

# PENN STATE BEHREND - SIGMA XI

***2015***

***TWENTY-FOURTH ANNUAL***

***UNDERGRADUATE STUDENT RESEARCH***

***AND***

***CREATIVE ACCOMPLISHMENT CONFERENCE***

***ABSTRACT BOOK***

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*(Contains proprietary information – no abstract included)*

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*(Contains proprietary information – no abstract included)*

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Penn State Behrend – Psychology

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Jennifer Diethelm (Matthew Venesky), Allegheny College – Biology

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Nicole Kingston, Shane Baker,Michelle Hornedo,Hasan Khan, Brenton Maloy, Nesve Ozsoy, Paul Ruiz-Pelet, and Laura Wheeler (Beth Potter), Penn State Behrend – Biology

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Allie Lundell (Matthew Venesky), Allegheny College – Biology

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Josh Paradise (Richard Bowden), Allegheny College – Environmental Science

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Ciara Petrick (Mathew Gruwell), Penn State Behrend – Biology

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Jason Turba (Om Singh), University of Pittsburgh at Bradford – Biology

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

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

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Emily Mitchell and Katelyn Reisenauer (James Warren), Penn State Behrend – Biology

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Corrie Olson, Bradley Nowosielski, and Sofiya Bychkova (Greg Andraso and Kelly Grant), Gannon University – Biology

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Alexander MacFarlane and Robert Ramirez (Quyen Aoh), Gannon University – Biology

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Miranda Thompson (Quyen Aoh), Gannon University – Biology

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Hillary Krill (Eric Pallant), Allegheny College – Environmental Science

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Nichole Latimer (Michael Campbell and Ann Quinn), Penn State Behrend – Biology

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Khalia Thompson (Caryl Wagget), Allegheny College – Environmental Science

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Alyssa Brindle (Caryl Waggett), Allegheny College – Global Health Studies

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**[Player Salary](#Bronson)**

Adam Bronson (Stephanie Martin), Allegheny College – Managerial Economics

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Nicolas Carbo (Ann Quinn and Phyllis Mansfield), Penn State Behrend – Sustainability/Business

[**Evaluating Physical Activity among Preschoolers at an Income Eligible “Pre-K Counts” Program in Rural Northwest Pennsylvania**](#Lingwall)

Cailyn Lingwall (Caryl Waggett), Allegheny College – Global Health Studies

**RUNNER-UP -** [**Zooming in: A Photovoice Project that Asks 4th Grade Students Living in Meadville, Pennsylvania to Frame How They Experience Physical Activity**](#Schwartz)

Sara Schwartz (Caryl Waggett), Allegheny College – Environmental Studies

[**ExpERIEnce Children’s Museum Exhibits**](#Tarosky)

Kimberly Tarosky, Erin Stroup, Amanda Balos, and Andrea Bogert (Melanie Ford), Penn State Behrend – Engineering

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Issaka Agbere (Jason Bennett), Penn State Behrend – Chemistry

[**Synthetic Modifications of Hypervalent Iodine Reagents**](#Brkic)

Anita Brkic (Michael Justik), Penn State Behrend – Chemistry

[**Oxidative-Substitution Reactions of Polyaromatic Hydrocarbons with BF3-Activated Iodonium Ylides of 1*H*-1-Hydroxy-1,2,3-Benziodoxathiole 3,3-Dioxide**](#Ekstrom)

Zak Ekstrom (Michael Justik), Penn State Behrend – Chemistry

[**Inhibiting Quorum Sensing Ability of Bacteria through the Use of Diversely Functionalized Isoxazolines**](#Kuehne)

Jessica Kuehne, Connor Link, and Ivonne Schneider (Amy Danowitz), Mercyhust University – Chemistry

[**Synthesis of Flavanones from 2-Hydroxychalcones using 1*H*-1-Hydroxy-5-Methyl-1,2,3-Benziodoxathiole 3,3-Dioxide**](#Lorigan)

Johnny Lorigan (Michael Justik), Penn State Behrend – Chemistry

[**Probing the Nitrite Reductase Activity of wt Human Serum Albumin Reconstituted with Heme**](#Luteran)

Emily Luteran (Mary Grace Galinato), Penn State Behrend – Chemistry

**RUNNER-UP -** [**Vacuum Ultraviolet Photolysis Matrix Isolation Infrared Spectroscopy of GeH4 in Argon and Nitrogen Matrices**](#Mott)

Pierre Mott III (Jay Amicangelo), Penn State Behrend – Chemistry

[**Influence of the Second-Sphere Coordination on the Nitrite Reductase Activity of Globins**](#Rodland)

Anthony Rodland and Jaclyn Gowen (Mary Grace Galinato), Penn State Behrend – Chemistry

[**Quantifying of Defect Sites for a Standard Single-Walled Carbon Nanotube Sample**](#Schirmer)

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

[**Characterization of an Ethanol-Benzene Complex Using Matrix Isolation Infrared Spectroscopy**](#Silbaugh)

Matthew Silbaugh (Jay Amicangelo), Penn State Behrend – Chemistry

**WINNER -** [**Molecular Modeling of Iron Porphyrins and Platinum Surfaces**](#Simkovitch)

Susanne Simkovitch (Jason Bennett and Scott Simpson), Penn State Behrend – Chemistry

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

Angelina Sprecher (Alan Jircitano), Penn State Behrend – Chemistry

[**The Effects of Quercitin, NiCl2(dcpm) and Whiskey Extract on Metastatic Cancer Cells**](#VanDyke)

Maddie VanDyke, Haley Nolf, Olivia Webb, Kayla White, Dan Rzewnicki, Andrew Claffey, and Benjamin Ivan (Charles Kriley), Grove City College – Biochemistry

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Ben Buckholtz (Ihab Ragai), Penn State Behrend – Engineering

[**Gerrymandering in Federal Legislative Districts**](#David)

Erica David1 (Robert Weissbach1 and Robert Speel2), 1Penn State Behrend, School of Engineering and 2Penn State Behrend, School of Humanities and Social Sciences – Electrical and Computer Engineering Technology

[**Radii of Inscribe Circle and Spheres**](#Emmel)

William Emmel and Kevin Nelen (Papiya Bhattacharjee), Penn State Behrend – Computer Science

**RUNNER-UP -** [**Evolving Complex Robot Behaviors in Real Time with Genetic Programming**](#Griebel)

John Griebel (C. David Shaffer), Westminster College – Computer Science

[**Analyzing the Integration of Cognitive Radio and Cloud Computing for Secure Networking**](#Karpinski)

Kelsey Karpinski, Taryn Walker, and Brennen Kelly (Syed Rizvi), Penn State Altoona – Security and Risk Analysis

[**Biometric Game Controller for Physiologically-Based Procedural Content in Games**](#Neu)

Joseph Neu (Matthew White), Penn State Behrend – Software Engineering

**WINNER -** [**The Effects of Motion Sickness While Using the Oculus Rift**](#Poljak)

Dylan Poljak (Matthew White), Penn State Behrend – Computer Science and Software Engineering

[**Major Cloud Providers: Which One Should You Choose?**](#Rosswog)

Christopher Rosswog (Jalaa Hoblos), Penn State Behrend – Computer Science

**RUNNER-UP -** [**Detecting Malicious Insiders in the Clouds**](#Schwoegl)

Michael Schwoegl and John Lewis (Jalaa Hoblos), Penn State Behrend – Computer Science and Software Engineering

#### ENGINEERING AND PHYSICS

**RUNNER-UP - Utilizing Diffuse Reflection to Increase the Efficiency of Luminescent Solar Concentrators**

*(Contains proprietary information – no abstract included)*

Seth Bowser, Seth Weible, and Christopher Spalla (Bruce Wittmershaus), Penn State Behrend – Physics

[**Parametric Study of Methanol Micro Fuel Cell Performance**](#Montagna)

Paul Montagna (Adam Hollinger), Penn State Behrend – Mechanical Engineering

[**RF Path Loss through Skin**](#Roney)

Travis Roney (David Loker and Steven Strom), Penn State Behrend – Electrical Engineering Technology

[**The Dynamical Evolution of Mars**](#Roth)

Jacob Roth (Darren Williams), Penn State Behrend – Physics

**WINNER - Concentration Dependence of Coated Gold Nanoparticles for Metal Enhanced Fluorescence**

*(Contains proprietary information – no abstract included)*

Joel Solomon (Bruce Wittmershaus), Penn State Behrend – Physics

[**Quench Tank Design**](#Woods)

Kyle Woods, Marcus Lindstrom, and Jonathan Weidner (Robert Edwards), Penn State Behrend – Mechanical Engineering Technology

#### PSYCHOLOGY I

**RUNNER-UP -** [**Working Memory under Pressure: There’s No Turning Back Now**](#Abdalla)

Rayan Abdalla and Jenny Rockwell (Victoria Kazmerski), Penn State Behrend – Psychology

[**Animal Interaction: Does Personality Effect “Kinection”?**](#Beatty)

Kayla Beatty, Danielle Carioto, and Howard Savoy (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

[**It Takes Two to Tangram**](#Bell)

Nicole Bell, Breanna Foster, and Megan Thompson (Victoria Kazmerski), Penn State Behrend – Psychology

[**Giving Back: Positive Effects of Mentoring on the Mentors**](#Chase)

Chelsea Chase, Kayla Cochran, and David Ohmer (Charisse Nixon), Penn State Behrend – Psychology

**WINNER -** [**Deception Detection: Investigating Individual Differences**](#Edwards)Erica Edwards and Christina Ayers (**Victoria Kazmerski and Dawn Blasko), Penn State Behrend – Psychology**

[**Sense of Belonging and Academic Achievement in College: Examining the Influence of Organizational Involvement**](#Faytak)

Andrew Faytak and Tyler Ferraino (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

**RUNNER-UP -** [**Navigating the STEM World: Psychological Readiness, Flexible Mindset, and Self-Efficacy in Spatial Performance**](#Harris)

Megan Harris, William Shelstad, Grace Waldfogle, Nicholas Bowser, and Dominik Dodds (Dawn Blasko and Heather Lum), Penn State Behrend – Psychology

**WINNER -** [**Sarcasm in the Workplace: The Influence of Power and Perspective**](#Leslie)

Christie Leslie, Alicia McAllister, Jeffery Roberto, and Hau Tuang (Dawn Blasko, Victoria Kazmerski, and Shariffah Sheik Dawood), Penn State Behrend – Psychology

[**Attachment, Social Support, and Pain**](#Matty)

Kaitlyn Matty, Mary Havers, Jessica Stoker, and Kayla Beatty (Carol Wilson), Penn State Behrend – Psychology

[**Preferred Leadership Type: Does Preference Vary for Different Types of Crises?**](#ShultzRoberto)

Jason Shultz, Jeff Roberto, and Franki DiSalvo (Victoria Kazmerski), Penn State Behrend – Psychology

[**Exercise or Video Games: A Comparison of Methods to Cope with Stress**](#Smith)

Brittany Smith and Sarah Jelinek (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

[**Nurse Turnover: Altruistic Behavior, Work Engagement, and Burnout**](#Spurgeon)

Nicholas Spurgeon, Hau Tuang, and Joshua Deck (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

#### PSYCHOLOGY II

[**Reducing Traumatic Stress Caused by Relational Victimization**](#Bell2)

Nicole Bell (Charisse Nixon), Penn State Behrend – Psychology

[**Analysis of Housing Condition on Social Anxiety in the VPA Model of Autism**](#Bodnar)

Colleen Bodnar (Jeff Cross), Allegheny College – Neuroscience

[**The Relationship Enhancement (RE) Scale: Some Preliminary Findings**](#Barnes)

Cara Barnes, Julie Brustle, Elizabeth Flaherty, Nickolas Forsberg, Dhavalkuamr Patel, Riddhi Patel, Omayra Rivera, Jay Shah, and Olivia Sweger (Mary Mino), Penn State University Park – Social and Behavioral Sciences

[**Differences in Cue-Reactivity Responses Dependent on Exposure Levels of Smoking and Non-Smoking Cues**](#Cox)

Erin Cox, Becky Haritnovich, Michelle Winwood, Hannah Rae and Jessica Braymiller (Matthew Weaver), Mercyhurst University- Psychology

**RUNNER-UP -** [**Why Do People Put up with Bad Dogs? Is it Love, Justification, or Support?**](#Dorrenbacher)

Wesley Dorrenbacher and Jessica Dylewski (Victoria Kazmerski and Dawn Blasko), Penn State Behrend – Psychology

**RUNNER-UP -** [**When Is a Hot Tango a Feisty Negotiation?: A Study of Embodied Metaphors**](#EdwardsCarter)

Erica Edwards, Cherylann Carter, Desmond Kane, Alysha Simmons, and Rachel Zimmerman (**Victoria Kazmerski and Dawn Blasko), Penn State Behrend – Psychology**

[**The Effects of Glucose Energy on Impulsivity**](#Kelley)

Marissa Kelley (Matthew Weaver), Mercyhurst University – Psychology

[**The Effects of Music on Typing Accuracy**](#Pegher)

Katelyn Pegher and Gwendolyn Dryer (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

[**Visual-Haptic Cross-Modal Perception of 2D Symmetry**](#Musich)

Trista Musich (Allison Connell Pensky), Allegheny College – Neuroscience and Psychology

[**Can Priming the Right Hemisphere Affect the Way You Think and Feel? Using Unilateral Muscle Contractions to Enhance Empathy**](#Ohmer)

David Ohmer and Steven Savoy (Victoria Kazmerski), Penn State Behrend – Psychology

**WINNER -** [**Behavioral Observation Coding of Romantic Partner Interactions**](#ShultzMeckley)

Jason Shultz, Mary Meckley, Jessica Stoker, Kayla Beatty, and Parrish Brown (Carol Wilson), Penn State Behrend – Psychology

[**Combined Effects of Mefloquine and GABAa and GABAb Antagonists on Behavior**](#Sever)

Elizabeth Sever, Daniel Daugherty, and Adam Brandner (Rodney Clark), Allegheny College – Psychology and Neuroscience

## ORAL Presentations

### BIOLOGY I

#### DNA Fingerprinting of White-Tailed Deer

Adele Bish and Stephanie Krofcheck (Frederic Brenner), Grove City College – Biology

DNA fingerprinting of short tandem repeats (STRs) in nuclear DNA from white-tailed deer (*Odocoileus virginianus*) was investigated as a means to assist in determining breeding patterns of deer herds. Liver tissue samples were collected from 52 deer residing in Presque Isle State Park in Erie, Pennsylvania. STRs for each DNA sample were amplified using nine fluorescent primers (one per STR) through traditional PCR. PCR products were confirmed using gel electrophoresis in 2% agarose gel and analyzed under UV light using a Bio-Rad imaging unit. Successful PCR products were analyzed using an Applied Bio Systems 310 single capillary automatic DNA sequencer using GeneScan software to accurately measure STR length. The data obtained were used to create a unique DNA fingerprint for each deer based on the STR size and frequency. The GenePop, FSTAT, and Arlequin analysis programs were used to determine potential gene flow within the sample population, and yielded results consistent with Hardy-Weinberg equilibrium. Although this study has been ongoing since June 2013, it is suspected that a more exhaustive study will show evidence of increased heterozygosity in the population, which would suggest a lack of inbreeding and the corresponding migration of bucks in and out of different herds. Data and results obtained from this preliminary study will contribute to clarifying paternal genetic history and inferring the breeding behavior among white-tailed deer herds in Presque Isle State Park.

#### Biofilm Characterization and flp/tad Gene Quantification of Haemophilus ducreyi’s Sexually-Transmitted versus Chronic Limb Ulcer Strains

Andrew Crofford (Tricia Humphreys), Allegheny College – Biochemistry

*Haemophilus ducreyi*, the causative agent of the sexually-transmitted infection chancroid, has sexually transmitted ulcer strains: class I (35000HP), class II (HMC112), and a newly discovered chronic limb ulcer (CLU) strain (NZS3). CLU are transmitted by non-genital interaction such as casual contact with a limb abrasion. One technique that bacteria use to survive fluctuations in environmental conditions is biofilm proliferation. It is unknown if these strains form biofilms, but it is hypothesized the CLU strain has greater mRNA expression and biofilm formation because of its seeming ease of transmission. Therefore, the three strains were compared for biofilm growth using real time RT-PCR and fluorescent and confocal microscopy. Three open reading frames within a polycistronic operon that codes for fimbria-like proteins (*flp*) and tight-adhesion proteins (*tad*) were compared in biofilm and planktonic cells. 35000HP planktonic cells generally had greater mRNA levels than biofilm cells; however, it was not statistically significant. Microscopy images identified extracellular DNA and polysaccharides, common biofilm formation indicators, which form a matrix around the cells. 35000HP typically had more proficient growth than HMC112, which had better growth than NZS3. Further investigation will identify if there is a difference between biofilm growth and transcriptional regulation in sexually transmitted versus CLU strains.

#### Investigating the Effects of DMN Treatment by Examining the Changing Gene Expression by QT-PCR

Olivia D’Annibale (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. Chlorpropham (CIPC) is the most common method to prevent sprouting; CIPC disrupts microtubules but there is 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. To determine a possible mode of action for DMN changes, the potato transcriptomes were examined following application of the sprout inhibitor. 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, RNA was extracted, and a cDNA library was produced. The average periderm residue levels for DMN ranged from 0.1 to 4.2 ppm depending on the level of exposure. RNA-seq analysis using Galaxy and QT-PCR results showed that the WRKY transcription factors are altered under DMN exposure while transcripts associated with plastid function and development decreased.

#### Barcoding Arthropods Across the Behrend Campus

Kyler Miller and Ryan Tarto (Matthew Gruwell), Penn State Behrend – Biology

The Barcode of Behrend project is a multifaceted biodiversity initiative to catalog the variety of arthropod populations that inhabit the Penn State Behrend campus. Arthropods, more specifically the class Insecta, are the most diverse group of organisms known. They contribute at the basic fundamental level to the environments which they inhabit. Barcoding is the process of using a highly conserved gene to identify a species; for animals they utilize the CO1 gene on the mitochondrial genome (mtDNA). Different organisms use different genes. This is due to specific criterion that must be met in order for the gene to be highly conserved yet allow enough mutation to occur to differentiate between species. DNA is amplified and sequenced. The result of the sequence is then compared to previously known sequences on GenBank and BOLD. Cataloging is an initial step to maintain the biodiversity of Penn State Behrend.

#### Do Cats in Canada Need Their Own Forensic Mitochondrial DNA Database?

Amanda Spadaro (Kristen Webb), Allegheny College – Biology

Mitochondrial DNA (mtDNA) sequences from biological samples can be used as exclusionary evidence in forensics, but only if the prevalence of each unique sequence, or mitotype, is known for the population. Previous research has analyzed the mtDNA control region of 1,300 domestic cats worldwide, finding 12 universal mitotypes of varying frequencies across populations. Populations in Europe and the United States were shown to differ significantly in mitotype distributions, indicating that these populations should not be represented by a single mtDNA mitotype database. Through DNA sequencing and analysis, mitotype frequencies were determined for a population of 25 cats from Winnipeg, Manitoba, Canada for comparison to frequencies from previously surveyed populations in the United States to see if regional databases are needed. Through this research, biologists can determine the degree to which the political separation between the United States and Canada may affect population substructure and if separate databases for the mtDNA control region of the domestic cat are required to accurately represent these populations.

#### Binding of Chronic Limb Ulcer Strains of Haemophilus ducreyi to Fibrinogen

Alice Tischler (Tricia Humphreys), Allegheny College – Biology

*Haemophilus ducreyi* is a fastidious Gram-negative bacterium, and the etiological agent of the sexually-transmitted infection (STI) chancroid. In recent years, several chronic limb ulcers (CLU) found on the legs of children in the South Pacific have been attributed to novel strains of *H. ducreyi*. These genomes have differences in the nucleotide sequence of the gene *dsrA* which codes for an outer membrane protein that binds to fibrinogen. Increased fibrinogen binding may be a way to explain the colonization of bacteria from a more casual limb contact than more intimate genital contact. The fibrinogen binding abilities of the traditional class I and class II strains were compared to four CLU strains by running SDS-PAGE and western blotting. Preliminary results indicate that there is variability in the fibrinogen binding of different strains of *H. ducreyi*. These differences appear to be more specific to individual strains as opposed to the categories of CLU and genital ulcer strains. A wider array of strains may be able to help elucidate significance of these differences.

#### Biosynthesis of Melanin and Ultra-violet (UV) Radiation Protection

Zhang-Jingyi and Aziz Yousif (Om Singh), University of Pittsburgh-Bradford – Biology

Melanin is a dark brown colored pigment responsible for the pigmentation in many plants and animals. It plays important biological roles in humans such as pigmentation of skin, eye, and hair, and transmission of neural impulses in the brain. Biologically, melanin functions as a radical absorbing agent and protects cells from free radials generated from UV radiation and visible light. Inability to synthesize melanin can cause diseases such as albinism and it can be a great concern due to the increased potential of skin cancer. Therefore, biosynthetic melanin can be used as an alternative pigment source for melanin-deficient patients. Microorganism *Streptomyces sp.-EF1* was found being able to synthesize melanin extracellularly and the pigment was characterized quantitatively. The pigment was coated onto various materials (glass slides and plastic chips) to create melanin shields against UV rradiation. In order to explore the UV – radiation protective function of the bio-synthetic melanin, the melanin shields were placed onto nutrient agar plates, spread with *E. coli* and then the plates were exposed to UV radiation for up to two hours. Microbial growth was observed at the areas covered and uncovered with melanin shields. The biosynthetic melanin revealed UV radiation protection in microbial populations.

### BIOLOGY II

#### An Investigation of the Methylation Status of the KEAP1 Promoter Region and Keap1 mRNA Expression in Canis lupus familiaris Hemangiosarcoma

Maria Bozzo (Kristen Webb and Ann Kleinschmidt), Allegheny College – Biology

Kelch-like ECH-associated protein 1 (*Keap1*) is a part of a cellular defense system that protects against oxidative stresses. Hypermethylation of cytosine bases in CpG islands in the promoter region of *Keap1* and reduced expression of Keap1 mRNA have been correlated to a number of different human cancers, but little work has been completed on human sarcomas. One human sarcoma, angiosarcoma is analogous to the canine cancer hemangiosarcoma. Hemangiosarcoma can be more easily studied than angiosarcoma due to its relatively higher prevalence in the canine population. In this study, the methylation status of the *Keap1* promoter region and the expression levels of Keap1 mRNA in canine hemangiosarcoma cell lines were investigated. Cell lines were subject to bisulfite treatment and methylation-specific primers were used to analyze the methylation status of hemangiosarcoma cell lines compared to a non-cancerous control using PCR. Real-time PCR was preformed to analyze mRNA expression levels in hemangiosarcoma cell lines relative to a non-cancerous control. This study contributes to the existing pool of research of *Keap1* in human cancers and opens up a new area of study in canine cancers.

