

***PENN STATE BEHREND - SIGMA XI***

***2011***

***TWENTIETH ANNUAL***

***UNDERGRADUATE STUDENT RESEARCH***

***AND***

***CREATIVE ACCOMPLISHMENT CONFERENCE***

***ABSTRACT BOOK***

# ORAL PRESENTATION ABSTRACTS

## BIOLOGY I

[**Potential Effects of Long-Term Changes in Forest Composition on Organic Matter Processing in Small Streams**](#Glass)

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

**RUNNER UP -** [**Identification and Description of New Species and a Revision of the Genus *Mycetaspis***](#Knuth)

Callie Knuth (Matthew Gruwell), Penn State Behrend, School of Science - Biology

[**The Interactive Effects of Salinity and Temperature on *Chironomidae* Development**](#Lob)

Daniel Lob (Pamela Silver), Penn State Behrend, School of Science - Biology

**RUNNER UP -**[**Vegetation Characterization of the Fringing Habitat Ecotone in the Erie Bluffs State Park Using Hierarchical Clustering and Indicator Species Analysis**](#McGivern)

James McGivern, Lindsey Bocian, Nathalie-Ann Brown, and Joseph Perenic (Mike Ganger), Gannon University, Morosky College of Health Professions and Sciences – Biology

[**The Active Ingredient in Antidepressants Decreases Bacterial and Viral Content in a Freshwater Aquatic Ecosystem**](#Mulugeta)

Surafel Mulugeta, Eric Clark, and Drew Spacht (Steven Mauro), Mercyhurst College, Zurn School of Natural Sciences and Mathematics - Biology

[**Effect of Nutrient Additions on Bacteria and Algae Growth in Groundwater Treated by Permeable Reactive Barriers and Sewage Treatment Facilities**](#OLeary)

Brendan O’Leary1 and Daniel Feinburg2 (Kenneth Foreman3), 1Allegheny College, 3Marine Biological Laboratory, and 2Hamilton College - Environmental Science/Geology

**WINNER -**[**Structure of the Nasal and Orbital Bones of the Squirrel Monkey *Saimiri boliviensis***](#Sharp)

Katie Sharp (Susan Rehorek and Timothy Smith), Slippery Rock University, College of Health, Environment, and Science - Biology

[**A Census of the Bat Community on the Campus of Gannon University, Erie, PA**](#Sturdivant)

Matthew Sturdivant and Morgan Pratt (Steve Ropski), Gannon University, Morosky College of Health Professions and Sciences - Biology

## BIOLOGY II

[**Demonstration of Antibiotic Resistant Gene Transfer via Conjugation between Bacterial Strains Isolated from Lake Erie**](#Augustyniak)

Alexander Augustyniak and Jasmine Shinko (Gregory Andrasoand Troy Skwor), Gannon University, Morosky College of Health Professions and Sciences - Biology

[**Kinetic Analysis of Wild Type and Mutant HDV Ribozymes: Determining Conditions for Kinetic Isotope Effect Analyses**](#Birch)

Cierra Birch1 and Wes Clark2 (Michael Harris2), 1Edinboro University of Pennsylvania and 2Case Western Reserve University - Biochemistry

[**Chemoreception on the Heads of Aquatic Salamanders: Distribution of Cephalic Cutaneous Taste buds in the Red-Spotted Salamander (*Notophthalmus virdescens*)**](#Caprez)

Jennifer Caprez (Susan Rehorek), Slippery Rock University, College of Health, Environment, and Science - Biology

[**Identification and Molecular Evolution of Endosymbiont, *Rickettsia,* in *Pholcus phalangioides,* Common Cellar Spider**](#Gdanetz)

Kristi Gdanetz (Matthew Gruwell), Penn State Behrend, School of Science - Biology

**WINNER -**[**1,4-Dimethylnapthalene (DMN) or Chlorpropham (CIPC) Treatments Indicate Different Mechanisms of Sprout Inhibition in Potato**](#Gleichsner)

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

[**BDE-209 Induced Alterations in the Oxidative Status of Mice Tissues**](#KubeldisO)

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

**RUNNER UP -** [**Assessing the Potential of Essential Oils as an Alternative Treatment for Chancroid**](#Lindeman)

Zachary Lindeman (Tricia Humphreys), Allegheny College - Microbiology

[**Effect of Subacute Ruminal Acidosis on TMR Preference in Lactating Dairy Cows**](#Maulfair)

Daryl Maulfair and Kolby McIntyre (A. Jud Heinrichs), Penn State University, College of Agricultural Sciences - Dairy and Animal Science

[**Antibiotic Resistance of Bacteria Isolated from Ground Beef**](#Snyder)

Sam Snyder (David Fulford), Edinboro University of Pennsylvania, School of Arts and Sciences - Biology

[**Effect of Photobiomodulation (NIR and NUV) on the Inflammatory Response from Cervical Epithelial Cells Infected with *Chlamydia trachomatis***](#Wasson)

Cassandra Wasson, Ashley Wimer, and Janis Eells (Troy Skwor), Gannon University, Morosky College of Health Professions and Sciences - Biology

## BUSINESS, HISTORY, AND PSYCHOLOGY

[**The Causes of Differing Development Levels among Nations: Cases of Chile and Mexico**](#Bologna)

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

[**Having to Leave Town for Children’s Medical Treatment: What Does it Really Cost a Region?**](#Brunot)

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

[**Quality of Student Life Research**](#Christman)

Arica Christman (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

**RUNNER UP -**[**A Continuation of the Youth Voice Project**](#Flinchbaugh)

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

[**Do Companies Benefit from Competitors’ Misfortunes?**](#Harned)

Matthew Harned and Syed Ammar Hussain (Sanjay Kumar), Penn State Behrend, Sam and Irene Black School of Business - Operations Management

[**“Libya's Top Clown” in Context: A History of Libya-US Relations**](#Moeller)

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

[**Reinvent Behrend**](#Puhak)

Lisa Puhak, Justin Wheeler, Kyle Garner, Jenna McCloskey, and Michael Kasprzak (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

[**Exploratory Research on Facebook-User Satisfaction**](#Southworth)

Zoe Southworth, Megan Wolf, and Marissa Lanich (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

[**Bullying in Schools: The Effects of Having a Disability and Being Bullied**](#Stottlemyer)

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

**WINNER -**[**Measuring International Exports at the County Level: Is it Possible?**](#Yates)

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

## CHEMISTRY

[**Environmentally Benign Syntheses of Alkynoic Esters Using 1-*H*-1-hydroxy-5-methyl-1,2,3-benziodoxathiole 3,3-dioxide**](#Bittner)

Danielle Bittner (Michael Justik), Penn State Behrend, School of Science - Chemistry

[**Improved Synthesis, Characterization and Collection of TiO2 Nanoparticles**](#Ibrahim)

Faisal Ibrahim and Nicolas Arrigo (Carl Hultman), Gannon University, Morosky College of Health Professions and Sciences - Chemistry

[**CVD Synthesis of Carbon Nanotubes**](#Kaiser)

Nicolas Kaiser and Travis Shaffer (Carl Hultman), Gannon University, Morosky College of Health Professions and Sciences - Chemistry

**WINNER -**[**Cyanide-Treated Iron (III) Meso-Tetra(4-carboxyphenyl) Porphyrin Modified Microelectrodes for Selective Oxidation of Hydrogen Sulfide**](#McKinney)

Stephanie McKinney (Jason Bennett), Penn State Behrend, School of Science - Chemistry

**RUNNER UP -**[**Development and Characterization of a Carborane Thiol Ink for Dip Pen Nanolithography**](#Ortiz)

Nathalia Ortiz and Michael Rose (Carl Hultman), Gannon University, Morosky College of Health Professions and Sciences - Chemistry

[Utilizing Representative Drawings to Explore Student Understanding of Chemical Equations](#Roseman)

Reni Roseman (Dyan McBride), Mercyhurst College, Zurn School of Natural Sciences and Mathematics - Chemistry

[**Correlation of Optical Microscopy Images with Atomic Force Microscopy Nanoparticle Images**](#Slater)

Jeff Slater (Carl Hultman), Gannon University, Morosky College of Health Professions and Sciences - Chemistry

[**The Characterization of Silicon Nitride Intermediates Using High Temperature Pyrolysis with SiH4 in N2 Matrices**](#Wolbert)

Alexander Wolbert (Jay Amicangelo), Penn State Behrend, School of Science - Chemistry

## COMPUTER SCIENCE, ENGINEERING, AND PHYSICS

[**Computational Models for Amorphous Materials**](#Hoard)

Brittany Hoard (Blair Tuttle), Penn State Behrend, School of Science - Physics

[**A Framework and Algorithm for Conversion of PLC Programs to Microcontroller Programs**](#Kerin)

Walter Kerin (E. George Walters III), Penn State Behrend, School of Engineering - Electrical Engineering

[**The Diffusion of Hydrogen Molecules through Amorphous Solids**](#MakepeaceMath)

Andrew Makepeace (Blair Tuttle), Penn State Behrend, School of Science - Physics

[**Interruptions and the Effects of Postponement of a Secondary Task**](#Pilarski)

Neil Pilarski (Terri Lenox and John Bonomo), Westminster College - Computer Information Systems

**WINNER -**[**Formability of Magnesium Alloy AZ31B at High Temperatures**](#SnyderN)

Nick Snyder and John Curtin (Fadi Abu-Farha), Penn State Behrend, School of Engineering - Mechanical Engineering

**RUNNER UP -**[**Design of a Portable and Lightweight EEG Device**](#Stumbough)

James Stumbough, Jake Leithner, and Ahmed Abdalla (Sudarshan Nelatury), Penn State Behrend, School of Engineering - Electrical Engineering

[**Design Patterns and Software Components for Programmable Logic Controllers**](#Young)Luke Young (E. George Walters III), Penn State Behrend, School of Engineering - Electrical Engineering

[**Learning to Play the Deadly Game of Amazons**](#Zavora)

Aaron Zavora (John Bonomo), Westminster College - Computer Science

## MATHEMATICS

[**Study of C(X,Z)**](#Hatt)

Ronald Hatt (Papiya Bhattacharjee), Penn State Behrend, School of Science - Mathematics

[**Single Direction Forcing in Spring Mass Systems**](#MakepeaceMath)

Andrew Makepeace (Joseph Previte), Penn State Behrend, School of Science - Mathematics

**WINNER -**[**Faithful Blockings of Finite Groups and Pedagogical Applications**](#Medwid)

Mark Medwid (Paul Becker), Penn State Behrend, School of Science - Mathematics

[**Using Permutation Groups to Construct Error-Correcting Codes**](#Montejo)

Raúl Montejo (Paul Becker), Penn State Behrend, School of Science - Mathematics

**RUNNER UP -** [**Optimal Forcing Location for Tree-Like Configurations of Coupled-Phase Oscillators**](#Riston)

Tanya Riston (Joseph Previte), Penn State Behrend, School of Science - Mathematics

**RUNNER UP -**[**A Generalization of Raabe’s Test**](#Sanfilippo)

Donald Sanfilippo (Papiya Bhattacharjee), Penn State Behrend, School of Science - Mathematics

**RUNNER UP -**[**Analyzing Higher-Order Sheffer Polynomial Sequences via Generating Function Expansion**](#Scavo)

Jeffrey Scavo (Daniel Galiffa), Penn State Behrend, School of Science - Mathematics

# *POSTER PRESENTATION ABSTRACTS*

## BIOLOGY I

[**Identification of Bacteria Isolated from Eggs of Native American House Wren Songbirds**](#Carlson)

Brian Carlson, Megan Fleming, Nicolas Kniseley, and Craig Richards (Beth Potter and Margaret Voss), Penn State Behrend, School of Science - Biology

[**Ontogenetic Diet Shift and Pharyngeal Tooth Remodeling in the Round Goby (*Neogobius melanostomus*)**](#Cowles)

James Cowles1, Jay Patel2, Alyssa Gleichsner2, and Rose Colt1 (Michael Campbell2 and Gregory Andraso1), 1Gannon University, Morosky College of Health Professions and Sciences and 2Penn State Behrend, School of Science - Biology

[**The Orbitonasal Glands of the Red-Backed Salamander (*Plethodon cinereus*)**](#Cummings)

Joshua Cummings1 and Trent Davis1 (Susan Rehorek1 and Sarah Woodley2), 1Slippery Rock University, College of Health, Environment, and Science and 2Duquesne University - Biology

[**Investigating *Uzinurra* Endosymbionts in the Scale Insect *Chionaspis pinifoliae* (Hemiptera: Diaspididae): Do the Bacteria Follow the Rapid Species Radiation Found in the Insect?**](#Doolittle)

Ashley Doolittle (Matthew Gruwell), Penn State Behrend, School of Science - Biology

[**Assessing Mesophilic Bacteria Found in Compost during the Winter Months**](#Elbert)

Nathan Elbert (Beth Potter and Ann Quinn) Penn State Behrend, School of Science - Biology

[**Reproductive Investment and Diet of Trout-Perch *(Percopsis omiscomaycus*) in Lake Erie**](#Foti)

Jarret Engstrom and Michael Foti (Edward Phillips), Gannon University, Morosky College of Health Professions and Sciences - Biology

[**Ultraviolet Radiation Extremophiles: Protein and Metabolite Profile of Ultraviolet Radiation Resistant Microbes**](#Gabani)

Prashant Gabani and Erin Copeland (Om Singh), University of Pittsburgh at Bradford - Microbiology

[**The Effectiveness of Dental Education Brochure in Low-Scoring Participants at Rural U.S. Clinic**](#Huser)

Kaitlyn Huser (Rebecca Kightlinger), Allegheny College - Environmental Science

**WINNER -**[**An Evaluation of Resveratrol as a Microbicidal Candidate against *Haemophilus ducreyi* Infection**](#Nawrocki)

Erin Nawrocki and Hillary Bedell (Tricia Humphreys), Allegheny College - Microbiology

**WINNER -**[**Discovering Recent Rates and Patterns of Bluff Recession in Eastern Erie County, Pennsylvania**](#Pluta)

Matthew Pluta (Anthony Foyle and Michael Naber), Penn State Behrend, School of Science - Environmental Studies

[**Biomass and Soil Nitrogen in Two Varieties of the Biofuel Switchgrass**](#Ream)

Kelsey Ream, Jodi Fletcher, Adrienne Nelson, Sara Salibury, Rachel McCarthy, Grace Talmadge, Akiko Tengyu, Kevin Thrope, Liz Suh, Alex Gazis, and Charles Haas (Rich Bowden), Allegheny College - Environmental Science

[**Effects of Hand Sanitizer vs. Soap on Hand Bacteria Density among Undergraduate Students**](#Woappi1)

Yvon Woappi and Joshua Flowers (Om Singh), University of Pittsburgh at Bradford - Biology

**WINNER -** [**Site-Specific Isolation and Screening of Antibiotic Producing Microorganisms**](#Woappi2)

Yvon Woappi (Om Singh), University of Pittsburgh at Bradford - Biology

[**Distribution of Taste Buds in Two Different Species of Small, Terrestrial Ectothermic Vertebrates**](#Xenakis)

Nicole Xenakis (Susan Rehorek), Slippery Rock University, College of Health, Environment, and Science - Biology-Cytotechnology

## BIOLOGY II

[**Isolation of Fibroblast and Myofibroblast-Like Cells from Palmar Fascia**](#Connell)
Jennifer Connell1, Koreen Morgan1, and Dana Hyde1 (Ali Abtahi2, Tim Cooney3, John Lubahn3, and Elisa Konieczko1), 1Gannon University, Morosky College of Health Professions and Sciences, 2Lake Erie College of Osteopathic Medicine, and 3UPMC Hamot - Biology

[**Ultraviolet Radiation (UVR) Resistance in Microbial Flora at Higher Elevation**](#Copeland)

Erin Copeland (Om Singh), University of Pittsburgh at Bradford - Microbiology

**WINNER -**[**Analysis of Lysine Biosynthesis in Plants Using *Arabidopsis* DHDPS Mutants**](#Drumheller)Bradley Drumheller and Emily Harrington (Michael Campbell), Penn State Behrend, School of Science - Biology

[**Biomatrica SampleMatrix® Long-Term DNA Extract Storage at Room Temperature**](#Engstrom1)

Jarret Engstrom1 (Cecilia Crouse2), 1Gannon University, Morosky College of Health Professions and Sciences and 2West Palm Beach Sheriff’s Office, Forensics Biology Unit - Biology

[**Cytotoxic and Genotoxic Effects of BDE-209 in Human Umbilical Vein Endothelial Cells**](#MooreJ)

Jessica Moore (Mary Vagula), Gannon University, Morosky College of Health Professions and Sciences - Biology

[**Effects of Oxidative Stress on Performance in Thoroughbred Racehorse**](#Naylor)

Meghan Naylor (Ann Kleinschmidt), Allegheny College - Biology

[**Inhibition of *Haemophilus ducreyi* by Vaginal *Lactobacillus***](#Nerone)

Aleksas Nerone (Tricia Humphreys), Allegheny College - Biology

[**A Kinetic Analysis of Secretion System and Quorum Sensing mRNA Gene Expression in Environmental versus Reference *Aeromonas hydrophila* Strains Using Real-Time PCR**](#Rhoads)

Jillian Rhoads1and Jasmine Shinko1 (Troy Skwor1,2),1Gannon University, Morosky College of Health Professions and Sciences and 2Children’s Hospital Oakland Research Institute - Biology

**RUNNER UP -**[**Evaluation of Antibiotic Resistance and Characterization of *Aeromonas spp.* from Presque Isle Bay**](#Shinko)

Jasmine Shinko1 and Alexander Augustyniak1 (Gregory Andraso1, Troy Skwor1, and Christopher Gee2), 1Gannon University, Morosky College of Health Professions and Sciences and 2Penn State Behrend, School of Science - Biology

[**The Cause of Body Mass Increase in the Eastern Coyote**](#Wood)

Stephanie Wood and Ashley Steiginga (Frederick Brenner), Grove City College, [Hopeman School of Science, Engineering and Mathematics](http://www2.gcc.edu/advising/DepartmentsHopeman.htm) – Biochemistry

## BIOLOGY III

[**The Expression of *ANI1* in Hermaphroditic and Male Gametophytes of the Fern, *Ceratopteris richardii***](#DiAngi)

Matt DiAngi1 (Mike Ganger1 and Troy Skwor1,2), 1Gannon University, Morosky College of Health Professions and Sciences and 2Children’s Hospital Oakland Research Institute - Biology

[**Analysis of Hematopoiesis in Zebrafish Embryos Perturbed in Folate Metabolism**](#Duberow)

Eilene Duberow and Tim Gaw (James Warren Jr.), Penn State Behrend, School of Science - Biology

[**Elucidating the Expression Patterns of C/EBPα in Zebrafish Embryos**](#Engstrom2)

Jarret Engstrom (Sarah Ewing), Gannon University, Morosky College of Health Professions and Sciences - Biology

[**Analysis of the Effects of Homocysteine on the Development of Zebrafish (*Danio rerio)***](#Halmi)

Andrew Halmi (James Warren Jr.), Penn State Behrend, School of Science - Biology

**WINNER -**[**Gene Expression Regulation of Sprout Inhibition and Water Retention Genes in Potatoes by 1,4-Dimethylnapthalene (DMN)**](#Hilldorfer)

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

[**Lipid Peroxidation and Antioxidant Enzyme Activities in BDE-85 Treated Mice**](#KubeldisP)

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

[**BDE-85 Induced Toxicity in Human Umbilical Vein Endothelial Cells**](#MooreJ)

Jessica Moore (Mary Vagula), Gannon University, Morosky College of Health Professions and Sciences - Biology

[**C-Banding and Karyotype Analysis of Chromosomes in *Allium sativum***](#Pieknik)

Julianna Pieknik, Alicia Norton, and Stephanie Farbizio (Marlene Cross), Mercyhurst College, Zurn School of Natural Sciences and Mathematics - Biology

**RUNNER UP -**[**The Influence of Antheridiogen and Spore Size on Gametophyte Growth and Development in *Ceratopteris richardii***](#Sturey)

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

[**Analysis of Human Aliment Single Nucleotide Polymorphisms**](#Vanco)

Alisa Vanco (Matthew Gruwell), Penn State Behrend, School of Science – Biology

**WINNER -**[**LD50 Concentrations of Resveratrol Varies Remarkably in a Cancer Progression Model Cell Line**](#Wantz)

Jessalee Wantz, Laura Stevens, Nicole Cifra, Sarah Abdelmessih, Lindsay Carlson, Elizabeth Covatto, Rachel Deir, Hasreet Gill, Sadie Hogan, Kristi Lemke, Jacob Lytle, Amy Maier, Jared McFadden, and Andrew Ruba (Durwood Ray), Grove City College, Hopeman School of Science, Engineering and Mathematics - Biology

## BIOLOGY IV

[**Rotational Behavior Treatment in the Rat Model of Parkinson’s Disease**](#Alberico)

Stephanie Alberico and Veronica Quinlan (Rodney Clark), Allegheny College - Neuroscience

[**Classical Conditioning of the Immune Response**](#Brandebura)

Ashley Brandebura, Ashley Adamson, and Robin Ellege (Rodney Clark) Allegheny College - Neuroscience

[**An Animal Model of Complex Autism in Sprague Dawley Rats**](#Dudek)

Sharon Dudek and Bonnie Cross (Jeffrey Cross and Jeffrey Hollerman), Allegheny College - Neuroscience

**RUNNER UP -[The Effect of Rhythmic Entrainment Intervention (REI) on Speech, Communication,](#Faber)**

**[and Repetitive Behavior of Children on the Autism Spectrum](#Faber)**

Rachel Faber (Rodney Clark and Jeffrey Cross), Allegheny College - Neuroscience and

Psychology

[**Administration of Brilliant Blue G Improves Recovery after Ischemic Stroke**](#Hassett)

Timothy Hassett II (Jeffrey Cross), Allegheny College, Neuroscience and Biology

**RUNNER UP -** [**The Effects of Oxytocin and Vasopressin on Social Recogniton in VPA Rats**](#Kahala)

Alisha Kahala (Jeffrey Cross), Allegheny College - Neuroscience and Psychology

**RUNNER UP -**[**Comparing d-amphetamine and Methamphetamine: Active Avoidance Learning and Neurotoxicity**](#Kmentt)

Stacy Kmentt (Jeffrey Hollerman), Allegheny College - Neuroscience and Psychology

