# PSBLetterheadMark

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

***2009***

***EIGHTEENTH ANNUAL***

***UNDERGRADUATE STUDENT RESEARCH***

***AND***

***CREATIVE ACCOMPLISHMENT CONFERENCE***

***ABSTRACT BOOK***

# *ORAL PRESENTATION ABSTRACTS*

## BIOLOGY AND ENVIRONMENTAL SCIENCE

[**Presence of Polyphosphate in the HCl-Extractible Phosphate Fraction**](#Click)

Devin Click (Milton Ostrofsky), Allegheny College - Biology

[**Utilization of Quantitative PCR for the Assessment of Human Contribution to Fecal Bacterial Pollution in Tributaries of Lake Erie**](#Hindman)

Ryan Hindman (Steven Mauro), Mercyhurst College - Biology

[**Differential Impact of Gliadin on Common Gut Bacteria: Implications for Celiac Disease**](#Hoover)

Kaitlyn Hoover (Steven Mauro), Mercyhurst College - Biology

**RUNNER UP -** [**Determining Rates of Infection of *Peromyscus leucopus* with *Borrelia burgdorferi* on Presque Isle State Park**](#Kuczaj)

Isis Kuczaj (Cynthia Rebar and David Fulford), Edinboro University of Pennsylvania - Biology

[**On an Optimization Algorithm in Foraging Theory**](#Nelatury)

Charles Nelatury (Margaret Voss), Penn State Behrend, School of Science - Biology

[**Determining the Role of N-Glycans in Apical Sorting Within Polarized Epithelial Cells**](#Piscitelli)

Michael Piscitelli (Beth Potter), Penn State Behrend, School of Science – Biology

**RUNNER UP -**[**Size Distributions of Dreissenid Mussels on Benthic and Vertical Substrates in Presque Isle Bay**](#Ropski)

Meaghan Ropski and Brian Wojtkielewicz (Greg Andraso), Gannon University, Morosky College of Health Professions and Sciences - Biology

[**Comparison of Shiga Toxin Gene Abundance to Commonly Used Microbial Indicators in Lake Erie**](#Olszewski)

Cody Smith and Adam Olszewski (Steven Mauro),Mercyhurst College - Biology

**WINNER -**[**The Music of Proteins: A Unique Analysis of Class III Peroxidase Proteins**](#Wahlmark)

Christopher Wahlmark (Ann Kleinschmidt and Jennifer Dearden), Allegheny College - Biology and Music

## BUSINESS AND ECONOMICS

[**Which Foreign Trade Partners Will Best Help to Stabilize the Erie Economy?**](#Balsiger)

Jennifer Balsiger (James Kurre), Penn State Behrend, Sam and Irene Black School of Business - Business Economics and International Business

**RUNNER UP -**[**Gasoline Prices and Consumer Expenditures: How Rising Gasoline Prices Affect per capita Consumer Expenditures Less Expenditures on Energy Goods and Services**](#Friedle)Andrew Friedle (Todd Nesbit), Penn State Behrend, Sam and Irene Black School of Business - Economics

[**Creating a More Timely Measure of Erie’s Standard of Living**](#Gilson)

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

**WINNER -**[**The Fort Lauderdale Forecast: Can Metro Areas Lead the Nation?**](#Halapy)

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

[**The Influence of Economic Freedom on Environmental Quality in the United States of America**](#McAndrew)

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

[**Customer Satisfaction with Restaurants**](#Sinclair)

Renee Sinclair, Shannon Reidy, and Brianne Loucy (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

**RUNNER UP -**[**The Impact of Culture on Software Piracy**](#Staul)Renee Staul (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - International Business and Marketing

[**The Causes and Consequences of Changes in the Composition of U.S. – China Trade**](#Walling)

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

## CHEMISTRY AND BIOCHEMISTRY

**RUNNER UP -**[**Development of Assays and Systems to Test the Functionality or Presence of Mismatch Repair Proteins**](#Dillen)

William Dillen1, Jill Clodfelter2, Samrat Dutta4, Ryan Topping2, and Aksana Vasilyeva2, (Karin Scarpinato2, 3and Lisa Unico1), 1Edinboro University of Pennsylvania, 2Department of Cancer Biology and 3Comprehensive Cancer Center, Wake Forest University School of Medicine, 4Wake Forest University - Biochemistry

[**Nanowire-Based Magnetorheological Elastomers: Enhancement of Controllable Elasticity**](#Foor)

Kayla Foor, Sydney Moser, and Joseph Filer II (Richard Bell), Penn State Altoona - Chemistry

[**Investigation of Reticulocyte Cell Bound Complement Activation Products, R-C4d and R-C3d, in Hospitalized Patients with Acute Infection**](#Lavin)

Shane Lavin1,2 (Barbara Paul1), 1University of Pittsburgh, Lupus Center of Excellence and 2Gannon University, Morosky College of Health Professions and Sciences - Biochemistry

[**Effects of Nitric Oxide Donors on hIK1 Endocytosis**](#ORourke)

Kellie O’Rourke (Heather Jones), Penn State Behrend, School of Science - Biochemistry

[**The Kinetics of Attachment of Chlorosilanes to Silica Gel Grade 643**](#Pierce)

Brittany Pierce (Alice Deckert), Allegheny College - Chemistry

**WINNER -**[Temperature Dependence of DNA and RNA Duplex Formation](#Sevcik)

Lesley Sevcik (Alice Deckert), Allegheny College - Chemistry

[**Green Oxidations with a Novel Polymeric Iodinane, Poly-[4-hydroxy(iodonio)]benzenesulfonate**](#Viggiano)

Rocco Viggiano (Michael Justik), Penn State Behrend, School of Science - Chemistry

## COMPUTER INFORMATION SYSTEMS AND COMPUTER SCIENCE

[**Platform Comparisons! – A Comparison of Different Languages and their Web- Development Platforms**](#Carper)

Dan Carper (John Bonomo and C. David Shaffer), Westminster College - Computer Information Systems

**WINNER -** [**TD Sorry! – A Look at Temporal Difference Learning Applied to a Popular Board Game**](#Lukich)

Pete Lukich (John Bonomo and C. David Shaffer), Westminster College - Computer Information Systems

[**Graphical Authentication Password System**](#Ohler)Matthew Ohler (Gary Walker), Penn State Behrend, School of Science - Computer Science

[**Graph Algorithm Visualizer**](#Osborne)

Geoffrey Osborne (Gary Walker), Penn State Behrend, School of Science - Computer Science

[**Bioinformatics Research: Co-Expression Metric Database**](#Paskorz)

Dennis Paskorz1 (Claude de Pamphilis2 and P. Kerr Wall2), 1Penn State Behrend, School of Science and 2Penn State University, University Park - Computer Science

[**The Development of a Maze Evaluation Metric**](#Slane)

Andrew Slane (John Bonomo and C. David Shaffer), Westminster College - Computer Science

## ENGINEERING

[**Formation of 5052 Aluminum Channels Using Electrically Assisted Manufacturing (EAM)**](#Beers)

Jeffrey Beers, Wesley Salandro, and Joshua Jones (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

[**Development of an Electrically Assisted Rolling Mill**](#Collins)

Trevor Collins and Steve Chilcott (John Roth and Richard Englund), Penn State Behrend, School of Engineering - Mechanical Engineering

[**The Effect of Repeated Interruptions of the Cutting Process on Tool Life**](#Craig)

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

[**Springback Elimination for AL-6111 Alloys Using Electrically Assisted Manufacturing (EAM)**](#Green)

Chad Green and Timothy McNeal (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

[**Effect on the Compressive Formability of Magnesium AZ31B-O When a Continuous DC Electrical Current is Applied**](#Jones)

Joshua Jones and Wesley Salandro (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

**WINNER -**[**Effects on Magnesium Microstructure Due to Electrically Assisted Manufacturing**](#McNeal)

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

[**Condition Monitoring for Indexable Carbide End Mill Using Acceleration Data**](#Milner)

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

[**Application of Electric Current in Friction-Stir Welding**](#Pitschman)

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

RUNNER UP -[Tensile Formability Enhancement of Magnesium AZ31B-O Alloy Using Electrical Pulsing](#Salandro)

Wesley Salandro and Joshua Jones (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

[**Numerical Study of the Thermal Residual Stresses from Friction-Stir Welding of 6061-T6 Aluminum**](#Wigg)

Benjamin Wigg (Jun Zhou), Penn State Behrend, School of Engineering - Mechanical Engineering

## ENGINEERING TECHNOLOGY AND PHYSICS

**WINNER -** [**Pulley Power – Mechanical Advantage**](#Butella)

Joe Spess (Bob Edwards and Kathy Holliday-Darr), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

[**The First Law of Thermodynamics and the Peltier**](#Coleman)

Keith Coleman and Oliver Kerr (Bob Edwards and Kathy Holliday-Darr), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

[**The Effects of Introducing Vibrations to Perspective Engineering Students**](#Danowski)

Shawn Danowski and James Bower (Bob Edwards and Kathy Holliday-Darr), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

[**Introducing Einstein’s Special Relativity to High School Students**](#Katsafanas)

Peter Katsafanas (Stephan Schaffrath), Slippery Rock University, College of Health, Environment and Science - Physics/Pre-Engineering

[**Bicycle Power Generation Display and Demonstration**](#Taylor)

Marcus Taylor and Keith DeNinno (Bob Edwards and Kathy Holliday-Darr), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

## ENGLISH LITERATURE

**[Women Superheroes in Television](#Haas)**

**[Research at the UCLA Film and Television Archive](#Haas)**

Ashton Haas (John Champagne), Penn State Behrend, School of Humanities and Social Sciences - English Literature

## GLOBAL STUDIES, HISTORY, AND POLITICAL SCIENCE

[**The Use of Modern Technology by Historical Institutions**](#Barlow)

David Barlow (Paula Treckel), Allegheny College - History

[**American Imperialism in the Philippines**](#Buonocore)

Cathryn Buonocore (John Rossi), Penn State Behrend, School of Humanities and Social Sciences - Political Science and History

**WINNER -**[**Dire Diplomacy: The Birth of Foreign Diplomacy during the American Civil War between the United States and Great Britain, 1860-1862 and Economic Factors**](#Jenks)

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

[**Tracing the History: Political Islam in Turkey**](#Kesikli)

Erkinalp Kesikli (John Collins), St. Lawrence University - Global Studies

**RUNNER UP -[A Question for the Contemporary Public Education System:](#Mattison)**

**[How Do We Know If We Are on the Right Path to Solutions If We Cannot Agree on the Origins of Our Problems?](#Mattison)**

Chrysanthemum Mattison (Melissa Comber), Allegheny College - Political Science

RUNNER UP -[The Spanish American War: The Arrival of the United States as a World Power](#Rand)

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

## MATHEMATICS

[**The Ring of Formal Power Series with Integer Coefficients**](#Blackstone)

Elliot Blackstone (Amos Ong), Penn State Behrend, School of Science - Mathematics

**WINNER -**[**Infinite Hackenbush Stacks**](#Chambers)

Landon Chambers (Paul Olson), Penn State Behrend, School of Science - Mathematics

[**Using Predictive Models to Estimate *E. coli* at Presque Isle**](#Epstein)

Elliott Epstein (Michael Rutter), Penn State Behrend, School of Science - Mathematics

[**An Example of a Vertex Replacement Rule That Gives Convergence as Well as Exponential Growth**](#Fye)

Casey Fye (Michelle Previte), Penn State Behrend, School of Science - Mathematics

[**Construction of a Coupled Oscillator Model That Mimics a Sea Lamprey**](#Hetro)

Nicholas Hetro1 (Joseph Previte2), Penn State Behrend, 1School of Engineering and 2School of Science - Mathematics

[**Summation of Rational Polynomials Using Integral Transforms**](#Nelatury2)

Charles Nelatury (Joseph Previte), Penn State Behrend, School of Science - Mathematics

**RUNNER UP -**[**The Effect of the “Steroid Era” on National Baseball Hall of Fame Voting**](#Wilson)

Benjamin Wilson (Michael Rutter), Penn State Behrend, School of Science - Mathematics/Statistics

## PSYCHOLOGY AND SOCIOLOGY

[**When More Anxiety Is Better: The Influence of Working Memory Capacity on Perception of Negative Mood**](#Barnes)

LaSheena Barnes, Samantha DeDionisio, and Paris Norwood (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

**RUNNER UP -** [**Ways To Improve Your Grade: Can Color Help You Get An A?**](#Bennett)

Brittany Bennett, Erin Dyne, and Thomas Sanner (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**College Women's Usage of and Beliefs about Aggressive Behavior Styles**](#Brown)Sara Brown (Gwen Kenney-Benson, Patricia Rutledge, and Rodney Clark), Allegheny College - Psychology

[**Our Children and War**](#Churchman)

Anne Churchman (Kathleen Mastrian), Penn State Shenango - Sociology

[**Implicit Stereotypes of Muslims: Can They Elicit Aggression?**](#Clark)

Darnelle Clark (Jamie McMinn), Westminster College - Psychology

[**The Effects of Academic Self Concept, Working Memory, and Anxiety on Memory Performance**](#Curilla)

Kaylee Curilla, Ashley Martin, and Jessica Schubert (Victoria Kazmerski) Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**The Effects of Implicit Stigmatization toward Obese Individuals on Prosocial Behavior**](#Eakin)

Shalyn Eakin (Jamie McMinn), Westminster College - Psychology

**RUNNER UP -** [**Training a Rat to Spell Using an FR1 Chain Schedule of Reinforcement**](#Eriksen)

Katherine Eriksen and Amelia Conte (Rodney Clark), Allegheny College - Psychology

**WINNER -**[**All People (But Not Stereotypes) Are Created Equal: The Role of Stereotype Threat on Spatial and Mathematical Cognition**](#Hodge)

James Hodge and Neil Rufenacht (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Is there an Influence of Sex and Violence on Brand Recall?**](#Hoke)

