum of a fluorophore is closely related to its absorption spectrum. However, the shape of the excitation spectrum varies dramatically as the concentration of the fluorophore changes due to Inner Filter Effect (IFE), which is caused by absorption of excitation radiation and emission radiation. The excitation spectrum resembles the absorption spectrum only when the solution is very dilute and IFE is negligible. Observed fluorescence intensity is a function of concentration, absorbance, and geometric parameters and can be corrected using these factors. This project is original research exploring the approach to convert observed excitation spectra into absorption spectrum for a fluorophore with a known concentration and known geometric parameters of the instrumentation. The equation used to recover absorption spectrum is modified from IFE correction equations. Two excitation spectra obtained with different geometry will be used to derive the absorption spectrum. The results show that the absorption spectrum can be recovered using a regular commercial fluorimeter, either with a modified sample stage or using a rectangular cuvette. The recovered absorption spectrum matches very well with the spectrum obtained with a UV-Vis spectrometer. (Former students also contributed to this project: Jonathan Thomas, Hilary Weismiller, Morgan Williams, Jacob Villamont, and Cameron Stephans)

#### Scanning Tunneling Microscopy Study of Gold Nanoparticles

Li Cash (Morewell Gasseller and Clint Jones), Mercyhurst University – Chemistry

STM, scanning tunneling microscopy, obtains images of objects on a conductive or semi-conductive surface at an atomic scale. Here we describe our ongoing work on the use STM to study gold nanoparticles deposited on highly ordered pyrolytic graphite (HOPG) and gold substrates. The focus of this project was to study geometric and electronic properties of gold nanoparticles produced in our own lab and compare them with commercially purchased gold nanoparticles. The commercially purchased particles are coated with a bovine serum albumin protein. The protein insulates the particles to a degree and the aggregation on drying is not so profound. Understanding the electronic properties of these nanoparticles is not only of fundamental interest but has also several important applications in the fields of nano-electronics, sensors, and medicinal therapy. The data presented here are only preliminary.

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

Tyler Colson, Grant Schirmer, Ryan Deutschlander (Lisa Nogaj), Gannon University – Chemistry

Single-walled carbon nanotubes (SWNTs) possess unique physical and optical properties that allow potential applications such as flexible electronics, super-tensile strength materials, and biosensors. Nanotubes are hollow cylinders comprised of aromatic rings, and their geometry results in electronic properties leading to metallic and semiconducting nanotubes. Semiconducting SWNTs are unique fluorophores. The varying diameters and chiralities of SWNTs provide each moiety with spectral characteristics including size-tunable energy of emission. However, photoluminescence is affected by defects introduced by harsh processing techniques required to dissociate nanotube bundles and produce aqueous SWNT suspensions for optical studies. These changes in fluorescence require quantification in accordance with varying degrees of damage. Our goal is to analyze the effects of sonication intensities and durations on the fluorescent properties of SWNTs to determine a best practice for sample production and to explore opportunities to develop sensing applications based on SWNT defect sites. SWNT samples were suspended in deuterium oxide solvent and sodium dodecyl sulfate surfactant. Following homogenization, sonication intensity and duration were varied; this process damages nanotube sidewalls and produces SWNTs of varying length, thus affecting its spectral characteristics. Absorbance and emission data were collected from 16 samples and interpreted in the context of current knowledge of SWNT characterization.

#### Thermostability Determination of Various Commonly Prescribed Antibiotics at High Temperatures by Liquid Chromatography-Mass Spectrometry

Heidi Frynkewicz and Zachary Borland (Matthew Heerboth), Gannon University – Chemistry

Amoxicillin and tetracycline are broad spectrum antibiotics that are used to treat common bacterial infections in humans. Amoxicillin, part of the beta-lactam antibiotic group, is commonly used to treat bacterial infections such as ear infections, bladder infections, and pneumonia. Tetracycline, a polyketide, is used as an alternative drug for patients with penicillin allergies. When patients are prescribed any of these medications, they are directed to follow certain storage conditions. According to drug regulations, amoxicillin should be stored at temperatures from 35.6 to 46.4°F (2-8°C), and tetracycline should be stored from 65 to 73.4°F (18-23°C). Since storing these medications incorrectly will cause the medication to degrade, there is a great need for the determination of their thermostability. The analytical method developed utilizes liquid chromatography-mass spectrometric detection that monitors antibiotic concentration changes after exposure to elevated temperatures. A decrease in the analyte signal on the LC-MS is detected when thermal degradation occurs; a positive relationship between the level of thermal degradation and the exposure time at high temperature level has been shown. Data will be presented for temperatures ranging from 90 to 200°F (32-93°C). These data will then be used to determine the validity of the indicated storage ranges for the antibiotics.

#### Spectroelectrochemical Investigation of Electropolymerized Ferriprotoporphyrin for Gasotransmitter Oxidation

Nicole Gardner (Jason Bennett), Penn State Behrend – Chemistry

Hydrogen sulfide (H2S), along with carbon monoxide (CO) and nitric oxide (NO), belongs to a class of gaseous signaling molecules known as gasotransmitters. The detection of H2S has gained particular attention due to its significance in the central nervous and cardiovascular systems. Electrochemical sensors are an attractive option for in vivo H2S detection. There is a need to selectively detect H2S in the presence of CO and NO so that the molecule’s physiological properties can be fully understood. Our group has been working on developing dicyano-ferriprotoporphyrin ((CN)2-FePP) as an electrocatalyst towards H2S oxidation. While this material has showed great promise, it currently suffers from some short-comings that must be overcome before it can be incorporated into a practical sensor. To understand further what is occuring at the electrode surface, spectroelectrochemistry (SEC) was utilized to observe the FePP deposition onto an optically transparent ITO eletrode. This research project involved utilizing SEC to observe the spectral changes that occured within the FePP layer at the electrode surface during its deposition, CN- coordination, and gasotransmitter oxidation. Understanding the nature of the (CN)2-FePP layer will allow for further advancement of the material and for its future incorporation into a practical amperometric gas sensor.