[**The Effects of Pilocarpine and Valproic Acid on the Median Eminence-Arcuate Nucleus Barrier**](#MacAdam)

David MacAdam (Jeffrey Cross), Allegheny College - Neuroscience

[**Benefits of Physical Activity Self-Monitoring on Sleep, Depression, and Anxiety**](#Mick)
Megan Mick (Sarah Conklin), Allegheny College – Neuroscience

[**Effects of Ambient Temperature on Reinforcing Efficacy of Methamphetamine in the Rat**](#Minsterman)

Jessica Minsterman1 and Rachel Fodi2 (Rodney Clark1), 1Allegheny College and 2University of Pittsburgh - Psychology

**WINNER -**[**Investigation of Erythropoietin as a Neuroprotective Agent for Pilocarpine-Induced Seizures in Mature Male Sprague Dawley Rats**](#Mozzoni)

Kelsie Mozzoni (Jeffrey Hollerman and Jeffrey Cross) Allegheny College - Neuroscience

[**The Teratogenic Effects of Methamphetamine on Olfaction**](#Strawser)

Lauren Strawser (Rodney Clark), Allegheny College - Neuroscience

## CHEMISTRY

[**Infrared Characterization of Silicon Nitride Intermediates Using a Microwave Plasma Discharge Source with SiH4 in Low Temperature N2 Matrices**](#Deniziak)

Adam Deniziak (Jay Amicangelo), Penn State Behrend, School of Science - Chemistry

[**Cycloaddition of Nitrile Oxides with Furans**](#Easley)

Chanel Easley (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

[**Spectral Analysis of Brooker's Merocyanine in HY Zeolites**](#Georgic)

Victor Georgic (Jennifer Holt), Penn State Behrend, School of Science - Chemistry

[**A Regioselective Synthesis of a Series of α-Acyloxy Ketones from a Novel Class of Alkynyliodonium Salts**](#Kristufek)

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

[**Energy Production of Common Carbon-Containing Fuels with Regard to CO2 Emission**](#Lehman)

Shane Lehman and Jordyn Piepenhagen (S. Al Studniarz), Penn State Shenango - Chemistry

[**Identifying Cyanide-Coordinated Fe (III) Porphyrins as a Possible Electrocatalytic Material for Selective H­­2S Oxidation**](#Neiswonger)

Marc Neiswonger (Jason Bennett), Penn State Behrend, School of Science - Chemistry

**WINNER -**[**Determining the Viability of Fe(III) meso-Tetra(4-sulfonatophenyl)porphine chloride as an Electrocatalyst for the Selective Oxidation of Carbon Monoxide**](#Pander)

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

[**Phenyl Derivatives of o-Aminobenzaldehyde and Its Self-Condensation Reactions**](#Phelps)

Jerry Phelps (Alan Jircitano), Penn State Behrend, School of Science - Chemistry

**RUNNER UP -** [**Residual Water Effects on Composite Host-Guest Systems**](#Thier)

Greg Thier (Jennifer Holt), Penn State Behrend, School of Science - Chemistry

[**Liquid Crystalline Derivatives and Metal Complexes of Their Self-Condensation of o-Aminobenzaldehyde**](#Wolfe)

Luke Wolfe (Alan Jircitano), Penn State Behrend, School of Science - Chemistry

## ENGINEERING

[**Nerve Control of Prosthetic Device**](#Canino)

Vince Canino1 and Paul Morris1 (David Loker1, Margaret Voss2, Yi Wu1, and John Roth1), Penn State Behrend, 1School of Engineering and 2School of Science - Electrical and Computer Engineering

[**Resistance of a Sailboat Rudder**](#Crowell)

Matt Crowell (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

[**Development of Design Equations for Compressive-Hook Integral Attachments**](#Davis)

Dustin Davis (Dean Lewis), Penn State Behrend, School of Engineering - Mechanical Engineering

[**A Real-Time Tool to Support PID Loop Tuning by Intuition**](#Dombrosky)

Dane Dombrosky (E. George Walters III), Penn State Behrend, School of Engineering - Electrical Engineering

**RUNNER UP -** [**Flywheel Energy Storage System**](#Kapp)

Dustin Kapp, Chad Bell, and Vince Canino (Dakshina Murthy Bellur), Penn State Behrend, School of Engineering - Electrical Engineering

[**Investigating the Installation of a Rooftop Solar Panel**](#King)

Joel King (Robert Weissbach), Penn State Behrend, School of Engineering - Electrical Engineering

[**Post-Pneumatic Forming Mechanical Properties of Lightweight Alloys**](#Lowe)

Dan Lowe and Eric Orton (Fadi Abu-Farha), Penn State Behrend, School of Engineering - Mechanical Engineering

**WINNER -**[**Design and Simulation of Class-E Resonant Circuit for Near-Field Wireless Power Transfer Application**](#Nocera)

Christopher Nocera (Dakshina Murthy Bellur), Penn State Behrend, School of Engineering - Electrical Engineering

[**Undergraduate Student Summer Research Fellowship Program for 2010**](#Pears)

Alyssa Pears, Zach Clark, Tyler Szczesny, Aharon Robinson, and Kyle Brown (Melanie Ford), Penn State Behrend, School of Engineering - Engineering Outreach Center

[**Bringing Heat Transfer to Grades K-12**](#SharpH)

Haley Sharp (Melanie Ford), Penn State Behrend, School of Engineering - Mechanical Engineering

**RUNNER UP -**[**Creating a Program to Calculate the Results of a Lab Demonstrating the First Law of Thermodynamics**](#Ward)

Burfoot Ward IV (Bob Edwards), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

## HUMANITIES AND SOCIAL SCIENCES

**WINNER -**[**Our Spatial World**](#Fanning)

Renee Fanning1, Chelsea Perry1, Erin Bliley2, and Charles Latchaw2 (Dawn Blasko1 and Kathryn Holiday-Darr2), Penn State Behrend, 1School of Humanities and Social Sciences and 2School of Engineering - Psychology

[**The Dark Side of Intimate Relationships: Conflict and Commitment**](#Gassner)

Breanna Gassner (Chiung-Ya Tang), Penn State Shenango - Human Development and Family Studies

[**Using Computer Games for Learning: Designing a Serious Games Measure**](#Klanica)

Daniel Klanica1, Brittany Bittner1, Chelsea Perry1, Renee Fanning1, and Yassine Benlamhidi1 (Dawn Blasko1, Kathy Holiday-Darr2, and Holly Blasko-Drabik1), Penn State Behrend, 1School of Humanities and Social Sciences and 2School of Engineering- Psychology

[**Implementation of IVF Guidelines**](#McBride)

LuAnn McBride, Paige Conroy, Stephanie Flinchbaugh, Ashley Burns, Melanie Copp, and Josey Westerdahl (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

**RUNNER UP -**[**Evaluating the Effectiveness of Youth Development Outcomes of the College for Kids Program**](#Meader)Meghan Meader (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Behrend Arboretum Web Site Update**](#Shoemaker)

Daniel Shoemaker1 (Michael Naber2), Penn State Behrend, 1School of Humanities and Social Sciences and 2School of Science - Creative Writing

[**Genetic Testing and Abortions**](#Stottlemyer2)

Jaclyn Stottlemyer (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences – Philosophy

[**Do the Assets Influence Life Satisfaction in College Students?**](#YoungD)

Danielle Young (Carl Kallgren), Penn State Behrend, School of Humanities and Social Sciences - Psychology

## PHYSICAL SCIENCE

[**Analysis of the Falkner-Skan Equation**](#Carbonara)

Justin Carbonara (Antonio Mastroberardino), Penn State Behrend, School of Science - Mathematics

[**The Moon: A Study of Our Only Satellite and Its Ability to Deflect Asteroids**](#Dulaney)

Michael Dulaney (Darren Williams), Penn State Behrend, School of Science - Astronomy

[**Given ε > 0, the δ is …**](#Gagliano)

Kendra Gagliano (Papiya Bhattacharjee), Penn State Behrend, School of Science - Mathematics

**Liquid Cell Luminescent Solar Concentrators**

*(Contains proprietary information - no abstract included)*

Jesse Gresh (Bruce Wittmershaus), Penn State Behrend, School of Science - Physics

[**Automated Video Podcast System**](#Handley)

Justin Handley, Christopher Marecic, and Tiana Novak (Gary Walker, Ron McCarty, and Wayne Anderson), Penn State Behrend, School of Science - Computer Science

**RUNNER UP -**[**Online Course Management System with Integrated Student Verification**](#Kosarik)

Zachary Kosarik, Brian O’Connell, Katie Copeland, and Gary Cunningham (Gary Walker and Ron DelPorto), Penn State Behrend, School of Science - Computer Science

[**Two-Dimensional Equilibrium Crystal Shapes**](#Schuman)

Clay Schuman and Kartik Darapuneni (Antonio Mastroberardino), Penn State Behrend, School of Science - Mathematics

**WINNER - Jamming of Low Aspect Ratio Granular Media in Vertical Channels**

*(Contains proprietary information - no abstract included)*

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

[**The Lane-Emden Equation**](#Watterson)

Terrance Watterson (Antonio Mastroberardino), Penn State Behrend, School of Science - Mathematics

## BIOLOGY I

**Potential Effects of Long-Term Changes in Forest Composition on Organic Matter Processing in Small Streams**

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

The American chestnut (*Castanea dentata*) was a dominant tree species in Pennsylvania forests prior to the chestnut blight, and its leaves must have been a significant energy source to microbes and invertebrates in small streams. Currently, red maple (*Acer rubrum*) and American beech (*Fagus grandifolia*) are dominant trees in northwestern Pennsylvania forests, but beech may be declining from beech bark disease. The objective of this study was to compare processing and energy utilization of leaves for the above three species in a stream food web. Leaf packs for each species were placed in a first order stream and sampled on five dates between October 2010 and March 2011. Breakdown rates were determined by percent mass loss in the packs, and were 0.012, 0.013, and 0.023 day -1 for chestnut, beech, and maple, respectively. Microbial respiration rates were determined by measuring changes in dissolved oxygen for 16 cm2 leaf samples in BOD bottles. Mean respiration rates ranged from 2.7 to 8.3 mg O2/m2/h, and were consistently lower for beech on each date. The results indicate that long-term changes in forest composition can influence utilization of the primary energy source at the base of the food web in small streams.

**Identification and Description of New Species and a Revision of the Genus *Mycetaspis***

### Callie Knuth (Matthew Gruwell), Penn State Behrend, School of Science - Biology

*Mycetaspis* is an obscure genus of armored scale insects found in the Neotropics containing only eight described species. These insects cause significant damage to many agriculturally important plants. In the spring of 2004, Dr. Gruwell discovered a new species of *Mycetaspis*. This species and several other new specimens were collected but never classified or described. Dug Miller, the foremost expert on scale insect taxonomy, recommended a complete genus revision be completed. To complete this task, three steps were taken: 1) Detailed characteristic drawings and descriptions were created in order to distinguish certain anatomical characteristics among species; 2) Distribution information about the genus was logged by compiling information provided from samples in the USA, England, and Brazil into an excel database. This information was also used to create a geographical distribution map that documents the spread of *Mycetaspis* over the last 111-year period; 3) A sample of *Mycetaspis* was provided for molecular analysis of cytochrome oxidase 1 and 2. The positive PCR results were compared with several standards to create a phylogenetic tree to determine placement of this genus in the armored scale insects. Through this research we have been able to correct misidentified specimens in the USDA collection and reduce the ambiguity of *Mycetaspis*. This genus revision provides important identification tools that will be available to those who need them and will slow the spread of these invasive species.

**The Interactive Effects of Salinity and Temperature on *Chironomidae* Development**

### Daniel Lob (Pamela Silver), Penn State Behrend, School of Science - Biology

Road salt migration into neighboring aquatic ecosystems during spring months from the bay-front highway outside Penn State Behrend is an ongoing occurrence resulting in disturbed ecological niches and disrupted growth cycles, especially to lower-ordered aquatic species such as *Chironomidae*, whose larvae provides a food source to many aquatic organisms. The objective of our experiment was to determine the effect of road salt on *Chironomidae* development time by mimicking near freezing temperatures found during early spring in the laboratory to force 1st-Instar larvae into diapause while subjecting them to 5 g/L and 10 g/L salt treatments and ultimately observe its effects by measuring adult emergence, size, and sex ratio. We found that the number of midges that survived and emerged was significantly greater among salinities (0 > 5 > 10 g/L). Thorax size and development time differed significantly between salinities but salinity and sex were interactive. Sex ratios differed between salinities (male skewed at 5 but =1 at 0 g/L), but size did not. Sex ratios changed significantly over time at 5 g/L (from more to less male bias), but didn’t at 0.

**Vegetation Characterization of the Fringing Habitat Ecotone in the Erie Bluffs State Park Using Hierarchical Clustering and Indicator Species Analysis**

James McGivern, Lindsey Bocian, Nathalie-Ann Brown, and Joseph Perenic (Mike Ganger), Gannon University, Morosky College of Health Professions and Sciences - Biology

The Erie Bluffs State Park is a 450-acre park located in northwestern Pennsylvania.  The park includes 441 vascular plant species within forest, old field, slump ravine, and bluff face communities.  One ubiquitous plant community found within the park is an ecotone formed where forest and field converge, hereafter referred to as the fringing habitat.  The fringing habitat contains approximately 36% of the species found within the park itself and is composed of species typical to forests and fields, along with a few species unique to this ecotone.  The long-term development of the park includes converting currently farmed areas into old fields.  The fringing habitat may serve as a source of colonists for these old fields and therefore an accurate understanding of the composition of the species within the fringing habitat is crucial for predicting the long-term development of these fields.  To characterize the vegetation, 146 quadrats were established within the fringing habitat.  Quadrats were 1 m wide and were 50 m apart.  The presence of vascular plant species within quadrats was determined.  Hierarchical clustering and indicator species analysis were used to identify specific vegetation types.  Data are currently being analyzed to determine vegetation patterns.

**The Active Ingredient in Antidepressants Decreases Bacterial and Viral Content in a Freshwater Aquatic Ecosystem**

Surafel Mulugeta, Eric Clark, and Drew Spacht (Steven Mauro), Mercyhurst College, Zurn School of Natural Sciences and Mathematics - Biology

Fluoxetine is the active ingredient in antidepressant drugs and has been shown to accumulate in recreational waters at levels that have the potential to negatively impact aquatic organisms including fish, algae, and crustaceans. However, the impacts of fluoxetine on aquatic microbes remain poorly understand. In this study, we examined how fluoxetine influences overall and specific bacterial and viral levels in the recreational waters of Presque Isle State Park in Erie, Pennsylvania. Our results demonstrate that fluoxetine is present in these waters and can decrease total bacterial and viral levels. Further, our studies comparing different bacterial types suggests that fluoxetine cytotoxicity is not uniform, indicating that fluoxetine presence impacts microbial aquatic ecosystems in a complex way that should be further examined.

**Effect of Nutrient Additions on Bacteria and Algae Growth in Groundwater Treated by Permeable Reactive Barriers and Sewage Treatment Facilities**

Brendan O’Leary1 and Daniel Feinburg2 (Kenneth Foreman3), 1Allegheny College, 3Marine Biological Laboratory, and 2Hamilton College - Environmental Science/Geology

Large numbers of ineffective septic systems on Cape Cod generate excess nutrients in groundwater, causing eutrophication in local estuaries. Nitrogen and phosphorus play a critical role in algal growth rates in estuaries that can lead to algal blooms. This study focuses on the impacts of permeable reactive barriers (PRBs) and the Falmouth Wastewater Treatment Plant (FP) on micro algae and bacteria in estuaries. Groundwater samples from five locations provided data on ammonium, nitrate, phosphate, chlorophyll, and bacteria concentrations for the analysis of the effectiveness of each PRB and the FP. Cross sectional profiles from the two PRBs revealed mixed success in intercepting the wastewater plume. One barrier showed no change in nitrates past the barrier while the second barrier revealed a change of 87 μM nitrate up gradient to 0-18 μM nitrate down gradient of the barrier. Laboratory tests showed groundwater from the PRBs was phosphate limited based on the large bacterial and chlorophyll responses to phosphate additions. Additionally, laboratory tests on water from the FP showed a response to nitrogen additions with a peak in chlorophyll concentration from 0.5 to 105 μg/mL during the incubation. PRBs and the FP are limited solutions for eutrophication. Quality of barrier installations and estuary influences need greater consideration.

### Structure of the Nasal and Orbital Bones of the Squirrel Monkey *Saimiri boliviensis*

Katie Sharp (Susan Rehorek and Timothy Smith), Slippery Rock University, College of Health, Environment, and Science - Biology

In many tetrapods, the nasolacrimal duct (NLD) carries a variety of fluids produced by orbital glands to the nasal region. In primates, little is known about NLD variation. *Saimiri boliviensis*, a species with markedly enlarged orbits in adults, was used to gain insight into the bony structure of the nasaolacrimal canal (NLC) and the impact of the NLD upon the orbital rim. Serial sections of a *S. boliviensis* skull were photographed, then aligned using Adobe Photoshop and imported into Scion Imaging Software. Three-dimensional reconstructions were then generated to interpret spatial relationships of the NLD and the bone that houses it. Reconstructions revealed that the lacrimal sac is bounded by the frontal process of the maxilla and lacrimal bone; however, the NLD was surrounded mostly by the lacrimal, which exhibits an elaborate process that encircles the duct dorsally and laterally. *Saimiri* have atypically enlarged lacrimal contributions to the NLC compared to other primates. Further work may determine if the nasolacrimal apparatus is likewise more elaborate or hypertrophied in this species compared to others.

### A Census of the Bat Community on the Campus of Gannon University, Erie, PA

Matthew Sturdivant and Morgan Pratt (Steve Ropski), Gannon University, Morosky College of Health Professions and Sciences - Biology

The bat population in the United States is diminishing because of the White-Nose Syndrome. Finding out where bats at Gannon University roost during the day and why is very important to the study of these animals. Bats were monitored from four to five days a week from April to November 2010 by walking a set path of the campus to obtain where specifically they prefer to roost during the day. Building surfaces, building temperature, the building itself, and concentrations of insects nearby are a few of the criteria that played a role when examining the bat population. When accessible, bats were marked with non-toxic paint to see if any used sites repeatedly. Total number of bats recorded were 1,224, of which 1,193 were little brown bats (*Myotis lucifugus*), 32 were possibly Eastern pipistrelles (*Pipistrelus subflavus*), and one big brown bat (*Eptesicus fuscus*). Of the 150 marked bats, 75 were observed one or two subsequent times on campus. These data suggest that the Gannon campus is not a permanent roosting site but merely a stopover/temporary site. These data compare very favorably with previous censuses conducted in 1995 and 2003.

## BIOLOGY II

**Demonstration of Antibiotic Resistant Gene Transfer via Conjugation between Bacterial Strains Isolated from Lake Erie**

Alexander Augustyniak and Jasmine Shinko (Gregory Andrasoand Troy Skwor), Gannon University, Morosky College of Health Professions and Sciences - Biology

Bacterial resistance to antibiotics has drastically increased over the last few decades. Resistance is frequently obtained either by natural mutations or by acquiring DNA from other bacteria, a process referred to as horizontal gene transfer. Conjugation is one mechanism of horizontal gene transfer that involves the transfer of DNA via cell to cell contact between bacteria. Our objective was to test this *mechanism* *in vitro* for the transfer of ampicillin and ciprofloxacin resistance genes between bacteria isolated from the waters of Lake Erie. MacConkey agar with and without ampicillin (50 µg/ml) was used to isolate lactose-fermenting (bright pink colonies), ampicillin sensitive (Lac+/AmpS) bacteria and non-lactose fermenting (non-pink colonies), and ampicillin resistant (Lac-/AmpR) Gram-negative bacteria. These isolates were co-incubated and plated onto ampicillin-supplemented MacConkey agar. The presence of lactose-fermenting colonies confirmed that conjugation had taken place. We also investigated conjugative ability between ciprofloxacin resistant (0.5 µg/ml), lactose-fermenting, Gram-negative bacteria and *Aeromonas spp*. Aeromonads have been associated with a multitude of human diseases, such as wound infections, pediatric diarrhea and pneumonia. These findings demonstrate the ability of different bacterial genera to share antibiotic resistance, which is concerning due to the presence of bacteria in water that are potentially pathogenic to humans.

### Kinetic Analysis of Wild Type and Mutant HDV Ribozymes: Determining Conditions for Kinetic

**Isotope Effect Analyses**

Cierra Birch1 and Wes Clark2 (Michael Harris2), 1Edinboro University of Pennsylvania and 2Case Western Reserve University - Biochemistry

The hepatitis delta virus (HDV) is a co-virus of hepatitis virus. The ribozyme of HDV is an enzyme that catalyzes the cleavage of RNA, but the mechanism of catalysis is controversial. The purpose of this experiment was to determine the conditions under which the Kinetic Isotope Effects (KIE) can be studied in order to define the mechanism. These conditions must necessarily be ones where substrate dissociation is faster than the conversion of substrate to product. The HDV enzyme was studied in its wild type and double mutant form. The double mutant has changes in the nucleotides that are involved in substrate binding and are designed to increase the rate constant for substrate dissociation. The initial goal was to determine the observed rate constant (*k*obs) for catalysis as a function of enzyme concentration to provide insight into the magnitude of the rate constants for catalysis (*k*3), substrate association (*k*1), and dissociation (*k*2). To assay product formation and determine *k*obs, enzyme and substrate solutions were prepared at defined concentrations and mixed to start reactions. Aliquots were sequentially removed and precursor and product were separated by thin layer chromatography. The conversion to product was scored by isotopic counting. Rate constants were determined by fitting “product formed” versus “time elapsed” to an exponential function. Data from multiple experiments were plotted to observe the dependence of *k*obs on enzyme concentration. These data were fit to a hyperbolic function to extract the rate constant for the chemical step (*k*3) and the fitted parameter *K*1/2 that is a function of all three rate constants. Further experiments were performed to synthesize more RNA substrate and HDV enzyme. Future experiments must use pulse-chase approaches to determine the magnitude of *k*2 relative to *k*3. Ultimately, these data will be used to define conditions under which the mechanism can be probed by KIE analysis.