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

[**The Media’s Role on College Men’s Self-Image**](#JonesS)

Sharesse Jones and Jessica Borrero (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

**RUNNER UP -** [**Does Parental Attachment Influence Our Eating Habits?**](#Moczulski)

Jennifer Moczulski, Kandyss Moir, and Kaitlin Schafer (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**The Influence of Parenting Styles on the Adjustment of College Students**](#Nguyen)

Linh Nguyen, Sara Praetzel, and Abby Zehe (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

**WINNER -**[**The Effects of Anxiety on Working Memory and Schema-Based Object Recognition**](#Schubert)

Jessica Schubert (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Music Videos and How They Affect Us**](#Smith)

Matthew Smith, Cassandra Huber, and Adam Ecker (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**The Effects of Reminders of Mortality on Prosocial Behavior**](#Svolos)

James Svolos, Odalys Urena, and Tekhara Watson (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

# *POSTER PRESENTATION ABSTRACTS*

## BIOLOGY - Environmental Science and Geosciences Section

[**Taste Bud Distribution in the Oral Cavity of the American Alligator (*Alligator mississippiensis*)**](#Anand)

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

**WINNER -**[**Do Nutrient Levels Affect Male Gametophyte Induction by Antheridiogen in *Ceratopteris richardii*?**](#Ayrapetov)

Asya Ayrapetov (Michael Ganger), Gannon University, Morosky College of Health Professions and Sciences - Biology

**RUNNER UP -**[**Identification of Bacterial Isolates from Nests of Three Native American Songbirds**](#Caroline)Amy Caroline (Beth Potter), Penn State Behrend, School of Science - Biology

[**Analysis of the Concentration of Chemical Elements in Vernal Ponds Adjacent to New Development within and near Penn State Erie, The Behrend College**](#Chisholm)

Jonathan Chisholm (Sarah Ewing), Penn State Behrend, School of Science - Biology

**RUNNER UP -**[**Monitoring the Spread of the Emerald Ash Borer, *Agrilus planipennis* Fairmaire, in Erie County**](#Cleary)

Rachel Cleary (Margaret Voss), Penn State Behrend, School of Science - Biology

[**The Population Biology of the Spotted Salamander, *Ambystoma maculatum*, Inhabiting Penn State Erie Wetlands**](#Crawford)

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

**RUNNER UP -**[**Taste Bud Distribution in the Hatchling Alligator (*Alligator mississippiensis*)**](#Duffy)

Michael Duffy (Susan Rehorek), Slippery Rock University, College of Health, Environment, and Sciences - Biology

[**A Comparison of Mercury Accumulation Rates among Eight Kettle Lakes in Northwestern Pennsylvania**](#Evans)

Jennifer Evans (Milt Ostrofsky), Allegheny College - Biology

[**Avian Population and Habitat Assessment of Siegel Marsh**](#Frischkorn)

Laura Frischkorn and Katherine Whitby (Lisa Mangel), Penn State Behrend, School of Science - Biology

[**Medicinal Plants: Educating Students and Community**](#Lilly)

H. Ryan Lilly (Paul Barney Jr.), Penn State Behrend, School of Science - Biology

[**A Survey of Farm Management Techniques and the Potential for Control of Parasitic Nematodes in Horses**](#McIntyre)

Kolby McIntyre (Margaret Voss), Penn State Behrend, School of Science - Biology

[**Greenhouse Gas Emissions Inventory of Mercyhurst College Main Campus**](#Prischak)

Brittany Prischak (J. Michael Campbell), Mercyhurst College - School of Natural Sciences and Mathematics - Biology

**RUNNER UP -**[**An Investigation of the Hemotoxicity of the Secretion of the Duvernoy’s Gland of the Northern Water Snake (*Nerodia sipedon*)**](#Ranayhossaini)

Daniel Ranayhossaini (Margaret Voss and Michael Campbell), Penn State Behrend, School of Science - Biology

[**The Effect of Anthropogenic Noise Disturbance on the Developing Avian Immune System**](#Richards)

Craig Richards (Margaret Voss), Penn State Behrend, School of Science - Biology

[**Methods to Renovate Paths in Wintergreen Gorge by Examination of Erosion Patterns**](#Stauffer)

Andrew Stauffer (Anthony Foyle and Michael Naber), Penn State Behrend, School of Science - Geography/GIS

[**The Effects of Thermoregulation on Foraging in *Anolis carolinensis***](#Trozzo)

Lara Trozzo (Margaret Voss), Penn State Behrend, School of Science - Biology

[**Walking Routes for the Penn State Behrend Arboretum**](#Wunderley)

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

## BIOLOGY - Molecular Biology Section

**RUNNER UP -** [**Determining the Role of N-Glycans in Apical Sorting within Polarized Epithelial Cells**](#Burnett)

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

[**A Co-Immunoprecipitation Approach to Identifying N-Glycan-Dependent Sorting Machinery in Polarized Cells**](#Cirillo)

Laura Cirillo (Beth Potter), Penn State Behrend, School of Science - Biology

[**Genetic Diversity of RD22 Genes in Arabidopsis thaliana**](#Dewey)

Alexander Dewey (Michael Campbell), Penn State Behrend, School of Science - Biology

[**Analysis of Folate Metabolism and its Effects on Neural Tube Development in the Early Zebrafish (*Danio rerio*) Embryo**](#Flynn)

Wes Flynn (James Warren Jr.), Penn State Behrend, School of Science - Biology

[**Real-Time PCR Analysis of NDP1 and OHP2 Expression in NDP1 Knockout Mutants Over a 24-hour Light Cycle**](#Giardina)

Bennett Giardina (Michael Campbell), Penn State Behrend, School of Science - Biology

**WINNER -**[**Auxin Effects on Defense Responses during Establishment of the Arbuscular Mycorrhizal Symbiosis in Tomato**](#Hanlon)

Meredith Hanlon (Catharina Coenen), Allegheny College - Biology

[**Expression Patterns and Functional Analysis of SK3 in Zebrafish Embryos**](#Hoyt)

Kaitlin Hoyt (Heather Jones and James Warren Jr.), Penn State Behrend, School of Science - Biology

[**Optimizing Protocol for the Raising of Baby Zebrafish (*Danio rerio)***](#Ober)

Julie Ober, Moriah Johngrass, and David Stull Jr. (James Warren Jr.), Penn State Behrend, School of Science - Biology

[**Acute Effects of Dimethylbenz[*a*]anthracene (DMBA) on Zebrafish (*Danio rerio*) Embryos**](#Paskorz2)

Dennis Paskorz (Sarah Ewing and James Warren Jr.), Penn State Behrend, School of Science - Biology

[**Sequence Comparison of *pal*, *wecA*, *lspA1*, and *lspA2* in Class I and II Strains of H*aemophilus ducreyi***](#Ricotta)

Emily Ricotta1and Nan Wang2 (Tricia Humphreys1,2), 1Allegheny College and 2Grinnell College - Biology

[**Overexpression of Tomato Ribosomal Protein L9 Gene Reduces Height in *Arabidopsis***](#Ryhal)

Marcie Ryhal, Angelica Jones, and Julie Palmer (Yi-Hong Wang), Penn State Behrend, School of Science - Biology

[**Determination of Altered Potato Gene Expression after Treatment with 1,4 Dimethlynaphthalene**](#Schmidt)

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

**RUNNER UP -**[**Use of a Strongly Acidic Analog of the Plant Hormone Auxin Demonstrates an Intracellular Location of the Auxin Receptor**](#Shinsky)

Stephen Shinsky (Catharina Coenen), Allegheny College - Biology

## BIOLOGY - Neuroscience Section

[**The Examination of the Proposed Immunostimulatory Mechanisms of Immune Defense**TM](#Amos)

Deirdre Amos (Susan Sapone), Gannon University, Morosky College of Health Professions and Sciences - Biology

[**The Predisposition of VPA Sprague-Dawley Rats to PTZ-Induced Seizures**](#BrownC)

Casey Brown and George Swinston (Jeff Cross), Allegheny College - Neuroscience/Psychology

**RUNNER UP -**[**Dissociation of Function in the Dorsal Hippocampus: Spatial Working and Reference Memory**](#Glover)

Lucas Glover (Jeffrey Cross and Amy Wiseman), Allegheny College - Neuroscience and Psychology

[**The Effects of Membrane Permeant and Impermeant Carbonic Anhydrase Inhibitors on the Olfactory and Trigeminal Responses to CO2 in Mice**](#Kenemuth)

Jessica Kenemuth, Ryan Hanson, and Shane Hennessy (E. Lee Coates), Allegheny College - Neuroscience

[**The Effects of the Acetylcholine Antagonist Mecamylamine on Obsessive-Compulsive Behaviors in Orbitalfrontal Cortex-Lesioned Sprague-Dawley Rats**](#Mazur)

Summer Mazur (Jeffrey Cross and Rodney Clark), Allegheny College - Neuroscience

[**The Effects of Matrine on Cancer Cells Compared with Normal Cells**](#OsborneM)
Megan Osborne and Elizabeth Clymer (Durwood Ray), Grove City College - Molecular Biology

**WINNER -**[**The Effects of Nicotine on the Ventilatory Response to CO2 in Neonatal Mice: Implications for Sudden Infant Death Syndrome**](#Rezk)

Marina Rezk (E. Lee Coates), Allegheny College - Neuroscience

**RUNNER UP -** [**Unearthing a Conotoxin that Targets the T-Type Calcium Channel Cav3.2**](#Welko)

Ashleigh Welko (Lauren French and E. Lee Coates), Allegheny College - Neurobiology

## CHEMISTRY, BIOCHEMISTRY, AND PHYSICS

**RUNNER UP -**[**Synthesis and Study of the Photophysical Properties of Dendron-Containing Molecules for Potential Use in Organic Light-Emitting Diodes**](#Bogart)

Alexandra Bogart and Katy Sherlach (Caroline Pharr), Mercyhurst College - Chemistry

[**Crosslinking Cellulase Enzyme for Post-Enzymatic Recovery**](#Bona)

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

**WINNER -**[**The Design of SPME Fibers Using Thermoresponsive Polymer Nanoparticles**](#Clarke)

Kimberly Clarke (Clinton Jones), Mercyhurst College - Chemistry

**WINNER -**[**Determining the Size of Casein Micelles under Acidic Conditions Using Dynamic Light Scattering: A Laboratory Experiment**](#Driscoll)

Sara Driscoll (Clinton Jones), Mercyhurst College - Chemistry

**Preparation and Characterization of Silver Nanoparticles Coated with Dye-Doped Silica**

*(Contains proprietary information - no abstract included)*

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

[**Monitoring the Oxygenation of Blood from Ingesting Wheatgrass Juice during Exercise**](#Handzel)

Michele Handzel and Jonathan Sibert (Candee Chambers), Mercyhurst College - Biochemistry

[**Isomerization of Itaconic Anhydride to Citraconic Anhydride by Dimethyl Sulfoxide**](#Hart)

Kyle Hart (Jack Williams), Mercyhurst College - Chemistry

[**A Novel Empirical Measurement of Silicon Nitrogen Complex Interaction Energies Using Matrix Isolation Infrared Spectroscopy**](#Hunziker)

Frederick Hunziker (Jay Amicangelo), Penn State Behrend, School of Science - Chemistry

[**Investigations of *N*-Isopropylacrylamide Microgel Behavior Based on Co-Polymerization with Allylamine**](#Lincoln)

Kayla Lincoln (Clinton Jones), Mercyhurst College - Chemistry

**Jamming in Low Aspect Ratio Materials**

*(Contains proprietary information - no abstract included)*

Jeffrey McCausland (G. William Baxter), Penn State Behrend, School Of Science - Physics

[**Preparation and Study of the Optical Properties and Hydrophobicity of Styrene-*co-N-*Isopropylacrylamide Microgel Colloidal Crystals**](#Pompei)

Richard Pompei (Clinton Jones) Mercyhurst College - Chemistry

**RUNNER UP -**[**The Photochemical Properties of Acetylfuroin**](#Robinson)

Michelle Robinson (Naod Kebede), Edinboro University of Pennsylvania, School of Science, Management and Technology - Chemistry

[**The Effect of Riping Methods on the Lycopene Concentration of Tomatoes**](#Squire)

Janine- Sade Squire (Marlene Cross), Mercyhurst College - Biochemistry

[**The Chemistry of a High Power Yet Simple Household Electrochemical Cell**](#Patel)

Jennifer Taylor, Susmita Patel, Anthonie Campbell, and Robert Dye (Ping Furlan), University of Pittsburgh at Titusville - Chemistry

[**Spectroscopic Characterization of Brooker’s Merocyanine in Sodium Y**](#VanderWeele)

Jessica VanderWeele (Jennifer Holt), Penn State Behrend, School of Science - Chemistry

[**Patterning and Shaping Materials through Soft Lithography**](#Whitney)

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

## COMPUTER SCIENCE, ENGINEERING, AND ENGINEERING TECHNOLOGY

[**Graphical Authentication Password System**](#Anderson)Richard Anderson and Jeffrey Karstaedt (Gary Walker), Penn State Behrend, School of Science - Computer Science

**RUNNER UP -**[**Two-Dimensional Heat Conduction Simulated through Electrical Potential to Illustrate Principles of Heat Transfer**](#Demetrio)

Timothy Demetrio (Bob Edwards), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

[**Modeling of Electrostatic Fringe Fields and Misalignment Effects**](#DeWalt)

Laura DeWalt (Oladipo Onipede), Penn State Behrend, School of Engineering - Mechanical Engineering

[**Graph Algorithm Visualizer**](#Hoffman)

Christopher Hoffman and Jack Horst (Gary Walker), Penn State Behrend, School of Science - Computer Science

[**Development of a Photographic-Based Method for Analyzing Spinnaker Shapes**](#Markwardt)