#### Synthesis of Novel Derivatives of 2-Aminobenzaldehyde and Metal Complexes of their Self-Condensates

Brandon Hough (Alan Jircitano), Penn State Behrend – Chemistry

2-Aminobenzaldehyde (oab) has been known to undergo directed self-condensation reactions, especially when it is in the presence of certain transition metal ions, such as copper(II) and nickel(II), forming tetradentate macrocyclic ligands. A platinum(II) dicondensate has also been studied, and has been shown to be photochromic when exposed to, then removed from light. These oab-based ligands have been studied, but not much is known about sterically and electronically modified derivatives of oab, or their potential to form their own macrocycles.

The focus of this research was to synthesize copper(II)- and nickel(II)-centered macrocyclic ligands from derivatives of oab compounds. Specifically, 2-amino-3-methyl-benzaldehyde, 2-amino-4-chloro-benzaldehyde, and 3-amino-2-naphthoic-benzaldehyde were synthesized starting with their corresponding amino acid. The aldehydes were used to form the metal-centered macrocyclic ligands. All products in the synthesis were characterized using IR and 1H NMR.

#### Direct Electrodeposition of Graphene Oxide on a Pt Electrode and its Potential as an Electrocatalyst Support Material

Matthew Moesta (Jason Bennett), Penn State Behrend – Chemistry

Hydrogen sulfide (H2S), nitric oxide (NO), and carbon monoxide (CO) are gaseous signaling molecules synthesized in the body. These gases are found at very low physiological concentrations and serve to help regulate ion channels, which are important in controlling many physiological functions. The detection of H2S has gained particular attention due to its significance in a variety of neurological disorders. Our research group has been working on developing electropolymerized ferriprotoporphyrin (FePP) as an electrocatalytic material supported on a platinum (Pt) electrode to selectively oxidize H2S over CO and NO. The short-comings of the direct deposition of FePP is that the deposited layer has small pinholes, limiting the material’s selectivity and stability. In order to overcome those short-comings the deposition of improved graphene oxide (IGO) onto the Pt, which could then support the FePP, was investigated. Initial studies in this project focused on achieving a reproducible synthesis of IGO. The electroreductive deposition of IGO was then studied to achieve complete coverage of the Pt surface. The IGO coverage was investigated using scanning electron microscopy and cyclic voltammetry in an HCl/KCl solution. The potential of using the deposited IGO as a support material for FePP in future sensor designs was assessed.

#### Investigating the Conformational Preferences of Aromatic Oligoureas using Substituted N,N’-Diphenylurea Compounds

Amanda Pawlowski1 (Mary Grace Galinato1 and Jhenny Galan2), 1Penn State Behrend and 2Texas A&M University at Galveston – Chemistry

Foldamers are synthetic oligomers that fold and assume secondary structures in solution and are compared to biopolymers. The objective of this work was to evaluate conformational preferences and behaviors of aromatic oligourea foldamers in different solvent environments using 1,3-diphenylurea and *N,N’*-dimethyl-*N,N’*-diphenylurea. Lorentzian fits to the vibrational peaks of specific modes obtained from infrared spectroscopy reveal populations of each conformation*.* NMR spectroscopy shows the configuration(s) in a specific solvent environment. Density functional theory (DFT) generates the energies of the possible conformations. For 1,3-diphenylurea, the N-H stretching region was probed and the spectra revealed 88% *trans, trans* and 12% *cis, trans* conformation. For *N,N’*-dimethyl-*N,N’*-diphenylurea, the C=O stretching region indicated 67% *cis, cis* and 33% *cis, trans* conformation. The energy calculations demonstrated that the most stable conformation for 1,3-diphenylurea is the *cis, trans*  form, which is only 0.17 kcal/mol more stable than the *trans,trans* configuration. For *N,N’*-dimethyl-*N,N’*-diphenylurea, the *cis, cis* conformation is 1.58 kcal/mol more stable than the *cis, trans* counterpart. Results will allow us to understand the driving forces that affect oligourea folding in solution, and will provide a basis for producing functionalized foldamers that can be used for catalytic reactions in different environments.

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

Mallory Prylinski (Alan Jircitano), Penn State Behrend – Chemistry

When o-aminobenzaldehyde is reacted with aqueous platinum(II), the dimer [N-(2-aminobenzylidene) anthranilaldehydato-O,N,N’]chloroplatinum(II) or Pt(AAA)Cl results. This compound possesses photochromic properties, where dissolved in acetonitrile it appears red-orange in the dark and purple in the presence of light. To understand better the mechanism of the photochromic reaction, an analog to Pt(AAA)Cl was synthesized with a phenolate trans to the coordinating aldehyde. The ligand N-(2-hydroxybenzylidene)anthranilaldehyde was created by reducing 2-amino benzoic acid , reacting the resulting alcohol with salicylaldehyde, oxidizing the resultant Schiff-base condensate with manganese(IV) oxide. This ligand can then be reacted directly with platinum(II) in water to give the photochromic purple complex [N-(2-hydroxybenzylidene)anthranilaldehydato-O,N,O’]-chloroplatinium(II), or Pt(HAA)Cl. When considering the trans effect of platinum(II), it is expected that the rate of the photochromic reaction would be influenced by the strength of the Pt-X bond trans to the coordinating aldehyde. Additionally other derivatives of the original ligand are being tested. Varied electronics and sterics were achieved by employing more substituted starting materials (2-amino-5-chlorobenzoic acid, aminopyrazinoic acid). The rate of the photochromic reaction of the various complexes is expected to depend on the electronics of the different substituents.