**Chemoreception on the Heads of Aquatic Salamanders: Distribution of Cephalic Cutaneous Taste Buds in the Red-Spotted Salamander (*Notophthalmus virdescens*)**

Jennifer Caprez (Susan Rehorek), Slippery Rock University, College of Health, Environment, and Science - Biology

Vertebrates have many means for monitoring the chemicals in the external environment.  The gustatory or taste system consists of discrete units, called taste buds, which line the oral cavity.  Thus far, non-oral taste buds have been identified in some fish species and there is an undocumented reference of taste buds in the skin of aquatic salamanders.  The purpose of this study was to determine the structure and distribution of cephalic cutaneous taste buds in the red-spotted salamander (*Notophthalmus virdescens*), an aquatic salamander commonly found in Eastern USA.  Small taste buds, 20 mµ in diameter, were observed in the epidermis of both the head and the jaw.  The taste buds on the head appeared to run in distinct tracts from the nose to the orbit.  Posterior to the orbit, the taste buds appears to be randomly arranged.  On the lower jaw the taste buds also appeared to run in tracts on the lateral aspect of the mandible. The distribution of cutaneous taste buds in aquatic salamanders suggests that taste is an important and often overlooked sense in aquatic animals.

**Identification and Molecular Evolution of Endosymbiont, *Rickettsia,* in *Pholcus phalangioides,* Common Cellar Spider**

### Kristi Gdanetz (Matthew Gruwell), Penn State Behrend, School of Science - Biology

It has been observed that *Pholcus phalangioides*, the common cellar spider, has skewed sex ratios in favor of females. This ratio could be caused by a bacterium inducing parthenogenesis, feminization, or male killing. We surveyed two populations of *P. phalangoides*, one raised by Ann Rystra and Chad Hoefler from Miami University of Ohio and a second wild population from Erie, PA. Basic DNA extraction was performed on the spiders, without the legs. PCR using generic bacterial 16S and *Wolbachia* specific 16S primers allowed us to identify that a *Rickettsia* species inhabits the cellar spiders. Sequences of different *Rickettsia* species, a known endosymbiont in a diverse number of arthropods, were obtained and compiled into a phylogenetic tree to determine the relation of cellar spider *Rickettsia* to all other *Rickettsia* endosymbionts. *Rikettsia* has been identified as a male-killing bacterium in ladybird species. Rystra and Hoefler treated groups of cellar spiders with antibiotics to determine if the skewed sex ratios were caused by the bacteria and if the ratios can return to 50:50. We determined the presence of bacteria in the treated spiders using PCR. *Rickettsia* has not previously been identified as an endosymbiont of *Pholcus phalangiodes*.

**1,4-Dimethylnapthalene (DMN) or Chlorpropham (CIPC) Treatments Indicate Different Mechanisms of Sprout Inhibition in Potato**

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

When potatoes sprout they produce the toxin solanine and undergo sweetening, making them unfit for consumption. Sprouting represents significant economic losses to the potato industry. To prevent sprouting, the sprout inhibitors Chlorpropham (CIPC) or 1,4-Dimethylnapthalene (DMN) are used. CIPC is a synthetic compound that prevents sprouting by disrupting microtubules, preventing the potatoes from healing when bruised during shipping. DMN is a natural compound whose mechanism of action is unknown. Microarray analysis was conducted on untreated, CIPC-, and DMN-treated potatoes to determine the mechanisms by which these compounds inhibit sprouting. Gene expression analysis indicated that DMN and CIPC function through different mechanisms. qRT-PCR tests focusing on cell cycle gene expression showed increased expression of CDKB1, a cell cycle inducer, following CIPC treatment. This suggests the development of a G2 block. DMN treatment caused increased expression of the KIP genes, which are cell-cycle repressors, suggesting the formation of a G1 block. Compared to the effects of CIPC, the manner by which DMN inhibits sprouting may offer economic and health benefits. This treatment option merits further investigation.

### BDE-209 Induced Alterations in the Oxidative Status of Mice Tissues

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

Polybrominated diphenyl ethers (PBDEs) are a class of brominated flame retardant compounds added to many consumer goods. These compounds by nature of their lipophilicity and persistence have become widespread environmental contaminants. They are present in detectable levels in approximately 97% of the American adult population. As of now the only congener still in use for industrial use is BDE-209, a deca-brominated congener. This study investigates the impact of BDE-209 on the oxidative status and antioxidant protection mechanisms of four mouse tissues *viz*. kidney, liver, brain, and intestine. Adult mice were injected daily with 0.25 mg/kg body weight of BDE-209 over the course of four days. Tissue samples were taken on the fifth day for the determination of lipid hydroperoxide levels and activities of superoxide dismutase and glutathione peroxidase. Analysis showed a significant change in the oxidant/antioxidant equilibrium of exposed mice; lipid hydroperoxide levels were found to be elevated, indicating oxidative stress. Further, the superoxide dismutase and glutathione peroxidase activities exhibited tissue-specific alterations indicating an increase in oxidative stress and a decrease in the ability of tissues to quench the oxidative stress.

**Assessing the Potential of Essential Oils as an Alternative Treatment for Chancroid**

### Zachary Lindeman (Tricia Humphreys), Allegheny College - Microbiology

*Haemophilus ducreyi* is the bacterium responsible for the genital ulcer disease chancroid. Many strains of *H. ducreyi* have developed resistance to common antibiotic treatments over the past 40 years; a development that is particularly disturbing considering that chancroid is a cofactor for the transmission of HIV. In light of these facts, it is important that alternative treatments for chancroid be explored. One such alternative that has proven to be effective in other species of bacteria is the use of essential oils. An initial disk diffusion assay utilizing five essential oils revealed cinnamon oil and thyme oil to be the most promising bactericides. Minimum inhibitory concentrations (MICs) and minimum lethal concentrations of cinnamon (MLCs) were then determined for nine strains of *H. ducreyi*, along with four control organisms, using the agar-dilution method. The MIC for cinnamon was 0.05% for *H. ducreyi*, and the MLC was 0.05%. Testing to determine the MICs and MLCs for the essential oil thyme is ongoing. Based on our initial results, cinnamon in particular seems to be a strong candidate for clinical trials to assess its potential as a treatment for chancroid.

**Effect of Subacute Ruminal Acidosis on TMR Preference in Lactating Dairy Cows**

Daryl Maulfair and Kolby McIntyre (A. Jud Heinrichs), Penn State University, College of Agricultural Sciences - Dairy and Animal Science

Subacute ruminal acidosis (SARA) is a condition where the pH of the rumen becomes abnormally acidic, because of overactive rumen microbes. A common cause of acidosis is overeating large amounts of readily available nutrients, specifically carbohydrates. Acidic by-products of fermentation are responsible for the change in the rumen environment. Salivary bicarbonate neutralizes acids during normal rumination, which is initiated by long-fiber particles. Ruminal acidosis can lead to cows going off-feed, compromising the health of the animal. In this study, eight multiparous rumen-canulated Holstein dairy cows were each given a choice between a long, slow-fermenting and a short, fast-fermenting ration. Beginning on day 1 following adaptation, feed intake was monitored. Rumen condition (pH, VFA production) was monitored beginning day 4. On day 5, cows were restricted to 75% ad libitum intake; rumen environments were monitored to demonstrate changes created by feed restriction. Cows were given 4 kg wheat grain on day 6, followed by ad libitum long and short rations. Preliminary results suggest a correlation between the decrease in ruminal pH attributed to SARA and increased preference for the long, slow-fermenting ration. These results imply that cows increase their intake of long-fiber particles as needed to maintain proper rumen function.

### Antibiotic Resistance of Bacteria Isolated from Ground Beef

Sam Snyder (David Fulford), Edinboro University of Pennsylvania, School of Arts and Sciences - Biology

Antibiotics are frequently used in both the beef and dairy industries. These antibiotics not only prevent and treat infection but also promote growth and increase milk production. Overuse of these drugs has been linked to antibiotic resistance in bacteria that has the potential to be deadly. Among these bacteria are *Escherichia coli, Shigella, and Klebsiella.* These bacteria can be acquired through improper cooking or poor sanitary conditions and resistant strains may make treatment difficult. The purpose of this study was to isolate bacteria foundin conventional ground beef and to determine their resistance to ampicillin, erythromycin, gentamicin, and tetracycline. Samples of ground beef from local markets were obtained and bacterial growth was promoted. The bacteria were inoculated onto EMB plates and each plate was observed for bacterial colonies. Samples of typical coliform colonies were used to inoculate a second EMB plate. Isolated bacteria were tested to determine species and antibiotic resistance. The results show that ground beef harbors a variety of coliform species. The most commonly isolated coliforms were *E. coli, H. alvei, Serratia,* and *Klebsiella*. Of the 34 coliforms tested, it was discovered that a majority are resistant to one of the four antibiotics used.

**Effect of Photobiomodulation (NIR and NUV) on the Inflammatory Response from Cervical Epithelial Cells Infected with *Chlamydia trachomatis***

Cassandra Wasson, Ashley Wimer, and Janis Eells (Troy Skwor), Gannon University, Morosky College of Health Professions and Sciences - Biology

*Chlamydia trachomatis*, an obligate intracellular bacterium, is the leading cause of bacterial sexually transmitted diseases nationwide and worldwide. With the majority of infections asymptomatic, failure to identify and properly treat could lead to sequelae, including pelvic inflammatory disease, salpingitis, and ectopic pregnancy in females and epididymitis and infertility in males. Near infrared light (NIR) has been associated with tissue healing, inflammation reduction, and pain reduction. Additionally, near-ultraviolet light (NUV) can restrict the growth of various bacterial pathogens. Because recent studies indicate antibiotics may increase the recurrence of chlamydial infections, particularly those of the eye, alternative treatments are necessary. Our objective was to assess NIR and NUV as possible alternative treatments for *C. trachomatis* infections. Human cervical epithelial cells, HeLa, were infected with *C. trachomatis* serovar E and treated with NIR or NUV at various dosages. Bacterial growth was assessed by analyzing the ratio of bacterial housekeeping gene (16S) to host housekeeping gene (beta-actin). Supernatants were also collected and assessed for the pro-inflammatory protein, IL-6. Our results demonstrated decreased bacterial growth and IL-6 production upon photobiomodulation, with NUV having a greater effect. These findings suggest further medicinal applications of NIR and NUV as possible alternative treatment options for *C. trachomatis* infections.

## BUSINESS, HISTORY, AND PSYCHOLOGY

### The Causes of Differing Development Levels among Nations: Cases of Chile and Mexico

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

It is well known that countries develop at very different rates causing some nations to be very rich, while others are left very poor. The goal of this research was to develop an understanding of why these differences occur. By understanding the causes to a successful nation, it will make it possible to guide policy makers of struggling nations in the correct direction. This paper will begin by exploring the two extremes of economic policy, free market and extreme governmental intervention. It is expected that the free market approach will be more beneficial to most countries, but how to begin implementing this approach depends highly on the culture of the specific country. This research will contribute to developing a strong understanding of the underlying causes to a nation’s success. This can then lead into the analysis of two specific countries. This analysis will involve examining the governmental structure, the country’s culture, etc. These results can then be compared and contrasted and should suggest that either governmental influence or free markets were more beneficial to those particular societies. This will then imply that there is evidence supporting either governmental influence or free market economic policies for most countries.

**Having to Leave Town for Children’s Medical Treatment: What Does it Really Cost a Region?**

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

Children who live in a rural or small metro area and happen to get sick—really sick—oftentimes cannot receive the treatment they need locally. This creates additional travel and opportunity costs to families in addition to the cost of medical treatment. The families, however, are not the only ones impacted; these individual costs also have a cumulative effect on the regional economy. If pediatric subspecialists could be brought into the smaller area, many of those costs might be avoided. As part of a local effort to increase children’s access to subspecialists, this project sought to determine the costs beyond treatment of the outmigration of pediatric patients from northwestern Pennsylvania to hospitals in Pittsburgh, Buffalo, and Cleveland for subspecialty treatments during 2007 and 2008. Specifically the costs of lost wages, transportation, parking, housing, and food were examined for children and their families seeking treatment in eight targeted subspecialties. Overall, the cost to the region beyond the cost of treatments was estimated to be 3.6 to 7.0 million dollars over the two-year period. This study can serve as a model for other small areas that wish to estimate their own costs from lack of medical treatment options for children.

### Quality of Student Life Research

Arica Christman (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

This research project addresses the factors that affect students’ satisfaction at Penn State Behrend. The sample was selected from high traffic areas of the college using systematic sampling. The data collection method used was self-administered surveys. In order to accurately depict the “Quality of Student Life,” a number of statistical methods were used, including linear regression, reliabilities, and factor analysis available in the SPSS software. The statistical tests were used to assess the relationships between variables, the strength of their relationships, the significance of the independent variables, and the reliability of the constructs. Once the results were found, their interpretations led to the formulation of a story based on the data. With the information gathered, we can conclude that faculty, ambiance, athletics, and education quality best predict students overall satisfaction with the college.

### A Continuation of the Youth Voice Project

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

Bullying in schools affects everyone exposed, including the targets, bystanders, and aggressors, and can result in traumatic responses. Research has shown that both perceived social support and coping methods are important mediators in the relationship between negative school experiences and levels of trauma. The purpose of this study was to examine the role school connectedness plays in the relationship between relational victimization and perceived levels of trauma and sought to determine which coping strategies were reported most effective in handling victimization. A questionnaire was distributed to a range of schools across the country and completed by grades 5-12. While controlling for gender and socioeconomic status, multiple regression analyses were conducted and split by grade level to examine the unique relationship between relational victimization and trauma. Results indicated that across grade levels, feeling valued at school as well as feeling part of the school were significant in mediating levels of trauma. Examination of the data further indicated that spending time with peers and receiving social support at school were the most effective methods in reducing the trauma experienced by the victims. Implications of these findings will be discussed as they relate to the educational setting to optimize student development.

### Do Companies Benefit from Competitors’ Misfortunes?

Matthew Harned and Syed Ammar Hussain (Sanjay Kumar), Penn State Behrend, Sam and Irene Black School of Business - Operations Management

Disruptions in supply chain networks could undermine a company’s economic performance. Prior studies have documented the adverse effects of disruptions in shareholder value. These studies intrinsically assume that shareholders are discouraged when a company experiences disruptions. In this study we contribute to current academic knowledge, by studying the impact of disruptions on competitors’ stock price. We postulate that discouraged shareholders holding a portfolio of stocks may view a competitor favorably and choose to invest in a competitor’s stocks. In this study we focus on the automobile industry. The time-frame of disruptions has been narrowed to the past 20 years to get a better understanding of their effect on the industry’s stock prices. The data are compiled from announcements of disruptions in national business journals such as *Wall Street Journal* and *Business Week*. Considering disruption day as day 0, we investigate the stock price changes for competitors for days prior to disruption and days post disruption. By showing the consequences of disruptions on competitor’s stock prices, we emphasize a stronger need for investment in risk mitigation practices. Our results also have implications for investment companies.

**“Libya's Top Clown” in Context: A History of Libya-US Relations**

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

America's collective memories of Libya are often exclusively from the 1980s and highlight Reagan's violent clashes with a seemingly insane Muammar Gaddafi. This research intended to find signs of reason behind Libya's foreign policy decisions in the decades following Gaddafi's Green Revolution. Primary sources, including news reports and state department documents, were analyzed to determine Libya's intentions while dealing with the United States and the American perspective of Gaddafi. By looking at the causes and objectives of the revolution and placing America's clashes with Libya into the much broader context of Cold War international relations, Gaddafi and Libya's foreign policy decisions seem arrogant and over-ambitious, though not totally unreasonable or nonsensical.

### Reinvent Behrend

Lisa Puhak, Justin Wheeler, Kyle Garner, Jenna McCloskey, and Michael Kasprzak (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

Being current students at Penn State Erie, The Behrend College, we decided to survey student satisfaction with the campus. The purpose of this study was to determine the factors affecting student satisfaction with Behrend, specifically. We began the study by developing a detailed questionnaire to survey current Behrend students. Data collection was carried out individually by all group members. Next, data were coded, compiled, and analyzed in the PASW statistics program. The results suggested a positive rating of overall student satisfaction. The data found two factors linked to satisfaction: students feeling a part of the college and students feeling their classes were beneficial to their education.

### Exploratory Research on Facebook-User Satisfaction

Zoe Southworth, Megan Wolf, and Marissa Lanich (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

In recent years, social networking has become a way of life for the young and old alike, and Facebook is at the forefront of it all. Despite its growing popularity, little research has been conducted to understand the feelings of Facebook users. Exploratory research performed at Penn State Behrend on the topic of Facebook, has produced informative results that begin to lay the ground work for understanding the Facebook phenomenon. The study was conducted on-campus using a survey. A sample of 193 students was selected from high traffic areas of the college. A factor analysis of the data left us with four main constructs to explain user satisfaction: user-friendliness, facilitation, a social connection, and the filling of time. Reliability tests, correlations, and a regression model revealed significant relationships between the variables and user satisfaction. This allowed our constructs to tell a story that begins to facilitate the explanation of why users keep returning to Facebook.

### Bullying in Schools: The Effects of Having a Disability and Being Bullied

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

The impact of being bullied can have serious effects on the lives of children, for example contributing to episodes of anxiety and depression. Subsequently, it is important that we take a close look at bullying and identify effective ways to prevent it. Evidence suggests that children with disabilities may experience bullying more frequently than children without disabilities. Therefore this study will focus on bullying for children with and without disabilities. Tests will be run to see if students with disabilities are bullied more than children without disabilities, if they experience more trauma from being bullied, if being disabled is the cause of the bullying, and how they cope with being bullied. If they cope differently than children with disabilities, are their coping strategies more effective or less effective? Finally, according to past research, children with disabilities are more likely to feel connected to their schools. This study will aim to further these findings and add to the plethora of research on this topic.

### Measuring International Exports at the County Level: Is it Possible?

Travis Yates (James Kurre), Penn State Behrend, Sam and Irene Black School of Business -

Business Economics

Those who wish to promote economic development at the county level often start by asking how a county makes its living. That usually leads to the question of what the county exports, both outside of the county and outside of the nation, to bring income to local residents. However, data on this topic seem to be elusive. This report sets out to determine just what data are, and are not, available on exports at the county level by examining an inclusive list of sources pertaining to exporting. Using the data that are available, the project demonstrates how to analyze exports at the county level. Since it is often not possible to rely on direct export data, the report also presents alternative methods to estimating export activities using federal government data on earnings and employment. The focus region is represented by ten individual counties surrounding Erie County, Pennsylvania and is located in northwestern Pennsylvania and northeastern Ohio, but the sources, methodology, and results of this report can be applied to any county in the country.

## CHEMISTRY

**Environmentally Benign Syntheses of Alkynoic Esters Using 1-*H*-1-hydroxy-5-methyl-1,2,3-benziodoxathiole 3,3-dioxide**

### Danielle Bittner (Michael Justik), Penn State Behrend, School of Science - Chemistry

In the presented research we demonstrate the ‘green’ synthesis of 2-alkynoic esters, synthetically useful sources of alkyne groups in the preparation of biologically interesting compounds, from 3-substituted 5-pyrazolones by treatment with 1-*H*-1-hydroxy-5-methyl-1,2,3-benziodoxathiole 3,3-dioxide (HMBI), a hypervalent iodine oxidant. The transformation of 3-substituted 5-pyrazolones into 2-alkynoic esters has been previously achieved using thallium(III) nitrate as the oxidizing agent, a particularly toxic metal salt whose reduced byproducts make purification of the compound of interest difficult. When HMBI is employed as the oxidizer instead of Tl(NO3)3, the use of toxic oxidants is avoided, and a simple aqueous workup is all that is required to quantitatively remove the reduced HMBI. This reduced by-product can be isolated and reoxidized with high efficiency (~93%) by treatment with a combination of hydrogen peroxide and acetic anhydride. We have observed that 3-substituted 5-pyrazolones derived from -ketoesters afford the product 2-alkynoic esters in high yield. In an intriguing observation, when 2,3-disubstituted 5-pyrazolones are employed, allenic esters are obtained. The 2-alkynoic esters produced by this research were varied by changing the R functional groups present, and the final products were fully characterized using 1H and 13C NMR using our Bruker Avance 400 NMR facility.

**Improved Synthesis, Characterization and Collection of TiO2 Nanoparticles**

Faisal Ibrahim and Nicolas Arrigo (Carl Hultman), Gannon University, Morosky College of Health Professions and Sciences - Chemistry

Improvements will be reported for the synthesis, collection, and characterization of TiO2 nanoparticles synthesized in formic acid solvent. The yields for the reaction have been improved from 20% to 74%. Part of the improvement in yields is due to new filtration methods used for collecting product. The reaction involves reacting TiF4 with SiO2 in formic acid solvent. Different reaction conditions were studied to see the effect on products. How samples were collected and prepared for both optical and atomic force microscopy analysis will be presented. Future work will involve making other metal oxide nanoparticles by using different metal fluorides as reactants with SiO2.

### CVD Synthesis of Carbon Nanotubes

Niclolas Kaiser and Travis Shaffer (Carl Hultman), Gannon University, Morosky College of Health Professions and Sciences - Chemistry

Carbon nanotubes were synthesized using chemical vapor deposition. The reactive gases were hydrogen and ethylene in a stream of nitrogen. The catalyst for the reaction at 600oC was nickel screen. The carbon nanotubes were observed using atomic force microscopy and optical microscopy. Reaction conditions were varied in order to see the effect on the resultant carbon nanotubes. Future work will involve using dip-pen nanolithography to produce a template on a substrate to serve as a new catalyst for the production of carbon nanotubes.