Kyle Markwardt (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

[**Development of a Mechanical Device for Sail Model Geometry Analysis**](#Matsushita)Ken Matsushita (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

[**Statistical Arbitrage Investing**](#Miller)

David Miller, Tim Herzog, and Tom Zajac (Joseph Previte and Ronald DelPorto), Penn State Behrend, School of Science - Computer Science

[**A More Efficient Model for Computing the Stability of Square-Rigged Vessels**](#Syiek)

Daniel Syiek (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

[**Multi-threaded Modeling of Amorphous Materials**](#Synowka)

Joseph Synowka (Blair Tuttle and Ronald McCarty), Penn State Behrend, School of Science - Computer Science

**WINNER -**[**Determining the Stability of the *Pride of Baltimore II***](#Tinlin)

Diana Tinlin(William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

## PHILOSOPHY

[**Steps to Achieve a Smoking Ban on Campus**](#AndersonM)

Melinda Jo Anderson (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

[**When did Morals Equate to Religion?**](#Ericsson)

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

[**Can Science-Based Sex Education Lower Teen Pregnancy in Erie, PA?**](#JohnsonR)

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

[**Re-Defining Socio-Cultural Norms: Breaking through the Myths of Gender**](#Lindenberger)

Jared Lindenberger, Kariann Yori, and Michael Nick (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

[**Skepticism and Stereotyping**](#Rothenberg)

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

**RUNNER UP -**[**The Ethics of Smoking and Practical Implementation of a Campuswide Smoking Ban**](#Rufenacht)

Neil Rufenacht, Leah Benjamin, and Kyle Molloy (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

**RUNNER UP -** [**Raising Awareness of Sexually Transmitted Diseases and Providing Contraceptives**](#Shrock)

Katie Shrock and Adam Nero (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

[**Understanding the Anonymities of Addiction**](#Srivistava)

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

[**Smoking Culture: How Education Can Decrease the Amount of Smokers**](#Wang)

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

**WINNER -**[**Cutting Costs for Medical Expenses**](#Weisenbach)

Nicole Weisenbach, Joe Johnson, Mike Johnson, and Breanna Williams (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

## PSYCHOLOGY AND SOCIOLOGY

[**Does the Brain Hear The Truth? Prosody and Detection of Sarcasm**](#Barnes2)

LaSheena Barnes, Danielle Wilson, Paris Norwood, and Jesse Eisert (Victoria Kazmerski and Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Tattoos and their Social Side Effects**](#Campbell)

Tim Campbell (Kathleen Mastrian), Penn State Shenango - Sociology

**WINNER -** [**The Visualization Project: Game Development and Outreach**](#Curilla2)

Kaylee Curilla1, Jessica Schubert1, James Hodge1, Danielle Wilson1, Janice Jerome1, Neil Rufenacht1, Ashley Martin1, Terra Carrier1, Erin Bliley2, Aurora Blasko Drabik, Jon Alquist2, Sid Carson2, and Marika Whiting1 (1Dawn Blasko, 2Kathryn Holliday-Darr, and 1Jennifer Trich Kremer), Penn State Behrend, 1School of Humanities and Social Sciences and 2School of Engineering - Psychology

**RUNNER UP -** [**Children’s Influence on Parental Spending**](#Dunlap)

Todd Dunlap (Kathleen Mastrian), Penn State Shenango - Sociology

[**The Effect of Text Messaging on Driving Performance**](#Eisert)

Jesse Eisert and Melissa Punk (Victoria Kazmerski and Jennifer Trich Kremer), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**The Influence of Cultural and Video-Game Experience on Spatial Task Performance**](#Fernandez)

Luis Fernandez and Jessica Schubert (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Media and Body Image**](#Hughes)

Tracy Hughes (Kathleen Mastrian), Penn State Shenango - Sociology

**RUNNER UP -**[**School Features and their Influence on Learning: Taking a Look at Green Kids**](#Jerome)

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

**RUNNER UP -**[**Making Silk Purses Out of Sows’ Ears: An Investigation of Inattention by Undergraduate Research Pool Participants**](#McKay)

Derek McKay, Jillian Mrozowski, and Amanda Tyler (Eric Corty), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**The Roles of Maternal Warmth and the 40 Developmental Assets as Resilience Factors in Children Witnesses of Domestic Violence**](#McKay2)

Derek McKay, Jillian Mrozowski, and Amanda Tyler (Carl Kallgren), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Superstitions and Pregnancy**](#Nagel)

Alexandra Nagel (Kathleen Mastrian), Penn State Shenango - Sociology

[**Physiological Effects of Relational Aggression**](#Pittner)

Amie Pittner1,2 (Heather Jones1 and Charisse Nixon2), Penn State Behrend, 1School of Science and 2School of Humanities and Social Sciences - Psychology

[**Usability Evaluation and Redesign of a College Alumni Web Site**](#Rufenacht2)

Neil Rufenacht and Justin Amrhein (Jennifer Trich Kremer), Penn State Behrend, School of Humanities and Social Sciences - Psychology

[**Perception of NCLB Act of 2001**](#Shollenberger)

William Shollenberger (Kathleen Mastrian), Penn State Shenango - Sociology

## BIOLOGY AND ENVIRONMENTAL SCIENCE

**Presence of Polyphosphate in the HCl-Extractible Phosphate Fraction**

Devin Click (Milton Ostrofsky), Allegheny College - Biology

Apatite phosphorus (HCl-extractible P) in lentic sediment is introduced by erosion of soil particles; therefore, its quantification in lake sedimentary profiles can be used to estimate the effects of runoff and land use changes in lake drainage basins. Bacterially-produced polyP may contribute to HCl-P values in the extraction procedure due to its acid-labile characteristics. Chemical extraction of both unamended and polyP-amended sediment was used to assess the presence of polyP in the HCl-extractible fraction. Of the added polyP, only 2.5% was recovered in the HCl fraction. Hydrolysis of polyP in 0.5 *N* HCl revealed that after 24 hours, only 35% of added polyP had been hydrolyzed. These results indicate that only minor amounts of polyP may be found in the HCl fraction, and thus will not notably lead to overestimation of HCl-P concentrations. 31P-NMR analysis revealed little detectable polyP in sediment from lakes of varying trophic status. The results of both chemical extraction and NMR analysis indicate that polyP does not significantly contribute to HCl-P values, and that its quantity in sediments is not affected by trophic status.

**Utilization of Quantitative PCR for the Assessment of Human Contribution to Fecal Bacterial Pollution in Tributaries of Lake Erie**

Ryan Hindman (Steven Mauro), Mercyhurst College - Biology

Nonpoint-source bacterial contamination of freshwater ecosystems is a pandemic problem that can pose serious health risks for its use for drinking or recreational purposes. In this study, we utilized quantitative PCR to assess the level of fecal bacterial pollution from samples collected on 43 days in summer and fall 2008 from eight Pennsylvania tributaries of Lake Erie, many of which are attractive fishing areas. Our results demonstrate a great deal of temporal variability in fecal bacterial levels on all streams analyzed. However, certain streams were generally more contaminated than others, and the percentage of bacteria arising from human sources appears to be the most likely explanation. Current efforts are underway to utilize 16S rRNA sequencing to gain a better understanding of the microbial population in these streams and to pinpoint sources of bacterial pollution.

**Differential Impact of Gliadin on Common Gut Bacteria: Implications for Celiac Disease**

Kaitlyn Hoover (Steven Mauro), Mercyhurst College - Biology

Gliadin, the main fraction of wheat gluten, is a ubiquitous component of the American diet, and is responsible for the intestinal damage typical of celiac disease. In our study, we observed gliadin’s impact on bacterial growth for common intestinal microbiota. To test this, we prepared gliadin fragments through a pepsin-tryptic digest of pure wheat gluten under acidic conditions. The relative concentrations of exponentially growing bacteria were determined by measuring the absorbance of a bacterial subculture at a wavelength of 590 nm under various gliadin concentrations in comparison to nontreated controls. Our results indicate that *L. acidohilusis’s* growthwas generally inhibited by gliadin, while growth of *E.coli* was stimulated. Further bacteria are being tested, and the implications our findings have on gut microflora and celiac disease will be discussed.

**Determining Rates of Infection of *Peromyscus leucopus* with *Borrelia burgdorferi* on Presque Isle State Park**

Isis Kuczaj (Cynthia Rebar and David Fulford), Edinboro University of Pennsylvania - Biology

*Borrelia burgdorferi*, the causative agent of Lyme disease, has been identified in the white-footed deer mouse, *Peromyscus leucopus*, populations on Presque Isle State Park. The purpose of the current research was to elaborate on previous findings of infection rates in *P. leucopus* in order to gain a better understanding of the enzootic maintenance of *B. burgdorferi*. *P. leucopus* were trapped during a period from July through September 2008. Sherman live folding traps baited with birdseed were set in the evening and checked in the morning for 2-3 consecutive days. Captured individuals were tagged, sexed, weighed, sampled, and released. Tissue samples were analyzed using real-time PCR techniques. Results indicate that infection rates during the trapping season of 2008 of *P. leucopus* with *B. burgdorferi* on Presque Isle State Park was 12.5%. No individual differences were observed in the infection rates in males and females; juveniles, subadults, and adults; or in trapping areas. Infection rates determined in this study are similar to those found in 2005 (10%), but differ from rates recorded in a 2003 study (75%). These findings suggest that infection rates may be more stable than previously observed.

**On an Optimization Algorithm in Foraging Theory**

Charles Nelatury (Margaret Voss), Penn State Behrend, School of Science - Biology

The objective of this research is to explain an optimization algorithm for the following problem: given two fixed vertices and a real-valued function, a third vertex on the function needs to be found such that the resulting triangle has the smallest perimeter. We derive an iterative process that yields an approximate value to the coordinates of that optimum point using some elementary theorems from analytic geometry. The causes of error in the method are intuitively determined by comparing a special situation where there is no error to situations where the error is large. In functions which have no curvature (straight lines), this algorithm gives the exact location of the optimal vertex in a single iteration. However, the error is large in situations where the given function has a high curvature or where the fixed vertices are far from each other. This error is described in terms of the complete elliptic integral of the first kind.

**Determining the Role of N-Glycans in Apical Sorting Within Polarized Epithelial Cells**

### Michael Piscitelli (Beth Potter), Penn State Behrend, School of Science - Biology

Epithelial cells may exhibit a polarized structure, meaning they have two distinct membrane domains, the apical and basolateral. This allows them to interact separately with our internal and external environments, providing protection and regulation of nutrients to the body’s organs. To generate distinct domains, proteins contain specific sorting signals recognized in the Golgi apparatus. Apical sorting signals are frequently found within the membrane or lumenally oriented regions and may include N- and O-glycans, glycosylphosphatidlyinositol (GPI) anchors, or specific trans-membrane residues. The mechanism for N-glycan-dependant trafficking is currently unknown. One proposed mechanism involves the use of a receptor to bind glycans directly or a protein conformation that is stabilized by glycans. To discern between these possibilities, the lysosomal protein endolyn has been studied. Apical trafficking of endolyn has been shown to rely on two specific N-glycans that happen to be located on a disulfide loop domain in endolyn. In this study, site-directed mutagenesis was used to mutate four cysteines into serines to knock out the disulfide loop domain and assess the effects on apical trafficking using immunofluorescence, Western blotting, and biotinylation.

**Size Distributions of Dreissenid Mussels on Benthic and Vertical Substrates in Presque Isle Bay**

Meaghan Ropski and Brian Wojtkielewicz (Greg Andraso), Gannon University, Morosky College of Health Professions and Sciences - Biology

Dreissenid mussels (zebra and quagga mussels) and the round goby (*Apollonia melanostomus*) have received considerable attention since their discovery in the Great Lakes. Several studies have shown that gobies prey on and may influence population structure of dreissenids. Our research from 2007 indicated that gobies prey disproportionately on medium-sized dreissenids in the 7-11mm size range. The purpose of this project was to investigate dreissenid size distributions in areas accessible (benthic surfaces) and inaccessible (vertical surfaces > 1m above the bottom) to gobies. We predicted that dreissenids in the 7-11 mm size range would be more abundant on vertical surfaces than on benthic surfaces. Dreissenids were sampled in September 2008 from both types of surfaces along the south pier of the shipping channel that connects Presque Isle Bay to Lake Erie. As predicted, size distributions of dreissenids differed between vertical and benthic surfaces. Specifically, medium-sized dreissenids (9-12mm) were more abundant on vertical surfaces > 1m above the bottom than on benthic surfaces. Gobies may be responsible for the observed difference in dreissenid size distributions on the two surfaces. However, other variables such as predation by other species, plankton distribution, water temperature, and current could contribute to the observed difference.

**Comparison of Shiga Toxin Gene Abundance to Commonly Used Microbial Indicators in Lake Erie**

Cody Smith and Adam Olszewski (Steven Mauro),Mercyhurst College - Biology

The shiga toxin gene produces a protein that is pathogenic to humans and when expressed can lead to severe gastrointestinal illness. This gene is most commonly associated with enterohemorrhagic *E. coli* as its host cell and responsible for many of the outbreaks associated with improperly cooked food. This work focuses on the relationship between the abundance of this gene compared to some of the commonly used microbial indicators for water quality which are used at Presque Isle State Park. Using real-time PCR to identify and determine the relative abundance of shiga toxin DNA in over 700 samples, we find that the distribution and relative amount of the shiga toxin gene is variable and shows no correlation to *E. coli,* enterococcus*,* or viral abundance. These results illustrate the need for standardized water quality protocols that focus specifically on pathogen detection.