#### Synergistic Effects of Resveratrol and Quercetin on Tumorigenic T2-A Mouse Cell Line

Lauren Gillespie, Sarah Blizard, Josh Godwin, and Amanda Lisby (Fred Brenner and Durwood Ray),Grove City College – Biology

The purpose of this study was to determine synergism between quercetin, a flavonoid, and resveratrol, a phenolic phytoalexin, in preventing growth of the T2-A mouse tumorigenic cell line. T2-A cells were derived from a local metastatic lesion produced in an NIH Swiss mouse injected with tumor cells derived from serial injections that began with a mouse transformed GhrasT-NIH/3T3 cell line. The T2-A cells were plated three days prior to the start of the experiment so that the average confluency of the cells on day 1 was approximately 1-10%.  Quercetin and resveratrol were dissolved in DMSO and then prepared in media such that all solutions had a final DMSO concentration of 0.1%.  T2-A cells were treated with both resveratrol (concentration: 0-300 μM) and quercetin (concentration: 12 μM). Photomicrographs were taken of six randomly pre-selected 2 mm2 regions on days 1-3. We will continue to look at the synergism between these compounds on other mouse cell types in our tumorigenic progression model (normal NIH Swiss embryonic fibroblasts, T1-A primary tumor cells, T3-HA hepatic metastatic tumor cells, and T4-PA pulmonary metastatic tumor cells) as well as when resveratrol concentration is held constant, but quercetin concentration varies.

#### Identification of Sequences Crucial for CG13222 Edge Regulation by Ultrabithorax

Eduardo Munoz (Bradley Hersh), Allegheny College – Biology

Hox genes encode transcription factors that regulate the development of all bilateral metazoans along the anterior to posterior axis. The transcription factors regulate development by binding to specific sequences of target gene regulatory elements. Hox proteins bind to a consensus sequence ATTA, which should appear on average every 256 base pairs in the *Drosophila* genome. Therefore, we hypothesize that additional sequences are required for Hox proteins to distinguish between actual target sites and a non-target site. I used the Hox protein Ultrabithorax (Ubx)-responsive site, *CG13222 edge cis-regulatory element*, to identify additional sequences crucial for Hox protein specificity. I hypothesized that the DNA sequences immediately downstream of the conserved ATTA site may contribute to the binding specificity of Ubx. We produced full-length Ubx-Ia protein in *E. coli* and purified it using affinity chromatography. We performed electro-mobility shift assays to determine the binding affinity of Ubx to wild-type and mutated sequences of the *CG13222 edge*. If the mutated sequences result in a loss of Ubx binding, the results would suggest the sequences downstream of the conserved ATTA site are necessary for Ubx to bind to the target site.

#### The Effects of Stress Physiology on Disease Resistance

Julie Murone and Joseph DeMarchi (Matthew Venesky), Allegheny College – Biology

Corticosterone (“CORT”) is the primary vertebrate stress hormone and plays an integral role in physiological and immunological responses. When secreted at low levels, CORT can improve an organism’s survival; however, when CORT is secreted at high levels, it is thought to be immunosuppressive. Despite the known association between stress physiology and disease resistance in domesticated organisms, it is unclear whether these associations are ecologically and evolutionary relevant in wildlife species. We explored these patterns using a 3x3 fully crossed laboratory experiment in which we exposed American toads (*Bufo americanus*) to CORT and the pathogenic chytrid fungus [*Batrachochytrium dendrobatidis* (“*Bd*”)]. Exposure to CORT and *Bd* each increased toad mortality, but these two factors did not interact to affect mortality. CORT tended to reduce the infection burden on toads and this pattern that was clearest when toads were exposed to high levels of CORT, a pattern opposite of most studies on domesticated animals. Additionally, CORT increased costs of exposure to *Bd*, as indicated by a higher mortality rate of toads exposed to, but not infected with, *Bd* compared to non-infected toads. Future studies that inhibit CORT secretion are needed to better our understanding of the relationship between stress physiology and disease resistance.

#### Effects of Polybrominated Diphenyl Ethers on the Cell Cycle Regulating Genes of Human Umbilical Vein Endothelial Cells

Connor Pletz (Mary Vagula), Gannon University – Biology

Polybrominated Diphenyl Ethers (PBDEs) are organobromine compounds widely used as flame-retardants. They are incorporated into a wide array of products including building materials, electronics, furnishings, motor vehicles, airplanes, plastics, and textiles. There are 209 congeners in this class of flame-retardants. Concern arises due to the fact that these PBDEs are mixed into the products rather than being chemically bound to them, allowing them to more easily leach out and enter the environment. These toxic chemicals have even caught the eye of the Environmental Protection Agency (EPA) as they have added them to the Concern List. In this study BDE-85, BDE-99, and BDE-209 are used to test toxicity on healthy human umbilical vein endothelial cells (HUVEC). These are three important congeners selected for their toxicity and prevalence, respectively. The genotoxic effects of these PBDEs will be analyzed specifically by assessing the expression of genes, focusing on TP-53, CRADD, ATM, RAD1, and ATR involved in apoptosis, DNA repair, and cell cycle regulation. The results of this report reveal alterations in the genes; CRADD, TP-53, and ATM in BDE-85 and BDE-209 exposed cells. Further research investigation is underway for the expression of CRADD, TP53, ATM, and ATR at these particular congeners.

#### Gene Expression in the IRBP-/- Mouse Model (Mus musculus)

Karishma Reddy and Katelyn Cassel (Christine Donmoyer), Allegheny College – Biology

Many vision diseases are caused by degeneration of photoreceptors within the retina. Interphotoreceptor retinoid-binding protein (IRBP) is essential for the normal development of photoreceptors; in the absence of IRBP, apoptosis occurs at postnatal day (p) 25. This study measured differences in retinal gene expression between the IRBP knockout (IRBP-/-)and C57/BL6 (wild-type) mouse strains. Our study examined gene expression at p21, p23, and p25. The genes examined were rhodopsin, IRBP, CIAPIN-1, Cry-BB2, Cry-GS, and Cry-GF. Our results show higher rhodopsin expression in the IRBP-/- at p23 compared to p25, which indicates apoptosis between these ages. At p25, an apoptosis inhibitor, CIAPIN-1 showed higher expression in the C57 compared to the IRBP-/-. This suggests that CIAPIN-1 is partially responsible for the IRBP-/- apoptosis. Identifying genes in photoreceptor apoptosis could help patients experiencing retinal degeneration.

#### The Effects of Malvolio and Vha68-1 Genes on Survival of Drosophila melanogaster Following Bacterial Exposure

Sara Townsend (Bradley Hersh), Allegheny College – Biology

An organism’s immune response is crucial to its survival, and many of the signaling pathways and mechanisms of the immune system are conserved from invertebrates, like *Drosophila melanogaster*, to vertebrates, like mice and humans. Though the major signaling pathways of the immune response are understood, many of the genes that affect those pathways and their functions remain unknown. A recent genome-wide RNA interference (RNAi) mediated in vivo screen of *D. melanogaster* exposed to *Serratia marcescens* identified more than 800 new genes that potentially could be involved in innate immunity, and about 40% of those had novel functions (Cronin et al., 2009). Our project examined the effects of knockdowns in two of those genes, *Malvolio* and *Vha68-1*, on the innate immune response of *D. melanogaster* after exposure to *S. marcescens.* We used a log-rank test to compare survival rates between genotypes and real-time quantitative PCR to measure levels of antimicrobial peptide gene expression. We expected to observe effects on either the rate of survival, the expression of the antimicrobial peptide gene, *diptericin*, or both. Understanding the pathways of the immune system in an invertebrate like *D. melanogaster* may allow us to better understand the more complex immune response of vertebrates.

### BIOLOGY III – Environmental Biology

#### Tracking Invasive Species using Environmental DNA (eDNA)

Samantha Czerniak and Brian Fuller (Greg Andraso and Kelly Grant), Gannon University – Biology

The ecology of local lakes has been disrupted by non-native species, particularly the round goby (*Neogobius melanostomus*). Round gobies were recently identified in Lake LeBoeuf, Erie County, Pennsylvania, and may have been introduced into other regional lakes. This species is thought to outcompete many native fish, yet gobies are difficult to detect because they are cryptic bottom dwellers. Our goal is to detect this invasive fish through the use of environmental DNA (eDNA). All organisms shed DNA into the environment and thus provide a “trail” that we can identify in different local lakes. For this assay to work, we must be able to specifically amplify and identify DNA from round gobies. We optimized primers to amplify segments of cytochrome oxidase I (COI) from these fish. We demonstrated the specificity of our primers by testing them against a panel of fish DNA. These primers allow us to detect DNA at concentrations as low as 10 ng/mL, which should be sufficient for amplifying round goby DNA out of lake water. We have tested different methods to extract DNA from nitrocellulose filters that are used to concentrate the eDNA. Currently, we are using these methods to track the distribution of the round goby within the waterways around Erie, Pennsylvania.

#### Morph-Specific Differences in Disease Prevalence and Pathogen-Induced Mortality in a Terrestrial Polymorphic Salamander

Alex Hess, Joseph DeMarchi, Alejandro Weil, Julie Murone, Cari-ann Hickerson, and Carl Anthony (Matthew Venesky), Allegheny College – Biology

Polymorphic species often face diverse selection pressures within their shared environment that can contribute to population divergence. Previous studies indicate that polymorphic species *Plethodon cinereus* (striped and unstriped), which vary in their degree of melanin-based coloration and differ in stress physiology. Association between melanin-based coloration and disease resistance has been observed among vertebrates, however, few studies have examined this relationship with amphibians. We exposed juvenile and adult P. cinereus to the pathogenic chytrid fungus [Batrachochytrium dendrobatidis (Bd)] and tested whether the different color morphs differ in their response to Bd. We predicted that unstriped salamanders would exhibit higher survival rates and greater resistance to Bd compared to striped salamanders. Our results suggest that unstriped salamanders have a higher prevalence of infection when they do not behaviorally avoid Bd. Unstriped salamanders exhibit higher rates of Bd induced mortality compared to striped salamanders. These results conflict with our initial predictions. Behavioral traits of the unstriped morph, including responses to predators, may contribute to increased levels of stress and reduced resistance to infection. Futures studies that directly manipulate glucocorticoid levels and/or temperature are needed to better understand the differences in Bd resistance in this species.

#### Relationships among Cyanobacteria and Sediment and Nutrient Load in Presque Isle Bay

Jeanette Girosky (Pamela Silver), Penn State Behrend – Biology

Cyanobacteria can cause harmful algal blooms (HABs). The direct causes of HABs are not known but HABs are usually indicative of eutrophication. Like many other areas in the Laurentian Great Lakes, Presque Isle Bay (Lake Erie, Pennsylvania) has begun experiencing HABs. Preliminary work in 2013 identified areas of concern that were correlated with known sources of sediment inputs that had recently been mapped. Phosphorus and nitrogen are known contributors to eutrophication, but nutrient data are scarce and not easily obtained for Presque Isle Bay. A study was conducted from May to October 2014, to collect nutrient and cyanobacterial data. Water quality data, including phosphorus and nitrogen levels, and phytoplankton data (cyanobacterial assemblage composition and density, and chlorophyll a) were collected at multiple sites in Presque Isle Bay to establish a baseline. This study will increase awareness of the eutrophication status of Presque Isle Bay, provide some of the information needed to understand the causes of HABs in Presque Isle Bay, predict blooms, and enable the development of better management practices.

#### Salamanders Increase Their Feeding Activity during Infection with a Pathogenic Fungus

Alexandra Hess, Caroline McCallister, Joseph DeMarchi, Makenzie Zidek, and Julie Murone (Matthew Venesky), Allegheny College – Biology

Immune function is a costly, but necessary, process that helps organisms prevent or reduce infectious diseases. However, hosts vary in their immunocompetence because of factors such as physiological state or reproductive status. When infected with a parasite, hosts frequently lose weight during the infection from costs associated with increased immune activity or because they exhibit sickness behaviors that reduce their food consumption. Weight loss and alterations in host behavior are common for many species of amphibians infected with *Batrachochytrium dendrobatidis* (*Bd*), a fungal parasite associated with global amphibian population extinctions. Research in our laboratory has demonstrated that individuals of the salamander *Plethodon cinereus* can clear their *Bd* infections quickly with seemingly few fitness costs. In the present study, we conducted feeding trials with *Bd*-infected and non-infected salamandersand tested whether *Bd*-infectedsalamanders increase their feeding activity as the infection progressed. We found that *Bd*-infected salamanders consumed more fruit flies than the non-infected salamanders during the first 14 days of the infection. However, by Day 28 (after the salamanders cleared their infections), these differences were negligible, suggesting that this species is able to mount an effective immune response against a normally extremely virulent parasite while maintaining its health.

#### A Census of the Bat Population on the Campus of Gannon University, Erie, Pennsylvania

Nikki McGaughey and Sarah Calve (Steve Ropski), Gannon University – Biology

For the past five summers a census of the bat population has occurred on the Gannon University campus in Erie, Pennsylvania. The numbers for the first three years held relatively steady, while the past two years’ data indicates a dramatic decline. White Nose Syndrome was first reported in 2006 in a cave in New York. The disease has killed an estimated 6 million bats in the eastern United States since then and has spread throughout Pennsylvania and into northeastern Ohio. This fungal infection has killed 95% of bats in some caves and may result in the listing of three bat species as endangered in Pennsylvania, including the Little Brown Bat (*Myotis lucifugus*), the predominant bat on the Gannon campus. This study compares yearly data by building, time of year, building side, and species composition to determine how White Nose Syndrome has affected the Gannon campus bats. A decrease in numbers may be partially responsible for an increase in West Nile Virus in the area. The results will also be used to place bat houses at appropriate locations to encourage bat presence on campus.

#### Fin Shape and Locomotion in Etheostoma Darter Fish

Rob Paul and Casey Bradshaw-Wilson (Lisa Whitenack), Allegheny College – Biology

Darters are a diverse group of species that are often found living sympatrically in the riffles of streams. By examining how they swim, we hope to better understand how they share space within the stream. We examined five different species (n = 4-10); *Etheostoma blennioides, E. caeruleum, E. flabellare, E. variatum,* and *E. zonale*. We were interested in the effect shape of their pectoral and pelvic fins had on motion. Aspect ratio of pectoral fins showed significant difference across all species. Two different swimming performance tests were used: a slip speed test, where the fish were placed in a flume with increasing flow until they could no longer sit on the substrate, and a fin angle test, where the fish were made to dart and the angles of their pectoral fins were measured at three different time instances; just before the dart (T1), during the dart (T2), and after the dart (T3). When mass was used as a covariate, there was no significant difference between slip-speed across species. Likewise, there was no significant difference between fin angles. This implies that the fins might be used primarily for another function, such as turning.

#### The Effect of Zinc and Acidic pH on Daphnia magna Mortality

James Rynes (Rich Bowden), Allegheny College – Environmental Science

Synergistic interactions are an important incidence in the environment, especially when relating to toxic substances. Thousands of man-made and naturally occurring compounds come into contact everyday and little research has been done on the potential toxicological impacts of these compounds to the aquatic environment. Synergistic reactions are important to identify because the concentration of a toxic substance may be recorded at a safe concentration in the environment, but after interacting with other compounds the toxicity may be substantially increased even though the compound was still at an allowable concentration set by regulatory agencies. The purpose of this experiment was to identify how Zinc concentration and pH effect Daphnia magna mortality. Background research has shown that as pH becomes more acidic Zinc becomes exponentially more toxic. Daphnia magna were exposed to pH values from 4 to 7 and Zinc concentrations ranging from 0 mgL-1 to 8 mgL-1. An r-squared value of .82 was obtained from the results of this experiment using multiple linear regression. The interaction between Zinc and acidic pH is important to identify because Zinc frequently comes into contact with acidic compounds in hydraulic fracturing fluid.

#### Estimating Growth of Young-of-Year Round Goby (Neogobius melanostomus) Using Size Frequency Distributions and Otoliths

Zachary Taylor (Greg Andraso and Kelly Grant), Gannon University – Biology

The round goby (*Neogobius melanostomus*) is a Ponto-Caspian invader that has impacted Great Lakes ecosystems. Numerous studies have investigated yearly growth rates of round gobies, but little is known about growth of young-of-year (yoy) individuals. On 27 June, 2013, we seined 92 round gobies from Marina Lake (Presque Isle State Park), 44 of which were 12-27 mm total length (TL). That cohort of small fish, not apparent during the preceding month, was assumed to be yoy individuals. Regression analysis on 244 apparent yoy collected between 21 June and 26 July revealed a significant relationship (F1,242 = 928.6, p < 0.000001) between TL and collection day in which individuals grew an average of 0.78 mm per day over the 36-day period. We also investigated growth rates of apparent yoy round gobies by counting daily increments on otoliths. Otolith analysis confirmed that the cohort of small round gobies were yoy individuals and revealed a significant relationship between TL and age in days (F1,9 = 58.3, p < 0.0001) in which round gobies grew an average of 0.86 mm per day. Our two methods of estimating daily growth rates are therefore in agreement and suggest rapid early growth in the species.

#### Tracking Aquatic Invasive Species Using DNA in the Feces of Piscivorous Fish

Jared Wilczynski, Samantha Czerniak, and Brian Fuller (Greg Andraso and Kelly Grant), Gannon University – Biology

Lake Erie’s ecology is disrupted by aquatic invasive species (AIS), such as the tubenose goby (*Proterorhinus semilunaris*); its impact on the Great Lakes ecosystem is relatively unstudied. Our current studies focus on discovering which species of fish prey upon tubenose goby. We use polymerase chain reaction (PCR) to detect specific DNA samples of this aquatic invasive species in the feces of piscivorous fish of Lake Erie. Identification of DNA for tubenose goby must be specific and accurate for our method to be successful. We optimized primers to be species-specific to segments of cytochrome oxidase I (COI) from the fish. We have demonstrated the specificity of our primer sets. We can detect DNA samples at a concentration below 10 ng/mL. The Qiagen Tissue Kit is the most effective method we use to extract DNA. This molecular approach offers advantages compared to the traditional gut content analyses because collection of feces does not harm the fish and it allows for community partners such as anglers to participate in our assessment by collecting fecal samples. Involvement of community partners allows us to map where and when piscivorous fish recently consumed tubenose goby.

### BIOLOGY IV - Microbiology

#### Isolation and Characterization of Magnetotactic Bacterium from Pond Sediment

Usman Ahmad and Jinyi Zhang (Om Singh), University of Pittsburgh at Bradford – Microbiology

Magnetotactic bacteria (MTB) are considered among a unique and diverse group of microorganisms with the ability to orient and migrate along geomagnetic field lines. This unique property is based on specific intracellular organelles, the magnetosomes, membrane-bound crystals of magnetic iron minerals organized into chains via dedicated cytoskeleton. Due to occurrence of magnetosomes, MTB are of great interest for paleomagnetism, environmental magnetism, biomarkers in rocks, and biomineralization. The bacterial magnetites have been exploited for a variety of applications in modern biological and medical fields. We hypothesized that pond sediments would contain a variety of MTB. We aimed to develop a series of racetrack methods to isolate MTB from pond sediments located in Alleghany National Park area. Total microbial flora of pond sediment was enriched in nutrient broth (NB) medium and applied to racetrack under a magnetic field generated using magnetic bars of opposite pole (north - south) with respect to control (i.e. no magnet). Microorganisms movement toward each north and south pole were observed under microscope and enriched in NB medium followed by single cell isolation method on nutrient agar plates, denoted as UM1 and UM2. Microbial growth was characterized at varying temperature prior their identification using 16S rRNA sequencing. Hence, the isolated microorganisms revealed manatotactic behavior toward a magnetic field under different magnetic racetracks.

#### Microbial Occurrence and Antibiotic Resistance in Bagged and Canned Food

Mariah Cole (Om Singh), University of Pittsburgh at Bradford, Bradford – Biology

Observed through annual food recalls, foodborne pathogens, such as *Escherichia coli,* and *Salmonella*, are commonly prevalent in today’s food production. Excessive use of antibiotics has led to a multitude of antibiotic resistant bacteria, including foodborne pathogens. We hypothesized that food products contain a variety of microorganisms, which may reveal antibiotic resistance. Results showed a diverse amount of microbial occurrence in all three-food types. Microbial isolation techniques were used to isolate a total of 112 microbial organisms from three food types; 6 isolates from baby food, 49 isolates from canned food, and 57 isolates from bagged vegetables. These isolates revealed a substantial amount of antibiotic resistance from four antibiotics tested: Ampicillin, Streptomycin, Chloramphenicol, and Kanamycin at concentrations of 100ug/mL, 500ug/mL, or 1000ug/mL. Ampicillin revealed the most microbial resistance with a total resistance of 54.46% from the total isolates, followed by Kanamycin with a microbial resistance of 26.79%, Streptomycin 25.00%, and Chloramphenicol 16.07%. Further research for 16s rRNA sequencing will identify the isolated microorganisms, as well their genetic elements of antibiotic resistance.

#### Factors Affecting the Sex-Determination Mechanism of the Soil Bacteria Lysinibacillus xylanilyticus on the Homosporous Fern Ceratopteris richardii

Haley Hallowell (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 and identified using 16S rRNA sequences. One of these, identified as Lysinibacillus xylanilyticus, was selected for further study. *C. richardii* spores were sown onto agar plates with various concentrations of *L. xylanilyticus*. After three weeks, *C. richardii* gametophytes grown with *L. xylanilyticus* were characterized as male, hermaphrodite, ungerminated, or newly germinated. *C. richardii* gametophytes grown in the presence of *L. xylanilyticus* were more likely to develop as hermaphrodites. However, recent experiments have given conflicting results based on *C. richardii* source and bacterial concentration.

#### Changes in the Bacterial Microflora Found on Door Handles Based on the Use of Agion Silver Technology

Hasan Khan, Brenton Maloy, Michelle Hornedo, Nicole Kingston, Nesve Ozsoy, Paul Ruiz-Pelet, and Laura Wheeler (Beth Potter), Penn State Behrend – Biology

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 Behrend 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 50 doors within four building on campus; 25 doors are silver-coated and the other 25 are non-coated. During the spring 2014 semester, culture-dependent techniques combined with sequencing of the 16S rRNA gene were used to determine the composition of bacterial populations being maintained on the door handles. Interestingly, control-coated door handles were found to contain almost equal concentrations of bacteria within the Firmicutes and Gamma-Proteobacteria phyla (50.8% vs. 48.8%, respectively) while silver-coated door handles had a much larger concentration of bacteria within the Firmicutes phylum (83.3%) and a smaller concentration of bacteria within the Gamma-Proteobacteria phylum (10.8%). Thus, the results suggest that Agion technology may be more effective against gram-negative bacteria than gram-positive bacteria.