**Cyanide-Treated Iron (III) Meso-Tetra(4-carboxyphenyl) Porphyrin Modified Microelectrodes for Selective Oxidation of Hydrogen Sulfide**

### Stephanie McKinney (Jason Bennett), Penn State Behrend, School of Science - Chemistry

Hydrogen sulfide, along with carbon monoxide and nitric oxide has been discovered to belong to a group of gaseous biomolecules known as gasotransmitters. The endogenous production of hydrogen sulfide comes from the enzymes cystathionine β-synthase (CBS) and cystathionine *ϒ-*lyase (CSE) and has shown to be a likely factor in certain neurological diseases. In order to understand and monitor the physiological roles this gas plays throughout the human body it is vital to be able to monitor the gas *in vivo*. Unfortunately, there is currently no method to selectively monitor hydrogen sulfide *in vivo*. Using microelectrodes, modified with an appropriate electrocatalyst, one may be able to remedy this problem. This research primarily investigated the deposition of Iron (III) meso-Tetra(4-carboxyphenyl) porphyrin (FeTCPP) onto the surface of a microelectrode, followed by a CN-treatment procedure, to develop an electrocatalytic material capable of selective H2S oxidation. Our results indicate this to be a very promising candidate as selective H2S oxidation, over NO and CO, was achieved.

**Development and Characterization of a Carborane Thiol Ink for Dip-Pen Nanolithography**

Nathalia Ortiz and Michael Rose (Carl Hultman), Gannon University, Morosky College of Health Professions and Sciences - Chemistry

Dip-pen nanolithography is a printing technique that can print molecules on a variety of substrate surfaces with a resolution of 5 nm. The research to be reported describes the effort to develop an ink using M9 carborane thiols. The carborane thiols are printed onto gold surfaces with a variety of different patterns. The M9 carborane thiols have a dipole moment that will be perpendicular to the surface they are printed on. The resolution and quality of the printed patterns are observed using atomic force microscopy and will be reported. The future goal of the research is to print patterns that will selectively attach species to a surface in a controlled manner. This will then be an example of nanotechnology self assembly.

Utilizing Representative Drawings to Explore Student Understanding of Chemical Equations

### Reni Roseman (Dyan McBride), Mercyhurst College - Chemistry

Numerous studies have been completed using particulate drawings as a means to facilitate student understanding of stoichiometry and specifically balancing equations. However, these studies are typically limited in scope in that they focus on the expert’s ideas of what a particulate drawing should look like and include. The purpose of this study is to investigate how students picture chemical equations through self-created diagrams. This study will help us understand how students interpret these equations, what chemical principles they believe are most important to include in their drawings, and in what ways they visualize these reactions. By analyzing data from student interviews the results indicate that even with a large body of prior knowledge about chemical equations in their traditional format, students have difficulty thinking about the compounds and elements as more than just a letter. During an interview students are presented with a progression of several equations. As students complete their diagrammatic representations they increasingly pull out more information that they believe is essential to accurately represent the chemical equation and create understanding of the diagram itself, gradually developing their representation to account for a wide range of stoichiometric concepts.

**Correlation of Optical Microscopy Images with Atomic Force Microscopy Nanoparticle Images**

Jeff Slater (Carl Hultman), Gannon University, Morosky College of Health Professions and Sciences - Chemistry

Results will be reported on how optical microscopy images at a magnification of only 800x may be used to reveal structural details for nanoparticles. Carbon nanotubes and 100 nm size particles of titanium dioxide will be observed both with optical and atomic force microscopy. Results will be reported on how different methods for viewing and preparing samples for optical microscopy analysis may give information on the structure of nanoparticles. This work may lead to simple optical microscopy methods that reveal structural details that normally require an atomic force microscope or other expensive microscopy techniques for viewing nanoparticles.

**The Characterization of Silicon Nitride Intermediates Using High Temperature Pyrolysis with SiH4 in N2 Matrices**

Alexander Wolbert (Jay Amicangelo), Penn State Behrend, School of Science - Chemistry

In this project, matrix isolation infrared spectroscopy will be used to characterize short-lived reaction intermediates that may be related to silicon nitride (Si3N4) chemical vapor deposition processes. Specifically, the intermediates involved in the high temperature reaction of SiH4 and N2 will be examined. Previous studies in Dr. Amicangelo’s laboratory of vacuum-UV photolysis of SiH4 in N2 matrices have successfully identified SiN2, Si(N2)2, HSiN2, and H2SiN2 as transient species of this reaction. However, while H3SiN2 was expected, it was not observed in the vacuum-UV experiments. A high temperature pyrolysis source has been constructed in our laboratory and this source is theoretically capable of producing the yet unobserved H3SiN2 species. In the current project the pyrolysis source will be used as a generation source in the high temperature SiH4 + N­2 reaction experiments and the products will be trapped in an N2 matrix at 12o K. Identification of the transient species produced in the pyrolysis experiments will be established by performing isotopic substitutions of the reagents (SiD4, 15N2), matrix annealing experiments (warming to 30o K and refreezing to 12o K), matrix ultraviolet-visible photolysis experiments using a mercury-xenon lamp, and by performing quantum chemical theoretical calculations using the Gaussian 03W program.

## COMPUTER SCIENCE, ENGINEERING, AND PHYSICS

### Computational Models for Amorphous Materials

Brittany Hoard (Blair Tuttle), Penn State Behrend, School of Science - Physics

The purpose of this research was to optimize computational models of amorphous materials to study their defects. Using C++ code written by Alicia Klinvex (class of 2008), three periodic models were created: a 216-atom model of crystalline silicon and 100- and 200-atom models of silicon atoms in random positions. The heating and cooling algorithm was then used to generate models of amorphous silicon. Quantum mechanic simulations were used to study the electronic properties of defects in amorphous materials. In this talk, results of the simulations will be discussed.

**A Framework and Algorithm for Conversion of PLC Programs to Microcontroller Programs**

Walter Kerin (E. George Walters III), Penn State Behrend, School of Engineering - Electrical Engineering

Programmable Logic Controllers (PLCs) are used in industry for control, as are microcontroller-based systems. While microcontroller hardware is much less expensive than PLC hardware, PLCs are often chosen for their ease of design and programming, typically resulting in lower overall cost due to fewer design hours. This research is centered on the idea that the ease of programming and design of PLCs can be combined with the lower hardware cost of microcontroller-based systems. To this end the 8-bit family of PIC microcontrollers and the Allen-Bradley CompactLogix PLC platform were used to develop an algorithm for converting PLC ladder logic to PIC assembly language. Conversion patterns were realized after several program conversions were completed by hand. A framework was developed that handles I/O pin configurations, system clock requirements, basic memory organization, and converts simple PLC ladder diagrams to assembly code. Conversion patterns have been developed for many of the most common ladder logic elements, including bit, compare, math, timer, and counter instructions. This research has demonstrated the feasibility of automatically converting ladder logic to efficient microcontroller code, which has the potential to combine the ease of PLC programming with the lower hardware cost of microcontrollers.

### The Diffusion of Hydrogen Molecules through Amorphous Solids

Andrew Makepeace (Blair Tuttle), Penn State Behrend, School of Science - Physics

Amorphous solids are used in a variety of electronic applications. Unlike crystalline solids, amorphous solids have a disordered lattice that requires a special effort to understand their atomic processes. The Activation-Relaxation Technique (ART) takes atoms, initially at a local potential minimum, and activates them by moving them iteratively to a saddle point in the potential surface, and then allows them to relax to a nearby potential minimum. The ART technique has proved computationally efficient and accurate for a variety of amorphous systems. The ART and its application to the case of hydrogen diffusing through amorphous materials such as silica glass will be discussed.

**Interruptions and the Effects of Postponement of a Secondary Task**

Neil Pilarski (Terri Lenox and John Bonomo), Westminster College - Computer Information Systems

Interruptions during a task are a fact of everyday life. As a person is attempting to complete a task, he or she can be interrupted multiple times in several different ways including external and self-interruptions. A typical information worker is interrupted every 12 minutes. When an interruption occurs, in general, a computer user is working on a primary task. The user must deal with the interruption and possibly have to deal with a secondary task. In the field of Human-Computer Interaction, information presentation formats are being changed to better adapt to how humans deal with interruptions while using a computer. A notable adaptation is the capability to defer an interruption when it occurs. When an alert appears telling the user that a secondary task needs to be completed, the user can decide whether or not to take the interruption and complete the secondary task, or to defer the secondary task until a later time. The research will determine whether subjects will choose to defer an interruption during high or low cognitive load. In addition, the research investigates whether or not the actual postponement had a positive or negative impact on both the primary and secondary tasks.

### Formability of Magnesium Alloy AZ31B at High Temperatures

Nick Snyder and John Curtin (Fadi Abu-Farha), Penn State Behrend, School of Engineering - Mechanical Engineering

The mechanical and physical properties of magnesium alloys offer a great potential for weight savings in the automotive industry, especially if used to form body panels. In order to achieve the weight reduction, the problem of limited room-temperature ductility of these alloys has to be resolved. Magnesium alloys are usually warm-formed to overcome this problem. It was found that they exhibit superior ductility and formability at even higher temperatures. However, a comprehensive database of their high temperature behavior does not exist, and is needed for broader utilization of these lightweight alloys. In this project, the formability of the AZ31B-H24 magnesium alloy is investigated under a forming temperature of 400°C with a strain rate of 0.005s-1, using a unique approach based on a pneumatic bulging test with varying elliptical dies. The results will be used to generate the corresponding forming limit diagrams (FLDs) at extreme temperatures. These diagrams may then be used by manufacturers to design sheet metal forming operations for lighter components, like body panels on a vehicle.

### Design of a Portable and Lightweight EEG Device

James Stumbough, Jake Leithner, and Ahmed Abdalla (Sudarshan Nelatury), Penn State Behrend, School of Engineering - Electrical Engineering

A portable, lightweight electroencephalogram (EEG) data acquisition module for medical diagnosis applications is designed. The system has three primary input channels and three auxiliary channels for taking additional event-related potentials to perform correlated processing. The overall design consists of an analog frontend and digital processing unit. The philosophy of the approach is to make it amenable for integrating this system in a mixed-signal, system-on-chip (SOC), which is the cutting-edge technology in the immediate offing. The analog segment consists of a two-stage instrumentation amplifier and a 4th order low pass Butterworth filter. The digital section consists of a microcontroller development board which includes an A/D converter and an RS232 communication unit. The unit has been tested on human subjects for proper signal acquisition and analysis. The EEG device is optimized for low cost, low maintenance, and quick setup.

**Design Patterns and Software Components for Programmable Logic Controllers**Luke Young (E. George Walters III), Penn State Behrend, School of Engineering - Electrical Engineering

Design patterns are defined as a relationship between classes and objects in software that form a specific functionality. These relationships are developed in abstract terms, allowing them to be expanded and adapted to many applications. Patterns have become an important paradigm in the field of software development and are emerging in many domain-specific applications. Research is being conducted to assess the applicability of patterns to control and automation software, focusing on Programmable Logic Controllers (PLCs). Anecdotal evidence suggests that many PLC programs lack good practices, resulting in systems that are static and inefficient. Development of design patterns and components has the potential to improve PLC software and overall system efficiency. A proposed methodology for developing and documenting PLC patterns has been detailed through the exploration of the Hand/Off/Auto pattern. These findings have been used to generate basic software components that can be used to effectively recreate the pattern. Preliminary results indicate that PLC patterns are based on the definition of, and transition between, device states coupled with their interface with software, hardware, and users. These interactions are used to define the functionality of the pattern and serve as the building blocks of efficient programming.

### Learning to Play the Deadly Game of Amazons

Aaron Zavora (John Bonomo), Westminster College - Computer Science

The Game of the Amazons was first introduced in 1988 by Walter Zamkauskas and has since captured the interest of game enthusiasts. It is a two-player board game played on a 10 x 10 board with each player controlling four pieces known as Amazons. It has been shown that deciding a winner in Amazons is NP-Complete even though it is a relatively simple game to play. In this talk, two learning algorithms will be discussed: artificial neural networks and genetic algorithm, both of which have a foundation in biology. The abilities of each learning algorithm will be compared with respect to a modified version of the Game of the Amazons, using a 5 x 5 board with two Amazons per player instead of the traditional 10 x 10 board with four pieces per player. We will address the strengths and weaknesses of each algorithm with respect to learning how to play the Game of Amazons. The genetic algorithm and artificial neural network will both be aided by computer-playing agent, Amazong, a two-time international Game of the Amazons tournament champion written by Jens Lieberum.

## MATHEMATICS

### Study of C(X,Z)

Ronald Hatt (Papiya Bhattacharjee), Penn State Behrend, School of Science - Mathematics

For any topological space X, C(X,Z) represents the collection of all integer-valued continuous functions on X. In this talk, the various properties of C(X,Z) will be discussed and how they compare to C(X,R), the collection of all real-valued continuous functions on X. The Intermediate Value Theorem and the Extreme Value Theorem in context to C(X,Z) for different topologies on X will mainly be discussed. The characteristic functions and their relation to any integer-valued continuous functions will also be discussed.

### Single Direction Forcing in Spring Mass Systems

Andrew Makepeace (Joseph Previte), Penn State Behrend, School of Science - Mathematics

Spring mass systems, described by the differential equation my'' + by' + ky = F(t) , where m, b, and k are constants and F(t) is a forcing function, are widely studied for their practicality, and much is known about systems forced in traditional manners. In this work, a system that can only be forced in one direction will be considered, that is, for example, F(t) >= 0 for all t. The resonance frequencies for various classes of positive functions (e.g. positive square waves and half-rectified sine curves) will be computed. Next, the best class of forcing functions that maximizes the response in the steady state for both amplitude and RMS power will be sought, for given maximum input amplitude and RMS power.

**Faithful Blockings of Finite Groups and Pedagogical Applications**

Mark Medwid (Paul Becker), Penn State Behrend, School of Science - Mathematics

This work is based upon a research article written by Dr. Becker involving faithful blockings of groups. A group is a set, G, and a binary operation, \*, which fulfill some axiomatic conditions: closure, associativity, invertibility, and identity. Dr. Becker's article discussed a way of representing certain types of groups as sets of blocked matrices. This introduced a different viewpoint to the typical method of representing groups as matrices. Blocked matrices offer a more concrete picture of how each element of the group behaves and interacts with others. These matrices have the potential to be an effective teaching tool in abstract algebra and other higher-level mathematics courses. The faithfully blocked representations are not only smaller than those traditionally presented in undergraduate classes, but also have blocking structure which reveals how group elements interact. This project developed new examples of faithful blockings in a broad range of finite groups and a series of computer labs to enhance teaching of some upper-level mathematics classes.

### Using Permutation Groups to Construct Error-Correcting Codes

Raúl Montejo (Paul Becker), Penn State Behrend, School of Science - Mathematics

An error-correcting code is a structure for storing and transmitting binary information in an efficient, error-resistant form. Coding theory seeks to develop optimized codes. A proposed algorithm extends codes for short binary strings to optimal codes for much longer binary strings. Specifically, the algorithm combines ideas from coding theory, group theory, and linear algebra to splice parallel copies of short codes, forming longer codes. An initial experiment extended a known optimal code of length 8 to a known optimal code of length 24. The eventual goal is to improve and generalize this algorithm, splicing codes of length 24 to produce optimal codes of length 72.

**Optimal Forcing Location for Tree-Like Configurations of Coupled-Phase Oscillators**

Tanya Riston (Joseph Previte), Penn State Behrend, School of Science - Mathematics

In a sea lamprey’s spinal cord, an electrical signal produces drives locomotory motion. Biological data has been obtained that test the lamprey cord’s ability to transmit signals of varying frequencies, when forced at different locations along the cord. These data suggest that the cord can tolerate higher frequencies closer to the middle of the cord. Dr. J. Previte and his colleagues have modeled the sea lamprey’s spinal cord with a system of differential equations that consist of a chain of coupled-phase oscillators.  Their model, when forced with varying frequencies, also agrees with the actual data. The research described in this talk involves generalizing Dr. Previte’s work on chains of coupled oscillators to tree-like configurations. By investigating the fixed points of this model, we were able to determine the maximum frequencies and force that the chain could withstand, based on the location that the configuration is forced. Under simplifying assumptions, the optimal forcing location can be determined.

### A Generalization of Raabe’s Test

Donald Sanfilippo (Papiya Bhattacharjee), Penn State Behrend, School of Science - Mathematics

When using the Ratio Test to analyze convergence or divergence of infinite series, in certain situations the Ratio Test fails; in other words, the test returns an inconclusive interpretation of whether or not the series converges or diverges. The mathematician J. Raabe discovered an alternative test that, in the case of an inconclusive ratio test, can identify a convergent or divergent series. The issue, however, is that even Raabe’s test fails and further exploration of the topic was needed to uncover a general solution for an inconclusive ratio test. The focus of this research has been to discover a generalized version of Raabe’s test for infinite series where this test fails.

**Analyzing Higher-Order Sheffer Polynomial Sequences via Generating Function Expansion**

Jeffrey Scavo (Daniel Galiffa), Penn State Behrend, School of Science - Mathematics

In 1939, I.M. Sheffer completely analyzed a special type of generating function, which he entitled *Type-0* and also discovered all of the orthogonal polynomial sequences (OPS) that came out of it, which are among the most studied and most applicable. Moreover, Sheffer also developed a more general generating function than the one that describes the *Type-0* sets - entitled *Type-k*. Daniel J. Galiffa analyzed a special case of the *Type-1* (*k=*1) class and showed that no new OPS arise from this structure by developing a new procedure, which relied on the computer algebra system Mathematica® 7. In this talk, the recent project is discussed, which focused on implementing this procedure to conduct a preliminary analysis of the *Type-2* class. This research gave insights into the higher-order Sheffer classes and also demonstrated the applicability of the method developed in the previous research. In addition, the research also addresses the fundamental *Type-0* class including an overview of Sheffer’s methodology for determining which *Type-0* sets are orthogonal and a summary regarding an elementary approach for obtaining the same results.

## BIOLOGY I

### Identification of Bacteria Isolated from Eggs of Native American House Wren Songbirds

Brian Carlson, Megan Fleming, Nicolas Kniseley, and Craig Richards (Beth Potter and Margaret Voss), Penn State Behrend, School of Science - Biology

House Wren (*Troglodytes aedon*) nests are constructed from a variety of materials including twigs, dirt, fur, and plant material. Nests provide a stable microclimate for developing eggs, but simultaneously promote the growth of microbial communities which may be transferred to newly laid eggs. Previous research has shown that avian eggshells can harbor bacteria almost immediately after introduction to the nest. This experiment quantified the diversity of bacteria present on naturally incubated eggs. Egg swabs were collected from a field site on Penn State Behrend’s campus during early and late incubation. Each sample was cultured to isolate bacteria from the eggs. Microbial DNA was extracted and PCR used to obtain sequence data from the 16s rRNA gene. Microbial sequences were subsequently aligned and analyzed using BLASTn to identify bacterial strains. Once sequence data have been obtained for all samples, they will be checked for any relationship between sample time (early or late incubation) and microbial diversity. Researchers are currently in the process of identifying the bacterial strains. These results will provide insight into the microbial communities that inhabit the eggs of these birds, and increase the understanding of the effects microbial communities have on avian egg viability.

**Ontogenetic Diet Shift and Pharyngeal Tooth Remodeling in the Round Goby (*Neogobius melanostomus*)**

James Cowles1, Jay Patel2, Alyssa Gleichsner2, and Rose Colt1 (Michael Campbell2 and Gregory Andraso1), 1Gannon University, Morosky College of Health Professions and Sciences and 2Penn State Behrend, School of Science - Biology

The potential of predators to regulate populations of dreissenid mussels (*Dreissena polymorpha* and *D. bugensis*) has been addressed since early in the dreissenid invasion of North America. Round gobies (*Neogobius melanostomus*) larger than 70 mm have been shown to prey extensively on dreissenids. However, round gobies smaller than 70 mm feed mainly on aquatic insects and crustaceans. The basis for this age-related diet shift in round gobies is not understood. We propose that ontogenetic changes in pharyngeal tooth morphology may contribute to the previously described diet shift in round gobies. Pharyngeal structures of round gobies ranging in length from 31-164 mm were investigated using light microscopy and scanning electron microscopy. Dimensions of upper and lower pharyngeal structures increased predictably with fish length. Pharyngeal structures of small round gobies contained an abundance of slender, recurved teeth that are consistent with eating soft-bodied prey. In contrast, pharyngeal teeth of large round gobies were molariform in appearance and typical of those found in molluscivorous fish. Replacement of slender teeth with molariform teeth was evident, and the rate of pharyngeal tooth remodeling appeared to decrease rapidly once round gobies reached approximately 70 mm in length. The genetic and environmental influences on pharyngeal tooth remodeling in round gobies merit further investigation.

### The Orbitonasal Glands of the Red-Backed Salamander (*Plethodon cinereus*)

Joshua Cummings1 and Trent Davis1 (Susan Rehorek1 and Sarah Woodley2), 1Slippery Rock University, College of Health, Environment, and Science and 2Duquesne University - Biology

Secretions of exocrine glands are released onto a surface. Exocrine cephalic glands in vertebrates can be subdivided into relatively simple skin glands and more complex, compound glands of the orbital, nasal, and palatal regions. In amphibians, the amount of published research on the skin glands vastly outweighs that which has been published on the more complex glands. The purpose of the present research was to describe the orbitonasal glands of the red-backed salamander (*Plethodon cinereus*). There was a clear distinction between the palepbral glands and the massive glands surrounding the nasal region. The palepbral gland rests ventrally to the orbit and extends dorsally along the medial cranial portion of the eye. The duct of the palepbral gland extended into the lower eye and opened on to the medial surface of the lower eyelid. Three glands were observed in the nasal region. A lateral and a medial nasolabial gland were located around the nasal capsule and opened into the nasolabial groove. In the palate, between the maxillary bones lay the intermaxillary gland, whose ducts opened into the roof of the mouth. On the histological level, there appeared to be neither sexual dimorphism nor seasonal differences in the structure of these glands.

**Investigating *Uzinurra* Endosymbionts in the Scale Insect *Chionaspis pinifoliae* (Hemiptera: Diaspididae): Do the Bacteria Follow the Rapid Species Radiation Found in the Insect?**

Ashley Doolittle (Matthew Gruwell), Penn State Behrend, School of Science - Biology

*Chionaspis pinifoliae*, pine needle scale, is a wide-spread, pest scale insect that occurs on every pine species, wherever pine trees are found in North America. Using DNA sequence data for three genes Gwiazdowski et al. discovered that this formerly designated single species should be divided in 10 cryptic species dispersed between Canada, the United States, and Mexico. Our research project was to investigate evolutionary patterns of the endosymbiotic bacteria to see if they demonstrated similar speciation tendencies. We obtained DNA samples from Gwiazdowski, and sequenced 16S rRNA from 8 of 10 putative species groups identified by Gwiazdowski et al. Phylogenetic analysis demonstrates that endosymbiont sequences follow a similar speciation pattern to the host insects although 16S rRNA is not as sensitive in determining species as the loci used for the host data set. To date, this is the first study to test the rapid evolution of endosymbionts within a recently diverged species complex.