### The Music of Proteins: A Unique Analysis of Class III Peroxidase Proteins

Christopher Wahlmark (Ann Kleinschmidt and Jennifer Dearden), Allegheny College - Biology and Music

In this project, the fields of music and biology have been combined through an investigation of the relationship of proteins and music, specifically motivic development and its influence of structure and function both in proteins structure and musical composition. Class III plant heme peroxidases were chosen as the model protein due to their core conserved structure, but diversity of sequence across species. Specifically, peroxidases 34 and 42 sequences from plants of the Brassicaceae family were compared. The set contained sequences for these two peroxidases from *Arabidopsis thaliana, Brassica rapa,* and *Alliaria petiolata.* While sequences for these peroxidases were available from the first two species, it was necessary to clone and sequence these homologs from *A. petiolata*. Using the Clustalw algorithm, comparisons were made and based upon the outcome, a three amino acid sequence was used as the basis for a three movement composition in the serial style for saxophone quartet. This conserved sequence, prevalent in these peroxidases of all three species of Brassicaceae will also play a major role throughout a piece of music, thereby defining its overall structure, and ultimately, its function.

## BUSINESS AND ECONOMICS

**Which Foreign Trade Partners Will Best Help to Stabilize the Erie Economy?**

Jennifer Balsiger (James Kurre), Penn State Behrend, Sam and Irene Black School of Business - Business Economics and International Business

Would it be possible to stabilize Erie’s economy by carefully picking foreign trading partners? Are there some foreign economies that are turning up just as Erie’s turns down? If so, trade with them might help us reduce the severity of our recessions. This research explores those questions by analyzing real GDP data for more than 188 countries, and comparing them to Erie’s earnings data in the search for negative correlations. The results are organized by continents. Several possible trading partners are identified, and an indepth look is offered into the top three most negatively correlated countries to further identify if their respective exporting industries would help Erie’s economic stability.

**Gasoline Prices and Consumer Expenditures: How Rising Gasoline Prices Affect per capita Consumer Expenditures Less Expenditures on Energy Goods and Services**Andrew Friedle (Todd Nesbit), Penn State Behrend, Sam and Irene Black School of Business - Economics

The speaker proposes a model to explain per capita consumer expenditures less expenditures on energy goods and services. The model will then be used as a resource to analyze what affects rising gasoline prices have on per capita consumer expenditures less expenditures on energy goods and services. The model used shows that rises in gasoline prices result in no substantial affect on consumer expenditures. However, due to endogenous variables included in the model further work is needed before a definitive conclusion can be reached.

### Creating a More Timely Measure of Erie’s Standard of Living

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

Employment and unemployment data are useful measures of economic performance, but they do not necessarily tell the whole story about the well-being of an area. The truth is some jobs pay better than others and employment data do not measure an area’s aggregate earnings. Earnings data more fully describe an area’s economic performance, but they are not timely enough to be truly useful, since they are lagged one-and-one-half to two years. To address this issue, this project uses lagged earnings and current employment data, industry by industry, to estimate aggregate earnings for Erie County on a more timely basis. This project determines whether this method is better than focusing on aggregate earnings, income, and employment data, and can provide Erie decision-makers with better information about the state of their economy.

### The Fort Lauderdale Forecast: Can Metro Areas Lead the Nation?

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

Local research has determined that Erie tends to lead the U.S. economy into recessions, and lags the U.S. economy out of recessions. Are there other metro areas that could consistently predict downturns and upturns? The purpose of this research is to identify metropolitan areas in the United States that lead the nation in the business cycle. The goal is to find a reliable set of data that could predict the future path the U. S. economy will follow and to provide a reliable estimate in regards to a time frame for that expected path. If a system could be developed to predict the path of the United States economy months in advance it would be of the utmost importance in financial planning and economic policy.

**The Influence of Economic Freedom on Environmental Quality in the United States of America**

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

Many recent studies find evidence suggesting that air emissions are relatively lower in countries with greater economic freedom. This paper seeks to determine whether a similar pattern exists at the state level; that is, we test whether air emissions are lower in U.S. states with greater economic freedom. We use four separate measures of air emissions: carbon, carbon monoxide, sulfur dioxide, and nitrogen dioxide. The results indicate some evidence that greater economic freedom in the labor market reduces emissions while greater economic freedom in the area of “Takings and Discriminatory Taxation” leads to greater emissions levels.

### Customer Satisfaction with Restaurants

Renee Sinclair, Shannon Reidy, and Brianne Loucy (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - Marketing

Conducting research on what drives customer satisfaction in restaurants is beneficial to restaurants and their stakeholders, as well as consumers. Our research attempts to determine what variables increase customer satisfaction and if those variables are different for males and females. A regression was run and suggested that the most important variables to increase satisfaction are the food being tasty and the friendliness of the staff. Exploring further, we discovered satisfaction varies depending on gender. The regression was run using overall satisfaction as the dependent variable, while the constructs used were customer treatment by the staff, the quality of the food, cleanliness, menu variety, ambience, and wait staff. Our results showed that females valued ambience, while males valued being treated fairly by the staff. In sum, our results will be helpful to better understand what consumer segments want and expect out of restaurants. This will in turn cause repeat business and loyal customers for the restaurant.

**The Impact of Culture on Software Piracy**Renee Staul (Syed Saad Andaleeb), Penn State Behrend, Sam and Irene Black School of Business - International Business and Marketing

Each year companies spend millions of dollars researching and developing new software. Unfortunately, with today’s advances in technology, people can illegally purchase or download the computer program, reproduce it at a much lower cost, and then sell it to the consumer at a low price. As a result, intellectual property rights (IPRs) and their enforcement internationally is a hot issue today. Companies rely on IPRs to protect their business while some countries do not enforce them. This study examines the relationship between software piracy and culture. This study of 61 countries attempts to correlate the piracy rate of software in each country to Hofstede’s four cultural dimensions as well as economic well-being. Past research studies have found a strong negative correlation between piracy rates and individualism especially. Furthermore, this thesis will attempt to build upon previous research of the topic by testing additional variables to better explain and/or predict the degree of a country’s intellectual property infringement measured by software piracy rates.

### The Causes and Consequences of Changes in the Composition of U.S. – China Trade

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

This research analyzes the structural changes of China’s economy and the increased role of China in foreign trade, while also evaluating possible implications through statistical trend analysis of changes in the trade bundle between the United States and China. China has emerged as one of the world’s fastest growing economies, posting double-digit GDP growth over recent years. The origin of this growth has its roots in China’s reform movement begun in 1979. Fueled by an abundant labor force, foreign investment, freer trade, and shifts towards a market economy, China has eclipsed Japan as the largest economy after the United States as measured at purchasing power parity. China’s economic growth, trade liberalization, and accession into the World Trade Organization (WTO) in 2001, have resulted in deepening economic ties between the United States and China. However, as the two economies have become more intertwined, conflicts have put pressure on the relationship. A growing trade deficit for the United States, China’s refusal to adopt a floating currency, and Chinese violations of intellectual property rights, in addition to growing concerns about the safety and quality of Chinese imports, have put Congress into motion attempting to protect American interests. With consideration given to the numerous factors that have affected China’s development, current relations, and recent market movements, this research will explore the consequences to both China and the United States, while suggesting future implications possible from recent developments.

## CHEMISTRY AND BIOCHEMISTRY

**Development of Assays and Systems to Test the Functionality or Presence of Mismatch Repair Proteins**

William Dillen1, Jill Clodfelter2, Samrat Dutta4, Ryan Topping2, and Aksana Vasilyeva2 (Karin Scarpinato2, 3 and Lisa Unico1), 1Edinboro University of Pennsylvania, 2Department of Cancer Biology and 3Comprehensive Cancer Center, Wake Forest University School of Medicine, 4Wake Forest University - Biochemistry

Mismatch repair proteins (MMR) have been found to facilitate the repair of small insertion/deletion loops, and base-base mismatches, as well as initiate apoptotic (cell death) pathways in response to certain types of DNA damage, including that which can be induced by several cancer chemotherapeutic drugs. There is evidence that defects in MSH2, an MMR protein, plays an important role in various forms of cancer. Its role in cell death also modulates response to chemotherapy. Further research of MSH2 may lead to a better understanding of DNA repair and MMR-mediated cell death pathways. A better understanding of MSH2 could possibly lead to new cancer therapies and avoidance of chemoresistance. Drugs such as cisplatin have been known to interact with DNA and lead to cell death. It is believed that the MMR protein complex formed by the dimerization of MSH2 and MSH6 inspects the DNA for lesions by kinking and straightening the DNA strand. Because models suggest cisplatination causes a kink in DNA, the conformation of the DNA was to be analyzed in the presence of cisplatin and the MSH2/MSH6 protein complex to determine if MMR-induced DNA bending/unbending was altered at cisplatin binding sites.  *In vivo* studies were to be initiated as well. The restoration of MSH2 to MSH2 deficient Hec 59 cells was to be attempted. Transfected Hec 59 cells would allow for cell studies of MSH2.

**Nanowire-Based Magnetorheological Elastomers: Enhancement of Controllable Elasticity**

### Kayla Foor, Sydney Moser, and Joseph Filer II (Richard Bell), Penn State Altoona - Chemistry

Conventional elastomers are a type of rubber that can be stretched or compressed to many times their original length, and return to their original shape without permanent deformation once the load is removed. Unlike conventional elastomers, the elasticity of magnetorheological elastomers (MREs) can be controlled with the application of a variable magnetic field. In this study, the static and dynamic characteristics of nanowire-based MREs are compared to MREs containing spherical particles. The MRE samples consist of a silicone rubber matrix in which different loadings of particles of differing composition and morphology were added. Both spherical and nanowire iron, cobalt and nickel-containing MRE samples were fabricated and their characteristics evaluated using a material test machine. The static and dynamic properties of the MREs were evaluated under a compressive load for the various MREs. The equivalent damping coefficient of the MRE samples was measured and compared under magnetic fields of various intensities. The dynamic stiffness and loss factor were measured under sinusoidal excitation in the frequency domain. The nanowire-based MREs displayed an increase in its damping range due to the enhanced interaction forces and contact area between particles.

**Investigation of Reticulocyte Cell Bound Complement Activation Products, R-C4d and R-C3d, in Hospitalized Patients with Acute Infection**

Shane Lavin1,2 (Barbara Paul1), 1University of Pittsburgh, Lupus Center of Excellence and 2Gannon University, Morosky College of Health Professions and Sciences - Biology

Previous studies have shown, abnormal levels of reticulocyte bound C4d and C3d (R-C4d, R-C3d) can be used as reliable and specific biomarkers for Systemic Lupus Erythrematosus (SLE) and also as a way to potentially monitor SLE disease activity. An acute infection, in terms of its effect on the complement system, can mimic SLE disease flare, which makes it a challenge for physicians to differentiate between the two. To evaluate the association between R-C4d, R-C3d, acute infection, and SLE, the levels of R-C4d and R-C3d of both hospitalized SLE (n=3) and non-SLE (n=11) patients with acute infection were measured through flow cytometry both cross-sectionally, and also longitudinally if levels were above baseline. The cross-sectional analysis of R-C4d revealed mean values of 1.36 in non-SLE patients, and 2.83 in SLE patients. The R-C3d mean values were found to be 0.14 in non-SLE patients and 0.28 in SLE patients. These data indicate that the levels of R-C4d are not influenced by acute infection

and further supports the utility of R-C4d as a biomarker for SLE. The differences in R-C3d values statistically were considered insignificant.

The longitudinal data were analyzed, but due to the small population size, no conclusions could be made.

### Effects of Nitric Oxide Donors on hIK1 Endocytosis

Kellie O’Rourke (Heather Jones), Penn State Behrend, School of Science - Biology

The human intermediate conductance ion channel, hIK1, is a calcium (Ca2+)-activated potassium (K+) channel that has a variety of roles in physiological functions. These functions include cancer development, cell-volume regulation, cell growth and cell proliferation. Nitric oxide (NO) is a signaling molecule increased by activation of nitric oxide synthase. Treatment of hIK1 transfected HEK cells with NO-donors, SNAP and PAP-NONOate, showed increased hIK1 protein expression levels. Additionally, cell surface immunoprecipitation experiments demonstrated increased levels of hIK1 at the cell surface with NO-donor treatment. Cell surface expression of hIK1 in untreated HEK cells was evaluated using biotin ligase labeled cells which were treated with strepavidin-Alexa 488 and detected using confocal microscopy. Channels in untreated HEK cells were rapidly endocytosed and, following a one hour incubation, a majority of the channel was located within endocytic vesicles. Treatment with the NO donors increased cell surface expression of hIK1 after one hour and a decrease in the amount of channel located in endocytic vesicles. These results suggest that NO may regulate hIK1 endocytosis and lead to an increased expression of active channel at the cell surface.

**The Kinetics of Attachment of Chlorosilanes to Silica Gel Grade 643**

Brittany Pierce (Alice Deckert), Allegheny College - Chemistry

ATR-FT-IR spectroscopy was employed to study the reaction kinetics of attachment of monochlorosilanes to a silica surface. Understanding the kinetics of attachment is of utmost importance because it regulates the amount of attaching molecule on the surface. Chlorodimethylphenethylsilane and Chloromethylphenylsilane were the monochlorosilanes of choice due to their relative simplicity and their characteristic aliphatic carbon and phenyl group IR markers. Reactions were carried out in hexane and stopped at five-minute increments through filtration and centrifugation. Solid products were then dried, scanned, and peak areas were evaluated. It was found that peak area increased as reaction time increased, but leveled off at a reaction time of 60 minutes. From this information a graph of peak area vs. reaction time was made and an equation of the line was found and used to determine rate constants. The rate constants were found to be pseudo first order in both monochlorosilane and silicahydroxide surface sites. Rate constants were found to be on the order of about .0726 s^-1.