#### The Bacterial Composition of the Microflora Found on Purple Martin (Progne subis) Eggs

Michael Knoll, Aimee Day, Sean Weaver, Eric Brown, MaryAnn Mason, and Kristen Webster (Beth Potter), Penn State Behrend – Biology

The community of microorganisms or microflora that lines the surface of avian eggs is the first line of defense against infection by pathogenic bacteria. The protective role of the microflora is derived from its composition and several studies have focused on identifying the bacterial components. While a diverse group of avian species has been studied, multiple species within the same family have not been independently studied. This depth is necessary to determine the degree of flexibility or plasticity within the microflora. The goal of this study was to identify the bacterial microorganisms found within the eggshell microflora of another avian species classified within the Hirundinidae family, the purple martin (*Progne subis*). Culture-dependent techniques revealed a predominance of *Pseudomonas* before and after clutch completion, though a slight decrease in the relative abundance was observed after the onset of incubation. Interestingly our results correlate with studies involving pied flycatchers, house wrens, and Eurasian magpies rather than tree and violet-green swallows. Given the variances between pied flycatchers, house wrens, Eurasian magpies and purple martins in regards to breeding habitat, diet, nest construction, and incubation behaviors, we hypothesize that a strong selective force may be provided by uropygial gland secretions or preen oil.

#### Inactivation of Pathogens on Contact Surfaces Using Decontaminating Substances Produced by Radiant Catalytic Ionization

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

Foodborne illness outbreaks linked to fresh products are becoming more frequent and widespread. The CDC estimates that each year 48 million people become sick due to foodborne pathogens and of the 48 million, 128,000 are hospitalized. Finally, of that 128,000, 3,000 die from foodborne pathogens. The National Institute of Health estimates the cost for foodborne illness per person averages 1,626 dollars correlating to 77.7 billion dollars a year the government spends to help those infected with foodborne illness. Removing or reducing the amount of these bacteria will increase quality and shelf life of many perishable and nonperishable goods. Radiant Catalytic Ionization (RCI) is thought to be safe in humans as an organic form of treatment to disinfect food contact surfaces through the use of radical oxygen species. RCI has countless applications for reducing the number of bacteria on a variety of surfaces with varying conditions. The focus of this study is the inactivation of pathogens which were introduced on to the tips of sterile cotton swabs, and food surfaces, using RCI. Our results indicate a 90% reduction in the recovery of bacteria with a 60-minute exposure to RCI.

#### Growth Kinetics of 2,4-Diacetylphloroglucinol-Producing Strains of Pseudomonas fluorescens on Components of Tomato Root Exudates

Jamie Wilkes (Catharina Coenen), Allegheny College − Biology

Plants supply a significant amount of carbon to the soil and changes in root exudation could affect symbiotic relationships between plants and root-colonizing bacteria. Many of these bacteria produce plant-protective antibiotics, such as 2,4-diacetylphloroglucinol **(**DAPG), which defend plants from disease. To characterize carbon utilization patterns in bacterial strains that produce DAPG, P*. fluorescens* strains Pf-5 and PhlD- were grown on carbon sources previously shown to be secreted by tomato roots. Culture density was measured at various time points at 595 nm to assess bacterial growth. Media containing fructose as the sole carbon source produced extremely slow growth. Growth on sucrose was slower than on glucose. Strains Pf-5 and PhlD- grew at similar rates, indicating that the PhlD- mutant’s inability to produce DAPG does not affect its carbon use. To assess whether slow growth of Pf-5 on sucrose was due to substrate-induced changes in metabolisms, inocula were pre-grown in glucose, sucrose, or fumarate before assessing growth kinetics on these carbon sources. Growth was unaffected by the carbon source used to grow inocula, suggesting that carbon-specific growth kinetics were not the result of delayed activation of carbon-specific metabolic pathways. Differential growth on carbon sources found in tomato root exudates suggest that factors affecting host plant carbon secretion patterns also affect competitive root colonization ability of plant-protective bacteria in the soil.

### BIOLOGY V – Neurobiology and Behavior

#### Creating Environmentally Conscious Students: Integrating Garden-Based Learning into the Family/Consumer Science 7th Grade Curriculum

Sydney Bedford (Caryl Waggett), Allegheny College – Environmental Science

Garden-based learning is a popular strategy to engage primary students in ecological processes. This educational approach enhances student learning while also teaching students to be responsible problem-solvers who are connected with their community. These skills are necessary for creating environmentally-conscious students who can address complex environmental issues. Meadville, Pennsylvania is a community with a high percentage of families living below the federal poverty level. Local school health screens in Meadville reveal that ~38% of children aged 5-17 are obese or overweight. Garden-based education can address the linked challenges of obesity and poverty. Students can learn valuable skills about environmental stewardship, and also about nutrition and healthy eating. This project is part of a Community Wellness Initiative showcasing a new community garden at a recreational complex adjacent to the middle school. I designed and tested six lesson plans addressing the ecology, nutrition, and sustainability of growing foods locally and the practical benefits of doing so. Lessons integrate garden-based learning into the “Family/Consumer Science” class in the 7th grade curriculum and are linked to statewide goals and standards for science and agriculture. Lessons focused on where food comes from, what is in our food, buying local, budgeting meals, food spoilage, and harvesting. https://ssl.gstatic.com/ui/v1/icons/mail/images/cleardot.gif

#### The Effects of Parental Involvement on Childhood Development: A Mouse Model

Kevin Crooks (Christy Donmoyer), Allegheny College – Biology

In 2009, it was estimated that approximately 9.5 million children live in orphanages in the developing world, and that number is projected to increase due to the HIV/AIDS pandemic as well as volatile economic situations and global political tensions. Recent studies have showed that even though physical resources, such as food and shelter, are available to some orphans, childhood development is negatively affected by the absence of parents. The hormone oxytocin, nicknamed the love drug, has been seen to activate specific neural pathways to motivate parents to nurture, bond with, and protect their offspring. A positive feedback loop is then started in which parents with higher oxytocin levels pass those behaviors through a secure attachment on to offspring, positively affecting development and future reproduction. The presence of a biological mother has also been seen to have positive effects on offspring development. This study assesses offspring development of mice following inclusion into one of four maternal groups: Biological mother with a saline injection 24 hours after birth (B), Biological mother with an oxytocin injection 24 hours after birth (BOT), non-biological mother with a saline injection (NB), or non-biological mother with an oxytocin injection (NBOT). Physical development, cognitive development, and survival of offspring were tested at Day 21, the end of adolescence.

#### Assessing Seventh Graders’ Knowledge, Behavior, and Attitudes toward Physical: Activity, Nutrition, and Local Foods

Liesel Anderson, Kimberly Garrett, Mason Hill, Catherine Kasianowicz, Cailyn Lingwall, Carly Luitgaarden, Josie Niovich, Stephen Nymick, Nandi Ramsey, Sadie Stuart, and Joe Wiesmeth (Caryl Waggett), Allegheny College – Environmental Science

Seventh grade students from Meadville Area Middle School were surveyed to gather baseline data on their behavior, attitudes, and knowledge related to nutrition, physical activity, and local food. This project was completed in conjunction with the Community Wellness Initiative in order to determine community needs surrounding food security, safety, and physical wellness. According to the Pennsylvania Department of Education, nearly 40% of Meadville children are obese or overweight. City Data reports that 30.6% of children in Meadville live below the poverty line. Results suggest that local seventh graders are enthusiastic about nutrition, physical activity, and local foods, while their knowledge, particularly in nutrition and local agricultural ecology, is low. Students’ consumption and exercise patterns suggest that they rely heavily on processed foods and fast foods in their diet and exercise less than recommended and less than they would like. Results of questions directed toward food and resource access suggest that while a majority of surveyed students have access to grocery stores and important appliances, disparities remain that may indicate levels of food insecurity within the community. Information from this survey will help determine funding priorities for community wellness programs and curricular design in Meadville Area Middle School.

#### An Epidemiological Study of Six Health Conditions in Young Adults

Sarah Miller (Mary Vagula and David Prier) Gannon University – Biology and Mathematics

The present scientific report outlines the incidence and prevalence of six conditions, namely, acid reflux disease, asthma, depression, eczema, hyperopia, and myopia in young adults. The data were collected from young adults currently living in Erie, Pennsylvania who were within the age range of 16-32 years with an average of 19.7 years. This is the age range where young adults experience both hormonal and environment changes combined with the responsibilities and anxieties of life that could lead to increased stress. Stress is incriminated for many adverse effects on the body, triggering some diseases or exacerbating autoimmune diseases. The objective of this study was to observe the incidence and prevalence pattern of some common conditions and mapping them using GIS software, and to compare the results to state and national data. The data were collected via a two-page survey with an informed consent form. The survey included 562 students representing 19 states, 5 international territories, and the U.S. Virgin Islands. Results indicated that females are more prone to some conditions than males, supporting previous observations of higher incidence of autoimmune diseases in women than men. The findings are expounded in the light of literature available on these six conditions.

#### Behavioral Effects of Diet Restriction in Male VPA Model Autistic Rats

Shelby Overman (Rodney Clark and Caryl Waggett), Allegheny College – Global Health Studies

Today, autism is diagnosed in 1 in 68 children according to the 2014 CDC. This is a significant jump from 2007 when the CDC reported only 1 in 150 children received an autism diagnosis. While many families believe that diet change can improve autistic behaviors, there is currently no scientific evidence to support this notion. The Gluten/Casein/Soy Free diet is among the most popular diet. In this study, VPA-model autistic rats were used to analyze the behavioral impact of a diet free of Gluten, Casein, and Soy compared to a control group on a regular rat diet. I chose to evaluate three behavioral tests based on previously observed autistic behaviors in rats: exploratory habits, interest in new/different objects, and social interactions/social aggression. The results of my study demonstrated a significant difference in two of the three behavioral tests observed between the two groups. Rats fed a diet free of Gluten/Casein/Soy showed more exploratory tendencies in the maze and greater interest in exploring new objects than did control rats. Further studies evaluating the behavioral effects of diet on alleviating symptoms of autism are recommended.

#### ADHD: What Can and Cannot be Done

Armaghan Raeouf (Mary Vagula), Gannon University – Biology

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurobehavioral disorder characterized by inappropriate hyperactivity, inability to focus, and impulsiveness; all of which are serious deterrents in children’s learning processes, social skills, and overall maintenance of health. In the United States alone, 11% of children are diagnosed with ADHD and the annual ‘cost of illness’ is estimated to be between $36-52 billion. Though annual prescriptions for ADHD have consistently risen since 2003, it can be managed by medications and non-pharmacological intervention. Despite its recognition, conclusive evidence pointing to a single cause has not been affirmed; however, genetics seem to be the most likely causation with a heritability rate of 80%. Due to the high incidence rates in specific parts of the world, geography and cultural backgrounds may also be contributing factors. It is important to increase the awareness of ADHD as it is one of the most common childhood neurodevelopmental disorders and its incidence is increasing at a significant rate. This presentation informs the current statistics on ADHD and reviews the multitude of underlying causes ranging from mother’s nutritional status at the time of pregnancy to psychosocial events in the child’s life.

### CHEMISTRY

#### Elucidation of Diphenylureas Conformational Preferences in Varying Solvent Environments

Dominick Ali1 (Mary Grace Galinato1 and Jhenny Galan2), 1Penn State Behrend and 2Texas A&M University at Galveston – Chemistry

The conformations and dynamics of biomolecules such as enzymes are key features that influence their catalytic properties. Although enzymes are naturally efficient, they cannot thrive in extreme environments such as low pH or high temperature. It is for this reason that the development of synthetic mimics, in particular, oligoureas, is warranted. This work outlines the conformational and dynamic preferences of oliogourea monomeric units, which are investigated via temperature-dependence NMR spectroscopy and computational chemistry. In particular, monomeric units of oligoureas, diphenylureas, specifically *N,N’*-diphenylurea (DPU) and *N,N’*-dimethyl-*N,N*’-diphenylurea (DMPU) are studied because of their ability to conform in solvent environments with different polarities. Current results of DPU and DMPU in d6-DMSO (ε = 46.7) and CDCl3 (ε =4.81) show temperature-dependence (296 K to 350 K for d6-DMSO, and 223 K to 323 K for CDCl3) peak shifts of the 1H and 13C resonances. Molecular dynamics (MD) simulations of DMPU in both solvents demonstrate that *cis-cis* and *cis-trans* isomers are populated at RT, while *trans-trans* is dominant in DPU under similar conditions. Our results allow us to understand the driving forces that affect oligourea preferences in these varying conditions.

#### Evaluating Graphene Oxide Electrochemically Reduced on Pt-Black as an Electrocatalyst Support for H2S Detection

Robert Custer (Jason Bennett), Penn State Behrend – Chemistry

Selective in vivo detection of H2S over CO and NO has gained a lot of recent attention due to its particular importance in vital physiological functions. Previous attempts at electrochemical detection of H2S shows that a cyanide-coordinated ferriprotoporphyrin (FePP) electrocatalyst supported on Pt is an attractive electrocatalyst for selective H2S detection over CO and NO. However due to the elemental sulfur produced as a product of the oxidation, adsorbing to exposed Pt, a decrease in sensitivity and selectivity was observed ovetime. The focus of this research was on using Pt-black as a supporting layer for FePP in order to inhibit this fouling. However, Pt-black was determined to be resilient to initial FePP adsorption, which makes polymerizing it directly on a Pt-black surface extremely difficult. To counteract this problem, because previous research has shown that FePP adsorbs to carbon layers very well, a layer of electrochemically reduced graphene oxide (ERGO) was deposited on top of the Pt-black surface. This presentation focuses on attempts to polymerize FePP on an ERGO/Pt-black surface. This includes microscopic characterization as well as characterizing its electrochemical response toward H2S, CO, and NO.

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

Cody Kindle (Jay Amicangelo), Penn State Behrend – Chemistry

Matrix isolation infrared spectroscopy was used to characterize a 1:1 complex of methanol (CH3OH) with hexafluorobenzene (C6F6). Co-deposition experiments with CH3OH and C6F6 were performed at 20 K using argon as the matrix gas. New infrared bands attributed to the CH3OH-C6F6 complex were observed near the O-H stretching vibrations of CH3OH, and near the C6F6 out-of-plane peak. Identification of the new infrared bands to those of the complex were established by comparing the co-deposition spectra with the spectra of the individual monomers and by performing density functional theory calculations for the CH3OH-C6F6 complex at the B3LYP/aug-cc-pVDZ level. The calculations predict a stable minima for the complex, termed a lone pair-π structure. Comparing the calculated shifts of the vibrational frequencies for both structures to the experimental shifts, it is concluded that the lone pair-π structure is most consistent with the experimental frequencies and is most likely the observed geometry of the complex in the matrix isolation experiments. Co-deposition experiments were also performed using deuterated methanol (CD3OD) and hexafluorobenzene at 20 K using argon as the matrix gas.

#### α-Amylase Inactivation in the Presence of Caffeine

Neel Rajan, Stephen Koellner, and Vincent Calabrese (Arshad Khan), Penn State DuBois – Chemistry

An enzyme present in our saliva and pancreatic secretion, α-Amylase, is responsible for the break-down of starch into glucose which then enters into our blood steam and provides energy for various activities. In this study we have noticed that as the caffeine concentration in the enzyme solution is increased, the enzyme activity is decreased with a decrease in the amount of glucose release from starch hydrolysis. If additional experiments that we plan to do support this conclusion, one can understand the positive role of caffeine in the controlling of blood sugar.

#### Spectroelectrochemical Elucidation of Human Serum Albumin – Heme Complex

George Tomoiaga (Mary Grace Galinato and Jason Bennett), Penn State Behrend – Chemistry

Human serum albumin (HSA) makes up more than 50% of the protein in the human plasma which makes it a good candidate for study. When hemin is added to the HSA, more specifically heme *b* (Fe(III) protoporphyrin IX), it forms an HSA-heme complex. A crystal structure of this complex indicates a phenolate ligand forming a covalent bond to the Fe center via Tyr161, as opposed to the proximal histidine ligand found in globins. Interestingly, the kinetics and thermodynamic parameters for binding of diatomic gaseous ligands and engineered HSA-heme are similar to those reported for myoglobin (Mb), making HSA-heme an artificial hemoprotein and a model complex for monomeric globins. In this study, the electronic structure and electrochemical properties of the HSA-heme are investigated using UV-vis spectroscopy in tandem with cyclic and square-wave voltammetries. The redox potential of the HSA-heme is much lower than Mb, mirroring the redox potential of catalase which also has a tyrosine as the proximal heme ligand stressing a nitrogen environment for experimental purposes. Implications on functionality of this complex based on our findings are presented in this work.

### ECONOMICS

#### Is There a Relationship between Local Inequality and Property Crime in U.S. Neighborhoods?

Phoenix Cooke (Stephanie Martin), Allegheny College – Economics

Previous research has only focused on analyzing relationships between inequality and violent crimes. The purpose of this research is to shed light upon relationships between inequality and property crimes. This study analyzes national neighborhood data from 2000 to 2010 to see if local inequality translates into increased levels of property crime. Property crime is defined in this study as: auto theft, burglary, and robbery. After a literature review, a theoretical framework is established for each of the three inequalities being studied: income inequality, unemployment, and racial inequality. Some theories discussed in this chapter are: Becker’s Rational Choice Theory of Crime, Social Disorganization theory, and Merton’s Strain theory. Finally, an empirical chapter will be introduced to determine if a relationship exists among the inequalities and property crime. Through OLS regressional analysis, it is expected there will be a positive correlation between all three inequalities and property crimes during the recession that occurred from 2007 to 2010. Outside of the recession, it is expected there will be lower levels of both inequality and property crime yielding weaker correlations among the variables.

#### Evaluating the Choice between Schooling and On-the-Job Training for MLB Prospects

Joe Dawida (Stephanie Martin), Allegheny College – Economics

Every year a select few high school baseball players are drafted by a Major League Baseball organization. They are then faced with the decision of either choosing to go to college, or forgo college and sign a contract with the organization which drafted them. The purpose of this research is to analyze all of the necessary factors that go into this decision in order to determine if a player should sign a professional contract or go to college. Looking at human capital, on-the-job training, risk assessment, and general statistics, this research aims to decide when a player should choose what to do based upon expected lifetime earnings of both decisions. This research paper hypothesizes that the round which a player is drafted will ultimately decide whether he should choose schooling or on-the-job training.

#### The Marcellus Shale Boom and Its Effects on Labor and Wage

Nicholas Hollinger (Stephanie Martin), Allegheny College – Economics

Previous research has briefly covered the natural gas boom in Pennsylvania. However, there are numerous articles that talk about the possibilities of labor increases and economic growth. This study is going to analyze the counties of Pennsylvania and see if there are actual employment gains. The research will analyze the county labor markets by sector and decipher whether the labor is transferred or new jobs are created. The study begins when the horizontal drilling (hydraulic fracturing) began to take off. The time frame of the study is from 2007 to 2013.

#### Farmer Suicides in India and GM Cotton

Eric Jorgensen (Stephanie Martin and Eric Palmer), Allegheny College – Economics and Philosophy

In this paper we look at the highly publicized issue of farmer suicides in India. We evaluate many of the data sources used throughout many academic articles that attribute a main causality of farmer suicides to bt cotton as a crop. This will be evaluated in the context of many complex variables that accompany this: such as globalization, climate change, and lending policies. We will look at the human rights connected with policies implemented to diminish suicide rates. As with any complex issue a single cause will be hard to isolate, however the findings connected can indicate a more economic cause to the problem, rather than just bt cotton as a crop. The work will show that where yields decreased and economic difficulties were apparent there was a rise in suicide rate among this population. This economic tie will also draw closely with the globalized market of cotton as a crop, which is produced in greater numbers in China and the United States. We will also show that while the price of cotton has decreased, the yields in India have also diminished leading to defaulted debts and higher stress on farmers.

#### Can the United States Sustain the Current Trade Deficit?

Ashley Keenen (Stephanie Martin), Allegheny College – Economics

Over the past few decades, the United States has become more reliant on international trade, especially with China, due to the demand for cheaper goods. The United States economy developed into a service industry, making them less efficient at producing certain goods that American consumers demand. The United States has chosen to keep tariff and non-tariff trade barriers low since they have become reliant on a vast amount of imports, and the United States. does not want to risk hindering the flow of goods from a foreign country. However, the economy of the United States suffers slightly from the trade deficit that has been present for nearly four decades due to the tendency to over import and export very little. The United States must find a happy medium between offending foreign trading partners, potentially impeding imports, and juggling a hefty trade deficit. If they raise trade barriers slightly, they might be able to deliver the amount of imports American consumers crave, reduce the trade deficit, and hopefully not offend valuable trading partners.

#### The Effects of Insurance as an Employer-Provided Fringe Benefit on Wages

Stephen Kukunas (Stephanie Martin), Allegheny College – Economics

This paper analyzes whether the inclusion of dental, health, and/or life insurance negatively affects the wages of an individual. Economic theory suggests that because an employer is offering fringe benefits like insurance, then they can pay less to employees as they are technically paying them with those benefits. However, results from similar studies have shown that things are not clear cut and many other factors like race, gender, age, and company size can affect the actual effect insurance has on wages. Insurance is more likely to be offered to employees who make more because it is often associated with better jobs. Thus I investigate the effect of employer-given insurance on income with respect to gender, race, age, and company size. This paper uses a longitudinal data set, which allows the analysis to control for ability bias and yields more precise estimates of the impact on wages.

#### Sabermetrics, Arbitration, and Discrimination in the MLB Romulus Marino (Stephanie Martin), Allegheny College – Economics

This paper presents an empirical analysis of wage discrimination in MLB from an employer and consumer standpoint. The foundation of this research is based on MLB arbitration and how players’ ethnicities may affect the ‘value’ at which certain teams may perceive them. In order to account for certain biases, the arbitration data is sorted into three different categories: high income, middle income, and low income. Player statistics from their adjacent arbitration years are used as a measure of productivity. Non-traditional statistics (namely WAR) are used as a means of regression analysis as well. Since the 1970’s there has been a plethora of research carried out not only in MLB, but in other major American sports to detect wage discrimination among minorities. It is the goal of this research to determine whether or not MLB organizations undervalue players from different countries, particularly players from Hispanic origins.

#### Social Media in the NGO Sector

Jaime Parke (Stephanie Martin), Allegheny College – Economics

My research topic explores the idea and the use of how altruism contributes to society in the form of nongovernmental organizations (NGO), specifically human-rights and environmental advocates. My research will also cover the theory of attention in how it is used as a variable to determine how successful an NGO is in the social media biosphere. Drawing connection, my research will add to information available for the growing sector of NGOs in the economic market as well as the under-researched area of business in social media. How and what NGOs do via social media will conclude how much attention they receive from the public and whether or not this factor is detrimental in their success of accruing resources that are used to further their own research, public visibility, and donations.

#### Impact of International Trade on Local Poverty

Theodore Wisinski (Kenneth Louie), Penn State Behrend – Economics

Curious how purchasing products in your city made abroad affect how your neighbors fare in everyday life? What about whether or not you and your community are better off because of the products that local business sends overseas? This empirical study focuses on identifying the impact of international trade on the extent and depth of poverty across state and local regions within the United States. With the increasing availability of data at the sub-national level (e.g., at the state and local levels for the United States), more empirical studies are being devoted to investigating the impact of international trade (or globalization more generally) on local labor markets. This is in stark contrast to most previous work, in which the focus has usually been on labor market effects at the national level. Detailed sub-national data can offer more insights into how trade may affect workers in a disparate way across geographical locales within the country. This study uses measures of import and export data as well as several control variables to assess whether local trade does, in fact, result in lower (local) levels of poverty and increase overall worker well-being as previous national level studies suggest.