### Assessing Mesophilic Bacteria Found in Compost during the Winter Months

Nathan Elbert (Beth Potter and Ann Quinn) Penn State Behrend, School of Science - Biology

Penn State Behrend has initiated a composting program to reduce its campus waste introduced to landfills and produce finished compost that can then be used on campus grounds. Composting is a relatively easy way to divert man-made waste from landfills and reuse organic material, because it ultimately relies on microbial processes and requires little human intervention. The process of decomposition is completely mediated by microorganisms within the compost pile and the goal of this study was to determine the identity and amount of mesophilic and thermophilic bacteria found in the composting process during winter months of January, February and March. This study concentrated on the identification of mesophilic and thermophilic microorganisms that are important for the decomposition reactions essential to composting. To determine the identity of bacteria, DNA was isolated from colonies grown on nutrient agar plates and the 16S rRNA gene was amplified using PCR. The number and identity of the isolated bacteria will be correlated with several biotic and abiotic factors. It is believed that differences in the maturation of the compost will be regulated by differences within the bacterial species that are found in the compost pile and may ultimately be regulated by the external ambient temperature as well as the core compost temperature.

**Reproductive Investment and Diet of Trout-Perch *(Percopsis omiscomaycus*) in Lake Erie**

Jarret Engstrom and Michael Foti (Edward Phillips), Gannon University, Morosky College of Health Professions and Sciences - Biology

Trout-perch (*Percopsis omiscomaycus*) were collected on 6 June 2009, from the shipping channel between Lake Erie and Presque Isle Bay in Erie, Pennsylvania. Trout-perch were weighed and measured, then dissected to obtain gonad weights, egg counts, and stomach contents. Total fecundity of females ranged from 179 to 745. Gonadosomatic index (GSI= ovary weight/total body weight x 100) was calculated, and the mean was 8.0 (range: 3.2-10.8), which probably indicates that they were close to, but not at peak spawning. Regression analysis showed that the relationship (r2 = 0.75, P < 0.001) between total fecundity and total length is explained by the equation: number of eggs = -318 + 8.061 (length). Diet analysis showed that 86% of trout-perch stomachs contained food, and those fish fed almost exclusively on Chironomidae larvae. The genera of Chironomidae most commonly found in the diet were *Cryptochironomus*, *Chironomus,* and *Polypedilum*.

**Ultraviolet Radiation Extremophiles: Protein and Metabolite Profile of Ultraviolet Radiation Resistant Microbes**

### Prashant Gabani and Erin Copeland (Om Singh), University of Pittsburgh at Bradford - Microbiology

The biosynthesis of radiation responsive pigments and extremozymes could be induced by modern biotechnological techniques to protect or provide an opportunity for other organisms to live in radiation-rich environment. It has been anticipated that these compounds (*i.e.* extremolytes) will provide useful drugs, especially antibiotics and anticancer drugs, as well as agricultural and industrial products of commercial significance. Among extremophiles, ultraviolet radiation (UVR) resistant microorganisms have been known to produce a variety of metabolites of therapeutic implications. We hypothesized that natural microbial flora of compost soil will show high UVR resistance with possibilities to obtain value-added products (*i.e*. extremolytes and extremozymes). The UVR-resistant microorganisms were isolated from soil samples collected at Tracy Ridge recreation area at the 2,245 foot elevation of Allegheny National Forest located in northwestern Pennsylvania in August. The soil samples were enriched in 50 ml nutrient broth under germicidal ultraviolet light subtype C (UVC) at intensity (4.8 W). The rate of microbial growth and survival was monitored after 1, 20, 30, 45, 60, 80, and 120 hrs at (9.5 J/m2/sec) on nutrient agar plates at 320C in dark. The highest rate of survival was obtained after 45 hrs (1.54 x 106 J/m2). The microbial survival rate was diminished beyond 2.75 x 106 J/m2 (80 hrs). A total of nine different UVR-resistant microorganisms were isolated using the single cell isolation method and designated as Br-1, Br-2, ylp-1, UVR1 - UVR6 within the range from 3.44 x 105 J/m2 (10 hrs) to 4.12 x 106 J/m2 (120 hrs) UVR doses. The growth patterns of isolated microorganisms were characterized at varying temperature (25 - 32 0C); a faster growing microorganism (32 oC) was obtained at 6.89 x 105 J/m2 (20 hrs). The microbial growth under the UVR was significantly less than the control group. The HPLC analysis of UVR-resistant microorganism reveals unique features of microbial metabolic products compared to the control. We predict that the types of metabolites produced by UVR-resistant microbes will have therapeutic and commercial significance.

**The Effectiveness of Dental Education Brochure in Low-Scoring Participants at Rural U.S. Clinic**

Kaitlyn Huser (Rebecca Kightlinger), Allegheny College - Environmental Science

Dental education research has not studied if dental education, through brochures, is effective in less-informed adults. The purpose of the study was to determine if administration of an educational brochure improved test scores among low-scoring adults attending a free dental clinic. A total of 227 patients present at a Remote Area Medical (RAM) dental clinic in Bristol, Tennessee consented to participate in this study. All participants completed a ten-question pretest, reviewed a dental brochure titled, “Brighten Your Smile,” and immediately filled out an identical posttest. Tests were scored on a scale of 1-10, one point awarded for each correct response. Participants who responded correctly to more than six questions on the pretest were eliminated from further analysis. Nineteen participants scored six or below on their pretest. The average change between pretest and posttest scores was 3.2 points. SPSS, psychology statistics computer software was used to determine statistical significance of p < 0.05 (p = 0.042). The “Brighten Your Smile” brochure was effective in improving scores in low-scoring participants.

**An Evaluation of Resveratrol as a Microbicidal Candidate against *Haemophilus ducreyi* Infection**

### Erin Nawrocki and Hillary Bedell (Tricia Humphreys), Allegheny College - Microbiology

*Haemophilus ducreyi* is a Gram-negative bacterium that is the causative agent of the sexually transmitted disease chancroid. Although chancroid is treatable with antibiotics, prevention with microbicides is an attractive alternative strategy in controlling its spread, especially in developing countries. Resveratrol is produced by plants in response to infection and has been shown to have antibacterial activity. For resveratrol (or any compound) to make an effective microbicide, it must kill a large percentage of pathogenic cells in a short period of time. This research employed minimum cidal concentration (MCC) assays to evaluate resveratrol’s potential as a microbicide. An organism’s MCC is the concentration of microbicide at which 99.99% of its cells are killed within 30 minutes. All *H. ducreyi* strains tested in both class I and class II had MCCs of 500 μg/mL or below. Resveratrol was also tested against natural vaginal flora of the *Lactobacillus* species. Certain species of *Lactobacillus* were co-cultured with *H. ducreyi* and were resistant to resveratrol, while others were susceptible to resveratrol at the same concentration. These findings suggest that the MCC of *Lactobacillus* varies widely depending on the strain, and further research must be done to evaluate the microbicidal activity of resveratrol *in vivo*.

**Discovering Recent Rates and Patterns of Bluff Recession in Eastern Erie County, Pennsylvania**

Matthew Pluta (Anthony Foyle and Michael Naber), Penn State Behrend, School of Science - Environmental Studies

Bluff recession is one of the most dominant hazards to the coastline of Lake Erie. With average recession rates of <0.5 m per year, it is becoming more important to be able to understand and recognize patterns of change in order to control the rate at which the bluff line is receding. In order to provide useful information, data from 1998 and 2007 between 12 Mile Creek and 20 Mile Creek in Erie County, Pennsylvania, will be interpolated to a raster. Using GIS (Geographic Information Systems), aerial LIDAR (Light Detection and Ranging) derived DEMS (Digital Elevation Models) will be combined with aerial photography to identify the bluff line at two points in time: 1998 and 2007. This will allow determination of the amount of change over a decade time frame and will highlight problem areas. Landowners and land management agencies, in the future, may use patterns of bluff recession in the study area to identify safe building sites, property lines, and the best practices for bluff erosion control. Results of this project will also add to a bluff recession study already in progress along a geologically different stretch of coast, west of 12 Mile Creek.

### Biomass and Soil Nitrogen in Two Varieties of the Biofuel Switchgrass

Kelsey Ream, Jodi Fletcher, Adrienne Nelson, Sara Salibury, Rachel McCarthy, Grace Talmadge, Akiko Tengyu, Kevin Thrope, Liz Suh, Alex Gazis, and Charles Haas (Rich Bowden), Allegheny College - Environmental Science

Soil nitrogen (N) exerts strong control over crop yields. This is particularly important in commercial switchgrass (*Panicum virgatum)* operations, where fertilizer is applied regularly to replace N removed during harvest. Knowledge of spatial N availability across a field can help fertilizers to be applied most effectively. The purpose of this study was to examine the relationship between soil N and switchgrass production. Total biomass and soil nitrogen were measured in twelve individual plots within two switchgrass fields, one Shawnee and one Cave-in-Rock, located in Crawford County, northwestern Pennsylvania. Soil at the Shawnee site contained 0.315 + 0.010 (SE) % N and at the Cave-in-Rock field, 0.216 + 0.011 (SE) % N. Average biomass collected was 9.95 + 1.07 (SE) MT ha-1 in the Shawnee field and 5.66 + 0.43 (SE) MT ha-1 in the Cave-in-Rock field. Biomass in Shawnee plots showed a strong positive correlation (r2 = 0.72) to soil nitrogen concentration, whereas, in Cave-in-Rock plots, it showed a very weak negative correlation (r2 = 0.36) to soil nitrogen concentration. Our results suggest that, because of switchgrass’ strong potential as a biofuel, further research to determine what other factors may be influencing biomass production in this species are necessary.

**Effects of Hand Sanitizer vs. Soap on Hand Bacteria Density among Undergraduate Students**

Yvon Woappi and Joshua Flowers (Om Singh), University of Pittsburgh at Bradford - Biology

Pathogenic propagation is one of the leading causes of illness within human-accommodating infrastructures. In the attempt to assess hand washing and hand sanitizer effectiveness against bacterial infections among college students, hand samples were randomly collected from 13% of the undergraduate student body at the University of Pittsburgh at Bradford. Each student was required to complete a cross-sectional survey regarding hand sanitizer/hand soap use and disease frequency. A different set of students were classified into three control groups, those who used hand sanitizer only, only washed their hands, or used both hand sanitizer and soap. Hand samples were collected from each different respective group and cultured at 37º C. Calculations such as bacteria density counts were obtained to help us investigate hand washing and hand sanitizer efficacy against bacterial growth. The data indicated that the use of hand sanitizer alone had a moderate effect on hand bacteria density with reduction efficacy at 71.62%. The use of hand soap alone did not reveal an impressive effect on hand bacterial density, with a 21.64% efficacy. However, the use of both hand sanitizer and hand soap had a tremendous effect on hand bacteria density reduction, with a 97.76% efficacy. Results recommend that proper hand washing with soap and sanitization (active ingredient 65% ethyl alcohol) lead to higher efficacy in hand bacteria reduction among college students than hand washing with soap only.

**Site-Specific Isolation and Screening of Antibiotic Producing Microorganisms**

### Yvon Woappi (Om Singh), University of Pittsburgh at Bradford - Biology

The low-molecular-mass microbial products of secondary metabolism, antibiotics, carry an important role in human health. It is thus of high necessity to search for novel antibiotic-producing microbial strains. We hypothesize that site-specific soil samples will have a diversity of antibiotic-producing microorganisms. Soil samples from residential and recreational areas were collected locally and examined for microbial antibiotic producing abilities on Potato Dextrose Agar (PDA), Nutrient Agar (NA), and Tryptic Soy Agar (TSA) media. The soil samples were sprinkled against 19 pathogenic microorganisms (obtained from ATCC) lawned across 114 solid medium plates in duplicate (38 of each PDA, NA and TSA). The antibiotic producing zone generating microorganisms were observed after 48 hrs of incubation at 37ºC. A total of 52 microorganisms were observed with zone formation from residential soil sample on NA medium followed by nine organisms from recreational soil sample. A total of seven and twelve microorganisms from residential soil sample revealed clear zone on TSA and PDA media, respectively. The square plate method was developed and used for secondary and tertiary screening. All from residential soil, the tertiary screening revealed six, four, and four microorganisms on NA, TSA and PDA medium, respectively with wider antibiotic producing zones. Microorganisms were purified by subculture and re-tested for antibiotic producing ability. Results revealed astrong presence of antibiotic-producing microorganisms in residential soil samples. The isolated microorganisms will be of tremendous aid to pharmacology and medicine of infectious diseases.

**Distribution of Taste Buds in Two Different Species of Small, Terrestrial Ectothermic Vertebrates**

Nicole Xenakis (Susan Rehorek), Slippery Rock University, College of Health, Environment, and Science - Biology - Cytotechnology

Taste buds are similar in all vertebrates. They are small, flask-shaped organs made up of sensory and support cells for nutritional support. They are spread out over a large surface area of epithelia. A closer look at lizards and other terrestrial vertebrates shows that taste buds have been found on the tongue and on the oral epithelium. Though there has been much published about the structure of taste buds in vertebrates, little is known about their distribution and quantity, especially in ectothermic vertebrates. The purpose of this study was to determine the distribution of taste buds of *Christinus marmoratus* (marbled gecko) and *Plethodon cinereus* (red-backed salamander). The taste buds in *C. marmoratus* were mainly observed scattered over the mucosa of the upper palate, with few taste buds on the mucosa of the lower palate and underside of the tongue.   No taste buds were observed on the dorsum of the tongue.  In contrast, far fewer taste buds were observed in the oral cavity of *P. cinereus* and they were more scattered throughout the upper palate. This evidence has shown that the *C. marmoratus* and *P. cinereus* do not use their tongue as a chemosensory organ because of the significant absence of taste buds on their tongues.

## BIOLOGY II

**Isolation of Fibroblast and Myofibroblast-Like Cells from Palmar Fascia**
Jennifer Connell1, Koreen Morgan1, and Dana Hyde1 (Ali Abtahi2, Tim Cooney3, John Lubahn3, and Elisa Konieczko1), 1Gannon University, Morosky College of Health Professions and Sciences, 2Lake Erie College of Osteopathic Medicine, and 3UPMC Hamot - Biology

Dupuytren’s contracture, a disease of palmar fascia, results in shortening, thickening, and fibrosis of the fascia. Fibroblasts appear first to produce extracellular matrix and collagen.  The fibroblasts then differentiate into myofibroblasts, which promote wound contraction. The goal of this study was to develop *in vitro* cell cultures from palmar fascia. To extract cells from tissue, enzymes dispase and collagenase were utilized. After enzyme digestion of the tissue, the remaining fluid was centrifuged, the pellet resuspended in media, and the cells grown in culture until confluent. At confluence, the cells were passaged into flasks containing serum- or serum-free media to differentiate the cells into fibroblasts or myofibroblasts. Once differentiated, the cells were maintained in culture through several passages. There was a distinct difference in both morphology and growth rate of the differentiated cells. The cells were fixed with formalin and permeabilized with methanol and then immunostained with monoclonal anti-vimentin or anti-smooth muscle actin antibodies. The cells were subsequently stained with a polyclonal antibody conjugated to rhodamine and examined by confocal microscopy. Preliminary results reveal that one of the differentiated cell types is fibroblasts. Future experiments will include the effects of hormones on growth, structure, and function of myofibroblasts and fibroblasts.

### Ultraviolet Radiation (UVR) Resistance in Microbial Flora at Higher Elevation

Erin Copeland (Om Singh), University of Pittsburgh at Bradford - Microbiology

Microorganisms that are capable of surviving in extreme environmental conditions including radiation (*e.g.* ultraviolet and x-rays) rich environments are known as extremophiles. Metabolic products, known as extremolytes, enable microorganisms to survive under extreme conditions, and have been known to provide products of commercial significance. We hypothesize that the microbial flora at higher elevation will demonstrate ultraviolet radiation (UVR) resistance. One-gram soil samples were enriched in nutrient broth and potato dextrose broth medium under germicidal ultraviolet light subtype C (UVC) with a dose rate of 12.8 J/m2/sec at 37oC. Of the 13 extremophiles that were isolated, seven demonstrated cellulose-degrading properties and eight were capable of producing acid. The organisms revealed varying levels of growth inhibition against 15 different antibiotics. The protein profile of radiation resistance microbial flora revealed unique expression of proteins after UVR exposure on 10% SDS-PAGE. The extracellular metabolic profile was examined using high-performance liquid chromatography (HPLC), which revealed distinct peaks of additional metabolites after UVR exposure. The observed protein expression and metabolic profile indicate UVR resistance in prokaryotic and eukaryotic microbial flora construct unique genetic makeup that could have applications in anticancer drugs, as well as a variety of other therapeutic implications.

**Analysis of Lysine Biosynthesis in Plants Using *Arabidopsis* DHDPS Mutants**Bradley Drumheller and Emily Harrington (Michael Campbell), Penn State Behrend, School of Science - Biology

The aspartate biosynthetic pathway leads to the production of lysine, threonine, methionine, and isoleucine. The branch pathway leading to lysine synthesis is hypothesized to be regulated by the enzyme dihydrodipicolinate synthase (DHDPS-1 and DHDPS-2). This experiment focuses on the behavior of two *dhdps* knockout mutants in *A. thaliana* (*dhdps-1* and *dhdps-2).* Gene expression was analyzed in each knockout mutant by extraction of RNA and conversion into cDNA template. Confirmation of the homozygosity of the *A. thaliana* knockouts was performed with PCR. The regulation of DHDPS-1 and DHDPS-2 was analyzed by QT-PCR in the two knockout mutants compared to wildtype. An internal control was used to standardize the readings and to determine the gene expression of DHDPS1 and DHDPS2 in each knockout. In order to conduct complementation of each mutant, restriction sites were used to insert each DHDPS gene region into the gateway vector pENTR11. The complementation was performed using primer sets with restriction sites present to amplify the gene regions, enzymatic digests, and insertion of genetic material by ligation. Further analysis of mutants will be performed by Rutgers University through use of *Agrobacterium tumefaciens* infection of *A. thaliana* and observation of phenotypic and genotypic results.

**Biomatrica SampleMatrix® Long-Term DNA Extract Storage at Room Temperature**

Jarret Engstrom1 (Cecilia Crouse2), 1Gannon University, Morosky College of Health Professions and Sciences and 2West Palm Beach Sheriff’s Office, Forensics Biology Unit - Biology

The main concern of any research analyst is to maintain extract integrity. Optimal storage is critical, especially with low quantity and quality DNA. The ability to retrieve and re-test these abstracts is crucial in the success of projects or in the forensic world, crime cases. DNA instability can lead to degradation of extracts due to freeze-thaw cycles, chemical contaminants, environmental damage, and buffers. Keeping DNA stable at freezing temperatures costs energy and storage space because of the large freezers needed. Biomatrica Sample Matrix lets researchers and forensic scientists store DNA at room temperature with the control of humidity. It was unclear whether Sample Matrix could be used in the forensic world to store DNA safely and preserve evidence for criminal cases. Validation studies were done on population density samples using Sample Matrix versus **-**20oC. Studies were done on samples after one week, two weeks, six weeks, two months, six months, and one year. Sensitivity and mixture validations were also done on serial dilutions ranging from 4.0 ng to 0.0625 ng. The %DNA recovery after all validation studies were analyzed was significantly larger using the Sample Matrix, and proved to be more trustworthy to store evidence.

### Cytotoxic and Genotoxic Effects of BDE-209 in Human Umbilical Vein Endothelial Cells

Jessica Moore (Mary Vagula), Gannon University, Morosky College of Health Professions and Sciences - Biology

Decabrominated diphenyl ether (BDE-209) is a congener of a class of organic flame retardants called polybrominated diphenyl ethers. Among the various polybrominated diphenyl ether congeners, the BDE-209 is the most abundantly used flame retardant in the world and is the only BDE that is still being used in the United States. Because of its extensive use and persistent nature it has become a widespread environmental contaminant. The purpose of this study was to evaluate the cytotoxic and genotoxic potential of BDE-209 on human umbilical vein endothelial cells at concentrations in par with the environment. The LDH cytotoxicity test is performed in cells exposed to 5 µM and 10 µM concentrations of BDE-209 for six hours. Significant increase in the release of LDH from exposed cells is observed at both the concentrations. The release of LDH from cells indicates disruption in the cell membranes. The concentration-dependent increase in cytotoxicity shows that this compound is disrupting the integrity of cell membranes and leaking the cytosolic enzyme LDH into the medium. This study also shows the alteration in the expression of three genes namely CHEK1, BRCA1, and ATM genes. These genes are involved in the maintenance of stability of DNA and also in the regulation of cell cycle.

**Effects of Oxidative Stress on Performance in Thoroughbred Racehorse**

### Meghan Naylor (Ann Kleinschmidt), Allegheny College - Biology

Oxidative stress is an important factor in the influence of exercise on the body. The production of reactive oxygen species has been shown to cause muscle damage and fatigue in various organisms. The exploration of oxidative stress in horses has been more recent but has shown that oxidative stress is related to exercise and hypothesized that it could affect the performance of the animal; however, the effect of different training methods on specific measures of oxidative stress has not been explored. In this study, two indicators of oxidative stress, lipid peroxidation and superoxide dismutase, were measured in two groups of horses: winter rested and winter raced. These measures of oxidative stress were also analyzed pre- and post-race. It was hypothesized that horses raced over the winter would show less oxidative stress than those rested for that period of time. However, the results suggest there is no significant difference in either pre- or post-race measures of lipid peroxidation and superoxide dismutase or in winter-rested and winter-raced horses. There is evidence, however, that horses having a consistent win record do individually show low levels of oxidative stress.