**Temperature Dependence of DNA and RNA Duplex Formation**

### Lesley Sevcik (Alice Deckert), Allegheny College - Chemistry

This study quantitatively examines the kinetics of duplex formation between oligomers of DNA/DNA, 5’-CACAGCAC-3’/5’-GTGCTGTG-3’; and RNA/RNA, 5’-CACAGCAC-3’/5’-GUGCUGUG-3’. All oligomers were chosen for their characteristic of not forming hairpins within the single strands. Stopped flow kinetic profiles, under second-order conditions, revealed increasing bimolecular association rate constants as a function of temperature for temperatures between 278 and 303 K. Temperatures were chosen to be low enough that the dissociation rate was negligible. Rate constants varied from 9.93 x 106 to 15.1 x 106LM-1s-1 resulting in an activation barrier of 3.96 kcal/mol and an Arrhenius pre-exponential of 1.12 x 1010M-1s-1 for DNA.

**Green Oxidations with a Novel Polymeric Iodinane, Poly-[4-hydroxy(iodonio)]benzenesulfonate**

### Rocco Viggiano (Michael Justik), Penn State Behrend, School of Science - Chemistry

[Hydroxy(tosyloxy)iodo]benzene (HTIB, Koser’s reagent) has become a cornerstone of modern oxidation chemistry. The reaction manifolds of this reagent have been explored extensively over the past three decades from both a mechanistic and synthetic vantage point. If there is any drawback to the use of this reagent it is the concurrent production of iodobenzene byproduct during the oxidation process. Several solutions to this problem have been proposed including polymer-based reagents and cyclic analogs such as 1-hydroxy-5-methyl-1,2,3-benziodoxathiole 3,3-dioxide. In the presented research, a linear polymeric analog of HTIB, poly-[4-hydroxy(iodonio)]benzenesulfonate has been prepared and its oxidation chemistry with “classic” substrates of HTIB has been explored. In any case, the reduced byproduct of this reagent is 4-iodobenzenesulfonic acid, a water soluble species that can be removed from the reaction mixture by routine aqueous extraction of the reaction mixture. In our investigation it was found that the reagent was capable of many similar chemical oxidations to HTIB.

## COMPUTER INFORMATION SYSTEMS AND COMPUTER SCIENCE

**Platform Comparisons! – A Comparison of Different Languages and their Web- Development Platforms**

Dan Carper (John Bonomo and C. David Shaffer), Westminster College - Computer Information Systems

This study compares Object-Oriented Programming languages each with their own Web-development platforms. If one desires a professional data driven Web site, a hand-coded application is almost certainly needed. But which language and tools should be used? How does one determine the best tool? The same application has been built on various platforms. Once these were completed, metrics were compiled based mostly on inheritance, polymorphism, coupling, and encapsulation to determine which language and platform produced the “better” solution.

**TD Sorry! – A Look at Temporal Difference Learning Applied to a Popular Board Game**

### Pete Lukich (John Bonomo and C. David Shaffer), Westminster College - Computer Information Systems

The purpose of this project is to create an artificially intelligent learning agent to play a computerized version of the board-game “Sorry!” and explore its learning capabilities. This agent will use a neural network that utilizes the temporal difference learning algorithm. The agent will train against an identical copy of itself, in hopes of learning to play “Sorry!” at an expert level. Agents at various stages of learning will be pitted against each other as a means of measuring the effects of learning. One issue that may lead to some interesting (or frustrating) results is the ever-present luck factor of “Sorry!”. Depending on which card a player draws on his/her/its turn, the game can change from a highly positive board state (good chance of winning) to a very negative state almost instantly. This issue may make training a “Sorry!” agent very difficult.

**Graphical Authentication Password System**Matthew Ohler (Gary Walker), Penn State Behrend, School of Science - Computer Science

Currently, password entry on most portable computing devices is accomplished using a series of text characters. With the complexity and power of mobile technology increasing, a new style of authentication system can take advantage of popular modern hardware configurations. We created a new graphic-based authentication mechanism, which incorporates the touch screens that are built into these devices. The authentication procedure has the user click a series of points on a background picture of their choice. The underlying algorithm for authentication is based on the angle and distance of each point in relation to the first point. It also uses a ratio system to allow for the user to scale the password. This allows the user the ability to change the resolution without having to recreate the password. This security scheme creates an intuitive authentication system for these devices. The user no longer has to click letters, which should decrease the chance of an observer easily spotting the password.

### Graph Algorithm Visualizer

Geoffrey Osborne (Gary Walker), Penn State Behrend, School of Science - Computer Science

The Graph Algorithm Visualizer was designed as an aide to teach graph and algorithm theory. Users can visually learn how and why algorithms work on various graphs through animations. The Graph Algorithm Visualizer allows a user to create a two-dimensional graph of nodes and edges. Several graph algorithms can be executed upon the created graph. The system ensures the graph meets the requirements of the selected algorithm. The algorithms are animated to show the graph as it is altered by the step by step process. Detailed information about the algorithm and important statistics are provided during this process.

**Bioinformatics Research: Co-Expression Metric Database**

Dennis Paskorz1 (Claude de Pamphilis2 and P. Kerr Wall2), 1Penn State Behrend, School of Science and 2Penn State University, University Park - Computer Science

In bioinformatics it is an interesting problem to detect significantly grouped genes, i.e. modules, from gene expression data sets generated using microarray technology. *Arabidopsis thaliana* was the first plant to have its whole genome sequenced, so the genes are well annotated and researchers have had the time to generate around 3,400 *A. thaliana* gene expression data sets. The large scope of these data sets makes *A. thaliana* an excellent model organism for the development of bioinformatic tools. With this in mind, we developed a pipeline to create a database of co-expression metrics that can be used for module detection in an UNIX environment with the R and perl programming languages using the aforementioned data sets. First, the data were processed with quantifying and normalizing algorithms. Then each gene pair was assigned a co-expression metric, in this case values from regression analysis. The values were then placed in a SQLlite database using the perl Database Independent Interface (DBI). Network theory approaches to module detection can now be applied. The pipeline created is generally applicable to any gene expression data set created with an Affymetrix microarray machine and adaptable to other microarray machine data formats.

### The Development of a Maze Evaluation Metric

Andrew Slane (John Bonomo and C. David Shaffer), Westminster College - Computer Science

Even though they've been a form of entertainment utilized throughout most of modern history, little to no research has been conducted on what makes a maze challenging. The purpose of this research project was to generate a metric that could be used to evaluate the difficulty of a maze. We first explored the various ways that a maze can be quantitatively evaluated, which we chose to call metric components, along with a variety of algorithms used to generate mazes. We next conducted a small experiment using human subjects to see which of the metric components had the greatest effect on the difficulty of a maze. We then used the results from our experiment to develop a metric that awarded a maze with a difficulty ranking based on a scale from one (easy) to five (difficult.) Finally, a second experiment was conducted, which compared the evaluations of our metric with that of human subjects to see if the metric was ideally sound. As an aside, we also took the time to evaluate each of our maze generation algorithms to see if they created mazes that were similar to one another or consistently of a certain type. Most of them generated similar mazes, but there were a few standouts that generated significantly different maze types.

## ENGINEERING

**Formation of 5052 Aluminum Channels Using Electrically Assisted Manufacturing (EAM)**

Jeffrey Beers, Wesley Salandro, and Joshua Jones (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

In recent years, the industrial demand for strong, lightweight metal alloys, such as 5052 Aluminum, has increased. Previous research has shown that the electrically assisted manufacturing (EAM) technique improves the material behavior of most metals by applying electricity during deformation; thereby, reducing the material’s flow stress and increasing its achievable elongation. Considering this, the research presented herein investigates applying EAM when fabricating channels from Al 5052. To fully determine the technique’s influence on the manufacturing process, the effects of die speed, current density, and pulse duration are examined. The results demonstrate that the channel formation process is improved using EAM. The improvements include decreased part springback, lower force/energy requirements, and increased achievable channel depth.

### Development of an Electrically Assisted Rolling Mill

Trevor Collins and Steve Chilcott (John Roth and Richard Englund), Penn State Behrend, School of Engineering - Mechanical Engineering

Rolling is a common industrial process that is used in order to reduce the thickness of metal plate and wire. Materials are commonly heated prior to undergoing this process in order to reduce the forces associated with plastically deforming materials. This practice has several less than desirable characteristics associated with it, however. Recent research has revealed that similar reductions in forces can be achieved by passing electrical current through a material as it is being deformed, while avoiding many of the negative aspects of heating. In order to further investigate the merits of this technique, a unique laboratory rolling mill is being designed. This mill will be specially designed to allow electrical current to be applied through the rollers into the material, while measuring the forces and torques required to accomplish this rolling. This mill will allow the effects of current on sample materials to be examined in a true to industry manor.

### The Effect of Repeated Interruptions of the Cutting Process on Tool Life

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

In industry it is common for tools to be placed in a machine and used continuously for their entire service life. Tool-wear testing for academic research commonly involves cutting a length of material with the tool in question, then stopping the cutting process to remove, measure wear, and replace the tool. Using this process, it is unavoidable that the conditions surrounding the tool and work piece, temperature being a prime example, will change from those during the cutting process. It is speculated that measuring tool wear in this fashion may artificially alter tool life. Through this investigation it was found that a difference in life between running a tool continuously to failure and periodically stopping the cutting process existed.

**Springback Elimination for AL-6111 Alloys Using Electrically Assisted Manufacturing (EAM)**

Chad Green and Timothy McNeal (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

Springback is one of the greatest obstacles in sheet metal forming. The present methods that are used to compensate for springback are costly and involve either a trial-and-error process or intensive mathematical modeling. Thus, a method is desired to remove or reduce the effects of springback. This paper demonstrates how electrically assisted manufacturing (EAM) can be employed to reduce/eliminate springback in Al-6111 through the application of a direct electrical current after deformation. In order to demonstrate how the electricity affects springback, two types of tests were performed, flattening and shape-retention. The first type, flattening, was divided into two series of experiments. The first series examined electricity’s effects when the pulse duration was varied. The second series studied the effect of the specimen’s beginning bend radius. The effect of each parameter was analyzed by examining the reduction in the specimen’s final height. The second type of test, shape retention, evaluated the extent that the electricity improved the specimen’s shape retention after being removed from a circular die. It is shown that, by applying direct current to the 6111 Aluminum Alloy after deformation, springback can be entirely eliminated in all cases.

**Effect on the Compressive Formability of Magnesium AZ31B-O When a Continuous DC Electrical Current is Applied**

Joshua Jones and Wesley Salandro (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

Currently, the automotive and aircraft industries are considering the increased use of magnesium within their products due to its favorable strength-to-weight characteristics. However, the implementation of this material is problematic as a result of its limited formability. Partially addressing this issue, previous research has shown that electrically assisted manufacturing (EAM) improves the tensile formability of magnesium sheet metal. While these results are highly beneficial towards fabricating the skin of the automobile and aircraft, a technique for improving the production of the structural/mechanical components is desirable. Given the influence that EAM has already exhibited on tensile deformation, this research focuses on incorporating this technique within forging operations. In related research, other materials have shown improved compressive behavior when deformed using EAM. Thus, this research endeavors to amalgamate these findings to Mg AZ31B-O which is traditionally hard to forge. As such, to demonstrate the effects of EAM on this alloy, several series of tests were explored. First, the sensitivity of the alloy to the EAM process was determined by varying the current density and strain rate during an upsetting process. Then, the ability to utilize impression dies was examined. Through this study, it has shown that the EAM process increases the forgeability of this magnesium alloy through improvements such as decreased flow stress and increased fracture strain.

### Effects on Magnesium Microstructure Due to Electrically Assisted Manufacturing

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

In today’s industry, the need for lightweight alloys with high strength properties is growing in several markets. More specifically, magnesium alloys are in high demand, however, the limited formability hinders the applicability. Previous research conducted has discovered that the formability of these materials can be increased using electrical pulsing during the deformation process. This is referred to as electrically assisted manufacturing (EAM). Although this method increases a material’s formability (reduced flow stress and greater elongation), a careful microstructural analysis is required to further evaluate the effects of electricity on the material’s microstructure. The research herein will examine microstructure of Magnesium AZ31B-O specimens. These specimens were previously tested in uniaxial tension while electrically pulsed with various pulsing parameters. These parameters were selected to show the effects of varying pulse duration, as well as current density. This microstructural analysis will focus on effects such as grain size, grain orientation, microvoids, and microcracks. The effects of the electrically pulsed material are compared to baseline (unpulsed, fractured) samples in addition to the unfractured material as it was originally received.

**Condition Monitoring for Indexable Carbide End Mill Using Acceleration Data**

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

In order to automate machining operations, it is necessary to develop robust tool condition monitoring techniques. In this paper, a tool-monitoring strategy for indexable tungsten carbide end-milling tools is presented based on the Fourier transform and statistical analysis of the vibrations of the tool during the machining operations. Using a low-cost tri-axial piezoelectric accelerometer, the presented algorithm demonstrates the ability to accurately monitor the condition of the tools as the wear increases during linear milling operations. One benefit of using accelerometer signals to monitor the cutting process is that the sensor does not limit the machines capabilities, as a work-piece-mounted dynamometer does. To demonstrate capabilities of the technique, four tool-wear life tests were conducted under various conditions. The indirect method discussed herein successfully tracks the tool’s wear and is shown to be sensitive enough to provide sufficient time to replace the insert prior to damage of the machine tool and/or work piece.

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

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

Friction-Stir Welding (FSW) is a relatively new joining process and has many applications. In FSW, the friction between the tool pin and the material softens the material and allows the pin to stir the materials in two work pieces and to join them together. This process allows the two work pieces to be joined without reaching the melting point of the material, thus a better weld. However, a large amount of mechanical energy has to be consumed for FSW of hard metals like titanium. In this study, first, the feasibility of conducting FSW with the correct tool pins by using the existing mills is investigated. Then, electric current is passed through the work pieces and is examined to determine its effect on the FSW process. The forces needed for regular FSW and FSW with electric current are measured and compared. The results indicate that, with the aid of electric current, improvement in welding speed and reduction of energy consumption might be obtainable, which can enhance the productivity and widen the range of applications of FSW.