### ENGINEERING

#### Incrementally Formed Stiffeners Effect on the Reduction of Springback in 2024-T3 Aluminum after Single Point Incremental Forming

Sean Dodds, Zachary Reese, and Brandt Ruszkiewicz (John Roth and Ihab Ragai), Penn State Behrend – Mechanical Engineering

Single Point Incremental Forming (SPIF) is a relatively new process to form sheet metal. SPIF utilizes machines such as CNCs and mills to form a part by making several spiraled passes, deforming the metal a certain distance, known as the step-size, with each pass. One major issue with this process is springback. Once the metal is removed from its clamping fixture, the residual stresses that resulted from the forming process cause the material to springback. The purpose of this paper is to demonstrate how incrementally forming a stiffener on the outside of the desired geometry will manipulate the stress concentrations in the metal, and effectively reduce the amount of springback that occurs after the specimen is unclamped from its fixture. For these tests, stiffeners were formed on the outside of a truncated pyramid; the material used for these tests was 2024-T3 aluminum. After the work pieces were removed from their clamping fixtures, the amount of springback that they experienced was examined using geomagic software to determine the ideal stiffener parameters for reducing springback for a truncated pyramid in 2024-T3 aluminum.

#### Fabrication and Mathematical Modeling of Microscale Fuel Cell Electrodes

Daniel Doleiden (Adam Hollinger), Penn State Behrend – Mechanical Engineering

With the advancement of portable technology, energy-dense compact power sources are of increasing concern. Microscale direct methanol fuel cells (DMFCs) show promise as an alternative to traditional lithium-ion battery packs due to their high power density. To facilitate the adoption of DMFCs as a mainstream mobile power source, manufacturing parameters must be defined to allow the rapid, consistent production of high-quality electrodes. In addition, mathematical modeling of electrode performance as a function of input parameters will aid in design optimization by eliminating the necessity of iterative fabrication design processes. Here, a study of DMFC electrode fabrication and simulation via mathematical model is presented. As a result of ongoing research, high performing (>20 mW/cm2) electrodes of various catalyst deposition widths were fabricated and tested, enabling a UNIX-based mathematical model of electrode performance to be fine-tuned to a given set of experimental parameters. A positive correlation between experimental data and model predictions was observed.

#### Study of Acoustic Signals and Mechanical Properties Dependence during Cold Drawn A36 Steel Quenching

Nicholas Erich and Chris Conklin (Chetan Nikhare and David Loker), Penn State Behrend – Mechanical Engineering

Heat treating is an important process in metal manufacturing and processing industries. One of the most important parts of heat treating metals is quenching. Quenching a metal is performed by heating it to a specific temperature in the furnace for a set amount of time then immediately cooling in a fluid medium. These media commonly include water, brine, air, or oil. By varying the temperature and cooling rate, desired mechanical and metallurgical properties can be achieved for the demands of the part. Since the cooling is done immediately after removing the metal from the furnace, quenching produces a sound emission. This work investigates A36 steel to study the link between the acoustic signature of the quench and the mechanical and metallurgical properties. The noise is captured by a beam former with 32 microphones. Various samples were quenched for different amounts of time and all sound emissions were recorded; tensile tests were performed to determine the mechanical properties of the steel. Also, microstructure analysis was performed. It is hypothesized that the mechanical and metallurgical properties will vary with the number of quenches, as will the acoustic signature.

#### An Investigation on the Relationship between Current Density, Pulse Period, and Pulse Duration

Jesse Jarrett (Chetan Nikhare), Penn State Behrend – Mechanical Engineering

Since the inception of the automotive and aerospace industry, the use of sheet metal has grown exponentially to suit the needs of large companies. In recent years, environmental regulations have been more rapidly implemented, and companies have had to respond by producing more efficient and environmentally friendly ways to manufacture parts. These methods include Electric Assisted Manufacturing (EAM). EAM is a method that processes a broad range of materials, and shows much promise to be an effective way for more efficient manufacturing. Since this technique is relatively new, information regarding the subject is limited. In order to broaden knowledge about the subject, this project use parameters such as current density, pulse duration, and pulse period to develop an equation. This equation can then be used to help automobile and aerospace industry companies get the best out of different materials in order to optimize efficiency.

#### Wear Monitoring Tool Holder

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

In milling operations, tool failure due to excessive wear can result in operator injury, damage to machinery, the production of poor quality parts, or costly downtime. To eliminate such undesirable outcomes in machining processes, it is necessary to develop a method for monitoring tool health that can predict tool failure and indicate the current health status of the tool to the operator. Due to the limitations of mechanistic models, an approach incorporating real-time monitoring of tool health is required for practical implementation in a manufacturing environment. This project examines the viability of an accelerometer-based real-time wear monitoring and tool failure prediction system incorporated into the tool holder of a vertical mill. The system is designed to be capable of autonomous operation and RF transmission to a remote computer for extensibility to accommodate small machine shops as well as highly automated manufacturing environments. Furthermore, a framework for communicating with the tool holder was created, enabling extensibilities including an internet-based monitoring system, automated part ordering system, and automated tool changes in CNC machines.

#### Methodology to Design a Multipurpose Product

Johnathan Moody (Shraddha Sangelkar), Penn State Behrend – Mechanical Engineering

Multipurpose products are the devices that have more than one functionality. This research investigates the design methodology of multipurpose products. We conducted this research because there is no current information on how to design multipurpose products or what the consumers prefer when buying multipurpose products. To bridge this gap in knowledge we created a database of existing multipurpose products to understand the baseline attributes of what has been designed and the common components used in multipurpose products. We also conducted surveys to observe customer preference on the functions of multipurpose products. This investigation led us to develop a methodology for designing multipurpose products. Further, using the methodology we are planning on designing a multipurpose product to survey during the summer of 2015.

#### Effect of Electric-Assisted Heating during Diffusion Process

Randy Redfield (Chetan Nikhare), Penn State Behrend – Mechanical Engineering

When metals are heated in the presence of specific elements, the elements may diffuse into the interstitial space given the size the atom being diffused is small enough. The current process that industry uses for diffusion uses a thermoreactive diffusion process involving a conventional furnace and gaseous nitrogen (N2), carbon dioxide (CO2), among other gases. The purpose of the diffusion is to coat the metal with a layer of alloyed metal to change the metals chemical and mechanical properties. Compared to the thermoreactive diffusion process, the electrically assisted diffusion process is expected to have a difference in the interstitial regions and flow path of diffusion because of the flow path of electrons throughout the metal. The electrical current passed through the metal produces resistive heating. In order to fully understand the effects of the electricity, the metal will undergo diffusion at a set temperature and pressure, both in the thermoreactive process and electrically assisted process. This is so the effects of the flow pattern of the electrons can be observed in full. Finally, given enough time and resources, we would like to investigate the driving forces involved with diffusion by varying the pressure.

#### Locally Applied Direct Electric Current’s Effect on Springback of 2024-T3 Aluminum after Single Point Incremental Forming

Brandt Ruszkiewicz (John Roth and David Johnson), Penn State Behrend – Engineering

Incremental forming is a sheet metal forming technology that utilizes a spherical tipped tool and a CNC machine to form a part through a series of spiraling tool paths. Springback is one of the largest concerns for incremental forming since a part can be the exact shape desired after forming until the part is unclamped from its forming fixtures, at which point it will springback due to the residual stresses resident in a part due to the forming process. This paper demonstrates how locally applied electric current can be utilized to reduce the springback due to residual stresses. The tests conducted in this paper demonstrate this concept via incrementally formed truncated-pyramid shapes that were formed from 2024-T3 aluminum. The residual stress concentration locations of the pyramid were determined using finite element analysis (FEA). Direct electric current was locally applied to the stress concentrations of the pyramid prior to unclamping. Various current densities, time intervals, and electrical pulse locations were examined to find the ideal conditions for reducing springback for a tested geometry of 2024-T3 aluminum.

#### Design for Developing World

Chris Spalla (Shraddha Sangelkar), Penn State Behrend – Engineering

The focus of “Design for Developing World” is to utilize the engineering students at Penn State Behrend to assist in designs that will benefit the unindustrialized world. By introducing new technology to these parts of the world we can help increase the standard of living while giving students the benefit of seeing real-world application of their studies. For instance, by utilizing solar driers to dry fish the quality of the final product can be vastly improved in addition to taking less time. The initial research done will help establish contact with counterparts in the regions where new designs can be implemented with a primary focus in areas surrounding Mumbai. Potential projects will be investigated to determine their scope and knowledge base to proceed. Depending on the difficulty and the work hours necessary to complete the projects satisfactorily, projects would be completed by me, the Behrend branch of Engineering Without Borders, or set aside for senior design projects for the 2015-2016 class.

#### **Change in Elongation and Tensile Strength during Annealing of AA5083 Alloy**

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

Sheet metal forming is a widely used manufacturing process for many different applications. The aerospace and automotive industries are strong players in sheet metal forming. Various types of metals and alloys are used for numerous stamping purposes in these industries. Mostly aluminum alloys are preferred over other high density metals due to their high ductility as well as strength to weight ratio to create stronger and lighter parts which eventually benefited fuel economy. The annealing process is one method to determine how these alloys will respond under certain conditions. It is common to expect that the longer an alloy is heated and held at higher temperatures, the elongation will increase with a decrease in tensile strength. This paper will provide the result of elongation and tensile strength of aluminum alloy 5083 (AA5083) after annealing. AA5083 will be analyzed at different annealing temperatures and times in three distinct directions to the rolling direction. It is expected to find a point where a different time and temperature can provide the same material properties. Saturation annealing temperature and time of this aluminum alloy will also be observed in order to determine the parameters of electric-assisted manufacturing.

### COMPUTER ENGINEERING / SCIENCE AND MATHEMATICS

#### Test Bed for Measuring Power of FPGA Multipliers Used in FIR Filters

Nick Angelo (George Walters), Penn State Behrend – Computer Engineering

Field Programmable Gate Arrays (FPGAs) are used for many high-performance Digital Signal Processing (DSP) systems. The dominant operation of these systems in terms of resources required, delay and power consumption is multiplication. One important type of circuit is a LUT-based multiplier. Recently, the collaborating faculty member filed a provisional patent for a fundamental circuit used in LUT-based multipliers. LUT-based multipliers using this circuit have been found to use significantly fewer resources and to be faster than the best LogiCORE IP designs available for licensing from Xilinx. In addition to measuring resource usage and delay, there is a need to measure and compare power consumption of these multipliers. The objective of this research is to develop an FPGA test bed that can be used to measure multiplier power consumption in a realistic DSP system with a realistic analog input.

#### Practical Hierachical Temporal Memory for Time-Series Prediction

Nicholas Hainsey (C. David Shaffer), Westminster College – Computer Science

In this project we will be modifying an existing application, Nupic Studio, in order to test the accuracy and practicality of using Hierarchical Temporal Memory (HTM) for time-series prediction under varying amounts of voice. HTM is a type of neural network developed by Numenta Inc. which models the neurons in the human neocortex. Nupic Studio in its current state is a graphical interface that allows the user to create and view an HTM network, train it, and get statistics on the network and its predictions. Currently it can read in data from a file step by step and perform predictions on what the next step should be. We will be adding the option to read in data from a network connection as well as the option to add noise to the data being read in.

#### GPS Adventure: Web Portal for Virtual Geocaching

Ben Parker (C. David Shaffer), Westminster College – Computer Science

With the growing usage of smart phones, access to GPS devices is increasing. One application of GPS devices is geocaching. Geocaching is a high-tech treasure hunt game utilizing GPS devices. One problem with Geocaching is maintenance of these “treasures,” they are likely to become a victim to vandalism, weather, or both. In order to combat this, a virtual treasure could be used in place of a physical treasure. Motivation to use the system should be provided for all participants whether hiding the treasure, or seeking the treasure. This project is the web portal for this game. This project will focus on a framework or API and website that will support this game. Users are able to search for, view, create, update, or delete missions and waypoints. Integration of social media into the project will be discussed.

#### Investigation of New LUT-Based Multiplier for Xilinx FPGAs

Steven Rose (George Walters), Penn State Behrend – Computer Engineering

Field Programmable Gate Arrays (FPGAs) are used for many high-performance Digital Signal Processing (DSP) systems. The dominant operation of these systems in terms of resources required, delay and power consumption is multiplication. One important type of circuit is a LUT-based multiplier. In 2013, Xilinx was issued a patent for a new LUT-based multiplier design. LUT-based multipliers using this circuit have been found to use significantly fewer resources and to be faster than the best LogiCORE IP designs available for licensing from Xilinx. The purpose of this research is to investigate this new design and compare it to the already available LogiCORE IP designs.

#### Numerical Solutions for Convection of Groundwater Adjacent to Horizontal Impermeable Surfaces with Axisymmetric Temperature and Mass Distribution

Timothy Sam and Shambhavi Gupta (Javed Siddique), Penn State York – Mathematics

In this project we discuss the effects heat and mass transfer have on axisymmetric buoyancy induced ground water flow adjacent to a horizontal impermeable surface. The wall temperature and mass concentration are taken as power functions of the radius. We use the boundary layer approximations to transform the governing system of non-linear partial differential equations into a system of non-linear ordinary differential equations (ODEs). The coupled ODEs are solved numerically using MATLAB’s boundary value solver, BVP4c. We present velocity, temperature and mass concentration profiles for physical parameters of the system.

#### Some Issues Regarding Quaternionic Calculus

Stanley Tuznik (Joseph Previte), Penn State Behrend – Applied Mathematics

The quaternion number system is a generalization of the complex numbers that was developed in the early nineteenth century by Hamilton. While these numbers find many useful applications in problems involving computer graphics and mechanical rotations, we are interested in understanding how the notion of differentiability relates to these numbers. After a brief introduction to the basic properties of quaternions, we will show that the notion of differentiability becomes much too restrictive for quaternionic functions. That is, there are only a few functions that satisfy differentiability. We will suggest several alternatives such as analyticity and examine their limitations.

#### The Neurodynamics of Bursting Oscillations in the Hindmarsh-Rose Model

Stanley Tuznik (Antonio Mastroberardino), Penn State Behrend – Applied Mathematics

The Hindmarsh-Rose model is a popular choice for simulating the behavior of a single neuron, as it is able to capture, qualitatively, the spiking and bursting behaviors that are observed experimentally. This three-dimensional nonlinear system relies on a slow adaptation variable which dynamically switches the neuron from a period of firing to a quiescent period, a phenomenon known as bursting. We describe the underlying mechanism behind the bursting by reducing the model to a single-parameter system in the phase plane. We then consider a simplified version of coupled oscillators used to model the coupling of two such neurons.

#### Evaluating the Viability of Online Learning Systems

Nicholas Verno (Terri Lenox), Westminster College – Computer Information Systems

In our modern world, technology is growing more rapidly than ever before. When it comes to education, technology is also playing a greater role; with online courses growing in popularity. This study seeks to observe students from different majors and observe how they learn across various disciplines such as math, literature, science, and many others. These students will be taking the course offered by Coursera titled “Learning How to Learn: Powerful Mental Tools to Help you Master Tough Subjects.” In this course, students will be learning from video lectures, exercises, and other types of problems. The ultimate goal from this study is to get feedback from the students with their opinions of online learning systems via surveys, and to determine if an online learning system can improve performance in the long-term.

### PSYCHOLOGY AND WOMEN’S STUDIES

#### Mediators and Moderators of Resiliency after Trauma: An Exploratory Study

Alyssa Craig, Cassandra Bramblett, Allison Rupe, Richard Greatbatch, and Jessica Stoker and the Coping, Stress, and Trauma Lab (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

Currently there is a lack of research on the relationship between resiliency and protective factors and the effects of trauma within the general population. The purpose of this study was to identify potential variables that mediate or moderate the relationship between trauma and resiliency.We developed a survey using validated questionnaires and posted it online for the general population to assess their history of interpersonal violence and other traumas, risk factors, resiliency and protective factors, as well as their effects. Researchers analyzed the data using regression.We hypothesize that individuals who exhibit greater amounts of resiliency and protective factors will also show greater levels of post-traumatic growth. We hope to collect enough data to perform analyses using structural equation modeling to find the possible predictive relationships between trauma and resiliency factors. Any relationships found could be used in clinical treatments and prevention efforts. We also plan to compare our findings with past clinical samples to see if there are any differences in resiliency factors for subjects who have experienced interpersonal violence or other traumas and subjects who have not.

#### An Experimental Method of Assessing Bystander Intervention and Risk Recognition in Sexual Assault Situation

Rebecca Dinsmore, Danielle Carioto, Christa Franco, Allison Gage, Kasey Jerioski, Taylor Morris and the Coping, Stress, and Trauma Lab (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

The current study strives to validate an experimental method of examining the likeliness to intervene in a sexual assault situation and to determine what variables are linked with enhanced bystander risk recognition. Participants were recruited at a medium-sized college (N = 49; 34% male) to progress through an acquaintance rape scenario from the position of a bystander. At each scene, they were asked how they felt and how they would respond. Participants then completed a series of questionnaires. Participants’ beliefs about the effectiveness of being a bystander were associated with earlier feelings of being uncomfortable and confused (rs = -.49 and -.46, respectively). Participants’ feelings were not significantly related with their own sense of efficacy, confidence in their ability to intervene, or pro-con decisions. The pattern of means suggest that participants were more likely to take action as risk increased, but men were more likely to intervene at crucial points. Our findings thus far suggest that an increase in an individual’s beliefs about effective bystander intervention is inconclusive with a person’s willingness to intervene in high-risk situations.

#### Meta-Analysis of Sexual Assault Prevention Programs

Richard Greatbatch and Jessica Stoker (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

Recent studies have shown that bystander intervention paradigms are effective tools in reducing sexual violence. Currently this meta-analytical project seeks to compare bystander-intervention training programs with various forms of sexual violence education programs. Research advocates that interventions that increase self-efficacy and skills have a greater effect in increasing behavioral change. The researchers foresee that the self-efficacy and skills learned by educating those with the bystander intervention model will have a significantly greater effect compared to other preexisting models. By using literature search engines, reference lists, and posting requests on listservs for unpublished data the researchers will identify and compare appropriate codes for main effects, moderators of effect, and outcome variables. This comparison will be done using meta-analysis software that will determine if bystander intervention programs provide a stronger effect than other forms of intervention. If results of the meta-analysis are concurrent with the hypothesis, incorporation of the most effective strategies into community and college programs can begin to take place.

#### Emma Sulkowicz, #CarrythatWeight, and the Erasure of Affect in Antirape Solidarity Moments

Andrea Jacoby (Barbara Shaw), Allegheny College – Women’s, Gender, and Sexuality Studies

In September 2014, Columbia University student, Emma Sulkowicz, gained widespread attention when her senior thesis, a performance art piece in which she was to carry her college-issued mattress with her at all times on campus in protest of Columbia’s inadequate response to her rape, went viral. Soon afterward, Sulkowicz’s performance was taken up in a series of demonstrations of antirape solidarity at college campuses nationwide. While the importance of solidarity and politics of visibility cannot be understated in the context of campus antirape activism, the rhetorical power of Sulkowicz’s performance piece is located in her public claiming of victimization, something which other people cannot physically carry for her. The nation-wide uptake of Sulkowicz’s demonstration erases the purpose and pain behind her symbolic action. In this paper, I will unpack the multiple meanings of Sulkowicz’s mattress in order to fully illustrate the rhetorical power of the original art piece. I then argue that the #CarryThatWeight demonstrations, despite their collective intention as acts of solidarity, undermine the discursive work of Sulkowicz’s original performance by co-opting and universalizing an individual experience of violence and victimization.

#### Feminist Criticism and Online Pro-Ana Communities

Alyxandra Mance (Barbara Shaw), Allegheny College – Psychology and Women’s Studies

Online communities provide support and entertainment for users of all walks of life. In this paper, I explore the pro-ana (pro-anorexia) community as a domain where anorexic behaviors and attitudes are encouraged. Self-proclaimed members of the pro-ana community push each other to self-starve, to excessively exercise, and to practice self-loathing in order to become “elite.” They potentially lure the impressionable and the vulnerable, persuading them that the community provides caring and nurturing advice as to how to best live as a woman in control. My research analyzes the pro-ana community as it is constructed in personal online blogs. I draw on postmodern cyberfeminism as a lens, asking larger cultural questions about how online gender norms frame women’s experiences of eating disorders.

#### Evaluation of the Impact of Therapy Dogs on Children with Physical, Behavioral, and Emotional Disabilities in an Educational Environment

Katey Marsh, Emily Galeza, Wes Dorrenbacher, and Brianna Zaffino (Heather Lum, Victoria Kazmerski, and Dawn Blasko), **Penn State Behrend – Psychology**

Animal-assisted therapy can have a positive impact on individuals in an educational setting. Unfortunately, the research has been largely anecdotal and lacked formal observations. The purpose of the current study was to measure the effectiveness of dog-assisted therapy for children with Autism in a more scientifically rigorous fashion. Once a week, observations were recorded with the current dog therapy program at the Elizabeth Lee Black School in the Barber National Institute. Each session was filmed and the videos were coded using behavioral markers such as emotional control, communication skills, social skills, body control, and attentiveness. Data from additional surveys were also collected from teachers and parents identifying the same behavioral markers. Comparisons were between sessions with the dog and education sessions without the dog. We predict children will show more positive behaviors in the categories of emotional control, communication skills, social skills, body control, and attentiveness when they have interacted with the dog compared to a classroom group setting. The data found will be used to measure the effectiveness of the current dog therapy programs and make suggestions for improvement.

#### How Survivors of Betrayal Trauma Interpret Conflict with Authority Figures

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

Trauma perpetrated by an individual in a position of authority is defined as betrayal trauma. Most research on betrayal trauma has focused on relationships between either parents or romantic partners as the perpetrators. We hypothesized that individuals who experienced betrayal trauma would be more likely to submit to authority figures compared to those who have not experienced betrayal trauma. In order to expand the knowledge about betrayal trauma and its long-term effects, we assessed participants’ trauma history, had them perform stress inducing tasks, and recorded their reactions to a confederate demanding that they leave the room. We divided participants into groups based on their trauma history. The groups were those who have experienced betrayal trauma, general trauma, or no trauma. Our preliminary data showed that individuals who have experienced betrayal trauma also showed a trend of flat affect after the confrontation with the confederate researcher. The group of individuals with betrayal trauma also had significantly higher amounts of PTSD symptoms, coping, and a lower internal locus of control. Future research should focus on reasons why victims of betrayal trauma are experiencing an alexithymia response to confrontation and examine if this correlates with symptoms of dissociation.