### Inhibition of *Haemophilus ducreyi* by Vaginal *Lactobacillus*

Aleksas Nerone (Tricia Humphreys), Allegheny College - Biology Department

*Haemophilus ducreyi* is the bacterial agent that causes Chancroid, a sexually transmitted genital ulcerative disease. In human challenge studies, there is a gender bias as some females exposed to *H. ducreyi* underwent rapid recovery or remained asymptomatic in comparison to male participants. As female hormones estrogen and progesterone have been found ineffectual at inhibiting *H. ducreyi* infections, the cause of these gender differences remains unknown. The differences in natural flora between men and women are another possibility. The dominant bacterial genus of natural vaginal microbiota is *Lactobacillus*, which is not typically present on male genitalia. This study examined the effects of common *Lactobacillus* byproducts, hydrogen peroxide and lactic acid, as well as spent supernatant of two *Lactobacillus* isolates, on the survival of two strains of *H. ducreyi*. Relatively low concentrations of hydrogen peroxide and lactic acid easily produceable by vaginal *Lactobacillus* strains proved lethal to both strains of *H.* *ducreyi* *in vitro*. When these byproducts were combined to best replicate the *in vivo* environment, all tested concentrations proved lethal. By further testing *Lactobacillus* strains to identify those that produce the greatest concentrations of hydrogen peroxide and lactic acid, possible probiotic treatments can be developed.

**A Kinetic Analysis of Secretion System and Quorum Sensing mRNA Gene Expression in Environmental versus Reference *Aeromonas hydrophila* Strains Using Real-Time PCR**

Jillian Rhoads1and Jasmine Shinko1 (Troy Skwor1,2),1Gannon University, Morosky College of Health Professions and Sciences and 2Children’s Hospital Oakland Research Institute - Biology

*Aeromonas hydrophila* is a bacteria that is known to cause an array of diseases in humans, including pediatric gastroenteritis, pneumonia, and skin disease. Previous studies by our laboratory have indicated a presence of tetracycline and ciprofloxacin resistant *A. hydrophila* in Presque Isle Bay that also demonstrate hemolysis and cytototoxicity. These virulent (disease-causing) phenotypes are dependent on the secretion of multiple toxins. Currently, it is known that *A. hydrophila* encodes genes involved in multiple secretion systems aiding in their virulence. Our objective was to determine expression of different genes associated with these secretion systems throughout their growth curve. Research also was done to determine whether or not a ciprofloxacin-resistant environmental strain differed in gene expression compared to the reference *A. hydrophila* strain (ATCC7966). To perform this, we analyzed the expression of ExeG (type II secretion system), AopB (type III secretion system), Vgr (type VI secretion system), AhyR (quorum sensing), and TapD (type IV pillus) mRNA by isolating RNA, performing reverse transcription, and analyzing cDNA via real-time PCR using 16S as our internal control. Together these data highlight the differences and similarities between environmental and reference strains, as well as bacterial population effects on virulence factor expression.

### Evaluation of Antibiotic Resistance and Characterization of *Aeromonas spp.* from Presque Isle Bay

Jasmine Shinko1 and Alexander Augustyniak1 (Gregory Andraso1, Troy Skwor1, and Christopher Gee2), 1Gannon University, Morosky College of Health Professions and Sciences and 2Penn State Behrend, School of Science - Biology

*Aeromonas* is a genus of bacteria which is ubiquitous in nature. They have been implicated in numerous human and fish diseases. Although *Aeromonas* species are potential human pathogens, their levels are rarely considered when assessing water quality. The objectives of this study were to characterize *Aeromonas* species within Lake Erie, assess pathogenicity, and determine their antibiotic resistance. *Aeromona*s species were isolated from Lake Erie water using *Aeromonas* selective agar with and without antibiotics. *Aeromonas* species identity was determined using restriction fragment length polymorphisms. All isolates were analyzed for hemolytic ability and cytotoxicity against human epithelial (HeLa) cells. A molecular profile was identified using multiplex PCR on six virulence genes. *Aeromonas* comprised 22% of all culturable bacteria from Lake Erie. Of the 122 *Aeromonas* isolates, six species were identified; only two (*A. hydrophila* and *A. veronii* biotype sobria) demonstrated significant antibiotic resistance. Additionally, both of these species demonstrated pathogenic phenotypes *in vitro*. Genotypic analysis identified a higher prevalence of virulence genes in these two species compared to other aeromonads. Together, our findings demonstrate antibiotic resistance among *Aeromonas* *spp.* previously associated with human disease. These strains further exhibited pathogenic phenotypes and genotypes.

### The Cause of Body Mass Increase in the Eastern Coyote

Stephanie Wood and Ashley Steiginga (Frederick Brenner), Grove City College, [Hopeman School of Science, Engineering and Mathematics](http://www2.gcc.edu/advising/DepartmentsHopeman.htm) - Biochemistry

The eastern coyote (*Canis latrans*) continues to expand in eastern North America. The purpose of this research is to explore the potential genetic factors in different populations of this species. Specimens were collected from various regions of Pennsylvania and frozen. Using primers designed from published genomic sequences of the western coyote, a 350 base pair mtDNA segment of the D-loop region of an eastern coyote was compared to the published GenBank sequences from a western coyote. This 350 base pair sequence matched the published region of the western coyote but other primers designed from the western coyote genome did not yield successful results suggesting that the genome of the eastern coyote differs in these regions. Additional primers were designed from mitochondrial D-Loop regions of Spanish Grey Wolf (*Canis lupus*) and Canada Grey Wolf (*Canis lycaon*). There was a 96% homology between the Spanish Grey Wolf and a 99% homology between the Canada Grey Wolf and the western coyote, respectively. It has been speculated that the Canada Grey Wolf and the Red Wolf (*Canis rufus*) both may have contributed genetic material the eastern coyote. Primers are now being tested, and results are not yet known.

## BIOLOGY III

**The Expression of *ANI1* in Hermaphroditic and Male Gametophytes of the Fern, *Ceratopteris richardii***

Matt DiAngi1 (Mike Ganger1 and Troy Skwor1,2), 1Gannon University, Morosky College of Health Professions and Sciences and 2Children’s Hospital Oakland Research Institute - Biology

The fern *Ceratopteris richardii* is a model system for understanding plant physiology and development. Gametophytes of *C.richardii* may develop into either males or hermaphrodites. Antheridiogen (ACE) is a pheromone produced by hermaphrodites that induces male development in undifferentiated spores. In its absence, gametophytes develop into hermaphrodites. Spores of the mutant, *her1*, always develop as hermaphrodites regardless of antheridiogen concentration. *ANI1* (antheridiogen induced 1) is a gene associated with male induction and has been shown to be expressed within the first six days of development, while *ANI1* is not expressed in hermaphrodites. We seek to quantify *ANI1* expression in wild type and *her1* mutants to test the hypothesis that *ANI1* is expressed at a higher level in wild type compared to *her1* gametophytes. To perform these tests, we isolated RNA was isolated from gametophytes at day five; reverse transcribed to cDNA, and real-time PCR performed with SYBR GreenTM. Gene expression of *ANI1* was quantified using tubulin as an internal control. The data provide novel findings elucidating gene influence on sexual differentiation.

### Analysis of Hematopoiesis in Zebrafish Embryos Perturbed in Folate Metabolism

Eilene Duberow and Tim Gaw (James Warren Jr.), Penn State Behrend, School of Science - Biology

Folic Acid has been shown to be an essential vitamin for normal development of the vertebrate embryo. Homocysteine, a molecule formed by folic acid metabolism, has been linked with neural tube defects, heart diseases, and stroke, and can be lowered with implementation of folic acid. A deficiency in folic acid leads to megaloblastic anemia, which is inadequate blood cell formation due to non-utilization of folic acid by the body. Recent studies of homocysteine treatments in zebrafish have produced pigmentation and neural tube defects, and heart formation and circulation abnormalities, which are all defects seen in humans. The research aims to determine if perturbing folic acid metabolism with homocysteine treatments will yield abnormalities such as reduced blood cells and megaloblasts in the blood, as well as observing defects in heart formation and blood circulation. Zebrafish blood was collected from embryos treated with homocysteine as well as control adults and subjected to Wright-Giemsa staining for blood cell type determination. Fluoroscein (a blood molecular marker) will be injected into embryos to observe circulation. The specific aim of the study is to observe if the hematopoietic abnormalities associated with folate deficiency in humans are seen in zebrafish embryos with perturbed folate metabolism.

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

Jarret Engstrom (Sarah Ewing), Gannon University, Morosky College of Health Professions and Sciences - Biology

C/EBPs are a family of transcription factors that function in numerous cellular processes. One of the most vital roles for C/EBPs is in the development and physiological function of many tissues including hematopoietic, adipose, and hepatocyte tissues. The loss of the C/EBPs ability to regulate gene expression in these tissues can lead to a range of physiological defects and disease, including cancer. It is not clear whether or not C/EBPα mRNA expression pattern is detectable and reproducible in zebrafish embryos using *in situ* hybridization. Suitable C/EBPα antisense and sense RNA probes were designed and synthesized to examine C/EBPα ’s gene expression using *in situ* hybridization. Briefly, a portion of the C/EBPα gene sequence was inserted into pBK-CMV using XhoI and EcoRI restriction enzyme sites. The probe synthesized from the T7 primer binding site represents the antisense (-) probe sequence and the sequence downstream from the T3 primer binding site is the sense (+) probe sequence (negative control). Once T7 and T3 RNA probes were successfully made, zebrafish embryos were collected at various times post-fertilization and fixed in 4% paraformaldehyde. Embryos were subjected to *in situ* hybridization; a five-day protocol involving hybridization between the embryos and each RNA probe followed by amplification of signal using an anti-digoxigenin-AP antibody and colorimetric detection of RNA expression in the embryos using BM purple. This project enabled us to elucidate C/EBPα’s gene expression pattern in zebrafish embryos and the reproducibility of our results.

**Analysis of the Effects of Homocysteine on the Development of Zebrafish (*Danio rerio)***

Andrew Halmi (James Warren Jr.), Penn State Behrend, School of Science - Biology

Folic acid is a vitamin found in leafy green vegetables that is essential for proper embryonic development in vertebrates. Folic acid deficiencies have been associated with many developmental and adult onset disorders such as neural tube defects, heart defects, Alzheimer’s, miscarriage, and many others. Zebrafish were used to study the effects of increased levels of homocysteine, a common symptom of folic acid deficiency. Zebrafish were exposed to 10, 50 and 100 milimolar solutions of homocysteine at three hours post fertilization and the fish were then raised at 24 and 28oC. The embryos were then observed at 24, 48, and 72 hours post fertilization and an array of different phenotypes were observed, such as abnormal heart and cardiac sac formation, trunk deformations, and pigmentation defects. Heart rates were observed in control and 100 mM embryos. 100 mM embryos exhibited abnormal rhythm patterns and had heart rates 15 bpm slower than controls (101.36 control v 85.8 100 mM.) Future studies will aim to determine the mechanisms of how these different abnormalities are generated.

**Gene Expression Regulation of Sprout Inhibition and Water Retention Genes in Potatoes by 1,4-Dimethylnapthalene (DMN)**

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

The potato is the fifth largest agricultural crop in the world, requiring regulation of tuber sprouting to prevent product loss. During sprouting, potatoes produce the toxin solanine and begin the process of sweetening, making them unmarketable. Therefore, potatoes are treated with sprout inhibitors, including 1,4-Dimethylnapthalene (DMN). DMN is a compound naturally found in potatoes that acts as a sprout inhibitor. Microarray analysis was conducted to study gene expression of untreated and DMN-treated potatoes to determine the mechanisms by which DMN inhibits sprouting. DMN increased the expression of the cell cycle inhibiting KIP genes. This data was confirmed using QT-PCR. The exact method by which DMN prevents sprouting is currently being researched, though we hypothesize that it causes a block in the G1 phase of the cell cycle. In addition to affecting cell cycle genes, microarray data demonstrated that DMN alters the expression of genes associated with expansin and osmotin proteins; these proteins are responsible for cell wall rigidity and water retention. These data support claims from farmers that potatoes treated with DMN tend to retain their weight when stored, signaling a lack of desiccation. Further research into the effects of DMN on water retention in potatoes will be conducted.

### Lipid Peroxidation and Antioxidant Enzyme Activities in BDE-85 Treated Mice

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

Polybrominated Diphenyl ethers (PBDEs) are a class of brominated flame retardant compounds added to many consumer goods. Commercial PBDE mixtures are available in three forms namely, penta BDEs, octa BDEs, and deca BDEs. These chemicals are notable for their lipophilic and biopersistent nature, being present in detectable levels in approximately 97% of the American adult population. This study investigates the impact of BDE-85, a penta-brominated congener, on the oxidative status and antioxidant protection mechanisms of four mouse tissues *viz*. kidney, liver, brain, and intestine. Adult mice were injected daily with 0.25 mg/kg body weight of BDE-85 over the course of four days. Tissue samples were taken on the fifth day for the determination of lipid hydroperoxide levels and activities of superoxide dismutase and glutathione peroxidase. Analysis showed a significant change in the oxidant/antioxidant equilibrium of exposed mice; lipid hydroperoxide levels were found to be elevated, indicating oxidative stress. Further, the superoxide dismutase and glutathione peroxidase activities showed tissue specific alterations indicating an increase in oxidative stress and a decrease in the ability of tissues to combat the oxidative stress.

**BDE-85 Induced Toxicity in Human Umbilical Vein Endothelial Cells**

Jessica Moore (Mary Vagula), Gannon University, Morosky College of Health Professions and Sciences - Biology

BDE-85 is a congener of a class of flame retardant compounds called polybrominated diphenyl ethers (PBDEs). To the best of authors’ knowledge there are no reports on the toxicity potential of this penta-BDE congener. This study, therefore, reports the toxicity potential of this congener on human umbilical vein endothelial cells. The purpose of this study is to evaluate the cytotoxic and genotoxic potential of BDE-85 on these cells at different concentrations. The LDH cytotoxicity test is performed in cells exposed to 5 µM and 10 µM concentrations of BDE-85 for six hours. Significant increase in the LDH release from exposed cells is observed at both the concentrations. The LDH release into the medium from exposed cells is proportional to the concentration to which they were exposed. These results indicate that this compound is capable of disrupting the integrity of cell membranes to such an extent that there is leaking of cytosolic enzyme LDH into the medium. This study also shows the alteration in the expression of three genes namely CHEK1, BRCA1, and ATM genes. These genes are involved in the maintenance of stability of DNA and also in the regulation of cell cycle.

### C-Banding and Karyotype Analysis of Chromosomes in *Allium sativum*

Julianna Pieknik, Alicia Norton, and Stephanie Farbizio (Marlene Cross), Mercyhurst College, Zurn School of Natural Sciences and Mathematics - Biology

Garlic (*Allium sativum*) is a member of the onion family (Alliaceae) and is an agriculturally important crop for both culinary and medicinal uses. The flavor components of garlic include allicin, which is thought to be responsible for garlic’s extensive health benefits. While there has been much research on garlic’s flavor components and their medicinal effects, little work has been done comparing the different cultivars of garlic with respect to their genetics, flavor, and keeping qualities. The genetic variability within the species is difficult to judge; most garlic is sterile and is propagated vegetatively via cloves. The different cultivars have been isolated genetically for most or all of their cultivated history. The purpose of this research was to compare seven cultivars of garlic, including one reported to be a rare wild species, and to assess the chromosomal variability and the relationships between cultivars. C-banding and G-banding were used to fix and stain the chromosomes from actively dividing root tip cells. The information gained from this study will be combined with information from GC-MS analysis of the flavor components of the seven cultivars, as well as with taste-test results and keeping quality data.

**The Influence of Antheridiogen and Spore Size on Gametophyte Growth and Development in *Ceratopteris richardii***

Tiffany Sturey (Mike Ganger), Gannon University - Biology

In many organisms females invest more into reproduction than males. *Ceratopteris richardii*, a homosporous fern, can develop into male or hermaphrodite gametophytes and it is hypothesized that this differentiation should be related to the developmental stage of individuals. More advanced spores are predicted to become hermaphrodites, while less advanced spores would become male. Antheridiogen (ACE), a hormone produced by hermaphrodites, induces spores to develop as males. ACE is thought to act directly to alter gene expression to determine male sex. Alternatively ACE may affect gametophytes by delaying growth and development, which may alter gender decisions. ACE may be indirectly inducing the spores to develop as male by influencing size instead of directly dictating gender. An experiment explored the determinants of size and their role in gender decisions. Four concentrations of ACE (0x, 0.5x, 1x, and 2x) were used to determine if ACE affects gametophyte size. A mutant, *him1*, which always develops as male, was used as a negative control, while spore size served as a covariate. Overall, *him1* mutants grew larger than wild type individuals. Spore size was positively related to the size of the gametophyte but was not predictive of its ultimate gender. High ACE concentrations reduced gametophyte growth.

### Analysis of Human Aliment Single Nucleotide Polymorphisms

Alisa Vanco (Matthew Gruwell), Penn State Behrend, School of Science - Biology

Quantitative population genetics analysis analyzes effects of genetic and environmental influence on the genome. This analysis can be completed using QTL mapping or through the assessment of other significant differences seen in the genome. The use of single nucleotide polymorphisms (SNPs) is another way of studying quantitative population genetics. The influence of SNPs on human aliments was the focus of this study. Single nucleotide polymorphisms were studied to analyze the significance played by SNPs in four human diseases. These diseases include celiac disease, myocardial infarction, bipolar disorder, and Alzheimer’s. Research was done using databases based on SNP research. The results from many resources were compiled to illustrate the effects SNPs have shown for these diseases.

**LD50 Concentrations of Resveratrol Varies Remarkably in a Cancer Progression Model Cell Line**

Jessalee Wantz, Laura Stevens, Nicole Cifra, Sarah Abdelmessih, Lindsay Carlson, Elizabeth Covatto, Rachel Deir, Hasreet Gill, Sadie Hogan, Kristi Lemke, Jacob Lytle, Amy Maier, Jared McFadden, and Andrew Ruba (Durwood Ray), Grove City College, Hopeman School of Science, Engineering and Mathematics - Biology

We have determined the dose of the anticancer natural phytoalexin resveratrol to kill 50% of the cells (LD50s) in our cell lines representing progressive cancer stages: We have undertaken to evaluate gene expression in resveratrol-treated normal NIH Swiss embryonic cells (NIH Swiss); non-tumorigenic immortalized cells (NIH/3T3 cells), moderately tumorigenic ras oncogene-transformed NIH/3T3 cells (ras-NIH/3T3 cells), highly tumorigenic primary tumor cells (T1-A), and lung metastatic (T4-PA) cells derived from T1-A cells. Cells were grown in resveratrol (0 to 300 uM) for 3 - 6 days. Cell counts were recorded daily, over the course of 3 - 6 days, using gridded plates and photographs of six pre-determined 2 mm square sections of each plate. An average percent change in cell number from each individual grid was then calculated. P-values were determined between each treatment time and dose and significance was determined. The NIH Swiss and NIH/3T3 cells were not significantly affected by 3-300 uM after 3 days. LD50s for the tumorigenic cells were ras-NIH/3T3 cells: LD50 = 3.5+/- 1.0 uM after 3 or 4 days; T1-A cells: LD50 = 45 +/- 5.0 uM after 3, 4, or 5 days; T4-PA cells: LD50 = 7.0 +/- 1.5 uM after 3 or 4 days.

## BIOLOGY IV

**Rotational Behavior Treatment in the Rat Model of Parkinson’s disease**

Stephanie Alberico and Veronica Quinlan (Rodney Clark), Allegheny College - Neuroscience

The unilateral rat model of Parkinson’s disease (PD) consists of chemically or electrically lesioning the substantia nigra in either hemisphere. The present study followed a within subject design where hemi-parkinsonian rats (n=8) were produced using 4 μL 6-OHDA. After recovery, subjects were tested for a rotational bias (either to the left or right) following d-amphetamine administration (1.78 mg/kg). After bias testing, subjects underwent 17 one-hour sessions of behavioral acquisition and maintenance of full rotations (360° turns) to the side of the observed bias. Rats were deprived of water between 24 and 35 hours prior to each session. A successive approximation program was implemented until the rotational behavior was learned. Once the behavior was acquired, it was maintained under a constant reinforcement (CR) schedule. Following the 17 sessions, the number of rotations was tested under three conditions: CR without d-amphetamine, CR and low dose d-amphetamine (0.56 mg/kg), and d-amphetamine (1.78 mg/kg) induced rotations.

### Classical Conditioning of the Immune Response

Ashley Brandebura, Ashley Adamson, and Robin Ellege (Rodney Clark) Allegheny College - Neuroscience

The purpose of this experiment was to determine immune system disorders that bypass activation of the “negative feedback loop” of immunity, alleviating the risk of immunosuppression.  Eighteen Sprague-Dawley rats served as the subjects. The control group received saccharin water paired with saline injections (3.20 mg/kg); the antagonist group received saccharin water paired with nor-BNI injections (3.20 mg/kg); and the agonist group received saccharin water paired with U69, 593 injections (0.32 mg/kg). The agonist and antagonist groups were further subdivided into classical conditioning (CC) and sustained drug treatment (SDT) conditions. The SDT received drug treatment for the entirety of the experiment, while the CC received drug treatment for only the first half and saline injections for the remainder of the experiment. The level of TNF-α present in rat blood serum at the conclusion of the experiment served as the independent variable. The results indicate that the lessened physiological effect demonstrated in the CC antagonist group was beneficial to overall immune system function, suggesting that the successful avoidance of “negative feedback loop” activation was achieved. The alternative treatment method put forth in this experiment should be tested in other experiments to compile evidence supporting the beneficial effects of “classical conditioning” treatments.

### An Animal Model of Complex Autism in Sprague Dawley Rats

Sharon Dudek and Bonnie Cross (Jeffrey Cross and Jeffrey Hollerman), Allegheny College - Neuroscience

Independent animal models of autism and of epilepsy have been developed and validated. An animal model of comorbid autism and epilepsy, a model of complex autism, was created in male Sprague-Dawley rats prenatally exposed to valproic acid (VPA) creating the VPA model of autism, treated with pilocarpine as adults, creating the pilocarpine model of epilepsy. The present experiment was designed to compare the effects of pre- and post-pubertal neutering on pilocarpine-induced seizures in male and female VPA rats, and age, gender, and strain-matched controls. It was hypothesized that VPA history, gender, neutering, and time of neutering would affect seizure severity and duration. A Modified Racine Scale was used to evaluate seizure severity, and the duration in each Racine stage was also recorded during a one-hour, post-pilocarpine observation period. VPA exposure, gender, age, endocrine condition, and history all played significant roles in determining vulnerability to pilocarpine-induced seizures. It would appear that the VPA rat model of autism combined with the pilocarpine rat model of epilepsy provide a useful animal model of complex autism.