#### Scanning Tunneling Microscopy Investigation of Carbon Nanotubes

Jessica Ritchie (Morewell Gasseller), Mercyhurst University – Chemistry/Physics

A scanning tunneling microscope (STM) is an instrument in which a sharp metallic probe scanned across a sample surface is employed to detect changes in surface features on an atomic scale. STM enables us to study surface structure, electronic structure, and chemical properties of the surface at the atomic scale. During the last three decades, the field of scanning tunneling microscopy has advanced explosively. The focus of our research is to use STM to image single-walled carbon nanotubes (SWCNT) that have been deposited on highly oriented pyrolytic graphite (HOPG) and gold substrates. We will present some of our preliminary data.

#### Synthesis of Alpha-Acyloxyketones from a Novel Class of Alkynyliodonium Salt

Alexis Rowley (Michael Justik), Penn State Behrend – Chemistry

A facile preparation of a series of alpha-acyloxy ketones has been developed from the reaction of potassium carboxylates with 1*H*-1-(1-alkynyl)-5-methyl-1,2,3-benziodoxathiole 3,3-dioxides, a novel class of alkynyliodonium salts. The reaction appears to occur via a conjugate addition pathway under mild conditions in moderate to quantitative yields. The salient feature of this reaction, unlike its predecessors is the by-product of the reaction which is a water-soluble iodotoluenesulfonic acid that can be easily removed through aqueous work-up, isolated, and re-oxidized. The reaction appears to be general for a variety of alkynyl ligands as well as a range of potassium carboxylates, notably those that contain electron-donating groups. Diverse methods for the preparation of α-acyloxy ketones are desirable given their recent applications as precursors in the synthesis of naturally made cortisone steroids and ketoses and as readily hydrolyzed ketol protecting groups.

#### Preparation of Ketones Using a Catalyst and an Oxidant from Alkynes

Kathryn Sauka (Michael Justik), Penn State Behrend – Chemistry

An environmentally benign method for the preparation of ketones from alkynes has been developed using 2-iodo-5-methylbenzenesulfonic acid, **1**, as a dual-phase transfer catalyst and oxidant. In a typical procedure, an alkyne substrate is treated with a catalytic amount of **1** and a stoichiometric amount of Oxone® in acetonitrile under reflux. Aqueous work-up allows for the facile separation of the product ketones from the water-soluble by-products. It is believed that **1** is oxidized in situ to form the active oxidant, 1*H*-1-(1-hydroxy)-5-methyl-1,2,3-benziodoxathiole 3,3-dioxide (HMBI), an analog of Koser’s reagent. The reaction appears to be general for a variety of terminal and internal alkynes, as has good tolerance of other functional groups. Previous methods for the conversion of alkynes to ketones involved strong acids in highly protic media (water) that did not solubilize the substrates. Catalytic methods such as this have great application in industrial preparations of organic molecules as well as in pharmaceutical research.

#### Effect of Heme Electron Density on the Nitrite Reductase Activity of Myoglobin

Amanda Stetz and Robert Fogle (Mary Grace Galinato), Penn State Behrend – Chemistry

Myoglobin (Mb) is an enzyme that acts as a nitrite reductase (NiR) in its Fe (II) form. The conditions by which Mb nitrite (NO2-) converts to nitric oxide (NO) are crucial to the understanding of most mammalian physiological processes. This study examines the role of heme Fe electron density on the reduction of NO2- to NO, by studying porphyrins with substituents modified on the 2, 4-positions in native heme *b* of wild-type myoglobin (wt Mb) with the following electron donating –R groups: acetyl, ethyl, and hydrogen. The conversion of NO2- to NO in the reconstituted Mb samples was monitored using UV-visible spectroscopy by observing the changes associated with Fe (II) and Fe (II)-NO/Fe(III) forms. The reconstituted Mbs samples that contain the more electron-donating substituents in the 2,4-positions had a larger bimolecular rate constant compared to those that have electron withdrawing –R groups. Compared against their redox properties, the trend in the observed rate constants suggests that Mb NiR activity is thermodynamically driven. These findings demonstrate that the heme Fe electron density influences the conversion of NO2- to NO.

### ENGINEERING

#### Injection Molding Fuel Cells

Andrew Arnold (Adam Hollinger), Penn State Behrend – Mechanical Engineering

The research will focus on finding a way to manufacture fuel cells through an injection molding process. Fuel cells are used in bigger applications, but it could be useful to find a way to harness their potential in smaller applications such as phones and computers. If they could be manufactured on a smaller scale at a fast rate, they could be effectively used and create an alternative energy source. Injection molding offers the faster rate of production that would be desired to achieve such a use. This could be something that has an impact on everyone since in the modern era most people carry cell phones and have laptops. This could be something that everyone can use. The main goal would be to see if injection molding could be a possible method for manufacturing small-scale fuel cells. So far, a list of materials has been selected for testing to see if it can pass the conduction needed in the current collectors. Our plans for the future are to try to injection mold with one of the materials and test it in a fuel cell application. The eventual outcome of the research is to find a way to efficiently manufacture the current collectors and the channels of the fuel cell through injection molding.