Tensile Formability Enhancement of Magnesium AZ31B-O Alloy Using Electrical Pulsing

Wesley Salandro and Joshua Jones (John Roth), Penn State Behrend, School of Engineering - Mechanical Engineering

In recent years, the industrial demand for strong, lightweight metal alloys, such as Magnesium AZ31B-O, has increased. However, the wide spread application of this alloy has been restricted due to its limited formability. Therefore, a manufacturing method which increases the alloy’s formability is highly desired. Previous work by the authors has shown that pulsed electricity increases the formability of many alloys without requiring reduced deformation rates. As a result, the research herein is focused on determining the effects of electrically assisted manufacturing (EAM) on Magnesium AZ31B-O. As a part of investigating these effects, various current density and pulse duration combinations (i.e., high current/short duration or low current/long duration) are examined. As expected, the effectiveness of the different combinations varied. However, a linear relationship is discovered between the current density and electric charge which can be used to predict a desired elongation. Moreover, at certain conditions, the alloy’s elongation is approximately doubled and its flow stress decreased; thereby significantly improving the material’s overall workability.

**Numerical Study of the Thermal Residual Stresses from Friction-Stir Welding of 6061-T6 Aluminum**

### Benjamin Wigg (Jun Zhou), Penn State Behrend, School of Engineering - Mechanical Engineering

Friction-stir welding (FSW) is a recently emerged solid-state welding process. It has attracted the interest of the military, automotive, and aerospace industries due to its many advantages over traditional welding processes, such as reduced residual stress and distortion, low cost, and improved mechanical properties. However, residual stresses as a result of high work piece temperatures as well as high material deformation rates can cause poor mechanical properties in addition to stress cracking around the weld. In this study, numerical models are developed to analyze the heat transfer and the thermal residual stress distributions in the work piece for various tool rotation and translation speeds in FSW. Corresponding experiments will also be conducted to validate the model predictions. The developed models can provide insight into the work piece’s thermal and mechanical behaviors and can be used to optimize the welding process to obtain quality welds.

## ENGINEERING TECHNOLOGY AND PHYSICS

### Pulley Power – Mechanical Advantage

Joe Spess (Bob Edwards and Kathy Holliday-Darr), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

The pulley project is designed to use pulleys in a way to attract potential students to consider an engineering degree and stimulate the minds of school children in any age group. The design consists of two separate pulley demonstrations, one for open house tours and the other for a 50-minute class for high school level students. The open house portion consists of two interactive activities and a poster; the interactive activities demonstrate how pulley systems are setup to create a mechanical advantage. The user will be able to see the differences in force needed to lift the same weight, and how that correlates to the distance needed to pull compared to how much the weight moved. Data will be gathered to show how the project relates to the users. The K-12 portion will have a separate set of pulley systems for each team. The students will be broken into groups and given a set of instructions for a desired pulley system. After they have built their system they will take measurements for their individual system and compare the results to other groups. Data will be collected and used to improve classroom activities.

### The First Law of Thermodynamics and the Peltier

Keith Coleman and Oliver Kerr (Bob Edwards and Kathy Holliday-Darr), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

This project was conceived as a fun and exciting way to interest future college students in the field of engineering. The need to heat and cool devices has grown in importance as everyday products have become smaller and more powerful. Visitors to a Penn State Behrend open house will be introduced to an interactive display that contains peltiers. They will be able to observe how a peltier can heat or cool beverages, boil or freeze water, and heat energy can be converted into electrical energy. Participants at the open house will be observed as they interact with the hands on display. We will record how long they interact with the display and any possible reactions. Students in the Penn State Educational Partnership Program will be given a kit with all of the necessary parts to build a simple thermoelectric cooler. Each kit will contain a different-sized heat sink and the students will record temperatures to observe how the sizing of the heat sink affects how efficiently their cooler works. We will record the students’ interest in our cooler activity with a pre- and post-survey.

**The Effects of Introducing Vibrations to Perspective Engineering Students**

Shawn Danowski and James Bower (Bob Edwards and Kathy Holliday-Darr), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

Technology is rapidly changing and for this reason we need more engineers now than ever. The goal of this project is to give all prospective students, as well as younger kids, an understanding of vibrations and lead them into an engineering path. In order to do this we will be conducting an open-house demonstration which we will use a mechanical wave driver, amplifier, and function generator to oscillate a base table, in which “bobble-head dolls” will be placed. With this, we will sweep through a range of frequencies and hit each of the dolls’ resonant frequencies. An oscilloscope will also display the input frequency. With this visually attracting display, we will observe and record the interaction that the perspective students and their families have. We will also be conducting an experiment with ninth graders involved in the Penn State Educational Partnership Program. This will consist of using a vibrating table to test balsa wood structures. The students will be given weights and told to place the weights on the structure to ensure stability during an earthquake. Each structure will then be placed on the shaker table (simulating an earthquake). The group whose structure lasts the longest without breaking, wins. To assess the effectiveness of this experiment, we will be giving pre- and post-quizzes as well as a questionnaire.

### Introducing Einstein’s Special Relativity to High School Students

Peter Katsafanas (Stephan Schaffrath), Slippery Rock University, College of Health, Environment and Science - Physics/Pre-Engineering

If American high school students are to be expected to compete in the global economy, they will need to improve their skills in science and reasoning. Their foreign contemporaries, having knowledge of the apexes of mathematics and physics will be more prepared to enter academia than their American counterparts. The profound theories introduced by Albert Einstein represent the pinnacle of what is possible when the highest intellectual processes of the human mind analyze the world. Galilean and Newtonian relativistic world views are already taught to students across the United States; and Einstein’s relativistic world view is the logical next step. The introduction of Einstein’s Theory of Special Relativity, leaving out his Theory of General Relativity, to high school students would greatly help high school students prepare for academia and working life beyond their microcosmic high school existence. Popular narratives of our time, especially in film and television (Star Trek, Lost, Fringe, etc.), are replete with space-time references and allusions to the physical and mathematical underpinnings. Motivated high school students should be given an opportunity to translate their intrinsic curiosity into scientific knowledge and skills, even if just at a rudimentary level.

**Bicycle Power Generation Display and Demonstration**

Marcus Taylor and Keith DeNinno (Bob Edwards and Kathy Holliday-Darr), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

We believe there is a need to encourage an interest in engineering in young people. Engineering is the means to a world that is better to live in and benefits everyone in some way. In order to gain the attention and interest of potential students, we have designed an energy presentation. This presentation will teach students about green power production and alternative energy sources. This presentation will be shown in two instances. First, in an open house at Penn State Behrend, and second in a K-12 grade-level lesson and hands-on activity. At the open house, a bike display will allow both students and parents to ride a bike and see what devices they can power by simply pedaling. During the K-12 activity, students will be educated on various green and renewable energy resources. This will be done by having the students, whom are enrolled in the PEPP program, both ride the bike, and build solar-powered cars. The students will be given pre- and post-assessments to gauge how much they learned.

## ENGLISH LITERATURE

### Women Superheroes in Television

**Research at the UCLA Film and Television Archive**

Ashton Haas (John Champagne) Penn State Behrend, School of Humanities and Social Sciences - English Literature

Recent research has shown the many obstacles and changes women in television have gone through over the past few decades. Between the years of 1975 and 1984, there were only about eight female-centered dramas on television. However, between 1995 and 2005, the number of female-centered dramas increased to about 37 shows. This increase in shows was a strategy to target more female audiences. The strategy had worked because on average about 52.3 million women watch television on a daily basis. The purpose of this research is to explore more in depth the popular television shows of the 1960s to present day shows. To be able to complete my research for my senior thesis, during Penn State’s Spring Break, I will be examining certain television shows at the UCLA Film and Television Archive. I hope to bring this information back and incorporate it into my thesis by comparing and contrasting the television shows I have watched. Particular areas I will be focusing on will be gender, social classes, and portrayals of women in television shows such as the way they dress, their behavior, and so on. I will then bring this research back and during the conference I will explain my results, explaining the difference and similarities between women superheroes in television.

## GLOBAL STUDIES, HISTORY, AND POLITICAL SCIENCE

**The Use of Modern Technology by Historical Institutions**

### David Barlow (Paula Treckel), Allegheny College - History

As technology becomes increasingly prevalent in our society, historical institutions such as museums have been forced to adapt in order to stay relevant. The Huntingdon County Historical Society, in Huntingdon, Pennsylvania, is just one such institution. Research conducted into how technology is being adapted in the wider world of historical institutions has been applied to the creation of an interactive map of the town of Huntingdon. This map will be placed in the Historical Society's visitors center and allow people to explore the town's history through images, text, and audio clips. It will also provide useful links for people who wish to continue their research beyond the scope of the map.

### American Imperialism in the Philippines

Cathryn Buonocore (John Rossi), Penn State Behrend, School of Humanities and Social Sciences - Political Science and History

During the United States’ development as a great power, Americans expanded westward across the continent. When this continental growth ended in 1890, Americans sought a new avenue for expansion. The solution found was imperialism and the extension of American influence to foreign countries. This paper explores America’s imperialist policy in the Philippine Islands from 1898 to 1902. Primary sources, such as news articles and speeches, as well as articles and books written by historians and political scientists show that American policy toward the Philippines was placed within the framework of racial and ethnic conflict, and different theories of imperialism. Research showed that American policy in the Philippines was motivated in part by Social Darwinist thinking, but had some benefits for both America and the Philippine Islands. Although this racial and ethnic framework contributed to a brutal war fought to maintain and establish control of the islands, American policy also contributed to Filipino political and economic development.

**Dire Diplomacy: The Birth of Foreign Diplomacy during the American Civil War between the United States and Great Britain, 1860-1862 and Economic Factors**

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

One central element in the American Civil War is the North’s and the South’s relations with foreign nations. The most important of these relationships was with the world’s greatest power, Great Britain. Although the Confederacy’s leaders had assumed that Britain’s economic dependence on southern cotton would force the country into the war on their side, Great Britain refrained from intervening and ultimately officially declared neutrality. The South’s “King Cotton” was counter-balanced by British economic ties to the North. Britain’s dependence on imported grain from the United States and the importance of the northern market for British goods took precedence over the cotton. These economic factors helped to keep the British neutral in the American Civil War.

**A Question for the Contemporary Public Education System:**

**Tracing the History: Political Islam in Turkey**

Erkinalp Kesikli (John Collins), St. Lawrence University - Global Studies

Acknowledging the current political instability and societal polarization in Turkey, in this paper I focused on the dominant polar of the two major political wings, what Prime Minister Erdoğan calls, “conservative democracy,” or what I call, “Islamism.” Within the paper I strived to see the social, political, and economic factors that paved the way for the rise of this dominant political trend, as well as the prevalent political instability. Arguing that the JDP phenomenon and the current societal polarization cannot be explained solely by examining the JDP era, in this paper I constructed a historical framework to elucidate these notions. Framing my research around three main concepts, secularism, democracy, and modernity, I traced how these three concepts situated themselves within Turkish society, how they changed the society and how the society has changed the meanings of these terms. Beginning from the early appearances of these notions in the nineteenth century, I identified the major ideologies, beliefs, and doctrines that were influential throughout the political history of the republic; I marked a certain number of events and individuals that acted as the cornerstones for today’s political structure; and placing these doctrines and historical elements on one side, and the events and the actions of major figures on the other side, I tried to figure out the interconnections between the two, and tried to explain the latter based on the former.

**How Do We Know If We Are on the Right Path to Solutions If We Cannot Agree on the Origins of Our Problems?**

### Chrysanthemum Mattison (Melissa Comber), Allegheny College - Political Science

Politicians and citizens alike question the effectiveness of public education. Where does it fall short and how can policy makers and school boards resurrect the integrity of such a prized public institution? My research seeks to discover if what we examine in the contemporary education system is what the founding fathers envisioned. The research begins by comparing what contemporary scholars say regarding this question. They explore deep-rooted problems of today’s education system and propose theoretical solutions. I have found a large disconnect between what people envision as dictating the public education system and the reality. Therefore every example of a solution does not effectively address the revealed problem: there is no consensus regarding the power structure of the public education system. Several authors judge teachers and other influential institutions as ineffective and deficient; but perhaps citizens are the catalysts to the changes in the education system that they frequently blame on third parties. While my results are inconclusive at this point, I expect to find that some key origins of problems in education have been overlooked, and these are central to the debate on the effectiveness and paths to remedy the public education system.

The Spanish American War: The Arrival of the United States as a World Power

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

The Spanish American War served as the catalyst that propelled the United States to the status of a world power. From the time of its independence, the United States was, out of necessity, focused on internal issues. As a result its foreign policy was mostly non-interventionist, unsystematic, and pacific. Hostilities between Spain and Cuba commenced on February 24, 1895, however the United States did not declare war on Spain until April 25, 1898. President McKinley’s justifications for going to war included humanitarian concerns, economic impact on commerce, and the expense of keeping the American armed forces at a high state of readiness. Additionally, McKinley concluded that the conflict between Spain and Cuba had degraded to a point to which neither side could achieve their goals and that allowing the war to continue would only continue the hardships. With the defeat of Spain, the United States gained influence over key commercial and strategic territories, the most important being Cuba and the Philippines. Control over Cuba and the Philippines provided the United States with platforms from which it could project power and influence into Latin America and Asia. The message to the world was that the U.S. policy of non-intervention was no longer valid.

## MATHEMATICS

### The Ring of Formal Power Series with Integer Coefficients

Elliot Blackstone (Amos Ong), Penn State Behrend, School of Science - Mathematics

The ring of formal power series with integer coefficients seems to be just an extension of the polynomial ring with integer coefficients but it is not. In formal power series, we do not worry about the question of convergence. Some irreducible elements in the polynomial ring may not be irreducible in the formal power series and vice versa. In searching for the inverse of an invertible element in the formal power series, we will use the method for solving difference equations.