**The Effect of Rhythmic Entrainment Intervention (REI) on Speech, Communication, and Repetitive Behavior of Children on the Autism Spectrum**

Rachel Faber (Rodney Clark and Jeffrey Cross), Allegheny College - Neuroscience and Psychology

There is a lack of empirical research in the area of musical entrainment programs for individuals with an autism spectrum disorder (ASD). The Rhythmic Entrainment Intervention (REI) program claims to positively affect speech, communication, and repetitive behaviors for children with an ASD by creating CD’s with unique entrainment beats on a hand drum. The purpose of the present research is to investigate the biological underpinnings to entrainment and how speech, communication, and repetitive behavior could be affected by an entrainment program like REI. The design of this study was a 2 x 3 factorial in which we studied the effect of the REI musical entrainment program CD on speech, communication, and repetitive behavior. The participants were randomly assigned to either the experimental (REI) or control (generic drumming) condition for 10 weeks. The parents of the participants were instructed to play the CD and have their child listen inactively 4-7 times per week. The effect of the 10-week study was measured by the Social Communication Questionnaire, which the participants filled out at the baseline, 5, and 10-week intervals.

**Administration of Brilliant Blue G Improves Recovery after Ischemic Stroke**

### Timothy Hassett II (Jeffrey Cross), Allegheny College, Neuroscience and Biology

A clot that forms in an artery preventing blood flow to the brain is classified as an ischemic stroke, which effectively deprives cells in its perfusion field of oxygen creating an ischemic area. There is also a secondary expansion of neuronal damage. ATP is released in excess into the effective cerebral area following a stroke, followed by the activation of the purinoceptor P2X7 which has been linked to the secondary injury. The P2X7 receptor is an ATP activated, ligand-gated ion channel that permits Ca2+ to enter the cell membrane. The goal of this study was to determine the neuroprotective effects of Brilliant Blue G administered before and after a two-vessel occlusion stroke model in rats. Brilliant Blue G is a purinergic receptor antagonist that competes with ATP for binding to the P2X7 receptor.

**The Effects of Oxytocin and Vasopressin on Social Recogniton in VPA Rats**

Alisha Kahala (Jeffrey Cross), Allegheny College - Neuroscience and Psychology

Current research shows oxytocin and vasopressin are implicated in facilitating social recognition. This study looked into the differences between vasopressin and oxytocin as well as gender on social recognition. To test this a sample of male and female VPA Sprague dawley rats, an animal model of autism was used as subjects due to their deficit in social recognition. The subjects were subjected to a repeated exposure social recognition test after receiving doses of oxytocin or vasopressin. The social recognition test consisted of a five-minute interaction time between the subject and a novel intruder, after a 15-minute interexposure interval the subject was re-exposed to the same intruder animal for an additional five minutes. After the second exposure the subject animal was held for an additional 15 minutes and then exposed to a novel intruder for five minutes. During the five-minute exposure times the amount of time the subject spent investigating the intruder was recorded and social recognition was defined as a decrease in investigation time during the repeated exposure trial.

**Comparing d-amphetamine and Methamphetamine: Active Avoidance Learning and Neurotoxicity**

Stacy Kmentt (Jeffrey Hollerman), Allegheny College - Neuroscience and Psychology

Attention-Deficit/Hyperactivity Disorder (ADHD) is diagnosed at increasing rates in the United States and stimulant medications are being prescribed in record numbers to treat the diagnosed children and adults. d-Amphetamine is one of the most commonly prescribed stimulants, despite its paradoxical function in the treatment of ADHD, and its striking resemblance to methamphetamine in structure and some of the effects it elicits. Though no concrete evidence has been presented about harmful effects of d-amphetamine, its use as a prescription treatment is controversial and heavily debated. The present study seeks to compare d-amphetamine and methamphetamine on learning behavior and neurotoxicity. Fifteen male Sprague-Dawley rats were treated with 2.0 mg/kg d-amphetamine, 2.0 mg/kg methamphetamine, or 0.9% NaCl for five consecutive days. Learning behavior was measured in a shuttlebox active avoidance task at the beginning, middle and end of treatment. Histological analysis using fluorogold will be used to measure neuron death in the striatum following the experiment.

#### The Effects of Pilocarpine and Valproic Acid on the Median Eminence-Arcuate Nucleus Barrier

David MacAdam (Jeffrey Cross), Allegheny College - Neuroscience

Epilepsy is a chronic neurological disorder characterized by recurrent spontaneous seizures due to neuronal hyperactivity in the brain. Autism is a pervasive developmental disorder characterized by social and communicative impairments. The comorbidity of autism and epilepsy ranges from 10 to 42%. Both of these disorders exhibit compromises in the blood-brain barrier (BBB). Circumventricular organs are areas where the blood-brain barrier is absent. The median eminence (ME) of the hypothalamus is one of these circumventricular organs. Hypothalamic hormones cross from the neighboring arcuate nucleus to the intercellular space of the ME and portal capillaries, but cannot travel back across the BBB. The goal of this study was to determine if autism, seizures, or both changed the ME barrier in Sprague-Dawley rats. Pilocarpine was used to induce temporal lobe epilepsy and prenatal valproic acid exposure created a model of autism. The barrier of the median eminence was assessed using Evan’s Blue dye perfused transcardially. It was hypothesized that rats exposed to VPA, pilocarpine, or both would exhibit an altered barrier compared to controls. Trends in the data show that rats exposed to both drugs show little or no Evan’s Blue staining in the ME while rats treated with only the drug exhibit relatively normal staining.

**Benefits of Physical Activity Self-Monitoring on Sleep, Depression, and Anxiety**
Megan Mick (Sarah Conklin), Allegheny College - Neuroscience

The positive influence of exercise on sleep, depression, and anxiety are increasingly well known. Compared to self report, pedometry—an objective measure of physical activity—has increased ecological validity.  The objective of this study was to investigate the effects of a pedometer intervention on measures of sleep, depression, and anxiety.  Participants (N=55) were randomly assigned to an intervention or control group.  Intervention group participants were given instructions to attain 10,000 daily steps assessed via pedometry for 72 hours. Controls wore the pedometers for the same time.  Baseline and post-study measures included the Pittsburgh Sleep Quality Index (PSQI), Beck Depression Inventory-II (BDI-II), and Beck Anxiety Inventory (BAI).  Pedometry data were collected with an Omron HJ-720ITC Pocket Pedometer.  Group did not have a significant effect on number of steps per day, p > 0.05.  There was a significant decrease in PSQI, BDI-II and BAI scores from baseline to 72 hours in both groups.  Pedometry data and PSQI, BDI-II, and BAI change scores were not significantly associated.  Although there was no between-group difference in steps per day, there was a significant improvement in sleep, depression, and anxiety from baseline in both groups.  These findings suggest that active self-monitoring through pedometry can encourage an increase in physical activity and can improve domains of sleep, depression, and anxiety.

**Effects of Ambient Temperature on Reinforcing Efficacy of Methamphetamine in the Rat**

Jessica Minsterman1 and Rachel Fodi2 (Rodney Clark1), 1Allegheny College and 2University of Pittsburgh - Psychology

Rats were trained in a standard conditioned place preference (CPP) procedure and examined with (+) methamphetamine (1.0- 5.6 mg/kg).  One side of the chamber was paired with 3.0 mg/kg (+) methamphetamine (I.P.) while the other side was paired with saline injections (1ml/kg bwt).  Dose response determinations were then made in the presence of temperatures of 75oF, 68oF, and 50oF chamber temperatures.  Methamphetamine (1.0- 5.6 mg/kg) produced dose-related increases in the overall time spent in the methamphetamine-paired side of the chamber under room temperature conditions (68oF).  Conversely, under the cool temperature (50oF), CPP appeared at higher doses than the training dose. In the warm temperature (75oF) CPP appeared at lower doses.  The present data marginally support previous findings that the reinforcing properties of psychomotor stimulants may be enhanced by increases in ambient temperatures.

**Investigation of Erythropoietin as a Neuroprotective Agent for Pilocarpine-Induced Seizures in Mature Male Sprague Dawley Rats**

Kelsie Mozzoni (Jeffrey Hollerman and Jeffrey Cross) Allegheny College - Neuroscience

Epilepsy is the most common neurologic disorder, affecting people of all ages. It results from a temporary physiologic dysfunction of the brain caused by a hypersynchronous discharge of neurons. Current research has suggested that the glycoprotein hormone erythropoietin (EPO), responsible for the production of red blood cells, is neuroprotective against neural injury induced by chemically-induced status epilepticus. The goal of this study was to determine if EPO is neuroprotective in the hippocampus against pilocarpine-induced seizures in Sprague-Dawley Rats. The design of this study employed three groups of six rats: a control group, a pilocarpine group and also a group pretreated with EPO 24 hours before pilocarpine. The behavioral effects of pilocarpine-induced seizures were evaluated using the Racine Scale for severity and duration of seizure stages. Histological examination of the brains of all subjects followed behavioral evaluations. Subjects were euthanized and perfused with formol saline and Evans Blue. The hypothesis was that when rats are pretreated with EPO before pilocarpine, EPO will indeed have a significant neuroprotective aspect in both the behavioral and anatomical tests. Behavioral and anatomical evidence supports this hypothesis.

**The Teratogenic Effects of Methamphetamine on Olfaction**

### Lauren Strawser (Rodney Clark), Allegheny College - Neuroscience

Methamphetamine has been shown to decrease the amount of dopamine in the brain as well as cause apoptosis of dopomiergic neurons. Since dopamine plays an important role in scent discrimination, the olfactory system can become damaged due to methamphetamine exposure. However, research has not studied these effects when the drug is exposed to the fetus in utero. The purpose of the present study was to explore the teratogenic effects of d-methamphetamine on the olfactory system. The dams were given subcutaneous injections of 10 mg/kg d-methamphetamine, 20 mg/kg d-methamphetamine, or saline solution on day 13 of their gestation periods. After birth and weaning, each mouse pup was tested in a hidden cookie test once a week for 10 weeks. The time it took to find the cookie was recorded for each mouse, averaged with the rest of its experimental group and then compared to other groups.

## CHEMISTRY

**Infrared Characterization of Silicon Nitride Intermediates Using a Microwave Plasma Discharge Source with SiH4 in Low Temperature N2 Matrices**

Adam Deniziak (Jay Amicangelo), Penn State Behrend, School of Science - Chemistry

Matrix isolation infrared spectroscopy uses a low temperature inert matrix to trap unstable molecules. This technique allows for the spectral characterization with infrared spectroscopy of short-lived, relatively unstable intermediates, which are often difficult to observe at higher temperatures and pressure due to their instability. This is accomplished by trapping the transient species in a solid N2 matrix at 12o K. In this project, experiments are performed using a microwave discharge plasma source with a mixture of silane (SiH4) in nitrogen (N2). The reagents are introduced directly into the microwave discharge plasma and the products are deposited onto a cesium iodide (CsI) window at 12o K. After depositing for a suitable length of time, which is typically three – four hours, the infrared spectra of the transient molecules produced can be obtained. The identification and characterization of the transient species produced in these experiments is established by performing these experiments with isotopic reagents (SiD4, 15N2), matrix annealing experiments in which the matrix is warmed to 30o K and then cooled back down to 12o K, by the use of matrix photolysis experiments using a mercury-xenon arc lamp (ultraviolet and visible radiation), and performing quantum chemical calculations using the Gaussian 03W program.

### Cycloaddition of Nitrile Oxides with Furans

Chanel Easley (Martin Kociolek), Penn State Behrend, School of Science - Chemistry

Nitrile oxides, which are derived from hydroximinoyl halides, are known to react with alkenes to give isoxazolines, five-membered heterocycles with adjacent oxygen and nitrogen atoms. Less is known about the cycloaddition of nitrile oxides with unsaturated heterocycles, the product of which would be bicycle compounds with properties of both the isoxazoline and the fused heterocyclic ring. In an attempt to synthesize novel bicyclic quorum sensors, one specific reaction became of interest, namely the cycloaddition of nitrile oxides with furans. Initial studies of the reaction of bromoformonitrile with furan under a variety of conditions, showed a very slow reaction and poor yields of the bicyclic products. This lack of reactivity could be attributed to the stability of the furan ring and/or the less reactive nature of the bromo-substituted nitrile oxide. For this reason, current studies are focused on the effects of different substituent groups on the nitrile oxide including bromo, phenyl and carboxyl. In addition, the effects of various substituents on the furan, including electron-donating and electron-withdrawing groups, will be examined. With these studies, we wish to determine the electronic nature of the substitution most optimal for cycloaddition, as well as its effect on the regiochemistry of this addition.

**Spectral Analysis of Brooker's Merocyanine in HY Zeolites**

Victor Georgic (Jennifer Holt), Penn State Behrend, School of Science - Chemistry

Zeolites are a class of porous crystallites made of silica and alumina.  They have a caged structure which gives them the ability to generate unique interactions with various guest molecules.  For example, zeolite hosts trap methane as guests for easy expulsion from cows. Heavy metals can also be trapped as a guest in zeolites from polluted water, making purification easier.  This research is designed to study the absorption of dye molecules in zeolites and characterize their spectral behavior as a model for other systems. The host-guest system of interest is the hydrogen-exchanged Y zeolite (HY) with Brooker's merocyanine (BM). The dye is inserted into the HY zeolite by soaking it in BM solutions of varying concentrations through a spontaneous dye-loading process. Characterization of the host-guest relationship was performed using solid-state absorbance and fluorescence spectroscopy. These results show that the dye concentration has a direct, linear relationship with the spectral shifts in the major peak position. These reproducible results show a much larger shift than previously reported in related systems which indicates the relevance of characterizing this host-guest relationship. A better understanding of this behavior will lead to a more fundamental characterization of general host-guest interactions.

**A Regioselective Synthesis of a Series of α-Acyloxy Ketones from a Novel Class of Alkynyliodonium Salts**

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

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

**Energy Production of Common Carbon-Containing Fuels with Regard to CO2 Emission**

Shane Lehman and Jordyn Piepenhagen (S. Al Studniarz), Penn State Shenango - Chemistry

The man-made contribution to atmospheric CO2 arises from the oxidation of carbon-based fuels. These fuels are such a good source of energy they are likely to be used in one form or another for some time. This paper examines which of the common fuels gives the least amount of CO2 per unit of energy and therefore, if all else were equal, they would be the carbon-based fuel of choice. The heat evolved per mole of CO2 product was calculated from the enthalpy data in the literature and also the heats of combustion. Natural gas and coal were found to give the least amount of CO2 per Joule and therefore contribute less to global warming than the other carbon fuels based on this criteria alone. Wood and ethyl alcohol were found to give the most CO2 per Joule and are therefore the worst of the common fuels. This report did not look at other important criteria for fuels, such as if they are a renewable (ethanol), if they are inexpensive and in great abundance, etc. Data are also presented on the measured increase in CO2 in the atmosphere (combined man produced and nature produced) and also the seasonal variation of atmospheric CO2. It is hoped that this paper will help continue the much needed discussion of the contribution of humans to the CO2 in the atmosphere.

**Identifying Cyanide-Coordinated Fe (III) Porphyrins as a Possible Electrocatalytic Material for Selective H­­2S Oxidation**

### Marc Neiswonger (Jason Bennett), Penn State Behrend, School of Science - Chemistry

In recent years, hydrogen sulfide has been identified as a third gasotransmitter, in addition to NO and CO, within the body. It is thought to be important in the studies of several neurological diseases. Selectively detecting hydrogen sulfide in the presence of NO and CO has been very problematic due to the slow oxidation kinetics of the reaction. In order to fully understand hydrogen sulfide’s physiological roles, it must be able to be detected *in vivo* in the presence of NO and CO. To this end, our group is actively pursuing electrocatalytic materials capable of selectively oxidizing hydrogen sulfide by improving the oxidation kinetics. This research identified chronamperometrically deposited iron (III) meso-Tetra(4-carboxyphenyl) porphyrin (FeTCPP), followed by a cyanide treatment process, as an electrocatalyst that can achieve this feat. This is the first material capable of selectively oxidizing hydrogen sulfide in the presence of NO and CO. However, before the material can be implemented in an amperometric sensor the deposition of the electrode catalyst and cyanide modification process must be optimized to improve the sensitivity of the porphyrin towards hydrogen sulfide.

**Determining the Viability of Fe(III) meso-Tetra(4-sulfonatophenyl)porphine chloride as an Electrocatalyst for the Selective Oxidation of Carbon Monoxide**

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

An important aspect of studying biological and environmental processes is detecting the presence of the gasotransmitters CO, NO, and H2S. There have been numerous studies concerning NO in the past few decades; however recent interest in CO and H2S has raised the issue of selectivity between the detection of each molecule. Selectively detecting one gas in the presence of the others is problematic because of slow oxidation kinetics, which leads to inaccuracies in quantitatively determining the gas of interest. Our goal is to develop a material that can selectively oxidize CO in the presence of NO and H2S. Preliminary research has shown that modifying an electrode with Fe(III) meso-Tetra(4-sulfonatophenyl)porphyrin (FeTSPP) can effectively catalyze the oxidation of CO by reducing the peak potential from 900 mV to approximately 350 mV (vs Ag/AgCl). However, before this electrocatalyst can be incorporated into a functional sensor, the interaction between the electrocatalyst and CO must be understood. This research studied the response of Pt electrodes modified with a film of FeTSPP towards the gases of interest using electrochemical methods, and quantum mechanical calculations to model the interactions of each gas with the electrode surface.

**Phenyl Derivatives of o-Aminobenzaldehyde and Its Self-Condensation Reactions**

Jerry Phelps (Alan Jircitano), Penn State Behrend, School of Science - Chemistry

*o*-Aminobenzaldehyde (oab) is an interesting molecule that undergoes a variety of self-condensation reactions, depending on the reaction conditions. In the presence of a metal ion, a macrocyclic complex is the product. For example, the copper(II) and nickel(II) complexes of oab are tetradentate macrocycles. The platinum(II) complex of oab is unique. A dimeric condensate is formed which is observed to be photochromic. When the condensate is dissolved in acetonitrile, the solution is dark purple when exposed to light, but becomes orange in color when placed in the dark. It has been shown that in the photochromic reaction mechanism, the coordinated aldehyde of oab is displaced from the platinum(II) ion by the solvent. The focus of this research was to synthesize the copper(II), nickel(II), and platinum(II) complexes of phenyl-substituted oab. More specifically, 4-phenyl-2-aminobenzaldehyde and 3,5-phenyl-2-aminobenzaldehyde were synthesized using a Suzuki cross-coupling reaction between 4-bromo-2-aminobenzaldehyde or 3,5-dibromo-2-aminobenzaldehyde, and phenylboronic acid. The products of these reactions and the condensations were characterized using IR and PNMR. The synthesis of the phenyl substituted oab derivatives and the properties of the condensation products with copper(II) and nickel(II) ions, along with the photochromic reaction of the platinum(II) dimer will be discussed.

### Residual Water Effects on Composite Host-Guest Systems

Greg Thier (Jennifer Holt), Penn State Behrend, School of Science - Chemistry

The insertion of guest molecules into host lattices has the potential for a variety of applications in drug delivery and waste treatment systems. However, the intramolecular interactions must be further understood to optimize these systems. This study focuses on the insertion of a dye molecule, Brooker’s merocyanine, into the microporous zeolite HY, which was analyzed by fluorescence and UV-Visible spectroscopy to characterize the dye-loading mechanism and dye-zeolite interactions. Significant fluorescence spectral peak shifts have been observed as a function of the dye concentration exposed to the sample. One possible explanation is due to a variation in water content co-adsorbed with the dye due to the hydrophilic zeolite pore’s preference to smaller more polar molecules. Spectroscopic time studies monitored the rate of dye adsorption. Initially wet and dried zeolites were studied to see if water molecules would block further adsorption. Additional studies involved dye-loaded zeolites subsequently exposed to water vapor, to see if the change in concentration of water affected the fluorescence peak positions. These results give an understanding of the role of water in these materials as it relates to spectral properties, which can be used to better understand and control the use of these materials for practical applications.

**Liquid Crystalline Derivatives and Metal Complexes of Their Self-Condensation of o-Aminobenzaldehyde**

Luke Wolfe (Alan Jircitano), Penn State Behrend, School of Science - Chemistry

*o*-Aminobenzaldedyde (oab) is a well-studied ligand precursor with many exciting possible metal chelating properties. It readily undergoes self-condensation to form an assortment of ligand macrocyclic complexes, depending upon the presence of specific metal ions. For example, in the presence of nickel(II) and copper(II), tetra-anhydrotetramer (TAAB) macrocyclyes are formed while with platinum(II), a dimeric condensate is formed. This dimeric condensate is photochromic when dissolved in acetonitrile. In the light, the solution is dark purple, while in the dark it is orange. This photochromic reaction is due to the displacement of the coordinated oab aldehyde from the platinum(II) ion by acetonitrile. Many derivatives of oab have been synthesized, but few liquid crystalline derivatives are known. One study of these long alkoxy chain derivatives have been shown to have liquid crystal properties with metal free ligands. The focus of this research was to synthesize several alkoxy oab derivatives through coupling 3,4 dihydroxybenzaldehyde with an alkyl halide (ethane to dodecane). The molecule can then be nitrated in the 6-position with nitric acid and acetic anhydride and reduced by hydrogenation with a Pd/C catalyst. These ligand precursors were analyzed using IR and PNMR. The nickel(II), copper(II) and platinum(II) complexes of the derivatives will be discussed.

## ENGINEERING

### Nerve Control of Prosthetic Device

Vince Canino1 and Paul Morris1 (David Loker1, Margaret Voss2, Yi Wu1, and John Roth1), Penn State Behrend, 1School of Engineering and 2School of Science - Electrical and Computer Engineering

Artificial limb control is an active area of research, and the control of prosthetic devices using electromyographic (EMG) interfaces is well established. This study extended current research into nerve control of prosthetic devices. The objective was to take electrical signals directly from the nervous system and transform them into corresponding mechanical motion realized by a motor. This is critical for injuries that result in the loss of muscle which prevent EMG control. The nerve control system created has four functioning blocks: nerve interface, signal analyzer, wireless transmitter and receiver, and motor driver. The nerve interface used electrodes to obtain the nerve potentials. Electrical signals from the nerve were analyzed. When the appropriate signal thresholds were met, a message was wirelessly transmitted. After receiving the message, the wireless receiver sent a corresponding pulse-width modulated (PWM) signal to the motor driver. The motor driver circuit had sufficient voltage and current capability to directly control a brushless DC motor. When testing with an invertebrate, electrodes were connected to a crayfish nerve and the nerve was stimulated with an artificial signal. The signal was conducted by the nerve and used to control the motor speed from a single input channel to the system.