#### Acoustic Noise Emission Data Collection and Analysis

Christopher Conklin (David Loker and John Roth), Penn State Behrend – Electrical and Computer Engineering Technology

Acoustic diagnostics development is recognizably increasing in modern manufacturing and industry. After completing a study of industrial publications focused on acoustic emission monitoring, the current research will focus on studying operational characteristics and tool wear for industrial machines and equipment. An acoustic camera system, containing a 32-element spherical microphone array, will perform and analyze the acoustic emissions from the applied systems and machines. These areas will be tested in order to determine whether their acoustic properties contain potentially valuable information for analyzing operations, maintenance, and machine health. For the testing portion of this research study, appropriate procedures are designed to agree equally with acoustic theory and monitoring standards in industry. Signal processing algorithms will be developed to distinguish machine characteristics and tool condition. The potential outcome of the analyzed data and devised algorithms could lead to new advancements in the applications researched in this study.

#### An Experimental Approach to Optimizing an Optical Character Recognition System

Tyler Ewing (Xiaocong Fan), Penn State Behrend – Software Engineering

Optical Character Recognition (OCR) is the process of converting handwritten characters into typed text that can later be searched, edited, printed, etc. This process can be broken into four main parts: segmentation, normalization, feature extraction, and classification. Each of these parts has many variables that can affect the overall accuracy of the recognition system. The only way to determine optimal values for these variables is through experimentation. This project focuses on experimenting with different modern feature extraction techniques. Each algorithm will be tested individually then combined to find optimal recognition accuracies. Through this experimentation it is anticipated that the system will have a competitive accuracy with today's modern OCR systems.

#### The Effects of Blended Coconut Shell Fibers and COC on the Mechanical Properties of Polypropylene Patrick Haney, Nathan Greene, and Matthew McGee (Alicyn Rhoades and Bradley Johnson), Penn State Behrend – Plastics Engineering Technology

This study focuses on the development and usage of biobased (coconut) reinforced polymers. Standard polymer fillers are often mineral based, leading to mining processes that are harmful to the environment and costly. In this study, Rhetech’s coconut shell fiber infused master batch, grade CFC30P600-00, will be blended with cyclo-olefin copolymer (COC) for increased toughness. Coconut oil will be utilized as a plasticizer, adding flexibility and improving processability. Incorporating these additives will create different mechanical and rheological properties with up to 15% biocomposition. The materials will be blended using a twin screw extruder to ensure ample mixing without degradation. After compounding, the materials will be injection molded into tensile bars in the Penn State Behrend Plastics Lab and then tested.

#### Development of a Convective Heat Transfer Exercise

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

The objective of this study was to design and develop a convection experiment to be used in the fluids and thermal sciences lab. This experiment will be used primarily for mechanical and electrical engineering technology students. This lab experiment demonstrates the principles of convection which are taught during the related course lecture. The primary purpose of the exercise will be to determine the average convection coefficient for a variety of air flow velocities through a tube with constant heat flux. The measured coefficients will then be compared to calculated values based on the theory that is learned in the lecture. Convection is a large part of the courses and it is important that engineering technology students understand the concept.

#### Pressure Drop across a Parallel-Plate Fin Heat Sink

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

The objective of this study was to compare theoretical pressure drops with actual pressure drops across parallel-plate fin heat sinks. The parallel-plate fin heat sinks were built using a custom fixture. Different thickness shims were used to control the number of fins, and different size fins were used to control the fin height. All of the heat sinks were tested using an air flow bench, and then compared to theoretical values. Robert Simons from IBM had previously published formulas in “*Electronics Cooling*,” a trade magazine, to help designers in selecting fans to use with heat sinks. The tests tend to verify the theory for most of the configurations. The actual data deviated from the theoretical data for the configurations with very few fins.

#### Using Machine Learning to Solve Nonogram Puzzles

Shane Shafferman and Matthew Campbell (Wen-Li Wang), Penn State Behrend – Software Engineering

This research examined possible artificial intelligence techniques to produce a nonogram puzzle solver. Gradient descent was utilized to create an application to solve a puzzle instance by examining the constraints of the puzzle and iterating through the puzzle to intelligently reach a solution. The gradient descent solution will alternate between scanning the rows and columns of the puzzle to find common solutions for the cells. The program will be able to learn from the proposed game rules and scan the current puzzle until a correct solution has been reached. The program was designed to visually show the steps the computer employs to be able to see how it reaches the correct solution. We also examined techniques such as ant colony optimization and simulated annealing to determine an efficient way to solve both large and small puzzles. These techniques can be utilized for image processing and dynamic city planning on a grid.

#### Fabrication of Microscale Fuel Cell Electrodes

Thomas Whiteford and Dan Doleiden (Adam Hollinger), Penn State Behrend – Mechanical Engineering

The objective of this research project was to enable the manufacture of anodes and cathodes for microscale fuel cells. By using a Carver Heated Press and an Advantage Oil Temperature Controller, anodes and cathodes will be hot-pressed at high temperature and pressure, sealing a Nafion membrane to the cathode. In the manufacture of these electrodes, temperature and pressure can be varied in each production run, and tested to see which combination of the before mentioned variables gives the best results. The main goal is to use these materials in microscale fuel cells, produced via 3-D printing or injection molding. Polymer-based fabrication techniques enable inexpensive and quick manufacture of microfuel cells for portable electronic applications.