**Infinite Hackenbush Stacks**

Landon Chambers (Paul Olson), Penn State Behrend, School of Science - Mathematics

We investigated Blue-Red Hackenbush , a combinatorial game, in its iterative form. Our work consisted of finding the game values (g) for any number of iterations (n) of various BR- Hackenbush stacks. We found a description of g as a function of n, denoted g(n), for several iterative BR-Hackenbush stacks. The geometric series representation of g(n) allows us to determine the limit as n approaches infinity of g(n). The result of this limit is the game value (g) for the infinite hackenbush stack represented by g(n). From studying these “infinite games,” we were able to make claims about all iterative BR-Hackenbush stacks. In addition to studying these iterative stacks, we also used constructable BR-Hackenbush stacks to create surreal sequences that approximate the “famous” irrational numbers π (pi) and e (Euler’s number.)

### Using Predictive Models to Estimate *E. coli* at Presque Isle

Elliott Epstein (Michael Rutter), Penn State Behrend, School of Science - Mathematics

The beaches of Lake Erie located in Erie County, Pennsylvania, on Presque Isle are popular recreational areas for residents and guests of the Erie area. The indicator used to determine recreational water quality at these beaches is the presence of *E. coli*. The current method for determining water quality is to examine *E. coli* concentrations from the previous day. In prior research, a predictive regression model for *E. coli* concentration was developed to determine the probability that *E. coli* concentration levels would exceed standards recommended by the U. S. Environmental Protection Agency. The previous model included predictor variables including water temperature, turbidity, bird count, rain levels, wind speed, among others. The goal of this research is to improve upon the current model, by obtaining more data and looking at more predictor variables, such as wind direction. The model can then be used to more accurately predict *E. coli* concentration levels at Presque Isle beaches. This will allow *E. coli* levels to be predicted before the beaches open, helping to ensure that the public will not be exposed to concentration levels that are too high.

**An Example of a Vertex Replacement Rule That Gives Convergence as Well as Exponential**

**Growth**

Casey Fye (Michelle Previte), Penn State Behrend, School of Science - Mathematics

In this research, mathematical graphs were studied. A vertex replacement rule R can be applied to a graph G to form a new graph R(G). If the replacement rule R is repeatedly applied to each resulting graph, we obtain a sequence of graphs {G, R(G), R2(G), R3(G)…}. A vertex replacement rule was constructed such that a sequence of scaled graphs converged and a sequence of marked graphs had exponential growth. The graphs created are considered a set X in Euclidean space. The box dimension is used to determine the size of the compact set X. In the box dimension, the set is covered using cubes or discs and are chosen to have a side length or diameter of ε. Cov(X, ε) is the minimum number of cubes or discs needed to cover X. The box dimension, d, is given by , where C is a positive constant C. For vertex replacement rules the box dimension can be calculated by dividing the ln(n) by ln(p), where n is the number of replaceable vertices in R and p is the number of replaceable vertices on a simple between two boundary vertices in G.

### Construction of a Coupled Oscillator Model That Mimics a Sea Lamprey

Nicholas Hetro1 (Joseph Previte2), Penn State Behrend, 1School of Engineering and 2School of Science - Mathematics

Mathematical models have been developed to describe the electrical impulses in the spinal cord of the lamprey that drive lamprey locomotion. Several of these models were studied by Dr. Previte along with undergraduate researchers from Penn State Behrend as well as students from his summer REU program. These mathematical models predict physical behaviors that cannot be tested in the lab with an actual lamprey. The main objective of this project is to build a physical model that mimics the swimming of a sea lamprey, but can be tested in a more controlled fashion. After the physical model is built, it will be used to test the veracity of the mathematical model.

**Summation of Rational Polynomials Using Integral Transforms**

Charles Nelatury (Joseph Previte), Penn State Behrend, School of Science - Mathematics

A closed-form expression for the series where *P(s)* belongs to a class of polynomials with order less than 5 is found in terms of the solutions of the generalized hypergeometric differential equations. The inverse Laplace transform of can be found by using the Fourier-Mellin integral. The series is rewritten as a combination of a sum and an integral using the definition of the Laplace transform. Uniform convergence is used to switch the order of the summation and the integration. The summation is performed and the remaining integral is used to reconstruct a hypergeometric differential equation. The general solution of this differential equation is found alternatively using the Frobenius method. The resulting power series belongs to a class of hypergeometric functions. Using a uniqueness theorem, it is deduced that the hypergeometric function and the sum of the above class are the same.

### The Effect of the “Steroid Era” on National Baseball Hall of Fame Voting

Benjamin Wilson (Michael Rutter), Penn State Behrend, School of Science - Mathematics/Statistics

Since its inception in 1936, the National Baseball Hall of Fame has dealt with controversy surrounding the method by which it elects former players. Many factors besides on the field performance must be taken into consideration when attempting to predict the probability that an eligible player will be enshrined in Cooperstown, New York. This study serves as an initial statistical investigation into the extent that one of these factors – a player’s connection with performance enhancing drugs – influences the voters’ decisions. Multiple linear regression was employed to produce a model representative of the percentage of votes obtained. The comprehensive data set used in the study includes the lifetime statistics and other relative criteria for every non-pitcher who received at least one vote from the Baseball Writers’ Association of America since 1871. The results predict the percentage of votes that certain players associated with the “Steroid Era” should receive, which will allow for a comparison once they reach the Hall of Fame ballot in the upcoming decade.

## PSYCHOLOGY AND SOCIOLOGY

**When More Anxiety Is Better: The Influence of Working Memory Capacity on Perception of Negative Mood**

LaSheena Barnes, Samantha DeDionisio, and Paris Norwood (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Throughout life we go through different experiences that can potentially affect our moods and can inhibit our ability to function. The current study examined whether working memory capacity and trait anxiety influenced the change in mood induced by extremely negative pictures. Participants were exposed to picture stimuli from the International Affective Picture System, ranging from neutral to strongly negative. Following the viewing of each photo, participants were then asked to solve an easy (low-working memory) or difficult (high-working memory) math problem. Participants then rated their current mood on a nine-point likert scale. Participants also completed a State-Trait Anxiety Inventory and a measure of working memory capacity (operational span task). We expect to find that picture type (neutral, mild, strong) will interact with math type (easy, difficult) such that, a difficult math problem will distract the participant from the influence of the strongly negative picture leading to a more positive mood. This is because the difficult math problem uses up more working memory and the negative connotation can’t be processed. Those with higher trait anxiety will show more positive mood in the negative condition because anxiety takes up working memory leaving less resources to process the negativity.

### Ways To Improve Your Grade: Can Color Help You Get An A?

Brittany Bennett, Erin Dyne, and Thomas Sanner (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

The media has led the public to believe that the colors you wear, the colors you see, and the colors around you affect your mood, anxiety, and performance, but to what extent? Do teachers put students at a disadvantage by using multiple colors of paper for their exams? The purpose of this study is to examine the relationship between color and academic performance. Participants were asked to complete basic mathematic problems of three levels of difficulty (easy, medium, and difficult) on three colors of paper (red, white, and blue). They also completed a measure of personality and anxiety. The design of this study is a 3 (color) x 3 (task level) x 2 (anxiety level) mixed design. Previous research has demonstrated that red may increase anxiety while blue is shown to calm. We predict that those in the red condition will have the poorest performance overall, followed by the white, and the blue the best. We also expect an interaction between color and task level such that when math is most difficult, the influence of color will produce the greatest impact on performance.

**College Women's Usage of and Beliefs about Aggressive Behavior Styles**Sara Brown (Gwen Kenney-Benson, Patricia Rutledge, and Rodney Clark), Allegheny College - Psychology

This study examined the correlations between college women's acceptability beliefs regarding different forms and functions of aggressive styles and their self-reported aggressive behaviors in middle school and college. Participants responded to a self-report questionnaire which asked them to report their acceptability levels and behaviors in middle school and college for different forms and functions of aggression. The results of the study supported the hypothesis that acceptability beliefs are correlated with self-reported behaviors. Furthermore, beliefs and behaviors were correlated when specific functions were examined. Proactive beliefs and behaviors were correlated with reactive beliefs and behaviors. Results also showed that aggressive acts were more acceptable and prevalent in middle school than in college. Last, this study addressed the concerns of past research by improving upon the internal reliability of the subscales of the Normative Beliefs of Subtypes of Aggression Scale.

### Our Children and War

Anne Churchman (Kathleen Mastrian), Penn State Shenango - Sociology

Our country has not been involved in war like we are today. We have more military personnel deployed into combat areas than ever before. These military people are made up of both men and women. The question is how are the children of these brave people coping with the absence of a parent? The reason for the study is to determine how this parental absence affects the children both emotionally and academically. What type of long-term effects will the children experience? These data may help educators and parents cope with these issues and bring this to the forefront of our society so that we all may help.

**Implicit Stereotypes of Muslims: Can They Elicit Aggression?**

Darnelle Clark (Jamie McMinn), Westminster College - Psychology

This experiment investigated implicit stereotypes of Muslims and their effects on aggressive behaviors. Sixty male and female undergraduate college students participated. An ANCOVA design was used to test the hypotheses that people who are exposed to a Muslim prime and a male prime would have more aggressive behaviors than those exposed to non-Muslim and female primes. Participants exposed to a Muslim prime were more aggressive than participants exposed to a non-Muslim prime. Participants were more aggressive in assigning low grades to an essay. There was a significant interaction between target religion and sex. Participants who were exposed to a Muslim male prime showed more aggression than participants exposed to a non-Muslim male prime.

**The Effects of Academic Self Concept, Working Memory, and Anxiety on Memory Performance**

Kaylee Curilla, Ashley Martin, and Jessica Schubert (Victoria Kazmerski) Penn State Behrend, School of Humanities and Social Sciences - Psychology

This study examined academic self concept, anxiety, and memory performance in relation to academic performance. We hypothesized that individuals with low academic self concept would perform worse on word recall, and that low academic self concept individuals would recall more negative words. We also predicted that higher academic self concept would result in better memory performance. Participants completed a word recall task, and measures of academic self concept, working memory, and anxiety. Our hypotheses were partially supported. While there were no differences among word categories (positive, negative, and neutral), those with low working memory performed higher on overall word recall, as opposed to those with high working memory. This is consistent with previous research on working memory and anxiety. Overall, the data suggest that it is important to take many variables into account when assessing reasons for poor academic performance.

**The Effects of Implicit Stigmatization toward Obese Individuals on Prosocial Behavior**

### Shalyn Eakin (Jamie McMinn), Westminster College - Psychology

This study included 62 male and female Westminster College students and examined implicit attitudes toward obese individuals. Participants’ helping behavior was assessed via responses to a prospective student's questions about their campus; their anti-fat prejudice was measured with the Implicit Association Test (IAT). It was predicted that obese women would be helped the least and rated as the least attractive and average weight women would be helped the most and rated the most attractive. Also, it was predicted that individuals with more anti-fat biases would give less help than individuals with fewer anti-fat biases when interacting with someone perceived as obese. Results indicated that obese men were perceived more harshly than obese women, and that implicit biases affect how well an obese prospective student will fit with college life.

### Training a Rat to Spell Using an FR1 Chain Schedule of Reinforcement

Katherine Eriksen and Amelia Conte (Rodney Clark), Allegheny College - Psychology

The current experiment confirmed and extended upon data gathered from previous studies to show that an FR1 chain schedule of reinforcement can be used to train a rat to spell. More precisely, a rat was required to spell the word “CAR” by standing on its hind legs in front of the letters “C,” “A,” and “R,” which were located on the wall of the chamber, in sequential order to obtain food. Furthermore, an errorless discrimination procedure was used by presenting letters to the rat other than “C,” “A,” or “R” so as to give the animal a choice between standing in front of either a correct or an incorrect letter. This was used to test whether or not the rat would choose the right sequence of letters to spell “CAR” and to show that by punishing the rat for making an incorrect response while reinforcing the rat for making correct responses shaped the rat’s behavior until it spelled the correct word. It was discovered that both backward chaining used to train the FR1 chain schedule of reinforcement and errorless discrimination functioned as effective procedures in training a rat to spell “CAR,”

**All People (But Not Stereotypes) Are Created Equal: The Role of Stereotype Threat on Spatial and Mathematical Cognition**

James Hodge and Neil Rufenacht (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

A major question in psychology and education asks why men outnumber women at the top of science, technology, engineering, and math (STEM) related fields. One factor involves stereotype threat; the anxiety of knowing that one is a potential target of prejudice and stereotypes. Participants were told either that men were better at spatial or mathematical performance (stereotype threat) or that there was no gender difference (control). Participants (N = 178) were asked to complete a spatial (MRT) and mathematical (MA) task in a timed or untimed condition. Based on previous research, we expected that a time limit may be more harmful to women in the stereotype threat condition. In both timed and untimed conditions, women showed a decrement in mathematical (but not spatial) performance under threat. Correlational analyses indicated that women who were more anxious during the math task had poorer performance and slower reaction times. Consistent with past research, women who reported that it was important to be good at math showed poorer performance on the math task under threat.

**Is there an Influence of Sex and Violence on Brand Recall?**

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

Marketers often assume that sex and violence will increase product sales. However, previous research suggests that sex and violence may inhibit an individual’s free recall memory. In some cases, heightened arousal may overwhelm an individual’s ability to process information. In the current study, participants were shown a violent (*The Sopranos*), sexual (*Sex and the City*), or humorous (*Malcolm in the Middle*) television show. During the show, all participants were shown the same set of violent, sexual, and neutral advertisements. They were then given a free recall memory task for the brands in the advertisements, followed by a recognition task. We expect that those in the humorous group will recall more brands than those in the sexual and violent groups because the participant’s attention will be focused on the violent and sexual content, therefore inhibiting the recall of the brand names. If there is congruence between program and advertisement type (i.e., violent program/violent advertisement), the effect of inhibition may be greater.