**Resistance of a Sailboat Rudder**

Matt Crowell (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

Sailboat rudders and airplane wings share the same purpose; create a force perpendicular to their direction of travel. This relationship between the two objects suggests that they would share similar geometries. This suggestion however can be called into question when you consider the fact that a boat rudder is in contact with two separate fluid mediums during operation. An airplane wing is only required to be in contact with one fluid medium, air. The sailboat rudder however, will cross the water-air interface, called the free surface, which submits it to different densities. These different densities create different resistance properties that will vary when compared to the more simplistic airplane wing. The purpose of the current research is to find if there is a different optimal shape for a sailboat rudder. In order to do this a model of an airplane wing must be created in ANSYS Fluent. The model then is compared to published values of lift and drag for an airfoil. Once the model has been confirmed for accuracy, it will be modified to reflect the presence of the free surface.

**Development of Design Equations for Compressive-Hook Integral Attachments**

Dustin Davis (Dean Lewis), Penn State Behrend, School of Engineering - Mechanical Engineering

Compressive-Hook integral attachments features, a type of snap-fit, are used in several different applications. In using snap-fits the loading capabilities need to be predicted to ensure it can handle the applied loads. Dean Lewis has previously researched this type of snap-fit and derived design equations to predict the loading capacities of this snap-fit with a second order curve fit. These equations are limited to a certain range of sizes since it is not based on any standard loading theory. Using the same data to derive the curve-fit equations, a new design equation to replace Lewis’ equations were generated by comparing the data to predicted results from standard eccentric buckling and Euler buckling equations. It was found that the eccentric buckling equation will always under predict the loading capabilities of the snap-fit, and that Euler buckling equation will almost always over predict the loading capabilities. The length measurement used in the equations could be measured in different ways, but it was found that it was not an important factor. Correction coefficients for each standard equation were created to predict the loading capabilities of the snap-fit more accurately.

### A Real-Time Tool to Support PID Loop Tuning by Intuition

Dane Dombrosky (E. George Walters III), Penn State Behrend, School of Engineering - Electrical Engineering

The Proportional-Integral-Derivative (PID) controller is the most commonly used algorithm for closed-loop control of process variables such as temperature, pressure, and flow. The theory for implementing the PID algorithm is understood by many engineers. Unfortunately, applying the theory is beyond the skill level of many practitioners. As a result, many control loops in industry are tuned by intuition rather than by using a mathematical-based procedure. Such “tuning by intuition” has proven to be adequate for many control loops. The objective of this research is to make tuning by intuition easier and more effective. This is accomplished by developing graphical, real-time tools to assist the practitioner. The outcome is a graphical tool that displays, in real-time, the effect each tuning parameter contributes to the loop output. This information can help the practitioner tune the loop faster and more accurately, resulting in better control. Such a tool can be used to complement the way many practitioners currently tune loops, rather than trying to teach them more complex techniques they may be resistant to learning and using.

**Flywheel Energy Storage System**

Dustin Kapp, Chad Bell, and Vince Canino (Dakshina Murthy Bellur), Penn State Behrend, School of Engineering - Electrical Engineering

Flywheel energy storage (FES) devices can be utilized for many applications as alternative sources of power. With the specialty rail business still thriving, a possible solution to eliminate overhead high voltage lines and battery banks used for auxiliary power could potentially be an FES device. Currently, research and development of an FES device is carried out at Brookville Equipment Corporation, Brookville, Pennsylvania for the use in powering auxiliary loads such as overhead lighting, emergency lighting, headlights, and radio communication in rail transportation. The FES system is designed to charge during normal and unscheduled stops of the vehicle while electric power is available and discharge to provide power to the onboard loads while the vehicle is in operation. The electrical energy is converted to mechanical energy during the charging stage by accelerating the flywheel to a desired speed, which, in turn will be converted back to electrical energy by the use of a generator to power the loads on the vehicle. In this work, research, design, simulation, testing, and challenges involved in completing the capstone project for the electrical engineering program at Penn State Behrend are presented.

### Investigating the Installation of a Rooftop Solar Panel

Joel King (Robert Weissbach), Penn State Behrend, School of Engineering - Electrical Engineering

In recent times, the pursuit of renewable energy has increased greatly. The use of solar panels, wind turbines, and other forms of renewable energy production can be used to reduce consumption of fossil fuels such as coal for day to day energy needs. In an effort to reduce energy consumption at the Penn State Behrend campus, the feasibility of installing a rooftop solar panel onto the roof of a campus building has been investigated. The first step was to study the National Electrical Code (NEC) and become familiar with the regulations concerning solar panels. Other items that were researched include determining which building is best suited for installing a solar panel, what type of solar panel would be best suited for the campus, compatibility with the current electrical system, the amount of maintenance a solar panel requires, costs associated with a panel, and a panel’s impact on the energy consumption of the building. Based on this effort, a recommendation is provided for the most suitable location, along with an expected cost for installation.

**Post-Pneumatic Forming Mechanical Properties of Lightweight Alloys**

Dan Lowe and Eric Orton (Fadi Abu-Farha), Penn State Behrend, School of Engineering - Mechanical Engineering

In the metal-forming industry, materials and process development are areas of primary focus, with little attention paid to the properties of the formed components. In superplastic forming (*SPF*), the issue of post-forming properties is particularly important because of the large plastic deformation, significant microstructural changes, and exposure to elevated temperatures for prolonged periods of time. In this project, a detailed experimental study on the mechanical and microstructural properties of superplastically formed magnesium alloy sheets is presented. The generated data is anticipated to prove the necessity to integrate post-forming analysis with material and process development, for successful optimization of this emerging forming process.

**Design and Simulation of Class-E Resonant Circuit for Near-Field Wireless Power Transfer Application**

Christopher Nocera (Dakshina Murthy Bellur), Penn State Behrend, School of Engineering - Electrical Engineering

Traditionally, batteries have been the primary power source for portable electronic devices such as personal digital assistants (PDA’s), mobile phones, music players, and remote controls. Batteries in these devices must be recharged or replaced frequently. Additionally, batteries are bulky and have adverse effects on the environment. Research in the area of wireless power transfer (WPT) has gained a lot of attention these days. Using WPT systems to charge portable devices could potentially lead to the reduction in the size and weight of the batteries, or eliminate them all together. In addition, the battery charger unit and its wire can be completely eliminated in a WPT system. Recently, resonant power converters incorporating loosely coupled inductive coils have been used to successfully transmit power over very short distances with relatively high efficiencies. Among the several resonant power converters, class-E power converters are the most popular due to their high efficiency. In this work, operation of class-E amplifiers which use coupled coils for near-field WPT is explored. Design and simulation of a class-E amplifier for charging a mobile device is presented. This work benefits young undergraduate researchers interested in exploring wireless power transmission technology using resonant converters.

### Undergraduate Student Summer Research Fellowship Program for 2010

Alyssa Pears, Zach Clark, Tyler Szczesny, Aharon Robinson, and Kyle Brown (Melanie Ford), Penn State Behrend, School of Engineering - Engineering Outreach Center

The purpose of the undergraduate research project was to bring together multiple student engineering disciplines to develop activities to educate young students in the surrounding areas. Many K-12 students today are not exposed to engineering until their late high school careers but through the advancement of the Engineering Outreach Program this will change for the Erie area. Four projects were designed or improved upon in order to educate these young minds. These four activities are the exploration of solar energy, demonstrating mechanical advantage using pulleys, the principles of Hooke’s Law of Elasticity, and experimentation with Peltier systems. The resulting activities are very impressive and will provide new knowledge of engineering concepts to the youth.

### Bringing Heat Transfer to Grades K-12

Haley Sharp (Melanie Ford), Penn State Behrend, School of Engineering - Engineering Outreach Center

Many students in elementary, middle, and high school do not get the opportunity to learn about the topics of engineering. The purpose of the present research was to conduct experiments pertaining to heat transfer and write lesson plans to teach these same experiments to students in various grade levels. Because heat transfer is such a broad topic, the experiments were narrowed down to just experiments with ice. The design of the study was to conduct an experiment with ice, and write three lesson plans on various grade levels. The experiments start off with the basics for elementary students, with added difficulty for middle school students, and more complex for high school students. The results of the experiments varied with the kind of liquid used to make the ice cubes and different materials the ice was placed on to find the melting time differences.

**Creating a Program to Calculate the Results of a Lab Demonstrating the First Law of Thermodynamics**

Burfoot Ward IV (Bob Edwards), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

The first law of thermodynamics lab looks at the energy balance of a hair dryer as an example of an open system. The lab requires students to keep track of 46 data points while performing more than 100 calculations. Because of all this data manipulation there are many chances for errors to enter the calculation process. This program will allow students to concentrate on the results of the lab without having to spend large amounts of time on the calculations. Because of this, the students can focus on the theory of the open system rather than spending all their time and energy on getting the calculations right. This program uses a thermocouple DAQ to take multiple temperature readings at one time. The program will then use the data from the DAQ and the front panel (that the students added) to calculate the final result, and output the result into an excel file so that the data can be used.

## HUMANITIES AND SOCIAL SCIENCES

### Our Spatial World

Renee Fanning1, Chelsea Perry1, Erin Bliley2, and Charles Latchaw2 (Dawn Blasko1 and Kathryn Holiday-Darr2), Penn State Behrend, 1School of Humanities and Social Sciences and 2School of Engineering - Psychology

Spatial skills are needed for many of today's professions. Careers in math, science, and engineering are perfect examples. However, these skills are not taught or developed in basic public school curricula. On average, males have an advantage over females in spatial skills. This may contribute to a lack of women in math, science, and engineering professions. We administered a pretest that measured the spatial abilities of the group of high school girls. Participants were involved in four training sessions, one per week over four weeks. Each week, they completed a module on the computer, drawings from the workbook, and played a game developed to improve spatial ability. Overall the girls improved in their spatial skills pretest to posttest and evaluations found that the girls enjoyed the training sessions. We also designed a game to use and improve working memory, which is a part of spatial intelligence. The game was designed to simulate a restaurant setting. Players took turns taking and memorizing each other's meal orders. Then they searched around the room to find the food stations to put together the orders. Surveys from players concluded that the game was both challenging and fun, key components of a successful educational game.

**The Dark Side of Intimate Relationships: Conflict and Commitment**

Breanna Gassner (Chiung-Ya Tang), Penn State Shenango - Human Development and Family Studies

With so many women in western Pennsylvania falling victim to domestic violence, I thought it would be interesting and beneficial to investigate the level of women’s commitment and their conflict tactics. It is especially beneficial to identify the level of women’s commitment to the relationship that pertains to negative interaction and violence. Do women who stay in a negative or violent intimate partnership have higher levels of relationship commitment? An on-line survey will be conducted with a maximum of 120 individuals throughout western Pennsylvania. Participants will be asked a series of questions that will help determine whether they are staying out of commitment, or whether they are staying to avoid further conflicts. According to commitment theory, negative correlations are expected between negative communication patterns and personal commitment (i.e., staying for affection) or moral commitment (i.e., staying for moral value). No relationship between structural commitment (i.e., staying because of constraints) and negative communication patterns is expected. The level of the relationship commitment will also be compared between women whose intimate relationship pertains to greater degree of violence with those whose intimate relationship pertains to lower degree of violence.

**Using Computer Games for Learning: Designing a Serious Games Measure**

Daniel Klanica1, Brittany Bittner1, Chelsea Perry1, Renee Fanning1, and Yassine Benlamhidi1 (Dawn Blasko1, Kathy Holiday-Darr2, and Holly Blasko-Drabik1), Penn State Behrend, 1School of Humanities and Social Sciences and 2School of Engineering - Psychology

Developing educational (serious) computer games requires multidisciplinary involvement including education, human computer interaction, and software engineering. Ideally these “serious games” would be interesting, fun, and self motivating while still meeting the goal of teaching students. Designing serious game is made more complex by the lack of evaluation methods for the games during and after development. The purpose of this study was to create and validate a serious games measure that can be used to guide the development of serious games, and be used as a preliminary measure once the games are completed as to their success. Over 400 items and heuristics collected from existing measures and studies in the fields of usability, gaming, design, expertise, learning, motivation, enjoyment, and technology acceptance were analyzed to create a short Serious Games Measure. Once the measure was created a validation study was conducted. Participants were randomly assigned to play a game that experts judged to be strong on one of the five constructs. Each game was then evaluated using the five-factor serious game scale. The results were analyzed for inter-item consistency and construct validity.

### Implementation of IVF Guidelines

LuAnn McBride, Paige Conroy, Stephanie Flinchbaugh, Ashley Burns, Melanie Copp, and Josey Westerdahl (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

As of today, no regulations are in place limiting the number of embryos implanted with in vitro fertilization. This appears to be the biggest risk of fertility treatments. It increases the risk of stillborn, neonatal death, and disability to the children born. On an average, one out of every four IVF pregnancies are multiple pregnancies compared to one in 80 for women who conceive naturally. Approximately 11,000 IVF babies are being born each year, which presents a significant public health concern. We must ask ourselves if it’s time for the government to regulate this multi-million dollar annual industry. A poster presentation will be used to show that guidelines need to be implemented for the safety and well-being of the children being affected. More specifically, it is argued that the number of embryos implanted with IVF should be limited to three and that an age limit of 50 be placed on women who receive IVF treatments. The cases of Nadya Suleman, the “Octamom” and Maria Carmen del Bousacha will be analyzed to further support our proposal.

**Evaluating the Effectiveness of Youth Development Outcomes of the College for Kids Program**Meghan Meader (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

College for Kids is a community outreach program that is offered through Penn State Behrend. Boys and girls from ages six to sixteen attended the College for Kids program in the summer of 2010. Of the 590 children who attended College for Kids, 215 returned their surveys. This project was designed to meet three objectives: (1) evaluate the current assessment measures used by the College for Kids program, (2) look for ways to improve survey return rates, and (3) and evaluate the relationship of the College for Kids program and positive youth development outcomes. We received 34% of our surveys back from our original 590 sent. Next year it will be beneficial to use an online survey to make it easier for participants. It was found that parents sent their children to College for Kids to gain intellectual stimulation, to gain personal enrichment, and to learn something new. Most parents said that their child had an overall great experience at College for Kids. It was also found that, from the parent’s point of view, the children did gain developmental outcomes in each of the developmental categories.

**Behrend Arboretum Web Site Update**

Daniel Shoemaker1 (Michael Naber2), Penn State Behrend, 1School of Humanities and Social Sciences and 2School of Science - Creative Writing

The Behrend Arboretum Web site will be redesigned and updated in order to make the information more accurate and enhance the current site. The page will be updated with aerial photos, Global Positioning System points, new links, and enhanced interactivity for visitors. This will be accomplished through the use of Web design software, modernizing the Web site, marker locations will be placed around campus with maps of the arboretum and campus direction maps. This project is vital to the work needed for the new markers and keeping the Web site current. In addition, this project will provide students, staff, and other members of the community with an interactive and user-friendly resource to help promote the diverse range of trees in the arboretum. This will be valuable to groups exploring the arboretum online or at the campus.

### Genetic Testing and Abortions

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

Genetic testing enables some pregnant women to determine whether their child has Down syndrome. Currently, such testing is offered to mothers who have an increased risk of having a child with Down syndrome and to those whose routine prenatal tests indicate the possibility of Down syndrome. However, recent advances may make testing for Down syndrome more common. A non-invasive prenatal genetic diagnosis (NIPD) was recently developed that could become a standard part of prenatal testing. This possibility raises several ethical dilemmas. First, should it be permitted if it will lead to more abortions? According to an article in the *New York Times*, 90% of women turn to abortion if they learn that their child has Down syndrome. Will more parents terminate their pregnancies if these tests become more common? Second, where do we draw the line? Soon we may be able to know our babies’ eye and hair color in advance. Should we be allowed to make decisions about whether to become parents based on such tests? The presentation addresses these questions by assessing whether it is ethically right to abort a fetus if you learn that it could have a disability.

**Do the Assets Influence Life Satisfaction in College Students?**

Danielle Young (Carl Kallgren), Penn State Behrend, School of Humanities and Social Sciences - Psychology

The 40 Developmental Assets are 40 common sense, positive experiences and qualities that help influence choices that young people make that help them become caring, responsible adults. Past research suggests that the Search Institute’s Developmental Asset Framework is an effective way to assess protective factors in youth. Extensive research has been done applying the 40 Developmental Assets to children and adolescents, but there has been little research on college students. The 40 Developmental Assets are relevant to college students because they may provide a new tactic for universities wanting to promote positive development including increasing retention rates and success among students. The present research was designed to explore the associations between college student’s life satisfaction and the 40 Developmental Assets. Approximately 200-250 Penn State Behrend undergraduate students will participate in this study. The participants will complete an online survey using zoomerang.com. They will complete two surveys, a modified version of the Developmental Assets Profile (DAP) and the Satisfaction with Life Scale (SWLS), along with some demographic questions. Based on past research, the researcher hypothesizes that there will be a positive correlation between the number of assets displayed and life satisfaction. Implications will be presented.

## PHYSICAL SCIENCE

### Analysis of the Falkner-Skan Equation

Justin Carbonara (Antonio Mastroberardino), Penn State Behrend, School of Science - Mathematics

In various industrial applications, fluid impinges on a solid surface. The governing

equations for this type of fluid flow are those given by the Navier-Stokes equations. In various problems, the Navier-Stokes equations are reduced to nonlinear ordinary differential equations after a similarity transformation. Similarity solutions are not only important for describing physically relevant aspects of a problem but also in validating the accuracy of numerical solutions. In this project, we will perform an analytical and qualitative analysis of these equations under various scenarios using a series of exponentials. We will also compare the analytical results to results obtained from numerical solutions for the velocity of the fluid found using MATLAB.

**The Moon: A Study of Our Only Satellite and Its Ability to Deflect Asteroids**

Michael Dulaney (Darren Williams), Penn State Behrend, School of Science - Astronomy

We developed a computer program to integrate the orbits of asteroids encountering the Earth-moon system. The program can be run with the Earth and the moon having different sizes and distances from each other, and to track close encounters and impacts of asteroids with the Earth and moon. We found that asteroids struck both objects, but the Earth had approximately four times more impacts than the moon. The percentage of asteroids hitting the moon increased as it was moved inward toward the Earth. We also found a significant increase in the number of asteroids approaching extremely close to the Earth, as the moons orbit was made smaller. This meant that small perturbations by the moon resulted in an impact.

**Given ε > 0, the δ is …**

Kendra Gagliano (Papiya Bhattacharjee), Penn State Behrend, School of Science – Mathematics

Given a function f, the definition of $\lim\_{x\to c}f(x)=L$ is as follows: “given $ε$ > 0, there exists $δ>0$ such that $\left|f\left(x\right)-L\right|< ε$ whenever $\left|x-c\right|<δ$.” In this research, we have compiled $δ$ for general polynomials and various rational functions. In this poster presentation I will display some of the results that we have achieved, giving values of $δ$ for a given $ε$, and a general function. Furthermore, we have focused on computing other limits, like $\lim\_{x\to \infty }f(x)=\infty $ or $\lim\_{x\to \infty }f\left(x\right)=L$ for some general functions $f$, and have compiled, using definition, the value of M, given ε > 0 or K > 0. These will also be displayed on the poster.

### Automated Video Podcast System

Justin Handley, Christopher Marecic, and Tiana Novak (Gary Walker, Ron McCarty, and Wayne Anderson), Penn State Behrend, School of Science - Computer Science

The Automated Video Podcast System is a prototype recording system that will record a multi-target video, such as a class lecture or business meeting. The system will support editing parts of the video, such as adding a cover page, transitional pages, and ending notes. After finalizing the video, the user will be given the option to convert the video to different formats. The user will upload the video to a specified destination, for viewing by anyone with access.

**Online Course Management System with Integrated Student Verification**

Zachary Kosarik, Brian O’Connell, Katie Copeland, and Gary Cunningham (Gary Walker and Ron DelPorto), Penn State Behrend, School of Science - Computer Science

Online Course Management System with Integrated Student Verification is an online course management system that will allow instructors to verify the identity of students. The course management system will be hosted on a Linux server running Apache, MySQL, and PHP. The client will run in the Java Runtime Environment, providing cross platform capabilities.

During the course enrollment process, a student’s image will be captured and his voice recorded using a webcam and microphone. After these data are processed, they will be sent to the server and stored as XML templates. When the student is completing an online exercise, quiz, or test, additional image and voice recordings will be captured and compared to the server templates, for identity verification. The system will also implement an online course management system, allowing instructors to upload video, audio, documents, and quizzes to the web server.

**Two-Dimensional Equilibrium Crystal Shapes**

Clay Schuman and Kartik Darapuneni (Antonio Mastroberardino), Penn State Behrend, School of Science - Mathematics

The classic materials science problem of minimizing the total surface energy under constant volume is particularly important for the design and implementation of engineering materials for their use in electronics, optics, and many other applications. By considering the effect of a regularization on the equilibrium shape of a solid particle in two dimensions, a 4th order nonlinear boundary value problem is derived. In this presentation, analytical solutions and numerical solutions obtained with MATLAB will be compared.

### The Lane-Emden Equation

Terrance Watterson (Antonio Mastroberardino), Penn State Behrend, School of Science - Mathematics

The Lane-Emden Equation is a nonlinear, second-order ordinary differential equation. It is used to describe the density profile of a gaseous star and in addition use the result to find the mass and pressure profiles. It is derived from a Poisson's equation and adapted to fulfill the conditions of a self-gravitating, spherical gas and assumes a power-law relation between pressure and density of the gaseous star. This presentation provides analytical and numerical solutions to the Lane-Emden Equation using Maple and the Homotopy Analysis Method, a very powerful technique for solving nonlinear differential equations.