#### A Comparison of Coping Strategies on Induced Stress

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

Although the human body is very resilient, it is still susceptible to various dangers, such as stress. Stress not only causes physical health problems, but can also affect mental health. Dealing with stress in long-term serious situations has been the main focus of previous research. There is less research on ways for young adults to deal with short-term, less severe stressors, such as balancing work and course load. Our study focused on how short-term daily stressors can be reduced in college students by coping methods. We induced stress in participants through the Trier Social Stress Test. Then, one of three coping mechanisms were employed; music, humor and mindfulness. Participants were also given stress and demographics questionnaires. The participants’ physiological responses and self-report of stress were measured. There was a main effect in that all coping methods reduced both physiological and perceived stress more than the control condition. Results showed the use of these healthy coping methods were more effective in reducing the induced stress compared to the control condition. Our results are promising in showing that there are

### SOCIAL AND BEHAVIORAL SCIENCES

#### Peoples Temple in San Francisco, 1970-1977

Jessie Lamb (Barbara Shaw), Allegheny College – History

Peoples Temple is most commonly known for the mass suicide and murders of its 918 members in the jungle of Guyana on November 18, 1978. However, this tragedy does not erase the productive work the Temple was involved in. Peoples Temple had a long history of social activism connected to the counterculture movements of San Francisco and northern California in the 1960s and 1970s. Peoples Temple ran nursing homes, drug rehabilitation centers, camps for mentally disabled peoples, and college scholarship programs. The Temple appealed to white, young, middle-class college graduates dissatisfied with the current society and to poorer urban African Americans who felt left out by society and unable to make a change. Temple friends included activist Angela Davis, leader of the Black Panthers; Huey Newton; and politician/activist Harvey Milk; among others. It is important to study Peoples Temple, as well as recognize the erasure of its social activism, in order to understand why particular people join fringe social movements and how the larger society works against these movements. There was something about Temple activism and it’s community structure that appealed to marginalized people. The culture of San Francisco during this time period allowed for the success of Peoples Temple.

#### The Unwritten War

Matthew Lesnett (Joseph Beilein), Penn State Behrend – History

Archie Clements—the true embodiment of a Civil War guerrilla, known more commonly as Bloody Bill’s “chief scalper” or “head devil”—has been painted by historians as a savage individual driven by bloodlust, but my work refutes this claim, arguing that Clements was driven to violence by the harm that beset his family and antebellum expectations. I used a variety of research methods, utilizing census records, other primary resources that provide witness observations of the war, and secondary sources to analyze the opinions of other scholars. Within the larger picture of the Civil War, Clements occupies an unwritten portion of American history, known as the Missouri guerrilla conflict. Furthermore, an in-depth study of Clements’ life provides us with a lens through which we can view past and present guerrilla actors. Although this paper is a work of history, there is relevance to the current circumstances of America’s overseas conflicts. While we may objectively view the enemies of America as bloody killers, the application of the lessons learned through my research and paper enables us to change our perspective and view these killers as men, motivated by their ideals, beliefs, and their desire to protect their families.

#### From Ye to Yeezus: Branding, Authenticity, and the Post-Soul Aesthetic as Employed in the Music of Kanye West

Alexander Neal (Joe Tompkins and Emily Yochim), Allegheny College – Communication Arts

Kanye West has been a cultural force since the debut of his first album 2004, and over the years he has garnered both positive and negative attention from the mainstream media. This presentation will situate Kanye West alongside many other cultural forces at work in our contemporary moment. The work focused on the concept of post-race and its representation within Kanye West’s music. The presentation will be working mainly with Mukherjee’s definition of post-race; this concept is viewed as the construction of a neoliberal or “proper” racial identity – one that fits within white dominant culture. The implementation of post-race in popular culture, specifically rap and hip-hop, allows listeners to be engaged in the contemporary discourse surrounding issues of race in America. West’s music offers a rich text in which to implement this theory of post-race and candidly discuss what it means, and how it is represented, within and across dominant culture. With the cultural relevancy possessed by West, the way that these concepts are embodied and expressed carries much weight, and therefore lends itself to great critique and conversation.

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

Danielle Ropp (Leigh-Ann Bedal), 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, but have things improved for veterans of the Iraq and Afghanistan Wars? With the increasing drawdown of troops from these combat areas, analyzing just how these veterans are received by the government and public is becoming increasingly important. Through research with a variety of primary, secondary, and government sources, I have concluded that the government and the American public has started to better address the issues Iraq and Afghanistan veterans face, unlike with Vietnam veterans. The general public has not turned against Iraq and Afghanistan veterans as they did with Vietnam veterans, and society is able to separate the soldier from the war itself. The recent VA and government reforms have helped to provide Iraq and Afghanistan veterans with many of the services they need, specifically focusing on educational and social issues. However, there is more that needs to be done to help veterans ease back into civilian life, specifically, more research into decompression programs that will cut down on issues with PTSD and suicide.

#### Diversity Discourse at Allegheny College: The Commodification of Citizenship in Neoliberal Times

Lee Scandinaro (Julie Wilson), Allegheny College – Communication Arts

This study was conducted to understand why identity is such a contentious and anxiety-provoking issue on college campuses. The following research investigates discourses of diversity at Allegheny College in an effort to answer this question: What is at stake here is whether higher education remains a place where public engagement is promoted or one consumed by corporate commodity culture. Six interviews were conducted with white men at Allegheny College, each around one hour in length. The responses collected serve as the main text for this project. These responses show that “diversity” is being used as a branding strategy at Allegheny College to attract savvy consumers of higher education. New perceptions of citizenship are being superficially achieved through diversity consumerism is this neoliberal landscape.

## POSTER PRESENTATIONS

### BIOLOGY I

#### Effects of Climate-Change Induced Shifts in Caddisfly Distributions on Ecosystem Function in High Elevation Ponds

Jared Balik (Scott Wissinger), Allegheny College – Biology and Environmental Science

Many ecologists have reported shifts in species distributions as a result of climate change. In the central Rocky Mountains (USA), long-term changes in snow pack, snow melt, and spring temperatures have prompted shifts in the distribution of detritus-shredding caddisflies that live in ponds. These shifts have occurred at montane and subalpine elevations along pond-permanence gradients, while certain species have gradually moved upslope. Shifts in the species composition of this detritivore guild have the potential to affect both detrital and algal trophic paths in pond foodwebs. The goal of our research was to determine how these shifts affect basic ecosystem processes, and specifically, the mobilization of detritus-bound nutrients. Here, we report on species-specific excretion rates of ammonium- nitrogen and soluble phosphorus obtained pond-side using an incubation technique conducted in closed microcosms. We found that 1) within species, there is little variation in the per-unit biomass rate of excretion, 2) some, but not all species have similar per-unit biomass excretion rates, and 3) that background levels of these nutrients decrease with elevation. Combined with survey data on abundance and nutrient/chlorophyll-a regressions, these data will be used to parametrize models to predict how shifts in species composition will affect overall pond productivity.

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

Kelly Cowher, Erin Eperthener, Caitlin Goncz, Brendan McCreath, and Stephanie Judd (Fred Brenner), Grove City College – Biology

Understanding dispersal patterns of the white-tailed deer (*Odocoileus virginianus*) is important to the management of this species. This study involves samples from the Dayton Ohio MetroParks (Germantown, Englewood, and Taylorsville), Mercer County Pennsylvania, and Presque Isle State Park in Erie, Pennsylvania. Obtaining samples from these areas allows migration and diversity to be observed within and between rural and urban habitats. To examine migration patterns, DNA from the non-coding mitochondria displacement loop (D-loop) was isolated from samples of liver and/or muscle of deer from these areas. Examining the mitochondrial DNA allows maternal lineages to be observed as well as nucleotide diversity of the deer in each area. 108 individuals were sequenced. Results of this study showed greater genetic diversity among the deer in rural habitats than those living in urban habitats, suggesting that surrounding environment does impact dispersal patterns. Specifically, deer living in the Dayton MetroParks showed the least amount of genetic diversity.

#### Determining a Safe Amount of Antifungal Treatment for Rana clamitans Tadpoles to Reduce Batrachochytrium dendrobatidis Infections

Jennifer Diethelm (Matthew Venesky), Allegheny College – Biology

In recent years, the pathogenic chytrid fungus *Batrachochytrium dendrobatidis* (Bd) has been cause for concern because of its ability to drive amphibian populations to extinction. In response, many zoos and aquariums are attempting to preserve at-risk species by utilizing captive breeding programs for species that are extinct in the wild. However, collecting, and clearing, amphibians of their Bd infections is not straightforward because many antifungal treatments can cause mortality by themselves. The purpose of this research was to investigate at what dose the antifungal Ick© could clear Bd infections in green frog (*Rana clamitans*) tadpoles without causing an increase in mortality. We used 2x4 factorial in which Ick doses (none, low, medium, and high) were crossed with Bd exposure (non-exposed and exposed). As predicted, Bd exposure reduced tadpole survival (*P* < 0.05). In addition, we detected a significant main effect of Ick on tadpole survival (*P* < 0.001), where tadpoles exposed to the medium dose had the highest mortality. Bd exposure and Ick did not interact to affect mortality. No evidence was given as to the effectiveness of Ick© in clearing Bd infections. Future research is needed to determine if Ick© is the best treatment for Bd infected amphibians.

#### Molecular Quantification of Cryptobranchus a. alleganiensis eDNA Using qPCR

Jordan Gaston1, Carolyn McPhee2, and Mayu Uemura2 (Matthew Venesky1 and Mizuki Takahashi2), 1Allegheny College and 2Bucknell University – Biology

Eastern hellbenders (*Cryptobranchus a. alleganiensis*) are currently in a state of decline, as natural and anthropogenic factors disturb their habitat. Hellbender’s long lifetime of 30-50 years can result in a skewed age structure if populations exhibit low juvenile recruitment. With already dwindling numbers, the need to identify and determine the age structure of remaining hellbender populations is urgent. However, current methods of surveillance are not only costly, but also disruptive to the salamander’s mating patterns. The non-invasive technique of eDNA sampling makes it a particularly useful tool for studying declining populations without disrupting the environment and has shown to be more effective than searching for species manually. This investigation was conducted to determine if known populations of hellbenders could be detected using qPCR applied to eDNA, if quantities of hellbender DNA present were correlated to seasonal mating patterns, and correlation to nocturnal activity. Trials of qPCR performed on streams with known hellbender populations have yielded successful detection of hellbender DNA. While only preliminary findings, data show higher levels of hellbender DNA present during peak mating seasons and more so when collected at night. Thus qPCR of hellbender eDNA may be a viable, sustainable option for natural hellbender population surveillance.

#### A Four-Year Study Examining the Antibacterial Effectiveness of Agion Silver Zeolite Technology on Door Handles within a College Campus

Nicole Kingston, Shane Baker,Michelle Hornedo,Hasan Khan, Brenton Maloy, Nesve Ozsoy, Paul Ruiz-Pelet, and Laura Wheeler (Beth Potter), Penn State Behrend – Biology

Laboratory studies have shown that small concentrations of silver are effective at inhibiting the growth of microorganisms through the disruption of important cell structures and processes. The additional ability to incorporate silver into surfaces has increased the usage of silver in the medical field and expanded its use into the consumer market. To understand the impacts of increased silver-containing antimicrobials, it is important to determine whether silver-based consumer goods are effective at reducing bacterial populations. Our study examined the antibacterial effectiveness of Agion silver zeolite technology applied to 25 silver- and control-coated door handles across a college campus. Door handles were sampled for six-week periods in the fall and spring semester and bacteria were cultured and enumerated on tryptic soy agar (TSA), MacConkey agar (MAC), and mannitol salt agar (MSA). A significant difference was observed between the bacterial populations isolated from silver- and control-coated door handles after three years. However, bacteria were consistently isolated from silver-coated door handles suggesting that the silver zeolite was only effective against a portion of the bacterial populations.

#### The Effect of Abiotic Environmental Changes on the Resistance of Green Frog Tadpoles Rana clamitans against the Fungal Pathogen Batrachochytrium dendrobatidis

Allie Lundell (Matthew Venesky), Allegheny College – Biology

During the last two decades, climate change associated with anthropogenic influences has been responsible for a wide range of hydrological variability in natural aquatic ecosystems. If hydrological variability increases an organism’s physiological stress, this would also reduce its capacity to fight off infections. In this study, we investigated whether varying the water depth and water surface area influenced disease resistance in green frog (*Rana clamitans*) larvae when exposed to the fungal pathogen *Batrachochytrium dendrobatidis* (*Bd*). Based on previous studies, we predicted that shallow depth and large surface area environments would be least stressful and thus result in the lowest *Bd* infections. Surprisingly, we found that most tadpoles resisted infection, regardless of the water treatment type and that exposure to *Bd* did not reduce tadpole survival. However, independently, container type significantly affected the time length of tadpole survival. The shallow depth container had the highest length of survival time while small surface area had the lowest. According to the results, depth is revealed to have a greater effect than surface area on tadpole survival, and overall, locations of hydrological variability would best promote tadpole survival in environments that are shallow and have a large surface area.

#### Over Winter Spatial Density Patterns of Whitetail Deer

Josh Paradise (Richard Bowden), Allegheny College – Environmental Science

Whitetail deer are undeniably one of the most influential big game animals of North America. As habitat generalists deer have mastered forest ecosystems in a plethora of climates, and affect them in variety of ways. Resource managers have been trying to track and predict the nuances of how deer interact within their environment. The goal of this study was to identify how the distribution of land covers effect the intensity of usage. Collected by the U.S. Forest Service, pellet counts from twenty-six one square mile study sites within the Allegheny National Forest (ANF) were used to identify habitat preferences of Whitetail deer. GIS was utilized to identify land cover categories including, coniferous, deciduous, mixed, and open. Across all blocks, land cover percentages and pellet counts were calculated: 14% coniferous with 184 pellets, 36% deciduous with 347 pellets, 43% mixed with 393 pellets, and 7% open with 61 pellets. Geostatistical analysis technique known as kriging was used to interpolate levels of usage from the pellet data. Results from this study show that when pellets were found in coniferous and open land cover they occurred at a much higher intensity. However, there were significantly less instances of pellets in open land covers.

#### Inactivation of Pathogens on Contact Surfaces through the Use of Radiant Catalytic Ionization

­Khyati Patel and Richa Patel (William Mackay, David Fulford, and Craig Steele), Edinboro University – Biology

Foodborne illness outbreaks linked to fresh products are becoming more frequent and widespread. The National Institute of health has released values for the cost for food borne illness, and per person on average it costs 1,626 dollars; this correlates to 77.7 billion dollars a year. Removing or reducing the amount of these bacteria will increase quality and shelf life of many perishable and nonperishable goods and prevent future outbreaks. New sanitizing technologies have emerged in recent years and are being used in a multitude of places to better decontaminate contact surfaces. Radiant Catalytic Ionization (RCI), is thought to be safe in humans as an organic form of treatment to disinfect food contact surfaces through the use of radical oxygen species. RCI has countless applications for reducing the number of bacteria on a variety of surfaces with varying conditions. The focus of this study was the inactivation bacteria introduced on to the tips of sterile cotton swabs, and food surfaces, using RCI. Our results indicate a 90% reduction in the recovery of bacteria with a 60-minute exposure to RCI, demonstrating that the oxidative gases produced with RCI is an effective surface disinfectant tool for use in food processing.

#### Sampling of Arthropods across the Penn State Behrend Campus

Ciara Petrick (Mathew Gruwell), Penn State Behrend – Biology

The Barcode of Behrend project used a variety of sampling techniques to collect arthropods from different environmental systems throughout the Penn State Behrend campus. Collecting samples from the different ecological niches ensured a diverse sampling of arthropods (i.e. aquatic insects, wood beetles, etc). The more variety that is collected the better understanding of the biodiversity on campus. It is important to understand the biodiversity of arthropods on campus as every organism contributes to the greater biodiversity on earth. Arthropods contribute much of Earth’s biomass and interact with other organisms. Samples were collected and stored in 100% ethanol to preserve DNA material for future extraction and DNA sequencing in order to barcode the diversity of arthropods on campus.

#### Antimicrobial Resistance among Microbial Occurrence in Grocery Store versus Farm Poultry Products

Jason Turba (Om Singh), University of Pittsburgh at Bradford – Biology

Occurrence of microorganisms in natural food product is ubiquitous; however, concerns remain if certain bacterial strains could emerge as specific pathogens with antibiotic resistance. The antimicrobial resistance (AMR) or antibiotic resistance among foodborne pathogens is of major concern in health sector. We hypothesized diversity of microbial occurrence will reveal a broad range of AMR in poultry products (i.e. meat and eggs) collected from local grocery stores versus farm. Therefore, the studies were set up to determine the existence of AMR among microbial occurrence in meat and eggs collected from local grocery and farms. The microorganisms were enriched nutrient broth medium from eggs, meat, and feces samples at 22°C. The enriched liquid culture was subjected to four different antibiotics, chloramphenicol, kanamycin, streptomycin, and ampicillin, at various concentrations ranging from 250-5000 μg/ml. The viable cells in antibiotics were determined after 48 hrs of incubation using standard colony forming unit (CFU) methods. A total of 14 different bacteria were observed, with bacteria such as *Stenotrophomonas rhizophila* showing AMR at higher concentration. The isolates were further tested on nutrient agar plates supplemented with varying concentrations (250-5000 μg/ml) of antibiotics. The isolates were identified using 16s rRNA sequencing via NCBI and easytaxon database. AMR was observed in nearly every culture to some degree of magnitude which invokes concern to the accumulation effect that overuse of antibiotics negatively has on the poultry industry, locally and commercially.

#### Chronic Nitrogen Inputs Decrease Carbon Enzyme Activity in a Deciduous Northwest Pennsylvania Forest

Lauren Wind (Rich Bowden), Allegheny College – Environmental Science

Soil bacteria and fungi exude enzymes that control soil organic matter processing, thus influencing forest productivity. Recent studies show that N additions to forests result in increased soil carbon (C), with some studies in N-poor forests showing reduced rates of enzyme activity. We examined effects of chronic N addition on soil enzyme activities in a productive, N-rich, temperate forest in northwestern Pennsylvania. Soil organic matter (SOM) and H+ concentrations were higher in the organic horizon than in the A horizon, and were higher in fertilized soils than control soils. The enzymes β-glucosidase, phenol oxidase, and peroxidase were assayed to analyze effects of increased N enzyme activity. Significant differences were found for β-glucosidase and peroxidase activity between treatments and soil horizons, but not for phenol oxidase activity. Peroxidase activity was 72% higher in the organic horizon and β-glucosidase was 64% higher in the A horizon of the control soil. Differences in enzyme activity between horizons are likely to be related to the predominance of organic matter quality within soil horizons. Long-term N deposition that reduces decomposition may result in short-term increases in SOM, but long-term effects on nutrient availability and forest productivity are unknown.

#### The Effect of 1,4-Dimethylnaphthalene on Saccharomyces cerevisiae Amino Acid and Protein Metabolism

Mohammed Al Shibar (Michael Campbell), Penn State Behrend – Biology

1,4-dimethylnaphthalene (DMN) is a compound, naturally occurring in plants, associated with inducing activated protein kinases (MPKs) and controlling osmotic pressure. In this research project, the effect of DMN on *Saccharomyces cerevisiae* (baker’s yeast) amino acid and protein profiles was investigated, to elucidate the process of which DMN can alter osmotic pressure and induce MPKs. Free amino acids were isolated and labeled using an AccQ-tag method. Labeled amino acid profiles were analyzed using High Performance Liquid Chromatography (HPLC), demonstrating that DMN has minimal or no effect on the amino acid profiles of *S. cerevisiae*. This research project has also focused on examining the expression of the HOG1, a protein involved in controlling osmotic stress. The results obtained, from samples isolated at multiple instances prior and post exposure to DMN, indicate that this exposure may alter the expression of HOG1, either directly or indirectly. However, further research is needed to confirm these results.

#### The Relationship between Spatial Memory and Cholinergic Signaling in the Rat Striatum

Jason Brandl and Stephen Hart (Catherine Mattinson), Gannon University – Biology

The striatum is an area of the brain that is essential for spatial memory and motor functions, and cholinergic interneurons are critically involved in neurotransmission within the striatum. These experiments sought to measure performance in a spatial memory behavioral task as well as record dynamic cholinergic signaling in distinct sub-regions of the rat striatum. To measure spatial memory performance in the rat, a Morris water maze was used to assess rats based on their correction or regression from their initial performance in this behavioral task. To examine differences in cholinergic signaling in striatal sub-regions, as related to spatial memory, we used 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*. After data collection is completed, correlative analyses will be performed to help to elucidate a better understanding of the relationship between cholinergic signaling in the striatum and spatial memory. These data will then be used to guide our future experiments in a rat model of aging.

#### The Evolution of Pharyngeal Arches and Teeth of Bluegill and Pumpkinseed Sunfish

Sourabh Goyal (Greg Andraso and Kelly Grant), Gannon University – Biology

We are exploring the epigenetic and genetic origins of different morphologies of bones. Specifically, we study the pharyngeal bones in two closely related sunfish: bluegills and pumpkinseeds. The morphology of the pharyngeal bones significantly differs in area and tooth type. Bluegills have a relatively narrow pharyngeal tooth plate with sharp, recurved teeth, whereas pumpkinseeds have a larger, thicker pharyngeal tooth plate with molariform teeth. We are currently cloning and investigating candidate genes to determine if differences in their expression correlate with the different morphology of the bones in bluegills and pumpkinseeds. In particular, my research has focused on cloning Beta-catenin. This gene functions as a downstream component of wnt signaling and has a conserved role in tooth and bone patterning.

#### Determination of CRKNOX1, CRKNOX2, and CRKNOX3 Expression in the Fern Ceratopteris richardii

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 the 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*. Primers were designed to amplify *CRKNOX1*, *CRKNOX2*, and *CRKNOX3* and used to assess their relative expression in *C.* *richardii.* RT-qPCR analysis showed *C. richardii* expresses all three *CRKNOX* genes. *CRKNOX1*, *CRKNOX2*, and *CRKNOX3* expression was highest in young sporophytes*.* Sequence analysis is currently being performed to confirm amplicon sequences.

#### Elucidation of the ANI1 Genomic Sequence in the Fern Ceratopteris richardii

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

Changes in expression of the *antheridiogen induced 1* (*ANI1)* gene in gametophytes of the fern *Ceratopteris richardii* were reported to be associated with male determination in response to antheridiogen. The *ANI1* full-length cDNA sequence is known; however, no information is available for the genomic sequence. The purpose of this study was to identify DNA sequences of regions flanking the *ANI1* coding region, including upstream regulatory promoter elements, and to identify any intronic sequences. Genomic DNA was isolated from *C. richardii* sporophyte tissue and amplified using *ANI1* gene-specific primers to identify the presence or absence of non-coding sequences. Amplicon length was consistent with the known length of the *ANI1* cDNA sequence suggesting *ANI1* is an intronless gene. Additionally, isolated DNA underwent parallel nuclease digestion using restriction enzymes chosen for their inability to cut the *ANI1* cDNA sequence. Cut DNA was circularized and amplified using primers designed for inverse PCR. The presence of multiple amplicons suggests further optimization of the inverse PCR method is required; however, these results may also be explained by the presence of related genes or variant alleles within the genome. Further studies continue to optimize the inverse PCR method and will isolate individual amplicons for DNA sequence analysis.