### MATHEMATICS AND PHYSICS

#### Jamming of Monodisperse Cylindrical Grains in Featureless Vertical Channels

Nicholas Friedl (G. William Baxter), Penn State Behrend – Physics

We study jamming of low aspect-ratio cylindrical Delrin grains falling through a featureless vertical channel under the influence of gravity. These grains have an aspect-ratio less than two (<2) and resemble aspirin tablets, 35mm film canisters, poker chips, or coins. The channel maintains a uniform square cross-section throughout the length and has a width greater than the grain size, such that, no combination of grain heights and/or grain diameters is an equal to the channel width. The grains are allowed to fall the length of the channel under the influence of gravity and occasionally form jams. These jams are stable structures in which the grains are supported by the channel walls and not by the grains themselves or the walls beneath them. The probability of a jam occurring and the jam's strength are influenced by the grain dimensions and channel width. We will present experimental measurements of the jamming probability and jam strength and discuss the relationship of these results to other experiments and theories.

#### Another Way to Look at Sunflower Seeds – Mathematically!

Samantha Key (Daniel Galiffa), Penn State Behrend – Mathematics

Recent research has shown no age-related differences in prospective memory (memory for when looking at the many ways to break down items into different categories, such as mass, color, length, shape, or even density). When looking at a pile of sunflower seeds, these options are all plausible, but one option was overlooked. When a closer look is taken at each individual seed, the white lines on the seeds become more apparent. when you split up the seeds based upon how many total lines are on each one, a normal distribution is expected to arise. However, this is not the case, and unexpectedly when the seeds are organized it becomes obvious that the seeds follow a Poisson distribution.

#### Continuous Density Gradient Centrifugation of Noble-Metal Nanoparticles

Wayne Peterson (Bruce Wittmershaus), Penn State Behrend – Physics

The study of nanoparticles has become a thriving area of research, in both the basic and applied sciences. Experimentation has shown that the physical, chemical, and optical properties of nanoparticles depend heavily upon their size and shape. Advancements in both the academic study and applications of nanoparticles depend heavily upon precise control of these parameters. New techniques have been developed that allow for the separation of silica-coated gold nanoparticles according to small discrepancies in both size and shape, allowing for a high degree of homogeneity in colloidal samples. The focus of this research has been to replicate this result, and to extend it to the separation of non-coated gold and silver nanoparticles, including particles smaller in diameter than those previously separated by the method in question. By centrifuging a sample of particles of assorted sizes in a continuous density gradient of a viscous fluid such as glucose in water, we were able to achieve a high degree of separation and selection based on the above parameters. To quantitatively determine the effectiveness of such novel methods, separation by size was verified by both spectroscopic analysis and transmission electron microscope images.

### PSYCHOLOGY I

#### Romantic Relationships and Monetary Discussions

Nicole Bell, Natalie Corso, Breanna Foster, and Rachel Hido (Carol Wilson), Penn State Behrend – Psychology

Money is one of the most necessary yet difficult topics for romantic partners to discuss without argument or conflict. Recent research shows that monetary reminders cause individuals to become self-focused, less helpful to others, and oriented toward their own inputs and outputs. Other research on romantic couples has shown the benefits of having a communal versus exchange orientation toward relationship partners. Importantly, no published research to date has linked relationship orientations with the priming power of money to examine whether and how it’s possible for romantic couples to maintain a communal orientation while discussing money. We began running our study during spring 2013 and thus far have tested 48 romantic couples. With our current data, we found that those in the money condition made significantly fewer decisions than those in the neutral condition, as predicted. This implies that those who must make money-constrained decisions show more reactance and less interpersonal orientation than those in the neutral condition.

#### STEM vs STIM: An Outlook of Potential Danger

Sean Bogart and Natalie Corso (Margaret Burke and Melanie Hetzel-Riggin), Penn State Behrend – Psychology

College student psychostimulant usage is becoming more prevalent to gain higher academic achievement. The usage among college students has increased more than 400% in the last decade alone. Psychostimulant use for academic achievement seems to be associated with increased course content difficulty. The researchers believe the stress of certain majors, especially those with a strong mathematics component, cause students to be more prone to using psychostimulants. To test this hypothesis, researchers are recruiting participants within STEM majors and outside the majors with heavy math and science requirements. They will be administering to participants a short math test, along with brief surveys assessing personality characteristics, drug abuse potential, and self-control methods to identify if this is a problem for

certain majors or all college students in general. Whether or not the hypothesis is supported by the results, if they indicate that this is truly growing on the campus, preventative measures need to be taken.

#### Jumping the Hurdles: Is Your Game Affecting Your Life?

Alyssa Craig, Alison DeFurio, and Jacqueline Husted (Victoria Kazmerski), Penn State Behrend – Psychology

Stress is something that everyone, especially college-level athletes, feels daily. This study explored the effects of participating in spring sports at a college level on perceived and physiological stress of a student. Surveys were administered to a control group of Introduction to Psychology students as well as to athletes. The surveys included questions regarding how students feel about their course load and obligation to their sports teams. Answers were recorded using Likert scale style responses, as well as partially open-ended questions. The first hypothesis stated that student athletes would have higher perceived stress compared to the control group. This may be due to the extra responsibility given to those athletes on top of their school work. The second hypothesis stated that student athletes would have lower physiological stress compared to the control group. This was believed to be true based on the information found about exercise helping the body cope with stress. The results provide insight on how to adapt programs to aid in stress management.

#### VIZ Collaborative Project: Using Spatial Skills in the Real World

Megan Harris, Callie Keating, Grace Waldfogle, and Qiyang Li (Dawn Blasko and Heather Lum), Penn State Behrend – Psychology

Spatial working memory (SWM) is a cognitive process that allows one to temporarily store and manage incoming location-based information. The Visualization Assessment and Training (VIZ) website currently provides several serious games that can be used to assess and train spatial skills. However, the current SWM task, Rotating Letters, presents the concept in such a way that it is typically misunderstood by users. This leads to in-task confusion and unreliable scores. The goal for the current semester was to develop and validate a new measure of SWM – the Spatial Perception and Orientation Task (SPOT) – that would eliminate the need for verbal components (i.e. letters). During the design stage, considerations were made for those with visual impairments and color vision deficiencies. The goal was to create a task that was gender neutral, enjoyable, and non-discriminative. Results of the validation study indicate that SPOT is a reliable method for assessing SWM. It scored highly on usability scales and was well liked by males and females alike. The simplified design is less confusing for users and accessibility is no longer an issue.

#### Observation and Avoidance in the Valproic Acid (VPA) Model of Autism

Shelby Hernan (Jeffrey Cross), Allegheny College – Neuropsychology

Autism is a neurodevelopmental disorder characterized by atypical imitation, communication, social interaction, and sensation. Current theories of autism attribute the dysfunction of the mirror neuron system and amygdala to characteristic idiosyncrasies in recognizing social actions, interpreting intentions, and avoidance; dysfunction ultimately affects the devices for observational learning and application of situational context. The behavioral hallmarks of Autistic VPA models are relatively unexplored, with little information regarding observation and learning. VPA and normal rats performed a passive avoidance step-down task consisting of conditioning and recall trials. Observer VPA and control rats watched conditioning trials of control rats prior to their own conditioning. Recall trials were administered 24 hours later.

There were significant differences between VPA and control performer conditioning latencies, and between VPA conditioning and recall latencies in both performance and observation conditions. There were significant differences between VPA performers and observers, as well as between VPA and control observer recall. VPA rats were more sensitive to the avoidance task and benefited more from observation than their counterparts. Interestingly, VPA observers had the longest step-down latency; this finding challenges the assumption that mirror neurons and the amygdala are defective in the VPA model of autism.

#### The Effects of Confidence and Experience on Programming Code Efficiency and Readability

Peter Huizar, Jeffrey Knapp, and Thomas Batko (Heather Lum and Dawn Blasko), Penn State Behrend – Computer Science

Over the years since computers have become prominent in society, numerous studies have been conducted on learning and ability of students with computers. The majority of these studies have focused on grades from quizzes and tests. The goal of this study was to examine the overall efficiency and readability of code from a student that has some computer programming experience against those with no experience in an introductory class and couple the results with their confidence. This may provide some insight into why some professional coders write code that is useful on projects and some write code they even have trouble revisiting at a later date. This study looks at three projects due over the course of the semester and two computer anxiety surveys, conducted at the beginning and end of the semester. The project code was reviewed for readability and efficiency and compared with the subject’s survey answers to see if there was a correlation.

#### Women in the Workplace: No Longer a Man’s World

Callie Keating and Natalie Corso (Shariffah Sheik Dawood), Penn State Behrend – Psychology

Out of all the CEOs in Fortune 500 companies, only 3% of these positions are held by women. We find this statistic alarming based on researched personality characteristics women possess over men. A top leader running a business is typically associated with having strong organizational skills, time management, efficiency, and quality in the product or service the company is supplying. While all of these skills are essential, personable skills are just as important in a leader, empathy being one that is strongly associated with strong leader-follower relationships. Research supports that empathetic characteristics are best represented by females, and we believe that empathy plays an important role in defining servant leadership. Servant leadership emphasizes that leaders be attentive to the concerns of their followers, empathize with them, and serve them as equals. Servant leadership will be measured using Northouse’s Servant Leadership Questionnaire, and empathy will be measured using Caruso’s Empathy Scale. We hypothesize that there will be a significant gender difference between male and female opinions on the CEO’s leadership styles, participants will find women to possess more empathetic traits as compared to men, and that servant leadership is strongly correlated with empathy.

#### Childhood Neglect as a Predictor of Violent Behavior

Jack Luchette (William McGuigan and Roxanne Atterholt), Penn State Shenango – Human Development and Family Studies

Research has established that childhood maltreatment experiences are associated with negative behavioral outcomes. Neglect is the most prevalent form of childhood maltreatment, the consequences of which require further investigation. This study explored whether childhood physical neglect increased the likelihood of violent behavior in a sample of delinquent males between the ages of 12-19 at a long-term detention facility in northwestern Pennsylvania. An anonymous survey was used to gather background information and data regarding childhood maltreatment experiences, drug use, and delinquent behavior. A step-wise hierarchal regression model tested for a significant relationship between childhood neglect and adolescent violent behavior while controlling for the effects of age, self-esteem, personal competency, depression, and chemical drug use. Results showed that a history of childhood physical neglect was the strongest predictor of violent behavior in this sample when the data were tested for all moderator and mediator effects.