#### Genetic Knockdown of Cystathionine β synthase (CBS) and Methylenetetrahydrofolate Reductase (MTHFR) in Zebrafish

Emily Mitchell and Katelyn Reisenauer (James Warren), Penn State Behrend – Biology

Vitamin B9 or folic acid is needed by the body to perform many different functions such as DNA and RNA synthesis, red blood cell production, and neural tube development. When analyzing the effects of pharmacologically disrupting folate metabolism in zebrafish, developmental abnormalities were observed such as abnormal pigmentation, circulation, and neural tube defects linked to increased levels of homocysteine, similar to defects seen in humans. Zebrafish are a widely used model system for genetic studies in vertebrate development because they share a considerable amount of genetic identity with humans. In our lab, we selectively knocked down gene expression of CBS and MTHFR with morpholino oligonucleotides to observe the resulting phenotypes based on folate metabolism disruption. CBS is an enzyme that uses folic acid to convert homocysteine and serine to cystathionine. MTHFR is responsible for converting homocysteine to methione. Therefore, knocking down CBS and MTHFR should result in higher levels of homocysteine and abnormal phenotypes. We injected embryos with Rhodamine Dextran, a fluorescent vital dye, in order to perfect our injection techniques before injecting the embryos with CBS and MTHFR morpholinos.

#### “Evo-Devo” of the Pharyngeal Apparatus of Bluegill and Pumpkinseed Sunfish

Corrie Olson, Bradley Nowosielski, and Sofiya Bychkova (Greg Andraso and Kelly Grant),

Gannon University – Biology

We are interested in the differences in the pharyngeal apparatus of bluegills (*Lepomis macrochirus*) and pumpkinseeds (*Lepomis gibossus*), closely related sunfish that can interbreed. The focus is determining why each species has different morphology of their pharyngeal bones, specifically ceratobranchial 5 (cb5) and pharyngobranchial 3 (pb3). As adults, bluegills have small bones with sharp teeth and pumpkinseeds have larger bones with molar-like teeth. We hypothesize that differences in expression of genes involved in bone growth and tooth development cause these morphological differences. Activity gradients of Ectodysplasin (Eda) and its receptor Edar, regulate the size and shape of bone and teeth in mice. Expressional levels of Bone Morphogenetic Protein 6 (BMP6) regulate bone size and tooth spacing in stickleback fish. We are attempting to clone these genes and investigate their expression in bluegills, pumpkinseeds, and their hybrids. RNA was extracted and reverse transcribed to synthesize cDNA. We designed degenerate primers to conserved regions of these genes and amplified those fragments. We are hoping to clone these cDNAs so we can perform qPCR to quantify the expression of these genes. Further cloning of full-length cDNAs is required to investigate the expression of these genes via *in situ* hybridization.

#### Examination of the Role of the transGolgi Network in Cell Survival during Acute Cellular Stress

Alexander MacFarlane and Robert Ramirez (Quyen Aoh), Gannon University – Biology

Nitrogen plays a key role in metabolism, DNA and protein synthesis. In *Saccharomyces cerevisiae*, cellular uptake of nitrogen is mediated by nutrient transporters such as Gap1. Gap1 is synthesized and transported from the *trans*Golgi network (TGN) and endosomes to the cell membrane through a regulated process that involves many proteins. We are investigating whether the clathrin adaptors Ent3 and Ent5 regulate trafficking of Gap1. Using fluorescence microscopy, we have found that deleting *ENT3* prevents transport of Gap1 to the cell surface and redirects it to the vacuole. To assess the effect of *ENT3* on cell fitness we examined growth rates. We found the deletion of *ENT3* severely impaired growth under conditions that require Gap1. Our results suggest that Ent3plays a critical role in nitrogen regulation. In the future we will investigate the role of Ent5 and examine how Ent3 interacts with other known regulators of Gap1 trafficking.

#### Changes in Canis lupus Skull Morphology in the Continental United States before and after the Endangered Species Act

Lara Stein (Lisa Whitenack), Allegheny College – Biology

Currently, the North American wolf is making a successful recovery, despite human extermination efforts that left the United States with only one small surviving pocket of individuals in Minnesota. This is thanks in part to extensive recovery efforts including reintroduction and the Endangered Species Act (ESA) of 1973. The wolves that were reintroduced to the United States post-1973 were of a different subspecies (*Canis lupus occidentalis*) than their original United States counterparts (*Canis lupus irremotus*), though its relevance is unclear as the two would have existed simultaneously and likely interbred. I hypothesized that there are morphometric differences in the United States wolf skulls of today (post-1973) and the United States wolf skulls of the past (pre-1973). This study uses geometric morphometrics and multivariate F-tests to explore morphological changes in the skulls of wolves from the continental United States before and after the 1973 ESA. 31 pre- and 31 post-ESA skulls significantly differed in shape with the post skull being more compressed with smaller zygomatic arches than the pre skulls. These differences are likely due to genetic drift, the founder effect, population bottlenecks, and recent hybridization with coyotes.

#### The Role of SCAMP3 in transGolgi Network (TGN) to Lysosomal Trafficking

Miranda Thompson (Quyen Aoh), Gannon University – Biology

A unique feature of eukaryotic organisms is the compartmentalization of specific functions into membrane-bound organelles. The movement of cargo between organelles, also known as membrane trafficking, is crucial to cell survival and is often disrupted in diseases. However, the mechanisms of how trafficking is disrupted is often unclear. Secretory Carrier Membrane Proteins (SCAMPs) are integral membrane proteins. There is emerging evidence that SCAMPs play important roles in trafficking of various proteins. We are interested in SCAMP3, which has been shown to be involved in ubiquitin-dependent trafficking. We present evidence that SCAMP3 is involved in trafficking molecules from the *trans*Golgi Network (TGN) to the lysosome. We show that SCAMP3 is co-localized with the adaptor Gga3, which traffics cargo from the TGN to the lysosome. We also show that ubiquitin and SCAMP3 co-localize in cells depleted of UBPY, a deubiquitinase implicated in lysosomal trafficking of cargo molecules. These results suggest that SCAMP3 may traffic lysosomal enzymes from the TGN to the lysosome. In the future, we will use RNA interference to deplete SCAMP3 and examine the effect on the trafficking of the lysosomal hydrolase Cathepsin D. Our results may have implications for neurodegenerative disorders, which often involves disrupted TGN to lysosome trafficking.

#### ANI1 Expression Varies Spatially in Hermaphroditic Gametophytes of the Fern Ceratopteris richardii

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

Gametophyte gender in the fern *Ceratopteris richardii* is influenced by a pheromone called antheridiogen, which is secreted by hermaphrodites. With antheridiogen, spores develop as males. Without antheridiogen, hermaphrodites develop. The gene *ANI1* (antheridiogen induced 1) is reported in the literature as being expressed during male development, in response to antheridiogen, and is thought to be important for male determination. Research in our lab has shown comparable *ANI1* expression in mature hermaphrodites. The purpose of this project was to determine the spatial expression of *ANI1* in the hermaphrodite and use this information to develop and test hypotheses to understand *ANI1* function. Mature hermaphrodites were exposed to two distinct types of cuts. One separated edge pieces containing antheridia from central portions containing archegonia, rhizoids, and a notch meristem. A second type of cut separated the bottom containing rhizoids from top pieces containing the notch meristem. *ANI1* expression in each piece was determined using RT-qPCR. Central portions exhibited higher expression of *ANI1* than edge pieces, while bottom pieces exhibited higher expression than top pieces. Our working hypothesis is that the rhizoids express high levels of *ANI1* and we have developed and implemented experiments to further support this hypothesis.

### ENVIRONMENTAL BIOLOGY

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

Dave Alexander and Alex Davis (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 22 August to 12 September 2013, 14-16 June 2014, 10-12 July 2014, 14-16 August, 2014, and 13-14 September 2014. The majority of animals found were male *Peromyscus leucopus* (white-footed mice). This project is the beginning of an ongoing study that will collect data from the spring and summer of future years for comparison. This research will provide valuable information regarding whether these habitat islands can successfully be used as natural mammal habitats.

#### Yoga: A New Way to Approach Environmental Education?

Brynya Bowden (Eric Pallant and Eleanor Weisman), Allegheny College – Environmental Studies

Environmental educators realize that individuals need not only information, but active experiences to increase environmental understanding. Yoga, a mind, body, and spirit experience, emphasizes physical activity and environmental awareness through its philosophical viewpoints. This project sought to determine if incorporating yoga into environmental education increases environmental understanding among elementary school students at the Environmental Charter School, Pittsburgh, Pennsylvania. I taught four environmental life cycles to two 25-student kindergarten sections. I met with both sections four times over one month for sixty minutes each time, alternating the sections that received an environmental life cycle only approach versus an approach that included life cycle analysis and a related thematic yoga exercise. Pre- and post-assessments of knowledge showed that, overall, the presence of yoga did not increase students’ environmental understanding. However, variations between the two sections and among topics suggested that in some cases, yoga did increase student learning of environmental lessons. For example, a lesson on the carbon cycle showed a four-fold increase in student understanding with inclusion of yoga. Kindergarten students may already have sufficient classroom activity that enhances learning, but older students, where physical classroom activity is usually limited, might benefit from inclusion of yoga.

#### Using STEM-Technologies for Educational Outreach: Programmable Microcontrollers Demonstrate the Flash Pattern of the New Pennsylvania Synchronous Firefly Species Photinus Carolinus

Brittni Cumberland, Megan Foster, James Horwedel, Ashley Maxton, Sarah Peacock, and Kristin Smithmyer (Denise Piechnik), University of Pittsburgh at Bradford – Biology

Fireflies, or lightening bugs, are members of the beetle family Lampyridae. Most members of this family use bioluminesence to communicate with potential mates. The Lampyrid species *Photinus carolinus* is unique among fireflies because groups of males flash synchronously to gain the attention of females, who also flash in response to the males. This fascinating behavior by *P. carolinus* is considered by some behavioral biologists to represent a new principle of courtship behavior, coined the “synchronization-response.” Populations of *P. carolinus* were recently discovered in Pennsylvania's Allegheny National Forest and the Allegany State Park of New York. Our interdisciplinary poster display highlights research on the unique aspects of *P. carolinus* to broaden public awareness of the natural history, autecology, and threats to this species. This research is combined with a realistic display of the complex flashing behavior of *P. carolinus* using LEDs controlled by programmable microcontrollers that are coded to mimic the synchronized courtship display*.* This approach represents an innovative and engaging way to inform the public about *P. carolinus,* its synchronous communication display, and the conservation efforts needed to protect this species.

#### Our Global Eco-Future: Preparing Students for International Environmental Problem Solving

Hillary Krill (Eric Pallant), Allegheny College – Environmental Science

To solve the world’s environmental problems, global issues such as climate change, undergraduate students should develop international collaboration and problem solving skills. Institutions of higher education have recently worked to engage undergraduate students in cross-cultural environmental discussions. Social media can be a useful tool for global communication among undergraduate students since students frequently use social media to communicate with their friends and peers. Thus, I designed a social media campaign to encourage students in the United States, England, and Brazil to participate in four Meatless Monday events in November and facilitated communication among students through Facebook and a blog. The results show that a small proportion of invited students participated in this campaign. By reviewing students’ responses to a survey that I administered, the results suggest that undergraduate students represent millennial culture in which they use social media for socialization purposes while following active student and extracurricular schedules. Cross-cultural barriers do not inhibit student participation as much as the fact that students are primarily restricted by their busy schedules and obligations.

#### Determining the Effectiveness of a Green Roof’s Ability at Neutralizing Acid Rain

Nichole Latimer (Michael Campbell and Ann Quinn), Penn State Behrend – Biology

Acid deposition, known as acid rain, is the result of nitric and sulfuric acid acidifying any type of precipitation.  This precipitation reaches its highest concentration in Pennsylvania and New York damaging the ecosystem. Green roofs are a possible solution to minimize the effects of acid rain on an ecosystem.  A green roof is a roof that is covered with vegetation for sustainability purposes.  The objective of this research was to determine the effectiveness of the green roof’s ability to neutralize acid rain. This research consisted of setting up the medium and three species of sedum (*Sedum spurium* ‘Voodoo,’ *Sedum rupestre* ‘Angelina,’ and *Sedum spurium* ‘Fuldaglut’) into trays.  These trays were kept indoors where the conditions were controlled to a 12 hour light regime, 700 ml water every week, and a constant temperature of 72˚F.  The medium with and without each type of  sedum was tested as to how well it neutralized acid rain at pH’s 7, 6, 5, and 4. The growth medium did buffer the water, but not to the desired pH 7.  Instead, the final pH values centered at pH 5.9. The implications of this research are that this medium would be most effective in an area with high amounts of acid rain.

#### Study of Regional PA Tick Species Utilizing Collections from Pennsylvania Game Commission CWD Hunter Check Stations: A Preliminary Study

Rachel Masciarelli, Stephanie Pitman, Amanda Hutzelmann, Amy Lind, Ryan Braumann, Amanda Everett, Abigail Cleveland and Colin Fort (Tracy Farone, Heather Barton, and Frederic Brenner), Grove City College – Biology

In humans and susceptible animals, the incidence rates and locations of tick-borne diseases have been shifting as tick species have been transported to different parts of the United States through varying migratory bird flight patterns, climate change, and geographical host range changes. While the Centers for Disease Control and Prevention (CDC) has predominantly documented *Ixodes* *scapularis* in Pennsylvania, we have identified *Dermacentor* *albipictus* ticks in addition to the *I.* *scapularis*. Ticks collected from six Pennsylvania Game Commission Chronic Waste Disease (CWD) deer check stations during the fall of 2013 indicate that *D. albipictus* is becoming a dominant collected species along with *I. scapularis*. In addition, *I.* *scapularis*, *D.* *variabilis*, *Rhipicephalus* *sanguineus* and the *D.* *albipictus* were identifiedfrom samples collected from the six regions and Presque Isle State Park. This is a significant public health concern because various tick species can introduce Lyme disease and other diseases into historically low incident-rate areas. Our research goals were to 1) Identify ticks by species, 2) Inform the public about potential exposures to current and potentially new tick-borne diseases in Pennsylvania, and 3) Provide opportunities for undergraduate student involvement in a cooperative research program.

#### What Do Students on Allegheny’s College Campus Know about BPA?

Khalia Thompson (Caryl Wagget), Allegheny College – Environmental Science

BPA, bisphenol A is a synthetic estrogen found in plastic products.  Although it has been banned from baby bottles and nipples, it is still found in everyday products such as cash register receipts, plastic water bottles, and the lining of metal cans. BPA has been researched and evidence has pointed to it being an endocrine disruptor, meaning it disrupts the endocrine system, leading to adverse health outcomes. Although there are products that advertise being BPA free, there are other products that people are exposed to containing BPA, that are putting them at risk without their knowledge. I plan on conducting a survey with students in the different sections of Introduction to Environmental Science, and Introduction to Global Health, to test their knowledge of BPA. The data from this survey will allow me to analyze how well known BPA is among college students.

### BUSINESS, HEALTH, AND COMMUNITY OUTREACH

#### Yes She’s a Woman, But Can She Race? Media Framing Theory Towards NASCAR Driver Danica Patrick

Melinda Aley (Huan Chen), Penn State Behrend – Communication

Research has shown that the media has the power to frame the opinion of an audience by the amount of time given to a subject or the tone used in the discussion. Previous research has found that women in sports are framed differently than their male counterparts. However, one exception seems to be Danica Patrick, the first full-time female driver in the NASCAR Sprint Series. As a female in a male-oriented sport, the media seems to frame her as having stronger driving capabilities than she truly has. In order to test the hypothesis, a content analysis was conducted to examine the amount of media attention given to Patrick, with a research design focusing on specific selections of drivers and races occurring during NASCAR’s Race for the Chase Championship. The results found that NASCAR gives Danica Patrick media attention much closer to that of top drivers than to drivers closer to her own abilities.

#### Assessment of Food Security and Barriers to Healthy Eating in the Meadville Community

Alyssa Brindle (Caryl Waggett), Allegheny College – Global Health Studies

A strong correlation has been observed between obesity and poverty, and the nutritional environment is thought to contribute to the present obesity epidemic. This research suggests that access to adequate, high quality, affordable food is critical. This study was conducted to obtain baseline data on price, quality, and availability of healthy food in the Meadville, Pennsylvania area, by evaluating 25 food outlets in the Meadville Pennsylvania area using the recently developed Nutrition Environment Measures Survey for Stores and Convenience Stores (NEMS-S, CS). This audit examined price, quality and availability of 11 categories of basic foods across stores. Comparing data from Meadville to national baseline NEMS study data in Atlanta, Georgia suggest that to families living in poverty, Meadville could be considered a food desert in terms of healthy and affordable foods due to their scarcity and limited availability. Studies show that intervention efforts to improve the food environment can positively impact families’ habits and behaviors. Findings from our research therefore can be used to design targeted interventions in the nutritional environment to improve food security for low-income families in the Meadville region.

#### An Investigation of Wage Discrimination in the NBA: Foreign Born vs. U.S. Born Player Salary

Adam Bronson (Stephanie Martin), Allegheny College – Managerial Economics

Through the 1980s and until the early 1990s, fan and employer discrimination were the focus of sports economic literature. Empirical evidence obtained among various economists showed that fan discrimination began to diminish in the NBA throughout the 1990s due to a rising presence of black players. Today, the representation of player nationality is the primary focus of wage discrimination research in the NBA. In respect to player salary, do foreign players receive a wage premium for their potential to generate revenue in foreign markets from NBA television contracts? The latter question, an analysis of wage discrimination by race, and the evaluation of possible NBA employer discrimination through a profit maximization model are examined in this research paper.

#### Organic Waste Logistics

Nicolas Carbo (Ann Quinn and Phyllis Mansfield), Penn State Behrend – Sustainability/Business

The purpose of this research was to analyze the plausibility and ease of separating food waste from regular waste as well as the benefits that can come along with organic recycling. The pilot study was designed to look at places that produced a lot of food waste. A realization that money could be saved through separating organic waste for composting in addition to recycling or trash was the intended outcome. The sample size consisted of three restaurants and two schools. All five locations were used to measure a baseline for amount of food waste generated for a certain size location. To quantify results, food residuals were weighed daily for a month-long period from the three restaurants. Food waste and numbers of students were quantified from the schools as well. The findings indicated environmental and monetary benefits were realized for the separation of organic waste from waste that would go out in the trash.

#### Evaluating Physical Activity among Preschoolers at an Income Eligible “Pre-K Counts” Program in Rural Northwest Pennsylvania

Cailyn Lingwall (Caryl Waggett), Allegheny College – Global Health Studies

Childhood obesity is a national epidemic, impacting health, productivity, and economics. Obesity and overweight impact lifelong mental and physical health. Childhood obesity accounts for $14.1 billion in direct health care costs nationally. While obesity rates among preschoolers declined in 19 of 43 states, rates continue to rise in Pennsylvania. Obesity and poverty are tightly correlated, and rural Pennsylvania faces high poverty rates. Fully 22.6% of Crawford County children (0-17) live below the federal poverty level (2013), and 12.9% of our low-income preschoolers were obese during 2009-2011. To mitigate the double regional impact of poverty and early obesity, this study focuses on the pre-school environment. Pre-K programs help children develop attention, behavioral, social, and academic skills for kindergarten. Preschoolers require more physical activity than elementary children, yet achieving recommended daily levels is difficult in childcare settings. Preschoolers require one structured and several unstructured hours of physical activity. Assessing the gap between recommended and actual activity is critical. I am evaluating activity deficits in an income-eligible 4-STARS Pre-K Counts program, and conducting interventions to bridge the daily gap. Helping Pre-K programs meet recommended physical activity can counteract long-term health issues while developing motor skills, social and problem solving skills, and improving learning.

#### Zooming in: A Photovoice Project that Asks 4th Grade Students Living in Meadville, PA to Frame How They Experience Physical Activity

Sara Schwartz (Caryl Waggett), Allegheny College – Environmental Studies

When promoting positive change for community wellness, it is vital to understand and consider the needs, wants, and perspectives of the community itself. Photovoice is a Participatory Action Research (PAR) method used to capture and share the perspectives of a segment of the community through their words and images. It is a particularly effective tool to give a voice to those who are considered a marginalized population and have limited say in decision-making. “**Zooming in**” provided an opportunity for 4th grade Meadville, Pennsylvania students to frame their behaviors and to voice their thoughts on physical activity in their community through photovoice. Over the course of five one-hour sessions, eight participants expressed the role of physical activity in their lives, inaccessibility and inactivity during winter, and potential designs for indoor activities and venues. Responses ranged from preferred activities to barriers to daily activity. Participants’ words and photos were showcased in a gallery with related photovoice projects (food justice and community identity) in an effort to share the youths’ perspective with community members and leaders, by identifying needs and highlighting challenges. This project emphasizes the value of this qualitative data collection tool for gathering and synthesizing a variety of individual, otherwise unheard, voices.

#### ExpERIEnce Children’s Museum Exhibits

Kimberly Tarosky, Erin Stroup, Amanda Balos, and Andrea Bogert (Melanie Ford), Penn State Behrend – Engineering

Recent technical difficulties have forced the local children’s museum to discard the adored bubble exhibit. As a result, new exhibits need to be created to fill this open space. The purpose of the research is to develop and create new exhibits that introduce children to science, engineering, math, and technology fields. After looking into exhibits that exist at other museums, the research team presented a list of eight projects to the museum coordinators. After much discussion, it was decided that the team would create two of the projects: a portable pipe-organ for the museum to take on trips to different communities and an LED control grid to remain stationary at the museum.

### CHEMISTRY

#### Comparing Graphene Oxide Electrochemically Reduced from Aqueous and Non-Aqueous Solutions for the Purpose of Serving as an Electrocatalyst Support Material

Issaka Agbere (Jason Bennett), Penn State Behrend – Chemistry

Dicyano-ferriprotoporphyrin ((CN)2-FePP) is an electrocatalytic material known to be sensitive towards H2S oxidation, however its polymerization on Pt electrodes leads to incomplete surface coverage and a minimally stable layer. Considering a way to overcome this problem, the use of graphene oxide as supporting material has become increasingly interesting due to its unique thermal, mechanical, and electrical properties. Although considerable research efforts have focused on depositing graphene oxide via electrochemical reduction (ERGO); most studies achieve this in an aqueous solution, but avoid addressing the difficulty in achieving complete surface coverage due to the evolution of H2 gas during the reduction process. This is especially problematic when trying to coat a metallic surface such as Pt. This presentation will compare the electrochemical deposition of ERGO on platinum electrodes using non-aqueous (ERGODMF) and aqueous (ERGOAq) solutions to determine which delivers better surface coverage while still retaining its electrochemical integrity and could potentially serve as an electrocatalyst support material in future devices.