#### The Effect of Familiar vs. Unfamiliar Music on Task Completion

Corvette Morrison (Melissa Heerboth), Mercyhurst University – Psychology

The purpose of this study was to determine the effects that music familiarity has on task completion. This study expands upon previous research on the effects of genre and music pace on task completion. College students were divided into three conditions including familiar music, non-familiar music, and a no music (control condition). The participants were asked to perform low importance tasks (word search and word memorization) and high importance tasks (reading comprehension and word problems) under one of the three conditions. Their performance on each task was then compared. The hypothesis is that while listening to familiar music, participants score higher on task completion on low-importance tasks but score lower on task completion on high-importance tasks. Also, it is hypothesized that while listening to unfamiliar music, participants score higher under the high-importance tasks than the low importance tasks. With the no music condition it is hypothesized that this condition has a negative effect on the low-importance tasks but produces the highest scores among the high-importance tasks.

#### Effects of Critical Hype on Consumer Intentions

M. Patrick Squeglia, Alicia Carroll, and Doug Kelly (Charisse Nixon), Penn State Behrend – Psychology

The effect movie critics have on the consumer decision-making process is a matter of debate among professionals in the fields of marketing and psychology. Movie trailers have begun to contain critical reviews in an effort to utilize their potential marketing influence. The aim of the current study was to explore the effect on-screen critical reviews have on consumer intentions. The results of this study highlighted the role of a trailer’s placement during previewing (e.g. shown first versus second) as paramount and irrelevant as to whether a trailer employed promotional reviews made by critics. A discrepancy may be present between an individual’s consumer beliefs about how film critics influence them and their consumer intentions actually elicited by such marketing techniques.

### PSYCHOLOGY II

#### Is Sarcasm in the Workplace Funny? Depends on Who You Are

Erica Edwards, Alicia McAllister, Christie Leslie, and Robert Fogle (Victoria Kazmerski, Dawn Blasko, and Shariffa Sheik Dawood), Penn State Behrend – Psychology

Although we use sarcasm all the time, there are situations where the speaker’s interpretation differs radically from the listener’s. Sarcasm is especially tricky in the workplace depending on whether the target is your coworker or employer. According to constraint-satisfaction theory, sarcasm is understood under a variety of social and environmental constraints. In this study, participants read brief scenarios that ended in a statement that could be interpreted as sarcastic or literal depending on context and perspective (speaker/listener), speaker status (boss/worker), and comment type (sarcastic/literal). We measured reading times and ratings of humor, sarcasm, and insult. We also measured five cultural dimensions and conducted a theory of mind task that measures the ability to perceive other’s emotions. The results showed that sarcastic comments were more humorous from the speaker’s perspective than the perspective of the listener, but the inverse was true for the literal comments. Culture also played a role; the groups were similar in humor ratings when the worker was speaking, but when the boss spoke, the individualists thought it was more humorous than the collectivists. Consistent with the constraint-satisfaction model, the data show that interpretation can be influenced by many variables, such as status, perspective, and comment type.

#### An Examination of Perceptual and Interactive Differences between a Live, Virtual, and Robotic Pet

Emily Galeza, Catherine Bertges, and Brianna Zaffino (Heather Lum), Penn State Behrend – Psychology

Humans utilize social interaction as an effective means of communication with other humans as well as non-human entities on a daily basis. In the current study, researchers focused on how gender may influence frustration and mood levels during interaction with a live dog, a robotic dog, or virtual pet. Participants were randomly assigned to one of the three conditions and asked to interact with the entity in two different scenarios; free play and specific training commands. Researchers measured the length of time it took for the participants to master each command as well as their perceived workload frustration levels. Pet experience, animal attitudes, anthropomorphic tendencies, personality traits, and other variables were measured. Researchers will be analyzing how gender, frustration level, and changes in mood are related to the animal interaction. This research is important because it has implications in how people interact with animals, live and robotic, as well as how robots and virtual animals can be created to be more similar to real creatures, in cases where live animals are not available.

#### Attachment, Social Support, and Pain

Mary Havers, Meghan Nee, and Kaitlyn Matty (Carol Wilson), Penn State Behrend – Psychology

Personality characteristics – namely attachment orientations – have been linked to chronic pain perceptions and to social support in separate studies. However, few studies have examined the joint influence of attachment and social support on perceptions of *acute* pain. Approximately 45 female undergraduates have been exposed to the tourniquet task while they viewed a photograph of either their romantic partner (support condition) or a stranger (control condition). Participants’ romantic partners will experience a support vs. control priming condition before reading and responding to a hypothetical pain scenario. We expect that more anxiously attached females will display lower pain thresholds and tolerances, greater subjective pain, and greater physiological arousal than less anxiously attached females. In addition, anxiously attached females and their partners should show less benefit from social support in reducing their pain perceptions compared to less anxious (i.e., more securely attached) females. This research will help to identify attachment anxiety as a potential vulnerability factor in coping with acute physical stressors such as pain.

#### Motivational Changes from High School to College: Perceptions vs. Actual Behaviors

Christina Kamien (Melissa Heerboth), Mercyhurst University – Psychology

There has been a large amount of research demonstrating that there are increasing health concerns within the collegiate population. Motivation is often associated with problems in health-related fields. This study is designed to determine how the transition from high school to university affects one’s motivation. Particularly this study focuses on motivation to exercise in the collegiate setting. This study asked collegiate students to assess their behavior, through self-report surveys on dietary, sleep, and exercise patterns, both in high school and in university settings. Past research has shown that there has been a significant decrease in the amount of physical activity that adolescents and young adults are participating in. It is important to determine which areas of an individual’s life lacks motivation among the collegiate population, and whether or not this plays into the decreased amount of physical activity during this crucial period.