#### Synthetic Modifications of Hypervalent Iodine Reagents

Anita Brkic (Michael Justik), Penn State Behrend – Chemistry

The current impetus in hypervalent iodine compounds is two-fold. New reagents including ‘engineered’ versions of those already in use are widely studied in the literature. Second, the scope and reactivity of these reagents are constantly being explored. In this investigation we have endeavored to study synthetic modifications of hypervalent iodine compounds. Our focus in this study is modifications of the betaines based on 2-[(aryl)iodonio]benzenesulfonates, while maintaining the iodonium moiety intact. Reactions we have studied include electrophilic aromatic substitution, ligand exchange and modifications of the sulfonate moiety.

#### Oxidative-Substitution Reactions of Polyaromatic Hydrocarbons with BF3-Activated Iodonium Ylides of 1H-1-Hydroxy-1,2,3-Benziodoxathiole 3,3-Dioxide

Zak Ekstrom (Michael Justik), Penn State Behrend – Chemistry

The treatment of polyaromatic hydrocarbons with bis(carbonyl)methylides of 1*H*-1-hydroxy-1,2,3-benziodoxathiole 3,3-dioxide formed in situ in the presence of Et2O·BF3 leads to bis(carbonyl)alkylation of the aromatic nucleus. The recovered reduced iodine compound is easily recovered by aqueous extraction and can subsequently be recycled and reused. This chemistry allows the facile functionalization of polyaromatic hydrocarbons, well known to be carcinogenic and mutagenic pollutants, as feedstock for organic synthesis.

#### Inhibiting Quorum Sensing Ability of Bacteria through the Use of Diversely Functionalized Isoxazolines

Jessica Kuehne, Connor Link, and Ivonne Schneider (Amy Danowitz), Mercyhust University – Chemistry

Bacteria that are resistant to antibiotics pose a serious threat to human health. As traditional antibiotics are failing, it is important to design new strategies for targeting bacterial growth and survival. One potential strategy is to inhibit quorum sensing. Quorum sensing is the process by which bacteria utilize small organic molecules to communicate among each other. Inhibiting the quorum-sensing ability of bacteria will have large impacts on human and environmental health as this could be an effective new antibiotic strategy. By introducing diversely functionalized isoxazolines synthesized from their respective functionalized aldehyde into bacteria, their quorum-sensing ability would be disrupted. A phenotypic bioassay will be utilized to determine the effectiveness of the isoxazolines to inhibit quorum sensing in bacteria. These synthetic routes will produce a wide range of viable molecules for the inhibition of quorum sensing in bacteria. Initial efforts in this realm are reported here.

#### Synthesis of Flavanones from 2-Hydroxychalcones using 1H-1-Hydroxy-5-Methyl-1,2,3-Benziodoxathiole 3,3-Dioxide

Johnny Lorigan (Michael Justik), Penn State Behrend – Chemistry

In this investigation various 2-hydroxychalcones were converted in moderate to high yields to flavanones by treatment with catalytic amounts of 1*H*-1-hydroxy-1,2,3-benziodoxathiole 3,3-dioxide (HMBI) in conjunction with Oxone® as the stoichiometric oxidant. The reduced materials are easily removed from the reaction mixture by liquid-liquid extraction. The flavanones were isolated and purified by recrystallization or preparative thin layer chromatography.

#### Probing the Nitrite Reductase Activity of wt Human Serum Albumin Reconstituted with Heme

Emily Luteran (Mary Grace Galinato), Penn State Behrend – Chemistry

Human Serum Albumin (HSA) is the most abundant protein in plasma and is a carrier for many compounds found in the body. HSA reconstituted with heme (HSA-heme) forms a pentacoordinate complex that has functional properties similar to myoglobin but has a proximal tyrosine residue instead of histidine, which is found in the latter. Beyond the fifth ligand, the similarities in structure lead to the main question of this work: does HSA-heme have the ability to reduce nitrite to nitric oxide (NO), thus displaying nitrite reductase (NiR) activity? Nitrite reductases are important because they regulate the production of NO, which is beneficial in the right amounts but detrimental in excess. The NiR activity of HSA-heme was studied by slow kinetics reaction and spectral analysis. Preliminary results indicate the potential formation of NO as indicated by color changes from light brown (before the addition of nitrite) to a peach color, which is characteristic of a ferrous nitrosylated compound. Spectral analysis shows overlay between the HSA-heme NiR product and the Fe(II)-NO form, further supporting the unique functionality of HSA-heme as a nitrite reductase. Future work entails using a more specialized technique to confirm the presence of NO beyond spectral analysis.

#### Vacuum Ultraviolet Photolysis Matrix Isolation Infrared Spectroscopy of GeH4 in Argon and Nitrogen Matrices

Pierre Mott III (Jay Amicangelo), Penn State Behrend – Chemistry

Germane (GeH4) was deposited in matrices of argon and nitrogen (N2) at 12 K with simultaneous vacuum ultraviolet (VUV) photolysis, producing transient species (unstable molecules) studied using infrared spectroscopy. Based on previous literature research, VUV photolysis of germane in an argon matrix produced fragments of the formula GeHx (x = 1, 2, 3). Based on previous work with silane (SiH4) from our group, VUV photolysis of germane in a nitrogen matrix was expected to produce fragments of the formula GeHxN2 (x = 1, 2, 3), but instead produced fragments of the formula GeHx in a nitrogen matrix. Theoretical calculations were performed using the Gaussian 03W computational chemistry program for each observed fragment, using density functional theory with the B3LYP functional and the aug-cc-pVDZ basis set. The theoretical calculations elucidated probable structures of the observed fragments, as well as simulated infrared spectra of each fragment. These simulated infrared spectra were compared with the experimental spectra to help assign observed infrared peaks to specific fragments.

#### Influence of the Second-Sphere Coordination on the Nitrite Reductase Activity of Globins

Anthony Rodland and Jaclyn Gowen (Mary Grace Galinato), Penn State Behrend – Chemistry

Globins serve a second function by acting as a nitrite reductase (NiR), converting nitrite (NO2-) to nitric oxide (NO), the mechanism of this reduction is unknown, but believed to follow a mechanism similar to *cd1* NiRs. Understanding this mechanism is important because the precise control of NO plays a key role in several biological processes for many mammals. Imbalance in NO concentration can lead to a variety of heath issues. One important aspect of this mechanism may be the hydrogen-binding second-sphere coordination network, which is formed between polypeptide matrix in myoglobin (Mb) and its heme propionate group. It is suspected that this network stabilizes the intermediates in the reaction, aiding in protonation. To study the effect of this network, heme *b* in wt Mb was replaced with a non-H-bonding heme, protoheme IX dimethyl ester (PPIX-DME). Slow kinetics reactions between PPIX-DME Mb and NO2-, monitored through UV-vis spectroscopy, were carried out. The loss of the Fe(II) species of Mb was monitored at 432 nm as a function of time. Preliminary results from the experiment indicate pseudo-first order decay, with a bimolecular rate constant similar to that of wt Mb (~5.0 M-1 s-1 at 25 °C).

#### Quantifying of Defect Sites for a Standard Single-Walled Carbon Nanotube Sample

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

Single-walled carbon nanotubes (SWNTs) possess physical and optical properties that allow for potential applications like flexible electronics, super-tensile strength materials, and biosensors. Nanotubes are hollow cylindrical structures comprised of aromatic rings that exist in a variety of geometries and lengths. Semiconducting SWNTs are unique fluorophores. Their optical properties are affected by defects introduced by harsh processing techniques required to dissociate nanotube bundles and produce aqueous SWNT suspensions. Our goal is to create a reliable method to quantify the average number of defect sites per SWNT in a standard sample. CoMoCAT SWNT samples were suspended in deuterium oxide solvent and an anionic surfactant. Following homogenization, sonication occurred for a standard length of time; this process damaged nanotube sidewalls and produced SWNTs of shorter lengths. Determining dimension distributions of the SWNTs is crucial to characterizing our samples and obtaining the average number of defect sites per nanotube. The sample was analyzed using an atomic force microscope (AFM). AFM allows for the determination of SWNT length and diameter distributions within a sample. Altogether, the defect quantification method will lead to better practice for SWNT sample production and will enable researchers to explore new opportunities to develop sensing applications based on SWNT defect sites.

#### Characterization of an Ethanol-Benzene Complex Using Matrix Isolation Infrared Spectroscopy

Matthew Silbaugh (Jay Amicangelo), Penn State Behrend – Chemistry

A 1:1 complex of ethanol (C2H5OH) and benzene (C6H6) was characterized by matrix isolation infrared spectroscopy. Co-deposition experiments of these two molecules were performed in both argon and nitrogen (N2) matrices at 20 K and yielded new peaks for the O-H group stretching within the ethanol and the out-of-plane bending vibration within the benzene. Identification of the new peaks assigned to the 1:1 C2H5OH:C6H6 complex was partly determined by comparing the co-deposition spectra to the separate monomer spectra of ethanol and benzene in an argon and nitrogen matrix. Theoretical calculations using the Gaussian 03W computational chemistry program at the B3LYP level with the aug-cc-pvdz basis set were performed for the C2H5OH-C6H6 complex. The theoretical infrared spectra were compared to the experimental spectra to help assign the peaks of the 1:1 C2H5OH:C6H6 complex.

#### Molecular Modeling of Iron Porphyrins and Platinum Surfaces

Susanne Simkovitch (Jason Bennett and Scott Simpson), Penn State Behrend – Chemistry

Selective in vivo detection of H2S over CO and NO is crucial to the understanding of disorders associated with the central nervous and cardiovascular systems. When deposited on a platinum surface, cyanide-coordinated ferriprotoporphyrin, or hemin, can be used as an electrode for H2S detection. Computational molecular models were used to better understand the role that hemin, an iron-porphyrin complex, play in a platinum-hemin based sensor. Using Projected Densities of States and isovalue plots of the frontier molecular orbitals, the HOMO and LUMO of both hemin and a simplified version of the molecule were determined to be similar. This simplified version consisted of a porphyrin ring with an Fe center but no side chains. The interaction between this simplified Fe porphyrin and the (111), (110), and (100) Pt surface cuts were modeled using dispersion corrected density functional theory (DFT). The binding energy indicated an energetically stable interaction within the porphyrin-platinum system. In addition, the spin state of iron in porphyrin was computationally determined for Fe(II) and Fe(III). Our DFT results match previously determined experimental and higher order (coupled cluster) theoretical results that were computationally more expensive.

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

Angelina Sprecher (Alan Jircitano), Penn State Behrend – Chemistry

The objective of this research was to design an analogue of *o*-aminobenzaldehyde to give a larger self-condensate ligand to accommodate larger metal ions. Increasing the size of a macrocycle can potentially allow lanthanide(III) ion complexes to form. Lanthanides are highly paramagnetic, making macrocycle lanthanide complexes good candidates for contrast agents for magnetic resonance imaging (MRI). The ligand precursor is formed in a six-step synthesis starting with the generation of 8-nitroquinaldine from 1-nitroaniline and crotonaldehyde with phosphotungstic acid as the catalyst. The 8-nitroquinaldine is brominated at the aromatic methyl. Tribromonitroquinaldine is hydrolyzed with sulfuric acid giving the carboxylic acid. The final steps involve the reduction of the nitro group using zinc phthalocyanine and hydrazine, forming the amino acid, followed by reduction of the acid to an alcohol with LiAlH4 and finally oxidation of the alcohol with manganese(IV) oxide to give 8-amino-2-quinolinaldehyde. The ligand is synthesized by Schiff-base self-condensation of three equivalents of 8-amino-2-quinolinealdehyde using a metal ion template. Progress toward the synthesis and characterization of the ligand precursor and the formation of a lanthanide complex will be presented.

#### The Effects of Quercitin, NiCl2(dcpm) and Whiskey Extract on Metastatic Cancer Cells

Maddie VanDyke, Haley Nolf, Olivia Webb, Kayla White, Dan Rzewnicki, Andrew Claffey, and Benjamin Ivan (Charles Kriley), Grove City College – Biochemistry

Our research focuses on developing amine- and methoxy-substituted derivatives of quercitin—a naturally occurring compound found to have mild antitumor effects – and testing their effectiveness against metastatic cancer cell lines in nude mice developed by Durwood Ray at Grove City College. Of the quercitin derivatives developed, 1-(2,5-dihydroxyphenyl)-3-(3,5-dimethoxyphenyl)prop-2-en-1-one, or compound 6, has proved the most effective in tests against T3HA cells (cells metastatic to the liver) and has also been tested with NIH/SWISS cells (normal mouse cells). More recent research includes the development and testing of dichlorobisdicyclohexylphosphenomethonenickel(II), or NiCl2(dcpm), and a whiskey extract against T4PA cells (cells metastatic to the lung). In early trials, NiCl2(dcpm) has shown some effectiveness and will be the subject of continued testing. Future research plans include the modification of the cyclohexyl ring in NiCl2(dcpm) as well as the testing of combinations of compounds for a synergistic effect.

### COMPUTER SCIENCE AND COMPUTER ENGINEERING

#### Cyber-Physical Security in Cloud Manufacturing

Ben Buckholtz (Ihab Ragai), Penn State Behrend – Engineering

Manufacturing technology changes with the needs of consumers.  The concept of cloud manufacturing (CM) was largely created due to the globalization of the world economy. Many of the key technologies have already been developed to make CM a dependable configuration in today’s manufacturing industry. Essentially, CM uses resources that can be transmitted anywhere from a central location to a device with internet access. While CM has the potential to solve issues in manufacturing, it has its own concerns. Among these is security, which is getting a lot of attention because it is a major reason consumers are not confident in adoption CM. Security is a topic growing in popularity, but it still lacks adequate information. Therefore, the goal of this research project was to study the security concerns in CM and to develop potential solution strategies. To accomplish this, topics including the Internet of Things, cyber-physical security, and worker safety will be discussed. This addition to the literature should assist researchers and industry members in taking steps toward future implementations of this emerging technology.

#### Gerrymandering in Federal Legislative Districts

Erica David1 (Robert Weissbach1 and Robert Speel2), 1Penn State Behrend, School of Engineering and 2Penn State Behrend, School of Humanities and Social Sciences – Electrical and Computer Engineering Technology

This research project pertains to gerrymandering and how to get more equivalent federal legislative district lines. This is important because we do not want one political party having an unfair advantage over another. The research will focus on analyzing the ratio of an area of a legislative district, to the ratio of a rectangle that encloses the district. A selection of these districts with varying ratios will be used in a survey of participants to identify which districts are considered to be gerrymandered. The survey responses will focus on states where districts are politically drawn to states where a commission tries to prevent political factors in the drawing of district boundaries. The data generated from the survey can then be used to determine whether a particular maximum ratio exists, whereby all districts whose ratios fall below this number will be considered to be gerrymandered. The result of this research will make the public more aware of gerrymandering and hopefully provide a better means of redistricting.

#### Radii of Inscribe Circle and Spheres

William Emmel and Kevin Nelen (Papiya Bhattacharjee), Penn State Behrend – Computer Science

The purpose of our research is to investigate how the radii of circles and spheres vary as they are packed into two and three dimensional shapes, for example, triangles and pyramids. We started with triangles and packed it with circles towards each corner, which gives rise to similar triangles. Using these similar triangles we developed a recursive formula for the radii of the circles that are packed inside. Finally, we used pyramids and packed them with spheres to develop a three-dimensional version. Similar to the two-dimensional case, there is a pattern for the pyramids as well, which allows for a recursive formula to be formed.

#### Evolving Complex Robot Behaviors in Real Time with Genetic Programming

John Griebel (C. David Shaffer), Westminster College – Computer Science

In this experiment, we use a genetic algorithm to evolve a robot that is able to navigate a maze, detect a burning candle, and extinguish it, and does so in less than five minutes. Among others, these are the rules of the Trinity College Fire-Fighting Home Robot Contest, which the robot will compete in. We will describe our choice of chromosome structure and genetic operations and discuss the impact of these choices on the optimization process in the genetic algorithm. The chromosomes were evaluated by applying them sequentially to the robot for short time periods. The evaluation time for each chromosome was increased over the evolution process. We will discuss problems associated with that process and give examples of the resulting robot performance.

#### Analyzing the Integration of Cognitive Radio and Cloud Computing for Secure Networking

Kelsey Karpinski, Taryn Walker, and Brennen Kelly (Syed Rizvi), Penn State Altoona – Security and Risk Analysis

The focus of this research paper was twofold: First, we discuss some of the critical issues and challenges currently inhibiting the realization of a cognitive radio network (CRN). Those problems include the utilization of jammers to prevent the spectrum sensing and communication. Primary User Emulation (PUE) still pose a significant mitigation challenge, as well as traffic-injected attacks. Second, we discussed the possibility of combining the cognitive radios (CRs) within the cloud operating architecture. We present a comprehensive critical analysis of the existing research efforts to integrate these two divergent fields. We identify critical issues and challenges that need to be addressed to successfully integrate the CRs into the cloud computing paradigm. In this paper, we also discuss the future scope and directions that need to be taken to maximize the benefits that these two fields could bring to the service users and providers.

#### Biometric Game Controller for Physiologically-Based Procedural Content in Games

Joseph Neu (Matthew White), Penn State Behrend – Software Engineering

Procedural content is a part of game programming wherein games are created based on a variable such as time or points while other times it is based using different types of random number generation algorithms such as Mersenne Twister. A big obstacle of creating new types of procedural content is variables relating to the player. So good game design integrated with cognitive load data would allow to engage a player more when they are bored and less when they are very engaged. This pattern of engagement of players has been studied greatly and heavily observed. To properly use this engagement of players, the game must be able to gather proper data from the player in the form of different biometric analysis. Factors gathered in biometric analysis include blood volume pulse, heartrate variability, and galvanic skin response. However, many of the current viable methods for gathering data are extremely invasive, involving electrodes glued to the player which will obscure the observational data. This study uses the design of sensors embedded in a piece of hardware many players are used to using-a custom game controller, which will allow data to be measured without using invasive techniques.

#### The Effects of Motion Sickness While Using the Oculus Rift Dylan Poljak (Matthew White), Penn State Behrend – Computer Science and Software Engineering

The Oculus Rift is a new piece of computer technology that allows a user to experience games and media in a three dimensional perspective. The purpose of the research into the device was to explore the effects of motion sickness while operating the device. Given that each individual would experience varying degrees of motion sickness based on different conditions, a test environment was constructed with four possible scenarios. Subjects were placed in one of the four environments with only user input response modified, and told to complete the scenario. Immediately after the test subjects were asked to fill out a survey regarding their experience. The information obtained by these surveys allowed us to isolate various factors that contribute to motion sickness when using the device. The results indicated that there were certain factors that influence motion sickness while using the device and through a combination of design planning and implementation can reduce the factors that influence motion sickness.

#### Major Cloud Providers: Which One Should You Choose?

Christopher Rosswog (Jalaa Hoblos), Penn State Behrend – Computer Science

Cloud computing services provide information technology as a service over the Internet or dedicated network, with delivery on-demand, and payment based on usage. Cloud computing companies offer services that include full applications and development platforms, servers, data storage, and virtual desktops. Before migrating to full-scale cloud computing, businesses should ensure that cloud providers will deliver necessary applications and transaction performance. Our research aims at comparing various cloud providers such as Amazon EC2, Google Cloud, Microsoft Azure, and Rackspace. Clouds will be compared based on three main features: 1) load, 2) performance, and 3) speed and bandwidth. Our testing tools include Apache JMeter and Iperf. JMeter is used to examine load and performance, and Iperf is used to test the network speed and bandwidth. The testing process will span several days and will be run at various times to achieve more accurate results. Data from the tests will be collected and graphed to show which cloud has the best overall performance.

#### Detecting Malicious Insiders in the Clouds

Michael Schwoegl and John Lewis (Jalaa Hoblos), Penn State Behrend – Computer Science and Software Engineering

Institutions are tasked with an inherent responsibility to protect its secrets and files from unauthorized access and use by intruders. While preventing outside intrusion into these services is a well-studied topic of interest, averting insider exfiltration of information and documents provides more challenges that are not normally present in the prevention of external intrusion into secure institutional cloud systems. For example, how does one prevent an employee from saving various classified documents (that they may normally have permissions to access) onto a flash drive and exfiltrating said documents? Our project seeks to increase the difficulty in which authorized and unauthorized employees can access classified documents. In effect, using our method, we can almost prevent severe breaches in security as was observed in the Snowden-NSA situation. Our solution involves the implementation of three main techniques: 1) encryption, 2) split-and-hide system, and 3) keeping track of user’s behavior. By using encryption we can ensure the integrity of files on the servers, whereas splitting and hiding them in secret locations will protect them against brute force assaults by intruders trying to piece them together. Last, the data collected from user’s activities may be a strong indicator of a suspicious behavior.

### ENGINEERING AND PHYSICS

#### Parametric Study of Methanol Micro Fuel Cell Performance

Paul Montagna (Adam Hollinger), Penn State Behrend – Mechanical Engineering

Research has shown that micro fuel cells have the potential to outperform traditional batteries in small electronic devices such as cell phones, tablets, and laptops. This is a crucial development because of the ever increasing amount of power required to operate these devices. However, commercial fuel cell development is still in its early stages, and feasible manufacturing processes along with further performance tests must be investigated before fuel cells can truly replace traditional batteries in small electronics. Currently, our research aims to test various factors that affect the performance of fuel cells that utilize methanol as the working fuel. Such factors include electrode aspect ratio (length versus width), fuel flow rate, and fuel concentration. Prior research has shown that low aspect ratio electrodes achieve higher power densities than high aspect ratio electrodes. It has also been observed that up to a certain point, performance increased with increases in fuel flow rate. After this point was reached, flow rate had a minimal impact on performance. Current and future research aims to further explore these factors, as well as many others, with the intent of optimizing micro fuel cell performance.

#### RF Path Loss through Skin

Travis Roney (David Loker and Steven Strom), Penn State Behrend – Electrical Engineering Technology

To date, the most common technique for controlling prosthetics is through body powered myoelectric systems. Myoelectric systems work by using very small muscle movements in the remaining part of the limb and converting that into movement of the prosthetic by way of electronic servo motors. This system has some disadvantages, including the lack of prehension feedback. Recent research has shown that there may be a more natural option. This being to implant electrodes within the fascicles of the nerves and use those signals to control the prosthetic limb. The objective of this research was to design a system for transmitting and receiving data that could realistically be reproduced in a form that could be embedded under human skin. The system was then to be used to test path-loss characteristics through several different mediums with similar characteristics to human skin. The system was designed using two microcontrollers (Arduinos), and two RF transceivers. The registers of the RF transceivers were configured such that there was cyclic redundancy checking. The result of this project was to develop the system ready to be used for path loss testing, and a formulated alternative skin medium.

#### The Dynamical Evolution of Mars Jacob Roth (Darren Williams), Penn State Behrend – Physics

It is currently believed that Mars once had liquid water on its surface. One hypothesis is that Mars’ orbit had lain between the orbits of Earth and Venus and was scattered out to its current orbit. Our research considers whether Mars could have had a stable orbit between Earth and Venus, whether Mars could have suffered a scattering event with Earth without a collision occurring, and whether Mars could have maintained a stable orbit after being scattered. Our results are inconclusive but it appears that Mars may have been scattered into its current orbit without colliding with Earth.

#### Quench Tank Design

Kyle Woods, Marcus Lindstrom, and Jonathan Weidner (Robert Edwards), Penn State Behrend – Mechanical Engineering Technology

The objective of this study was to design a quench tank for a Mechanical Engineering Technology senior design team. This quench tank was used to test a temperature probe. The tank was 100 to 150 gallons, with an agitation system as well as a cooling system designed to aid in the testing process. Multiple tanks were considered and chosen based on the budget and convenience. Testing was done in a grid-like pattern to ensure consistency in results. The preliminary test results will be reported.

### PSYCHOLOGY I

#### Working Memory under Pressure: There’s No Turning Back Now

Rayan Abdalla and Jenny Rockwell (Victoria Kazmerski), Penn State Behrend – Psychology

Pressure during performance tasks can really cause one’s results to be lower than what they may have expected. Adding on stereotype, threat may increase pressures of the working memory, thus increasing pressure during the task more than the monitoring and outcome groups. Participants were randomly assigned into three groups: monitoring- (stereotype, non-stereotype threat), outcome (stereotype, non-stereotype threat), control (stereotype, non-stereotype threat) completed a digit span memory task, and ended the study with a mindset test. It was found that both monitoring and outcome pressures were both increased when doing a stereotype threat task, also decreasing their working memory capacity. Finally, in our study, participants in the non-stereotype threat condition had a higher score on the digit span task than those in the stereotype threat condition.

#### Animal Interaction: Does Personality Effect “Kinection”?

Kayla Beatty, Danielle Carioto, and Howard Savoy (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

The current study will measure the reduction of stress levels by interacting with a simulated animal. We will examine which personality variables (neuroticism, extroversion, and openness) influence stress levels during a simulated animal interaction. Participants will be recruited from a medium-sized college to interact with an animated animal on an Xbox Kinect. Participants will be given a scale to assess their stress before and after interacting with a simulated animal. Then complete two more questionnaires regarding personality and another stress test. It has been shown that animal interaction has been a successful way to reduce stress in people. But there is a gap in current research regarding animal interaction in a college setting to decrease stress. We hypothesize that interacting with a simulated animal will reduce stress, and that personality variables (neuroticism, extraversion, and openness) will affect stress levels after animal interaction.

#### It Takes Two to Tangram

Nicole Bell, Breanna Foster, and Megan Thompson (Victoria Kazmerski), Penn State Behrend – Psychology

Prior research has found that person praise hinders performance, whereas process praise enhances it, but has not looked to see if the effects of praise generalize to undergraduate students and creativity, which was the aim of this study. The current study looked at how person and process praise influenced a person’s creativity, motivation, and task performance. Contrary to our predictions, results show that participants did not perform significantly better on tasks, nor were they significantly more creative when praised with process praise. Additionally participants did not perform significantly worse on tasks, nor were they significantly less creative when praised with person praise. In the future, praise could be studied with an authority figure administering the praise or assessing the differences between cultures.

#### Giving Back: Positive Effects of Mentoring on the Mentors

Chelsea Chase, Kayla Cochran, and David Ohmer (Charisse Nixon), Penn State Behrend – Psychology

Theoretically it has been suggested that mentoring training and experience improves leadership skills, empathy, and connectedness, but these hypotheses have not been yet confirmed through empirical study. Given the theoretical expectation that mentoring training and experience will also improve knowledge and skills for the mentor, we feel it is necessary to confirm this theoretical proposition through the collection of empirical data. Participants may learn about their connectedness and attachment to others, their coping styles, their leadership abilities, their psychological outcomes, and self-esteem as part of the study, which may allow them to be more self-reflective and identify how to effectively interact with others and react to life.

If we are able to show that the mentoring program does improve the outcomes in connectedness, attachment, psychological outcomes, myth acceptance, etc. in the mentors, then we will have evidence that mentoring helps not only the children who receive the mentoring program but also those who are trained as mentors.

#### Deception Detection: Investigating Individual Differences Erica Edwards and Christina Ayers (**Victoria Kazmerski and Dawn Blasko), Penn State Behrend – Psychology**

Deception is intertwined in everyday life and being able to detect deception in our personal or professional lives could be beneficial. In deception detection: Investigating Individual Differences Part I participants read scenarios involving deceptive or truthful situations. They were asked to rate how deceitful these scenarios were in terms of honesty. This study looked at how deception is carried out by the perception of deceitful language. For Part II the study analyzed the language of deception with the use of an eye tracker. We expect to find participants spend more time reading deceptive verbal cues within the context of a lie.

#### Sense of Belonging and Academic Achievement in College: Examining the Influence of Organizational Involvement

Andrew Faytak and Tyler Ferraino (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

College student attrition and retention is a prevalent problem in American universities. Finding ways to increase student retention would benefit universities and students alike. If schools were able to fix issues that cause students to dropout, tax payer money would not be wasted in financial aid to those who struggle academically and socially and do not finish their degrees. By surveying students in select clubs and organizations, the researchers will be able to better understand how amount of time dedicated to clubs, position held in clubs, and number of clubs involved in influences sense of belonging to the university. The researchers will evaluate the correlation between club involvement and academic success. Participants included students involved in organizations, as well as students who were enrolled in courses that require them to volunteer as participants in research. Participants completed a survey with demographic items and questions pertaining to club involvement, sense of belonging, etc. It is hypothesized that increased involvement time and higher position held will lead to increased sense of belonging and increased academic success. Furthermore, students who participate in more clubs are predicted to have a greater sense of belonging and greater academic success.

#### Navigating the STEM World: Psychological Readiness, Flexible Mindset, and Self-Efficacy in Spatial Performance

Megan Harris, William Shelstad, Grace Waldfogle, Nicholas Bowser, and Dominik Dodds (Dawn Blasko and Heather Lum), Penn State Behrend – Psychology

Many STEM professions show an unbalanced gender ratio favoring males. Psychological science has identified variables that may impact the underrepresentation of women in fields such as engineering. One of these is women’s average lower performance in spatial visualization and another is assuming that foundational skills are innate instead of learned. In the on-going study, we worked with local female and minority students who took part in Behrend’s Minority College Experience / Women in Science and Education (MCE/WISE) program. Each summer, the VIZ team offers a six-week spatial training program, Our Spatial World (OSW), to these students. The OSW project has two goals: 1) to assess and train spatial skills and 2) to help students develop positive attitudes towards spatial skills and STEM fields. The program consists of a pre-test, four weekly spatial training sessions and a post-test. Each 1.5-hour session includes lecture, hands-on experience, and a spatial game. A special emphasis is placed on learning self-efficacy and the idea that spatial skills can be learned and improved upon. Overall, participants improved performance on spatial-related tasks from pre-test to post-test. They also expressed greater levels of confidence, learning self-efficacy, and interest in STEM fields after the training.

#### Sarcasm in the Workplace: The Influence of Power and Perspective

Christie Leslie, Alicia McAllister, Jeffery Roberto, and Hau Tuang (Dawn Blasko, Victoria Kazmerski, and Shariffah Sheik Dawood), Penn State Behrend – Psychology

Sarcasm is a variant of irony and is often used to express one’s feelings while implying the opposite. There is little research on the factors that influence the perception of sarcasm in work place relationships. In accordance to The Politeness Theory, sarcasm can be used as a form of humor and often functions as a way to maintain consensus, relieve conflict, and retain control. Our research is designed to analyze cultural differences in the interpretations of sarcasm, specifically looking at power distance in the context of Hofstede’s Dimensions. Our study assessed the perspective of the characters in the scenario and how perspective affects the interpretations of those scenarios. Participants read scenarios describing a sarcastic or sincere interaction with a boss or coworker. Participants rated these comments on how they perceived the sentence and the speaker; and self-reported on levels of personal sarcasm and collectivism. Results showed that reading times for the sarcastic statements were longer than those of literal statements in both perspectives. Results also showed that from the listener perspective, sarcastic statements were more insulting, while from the speaker perspective they were more humorous.

#### Attachment, Social Support, and Pain

Kaitlyn Matty, Mary Havers, Jessica Stoker, and Kayla Beatty (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 66 female undergraduates have been exposed to the tourniquet task while viewing a photograph of either their romantic partner (support condition) or a stranger (control condition). Participants’ romantic partners experienced 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.

#### Preferred Leadership Type: Does Preference Vary for Different Types of Crises?

Jason Shultz, Jeff Roberto, and Franki DiSalvo (Victoria Kazmerski), Penn State Behrend – Psychology

Our primary focus of leadership consisted of authentic, transformational, and servant leadership. There is uncertainty as to which leadership is most preferred by employees and whether or not one type becomes more appealing under certain corporate conditions. Our study was designed to provide insight into situational preference of leadership with the newer genre leadership types. College-aged participants (n = 210) were initially given a modified survey to identify there ideal leader that included the authentic, servant, and multifactor leadership questionnaires. We developed three different types of company climate for comparing and analyzing our data: status quo, internal crisis, and external crisis. The results showed a main effect of leadership, supporting the hypothesis that the ideal leadership type is transformational leadership. However, there was a significant interaction that revealed that in an internal and external company climate condition, people prefer transformational leadership. But, in the status quo condition, people prefer the servant leadership. These findings can be utilized by companies to determine what type of a leader should be selected for their company based on the condition the company is in at the time.

#### Exercise or Video Games: A Comparison of Methods to Cope with Stress

Brittany Smith and Sarah Jelinek (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

Stress is experienced by college students on a day-to-day basis and by the major events occurring in their life. With all of this stress experienced, college students need effective ways to cope. The purpose of the study was to evaluate the effectiveness of using exercise or video games as a coping strategy to reduce stress in college students. This study was guided by the hypothesis that exercise will be more effective in reducing stress than video games. This experimental study was conducted by having participants partake in either an exercise interactive game (Dance Central 2), video game (Bejeweled 3), or control group (reading magazines). After their assigned activity, the participant completed self-report questionnaires on stress (one of which will be given before and after the activity). The researchers will conduct a one-way ANOVA data analysis that expects to find, through the response of each questionnaire, that exercise will significantly reduce stress more than video games in college students.

#### Nurse Turnover: Altruistic Behavior, Work Engagement, and Burnout

Nicholas Spurgeon, Hau Tuang, and Joshua Deck (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

Turnover within the nursing field is becoming an increasing burden in the health care industry. Turnover is defined as the rate at which workers leave their place of work and are replaced. Past research has stated that the projected shortage of nurses within the field is 600,000 with the actual nurse turnover costs being approximately $8 million. To contribute further research on turnover, our study assesses if burnout and altruism predict work engagement within the nursing field. Our study includes professionals within the nursing field and nursing students that will be completing surveys online. We anticipate our outcome to predict that altruism is a mediating factor between the relationship of burnout and work engagement. If altruism is a mediating factor, health care facilities can select employees who are less likely to be affected by burnout and have higher work engagement.

### PSYCHOLOGY II

#### Reducing Traumatic Stress Caused by Relational Victimization

Nicole Bell (Charisse Nixon), Penn State Behrend – Psychology

The current study addresses relational victimization and its effects on post-traumatic stress. It specifically looks at possible mediators, such as empathy, social support, and optimism, which may explain differences in stress following victimization. Many studies have looked at similar mediators regarding physical victimization, but not for relational victimization. Identifying mediators for relational victimization may explain why some people with high victimization are less prone to post-traumatic stress than others. In order to test for this relationship, participants complete surveys assessing overall victimization, post-traumatic stress, and internal and external mediating factors such as optimism, school connectedness, social support, and empathy. Upon completion, I hope to find possible factors that explain individual differences in the relationship between relational victimization and post-traumatic stress.

#### Analysis of Housing Condition on Social Anxiety in the VPA Model of Autism

Colleen Bodnar (Jeff Cross), Allegheny College – Neuroscience

Autism is a neurodevelopmental disorder characterized by social impairment, deficits in communication, and perseveration of abnormal behaviors. Valproic acid (VPA) is used as an anticonvulsant therapy. In pregnant mothers, it has been found that doses of valproic acid taken during pregnancy increases the risk of bearing children with autism. The valproic acid model of autism is used in rats and shows both anatomical and behavioral similarities with human cases of autism and is a proven model for experimental studies of autism. The current study examined social behaviors in the autism model. Rats are social animals who live in colonies and engage in multiple social behaviors. Most social behaviors in rats are mediated by olfaction. To examine the possibility of malfunctions in the social behaviors in the VPA rat model the current study examined olfactory discrimination in control and VPA animals. The three chamber maze, which is also a test for social anxiety, was used for olfactory discrimination. Furthermore, we investigated the effects on isolate housing on behavior of VPA and control animals. We found that isolation of VPA animals caused abnormal olfactory preference when compared to VPA group housed animals, and all controls.

#### The Relationship Enhancement (RE) Scale: Some Preliminary Findings

Cara Barnes, Julie Brustle, Elizabeth Flaherty, Nickolas Forsberg, Dhavalkuamr Patel, Riddhi Patel, Omayra Rivera, Jay Shah, and Olivia Sweger (Mary Mino), Penn State University Park – Social and Behavioral Sciences

Understanding communication style is particularly important when students enroll in a course designed to improve communication skills. The Relationship Enhancement (RE) approach teaches specific communication skills that speakers can learn and apply to exchange ideas most effectively. In order to determine students’ communication style, a Relationship Enhancement Scale was developed to measure students’ communication preferences before engaging in RE training, during this training, and when the training was completed. In order to measure these preferences, this scale contains communication scenarios that present three possible responses that indicate whether the student would express his/her feelings, listen, discuss, or negotiate when faced with interpersonal issues. In order the scale’s effectiveness, a pilot study was conducted over four semesters. Forty-five students responded to the RE Scale questions on three occasions (before learning skills, during the skills training process, and at the end of the semester). Based on students’ self- reports of their communication style, the RE Scale score before learning the skills gave the instructor and each student an idea of the student’s communication style preference when dealing with interpersonal issues (speaking, listening, or discussion negotiation). The RE Scales scores during class and at the end of the course were compared with the students understanding of the skills and their effectiveness when demonstrating them in class. Preliminary findings have indicated students’ skills in class and their scores indicated an increased level of understanding of each of the three RE skills and that the most skilled communicators incorporated discussion negotiation skills most effectively and selected this communication style preference the most.

#### Differences in Cue-Reactivity Responses Dependent on Exposure Levels of Smoking and Non-Smoking Cues

Erin Cox, Becky Haritnovich, Michelle Winwood, Hannah Rae and Jessica Braymiller (Matthew Weaver), Mercyhurst University- Psychology

Smoking is an increasing concern for public health of the general population, but especially for college students. The purpose of this study was to determine if exposure level to smoking cues and non-smoking cues create a differing response for smokers and non-smokers. Three different groups of undergraduate participants were tested on psychological and physiological responses to four different cue exposure levels. Psychological responses were measured using the Questionnaire on Smoking Urges (QSU) and physiological responses were measured as a change in electrodermal activity (EDA). Data collection is ongoing, but preliminary analyses indicate an effect of cue exposure in both measures. QSU results indicate an effect of cue exposure (F(1.53)= 5.924, p= 0.019) and a group by QSU interaction (F(1.53)= 13.498, p= 0.000). EDA results were significantly different based on one smoking cue-exposure level or non-exposure level (F(1.530)= 4.141, p= 0.047).

#### Why Do People Put up with Bad Dogs? Is it Love, Justification, or Support?

Wesley Dorrenbacher and Jessica Dylewski (Victoria Kazmerski and Dawn Blasko), Penn State Behrend – Psychology

Recently, people have raised the question that owning aggressive dogs can be a danger in today’s society. This study investigated factors influencing people’s perceptions of owning “aggressive” dogs. Participants read detailed scenarios that described dogs showing aggressive behavior either as the first interaction or as the second interaction. There was a bystander in the scenario that was either male or female, in which the participant had to place themselves in the bystander’s point of view. After reading each scenario, the participants were able to answer questions about perceptions of dog ownership. Our findings suggested there was a positive correlation of people who support aggressive dogs to have a higher anxious attachment style in comparison to other attachment styles. Future research should look at the relationship between attachment styles and abuse in romantic relationships.

#### When Is a Hot Tango a Feisty Negotiation?: A Study of Embodied Metaphors

Erica Edwards, Cherylann Carter, Desmond Kane, Alysha Simmons, and Rachel Zimmerman (**Victoria Kazmerski and Dawn Blasko), Penn State Behrend – Psychology**

Nonliteral language is often used to convey abstract and complex meanings in communication. Metaphors, a form of nonliteral language, can hold embodied roots (e.g., the business deal was a hot tango). Embodied language is thought to be processed through corresponding brain pathways, such as the auditory and motor systems. To better understand the nature of embodiment, the current study examined participants’ ratings of both auditory and motor metaphors and semantically equal control stimuli. Participants compared the metaphors and semantically matched controls on similarity and rated vividness. Participants also completed the Randomized Short Betts' QMI, an assessment of vividness of imagery and the visioning ability scale, an imagery vividness scale. Further analysis will be conducted to determine relationships between the sentence ratings and the vividness scales. We expect to find that participants will rate the vividness of the meaning for the metaphors higher than the control stimuli. Also, we anticipate participants with higher QMI and the visioning ability scale scores will rate the stimuli as more vivid.

#### The Effects of Glucose Energy on Impulsivity

Marissa Kelley (Matthew Weaver), Mercyhurst University – Psychology

Research has shown a relationship between energy level and impulsivity. The purpose of this research was to examine this relationship using subjective and objective measures. Impulsivity was measured using the Baratt’s Impulsivity Scale, Hot Sauce Allocation, and a Delay Discounting Task. The participants were divided into two groups. One group received the glucose and the other did not. The research is ongoing but it is proposed that the participants who did not receive glucose would show higher impulsivity across all measures indicating a negative correlation between impulsivity and glucose energy levels.

#### The Effects of Music on Typing Accuracy

Katelyn Pegher and Gwendolyn Dryer (Melanie Hetzel-Riggin), Penn State Behrend – Psychology

Music disrupts working memory capacity, due to an overload when completing cognitive tasks. Additionally, listening to music can hinder typing fluency by 60 words per minute on average. The effects of music on typing accuracy will be investigated on undergraduate psychology students at a northwestern university. Each participant will be assigned to a typing test order and will be tested on their typing ability. Each participant will be required to listen to each of the four music groups: 1) classical, 2) pop, 3) rock, and 4) no music (control). The hypotheses are that no music will result in the least amount of typing errors, and that hard rock will result in most amount of typing errors. A one-way ANOVA will be run to analyze results gathered based upon typing accuracy and speed. The main implication of this study was to find that students who listen to music while completing school work will not perform as well as students who do not listen to music while completing school work.

#### Visual-Haptic Cross-Modal Perception of 2D Symmetry

Trista Musich (Allison Connell Pensky), Allegheny College – Neuroscience and Psychology

Research has shown that object symmetry is understood by touch or vision alone. We investigated whether this information is transferable between these modalities. We also measured participants’ strength of visual imagery to determine if this could predict one’s ability to perform this task. We ran a 2x2x2 mixed-model design testing study-test conditions between-subject (haptic-visual, visual-haptic), within-subjects variables of line contour (straight, curved), and object symmetry (symmetrical, asymmetrical). Our results replicated previous studies showing that symmetry is extracted by touch and vision. We extended this finding by showing that symmetry is transferable between these modalities, with superior performance in the visual-haptic condition. The correlations with visual imagery differed between conditions and across variables and may represent a beginning step in understanding why such large individual variability exists in haptic performance.

#### Can Priming the Right Hemisphere Affect the Way You Think and Feel? Using Unilateral Muscle Contractions to Enhance Empathy

David Ohmer and Steven Savoy (Victoria Kazmerski), Penn State Behrend – Psychology

Empathy is one’s ability to put themselves in another person’s shoes and identify with their emotions. Something that is not known about empathy is whether or not it can be primed. There were 49 students that participated in our research study. Unilateral muscle contractions were used to stimulate the brain hemispheres. The participant squeezed a stress ball four times. There were three groups, the right hemisphere prime (left hand squeeze), left hemisphere prime (right hand squeeze), and the control without stimulation (no squeeze). This was used to predict that stimulation of the right hemisphere would make a person more empathetic. We created scenarios to measure empathy by manipulating internal and external attribution along with the sex of the empathetic target. In our preliminary data, we found the stimulation to be unsuccessful, and no significant difference based on squeeze groups in line bi-section, creativity or empathy. There was a significant positive relationship between the scores on the RAT and the Reading of the Eye’s in the Mind. We are currently in progress of running more participants. For future studies, we would suggest a more in-depth examination of the effects unilateral muscle contractions have on the brain.

#### Behavioral Observation Coding of Romantic Partner Interactions

Jason Shultz, Mary Meckley, Jessica Stoker, Kayla Beatty, and Parrish Brown (Carol Wilson), Penn State Behrend – Psychology

Research has shown money to be one of the most difficult discussion topics for romantic partners, especially with regard to argument or conflict avoidance. Preliminary research shows that money-primed individuals are more self-focused, less helpful, and more oriented toward their own communicative input and output. To our knowledge, no published studies have examined the effect of money-priming on relationship partners, nor investigated personality or relationship variables as moderators of money-prime effects. The purpose of this investigation was to analyze behavioral data collected in a study of the effects of monetary discussions on romantic couples. Sixty romantic couples were recruited and randomly assigned to discuss either a money or non-money related decision. Each interaction was coded by independent researchers and analyzed for evidence of conflict and support behaviors. We expected to find that money-primed couples would show less communality and collaboration than non-money-primed couples; results showed the total number of decisions made was significantly less in the money-primed group, indicating the likelihood of disagreement or conflict. Additionally, data was transcribed and analyzed for differences in the couples’ discourse across conditions, which yielded additional significant differences. Future investigation of personality characteristics as potential buffers of money effects will be conducted.

#### Combined Effects of Mefloquine and GABAa and GABAb Antagonists on Behavior

Elizabeth Sever, Daniel Daugherty, and Adam Brandner (Rodney Clark), Allegheny College – Psychology and Neuroscience

Malaria remains a constant threat to the health of many people, especially those in developing nations. In the later part of the twentieth century, Mefloquine was introduced as an effective anti-malarial medication throughout the developed and developing world. However, recent reports of psychotic side effects associated with Mefloquine compromised the drug’s clinical utility. This study was designed to determine the characteristics of Mefloquine’s behavioral effects. Six experimentally naïve Sprague-Dawley rats served as the research subjects and were placed on 23-hour food deprivation. We determined their baseline performance on a fixed interval – 30 second (FI-30) schedule of food presentation. Mefloquine (0.3-3.0 mg/kg) was administered for two weeks. Subsequent antagonism tests were administered with GABAa and GABAb antagonists. We compared performance after Mefloquine administration and after antagonist administration to the baseline.