#### Rape Myth Acceptance, Gender, and Perception of Blame

Katelyn Marsh, Danielle Carioto, Richard Greatbatch, Kasey Jerioski, John Moore, Taylor Morris, and Jessica Stoker (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

Risk perception is a behavioral factor that can lead to possible victimization. Due to the frequency of the victim being blamed, there is a tendency for people to perceive very little personal risk (Messman-Moore & Brown, 2006). In order to enhance risk perception and reduce possible rape situations, the belief that the victim is to blame needs to be refuted. In this study a total of 139 participants (51.1% male; mean age = 19.9, *SD* = 1.59) were recruited to participate in the study. Participants read a script that depicted an acquaintance rape and reported the degree to which they blamed the woman, the man, or the situation in the script. Both gender and rape myth acceptance (RMA) had significant main effects on victim blame in that women and those with higher RMA scores were more likely to blame the victim. There was also a two-way interaction between gender and RMA, *F* (1, 131) = 4.97\*, where men with low RMA scores had the lowest victim blame, while men with high RMA scores and all women scored significantly higher on victim blame. These results show bystanders as likely to perceive a threat if they realize their own propensity for biases.

#### Attachment Style and Stress-Motivated College Drinking Behavior

Kaitlyn Matty and Katie Genberg (Victoria Kazmerski), Penn State Behrend – Psychology

Heavy consumption and drinking-related harm occur in a large proportion of college populations. We examined the kinds of social and personal influences that might account for the observed variance in students' drinking patterns, specifically in terms of adult attachment. This study was conducted to examine the relationship between attachment style and drinking behavior in young adults in relation to stress. Participants were recruited via Penn State Behrend’s research participation pool. Participants filled out a questionnaire about their attachment style and were primed with photographs based on a positive or negative relationship situation. Participants were also asked to write a brief description about what they think is going on in the photo. We expected the results would show securely attached individuals would feel the desire to drink less often compared to anxious and avoidant attached individuals when primed with a negative photograph; anxiously attached individuals would feel the strongest desire to drink when primed with the negative photograph. These results provide support for future research into the role romantic attachment and stress could potentially play in a student’s choice to consume alcohol.

#### Roles of Event History and Personality on Coping Responses to Stressful Situations

John Moore and Katelyn Marsh (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

Betrayal trauma is caused by a trusted individual who possibly had an authoritative role in a person’s life; therefore, in the future, submission to authority may be more likely (Freyd, 1997). We hypothesize that those who have experienced betrayal trauma are more likely to submit to authority figures compared to those who have not experienced betrayal trauma. Participants will be given questionnaires assessing their history of trauma, affective state, and personality style. They will be instructed to complete a series of stress-inducing tasks. A confederate researcher will confront them about the room they are using; then, the participant will be interviewed and recorded about their reaction and how they wished to react after being confronted by the confederate. We expect that individuals who have a history of betrayal trauma will have a significantly higher level of negative affect after the confrontation than other participants. We expect participants with higher levels of neuroticism to report higher levels of negative affect; inversely, extraverts are expected to report lower levels of negative affect. Results may help authority figures learn more effective ways of communicating, while victims may learn to effectively cope with their negative experience and be trained in appropriate assertiveness (Freyd, 1997).

#### Stress and the Use of Social Media: Influences of Personality and Age

Erica Robertson and Natalie Polana (Victoria Kazmerski), Penn State Behrend – Psychology

In recent years, technology has overwhelmingly become the major source of information, entertainment, and communication. Out of the world’s estimated 7 billion people, 6 billion have access to mobile phones and only 4.5 billion have access to working toilets. Why is it that more people would rather have access to phones over working toilets? Specific individual personality traits can influence the use of social networking on a daily basis. In addition, individual personality traits are multidimensional, resulting in adaptive and maladaptive behavior characteristics which may contribute to interpersonal stress. These correlational patterns may differ in adults when compared to college students. The purpose of this study was to determine if there is a relationship among college student stress levels, personality, and use of social media on a daily basis. Our hypothesis is that individuals who spend more time on social networking sites will result in higher levels of stress. This pattern may differ by personality traits. Also, we predicted the influences on the use of social networking will differ between college students and adults. The results of this study will be important in order to inform students about their stress levels and coping mechanisms.

#### Effect of Extraversion on Stress Reactivity

Kristine Wright (Melissa Heerboth), Mercyhurst University – Psychology

Based on discrepancies in the results of past research on the effects of personality traits on stress, the purpose of this study was to determine a potential relationship between extraversion and stress reactivity in a social setting. Specifically, testing the hypotheses that there are differences in stress reactivity between introverts and extraverts, and introverts will have a higher stress level compared to extraverts when faced with a social stress. Participants were recruited from the Mercyhurst University Introduction to Psychology class (n=30). Social stress was simulated with mental math in front of an audience and measured with salivary cortisol samples and a self-report before and after inducing stress. Results from the salivary cortisol samples and self-reports were compared to extraversion levels obtained using the Big Five personality dimensions. This study aims to fill in gaps in previous research and provide more information on the relationship between personality and stress.