### The Media’s Role on College Men’s Self-Image

Sharesse Jones and Jessica Borrero (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

The purpose of this study was to examine media effects on male self-image and how they play a negative factor in the way men see themselves in this culture. College males were asked to fill out questionnaires and scales that measure self-image. We believed that a male’s self-image is negatively affected by the media, such that overweight and skinny men may feel more inferior to muscular guys and seek to be more like them after viewing images in magazines or television. However, muscular men feel good about themselves when they are compared to other muscular men and meet the society’s standards. We found that the media had no significant effects on males’ self-image. Media effects may need longer exposure to affect male self-image. Our implications are to find positive ways to increase males’ self-image and draw their focus away from the media.

**Does Parental Attachment Influence Our Eating Habits?**

Jennifer Moczulski, Kandyss Moir, and Kaitlin Schafer (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Research has shown that 10% of college students suffer from anorexia nervosa or bulimia nervosa, and 35% of college students are overweight. The purpose of this study was to determine the effect of different parental attachment styles on the eating habits of college students. Participants sampled three snack foods – apple chips, baked Lays and original Lays - and rated them on preference. Participants were randomly assigned to two groups – half completed the Parental Attachment Questionnaire and were primed with thoughts of their parents while they ate, and half completed a non-priming leisure survey. All participants completed surveys regarding their normal eating habits. Previous research has shown that there is a correlation between insecurely attached individuals and poor eating habits. We hypothesized that securely-attached participants will favor the healthiest snack food and have healthier eating habits. We hypothesized that those anxiously attached would favor the unhealthy snack food, those with avoidant attachment would eat little, and both would display overall unhealthy eating habits. We hypothesize an interaction between parent priming and attachment such that securely attached individuals would not be affected by priming, but when primed by thoughts of their parents, insecurely attached individuals would eat more, unhealthy food.

### The Influence of Parenting Styles on the Adjustment of College Students

Linh Nguyen, Sara Praetzel, and Abby Zehe (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

This study investigated the influences of four different types of parenting styles on a students’ adjustment to college. Academic skills and social interactions were assessed. It was hypothesized that authoritative parents were a greater influence on students’ adjustment to college, while the other parenting styles had no influence. Self report surveys were distributed to assess adjustment and parental influence. There were 109 student participants surveyed at Penn State Erie, The Behrend College. Results showed that there was a positive relationship between authoritative scores and students’ overall adjustment. Students who rated their parents high on the authoritative scale had better college adjustment. The implications for this study may help caregivers find the best way to raise their child.

**The Effects of Anxiety on Working Memory and Schema-Based Object Recognition**

Jessica Schubert (Dawn Blasko) Penn State Behrend, School of Humanities and Social Sciences - Psychology

Schemas are a mental framework for organizing information. Research suggests they may influence memory. This study investigated the influence of anxiety on working memory and its impact on scene recognition. Participants studied schematic scenes, and completed a test of recognition memory for target object. Objects were schema consistent, inconsistent or irrelevant. Anxiety was induced after the first trial. Accuracy and response time were measured. Those under no pressure remembered more inconsistent items than those under high pressure. This fits with previous research which shows that inconsistent items are remembered best under normal circumstances. In the high pressure condition, however, participants recalled more consistent items. This is also consistent with previous research which demonstrates that when cognitive resources are diminished, we tend to fill in memory gaps with expected items. These results have many implications for eyewitness memory.

### Music Videos and How They Affect Us

Matthew Smith, Cassandra Huber, and Adam Ecker (Victoria Kazmerski), Penn State Behrend, School of Humanities and Social Sciences - Psychology

In this study we examined the effect of violent music videos on aggression and prosocial behavior. Three different genres of music were used: rap, metal, and popular music. A survey measuring aggression and prosocial behavior was given to participants before and after watching a music video. We then examined whether or not the music videos affect aggression and which genres of music invoke the most aggression. To do this we used a Repeated Measures ANOVA. We found that the rap style of music had a main effect, increasing anger in participants. This confirms previous reports that rap music is the most aggressive form of music.

### The Effects of Reminders of Mortality on Prosocial Behavior

James Svolos, Odalys Urena, and Tekhara Watson (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Reminders of our own death create the potential for a paralyzing terror which alters one’s behavior. The current study examined the effects that mortality salience had on cooperative behavior. Participants were induced with either mortality salience or exam anxiety. Participants in groups of two, depending on how they were primed, played the Prisoners’ Dilemma (PD) game, where they either had the opportunity to cooperate or defect to earn points. The money in the game could be donated to either a local (in-group) charity or international (out-group) charity. We hypothesized that priming with mortality salience would result in more prosocial behaviors than priming with exam anxiety. We expected to find that game pairings of two participants in the mortality salience group would demonstrate more cooperative behaviors in the PD than control or mixed pairings. We expected that the participants in the mortality salience group would donate more money to charity (especially to the in-group) than the control. We feel this is because reminders of mortality lead individuals to cling more to their community.

## BIOLOGY - Environmental Science and Geosciences Section

### Taste Bud Distribution in the Oral Cavity of the American Alligator (*Alligator mississippiensis*)

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

The taste bud distribution in the American alligator (*Alligator mississippiensis*) has not been studied in great detail in alligators, but mainly studied in mammals.  Prior studies conducted on a small, histological scale found taste buds on the tongue and upper palate.  It was expected that a gross inspection would find that alligators would have decreased numbers of taste buds in larger specimens.  Hatchling and neonate *Alligator mississippiensis* tongues and upper palates were stained with Chicago blue stain and inspected under a dissecting microscope, where the taste buds were counted.  Taste buds were evenly distributed on the tongues, but not on the upper palates where more taste buds found in the back areas of the upper palate.  There were no taste buds found on the lower palate.  Although larger alligators had more taste buds, there was not a proportionate increase in taste bud number. Compared to surface area, larger alligators had relatively fewer taste buds than smaller specimens.  The similarity in number for the tongues and upper palates, regardless of size, seemed to suggest that taste might be less important for an adult alligator than a hatchling.

**Do Nutrient Levels Affect Male Gametophyte Induction by Antheridiogen in *Ceratopteris richardii*?**

Asya Ayrapetov (Michael Ganger), Gannon University, Morosky College of Health Professions and Sciences - Biology

In the homosporous fern *Ceratopteris richardii*, gender is not determined chromosomally. Rather hermaphroditic gametophytes produce a hormone called antheridiogen, which induces maleness in undifferentiated gametophytes. The percentage of males increases with increasing density of gametophytes, presumably due to the cumulative effect of antheridiogen from multiple hermaphrodites. Some have argued that antheridiogen lessens competition between gametophytes. Such competition is expected to be most intense between hermaphrodites given that they support zygote, embryo, and sporophyte growth. Therefore, it is hypothesized that at lower nutrient levels, the effect of antheridiogen in inducing male gametophytes is greater than at higher nutrient levels. To test this hypothesis, *C. richardii* spores were sown over a range of densities (5 to 50 per 10 cm2) in four nutrient-level treatments (100, 50, 25, and 12.5% of full-strength nutrient agar). Gametophytes were grown for three weeks at 28o C with a photoperiod of 14 hours. An ANCOVA found an overall positive relationship between gametophyte density and percentage of male gametophytes. The relationship between density and percentage male gametophytes did not differ among nutrient levels, indicating no effect on the rate of male induction by antheridiogen. A post-hoc power analysis showed that the experimental power was 99%.

**Identification of Bacterial Isolates from Nests of Three Native American Songbirds**Amy Caroline (Beth Potter), Penn State Behrend, School of Science - Biology

Bird nests are complex structures used for the laying, incubating, hatching, and growing of avian offspring. Nests are constructed from a variety of different environmental materials, such as twigs, grass, dirt, fur, and plant material, but can also include materials left by humans, like clothing fibers and hair. Although the nests are meant to provide an environment for growing of the offspring, they also provide an environment suitable for microbial communities to flourish in the nests and on the eggs. The nests and eggs of three North American song birds, including black-capped chickadees (*Parus atricapillus*), house wrens (*Troglodytes aedon*), and American robins (*Turdus migratorius*), during different stages of development were used to determine the different types of bacteria inhabiting the structures. So far, a stage 4 (post-fledge) black-capped chickadee nest has been looked at. The nest bacteria have been cultured, isolated and their DNA has been purified and sequenced. Currently, the sequences are being analyzed using BLAST.

**Analysis of the Concentration of Chemical Elements in Vernal Ponds Adjacent to New Development within and near Penn State Erie, The Behrend College**

### Jonathan Chisholm (Sarah Ewing), Penn State Behrend, School of Science - Biology

There is a need to determine levels of toxic elements remaining in an area after completion of new construction to better understand the impact these elements may have on organismal growth and survival. The objective of this study is to examine water samples collected from ten vernal ponds across Penn State Behrend to determine if the concentration of one or more of the elements of interest exceeds U.S. EPA water quality limits. Preliminary analysis of water collected from seven Behrend ponds using inductively coupled plasma - atomic absorption spectrophotometry revealed levels of iron, manganese, and aluminum that exceed U. S. EPA drinking water limits. After the first and complete snow thaw, water samples from ten ponds will be collected and analyzed for 10 elements known to be toxic at high concentrations including arsenic, iron, aluminum, cadmium, manganese, selenium, cobalt, copper, lead, and zinc. These results will be summarized geographically in relation to recent construction around the Penn State Behrend campus. The results from this experiment will be used to design studies to examine the effect(s) of an identified element present at toxic levels on the survival of amphibian species that utilize these ponds for reproduction and development.

**Monitoring the Spread of the Emerald Ash Borer, *Agrilus planipennis* Fairmaire, in Erie County**

### Rachel Cleary (Margaret Voss), Penn State Behrend, School of Science - Biology

The Emerald Ash Borer (EAB), *Agrilus planipennis* Fairmaire, is an invasive beetle native to Asia. This beetle thrives on any species of Ash tree, *Fraxinus sp.* EAB larvae eat the phloem and the adults eat the leaves. It has been located in Michigan and is spreading east through Ohio. In summer 2007, EAB was found in Butler, Beaver, Lawrence, and Allegheny Counties of Pennsylvania. These areas were quarantined to restrict the movement of the beetle. In summer 2008, The Pennsylvania Department of Agriculture (PDA) organized survey teams for the counties surrounding the infected area. Each county in the survey had two person teams and the county was broken down into grids 1.5 miles by 1.5 miles. Purple box traps and sweep netting were the means of surveying for the insect. Each grid was surveyed visually and a box trap was set when available. The box traps were serviced once more and taken down. Any insects of interest were sampled and identified by PDA. Erie County did not have any positive sightings of the beetle, however, it was found in Mercer County, two counties south of Erie. It is expected that EAB will continue to spread. Further surveys will be done to monitor the spread of EAB.

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

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

The spotted salamander, *Ambystoma maculatum*, is one of the many organisms that inhabit the campus of Penn State Erie, The Behrend College. Habitat degradation as a result of development and construction may have negative effects on many of these organisms; the extinction of one species may have disastrous effects on numerous other organisms. Pit fall traps will be set at pond 4 located next to the athletic fields and the recently constructed Bayfront Connector. As they migrate to their natal ponds to breed, this study will determine if spatial migration patterns have been affected. The salamanders will be massed, sexed, and their length recorded, and the temperature and amount of precipitation each day will be recorded. Also, algae found in the gelatinous matrix of salamander embryos will be identified both by dichotomous key and by DNA sequence information. Individual alga cells will be collected and grown on TAP medium using aseptic technique, and cells will be transferred to eventually produce a pure culture. DNA will be isolated from the algae and using PCR and sequencing, genes from the chloroplast will be isolated and characterized. Eventually symbiotic relationships between the algae and the embryos will be explored.

**Taste Bud Distribution in the Hatchling Alligator (*Alligator mississippiensis*)**

Michael Duffy (Susan Rehorek), Slippery Rock University, College of Health, Environment, and Sciences - Biology

Taste buds occur in the oral cavity of most vertebrates. However, in general, it is presumed that their appearance in reptiles is uncommon and that they have little or no sense of taste. Many studies in taste buds concentrate on mammals, but few concentrate on reptiles, including crocodilians. Recent studies on alligators have focused on the structure and distribution of taste buds in adults and subadults. Nothing is known about the precise distribution of taste buds in either the subadult or hatchling. Thus, the purpose of this study was to systematically examine the distribution of taste buds in the hatchling American alligator (*Alligator mississippiensis*). Palates and tongues were histologically examined, and one tongue was reconstructed using a 3-D imaging program. Taste buds were found everywhere but the lower palate. The epithelium on it was too thin to support taste buds. The distribution of taste buds on the tongue seems random. Larger taste buds were located toward the anterior portion of the tongue and smaller, more numerous ones were located on the posterior portion. The presence of taste buds in the oral cavity of the hatchling American alligator suggests that taste is important to their survival.

**A Comparison of Mercury Accumulation Rates among Eight Kettle Lakes in Northwestern Pennsylvania**

Jennifer Evans (Milt Ostrofsky), Allegheny College - Biology

Pennsylvania is located in the airshed of the industrial heartland of the United States, resulting in high concentrations of atmospheric mercury and other pollutants accumulating in lentic systems. Mercury was the focus of this study due to the high number of fish consumption advisories in the area. Sediment cores from eight kettle lakes in northwestern Pennsylvania were analyzed for mercury, carbon, nitrogen, and sulfur. An accumulation rate was estimated for each lake using two dated cores and the mercury horizon for each lake. The results show that mercury concentrations and percent sulfur are significantly correlated, indicating that both are atmospheric in origin. The estimated mercury accumulation rates were found to be correlated to the watershed:lake area ratios (R2 = .35). Lakes Sandy and Pleasant were suspected of having pointsource inputs of mercury into their watersheds, but Sandy was the only lake that had higher than normal estimated mercury accumulation rates. Further studies on these lakes should focus on determining the actual mercury accumulation rates by the use of lead-210 dating in order to more accurately demonstrate its correlation with watershed:lake area.

### Avian Population and Habitat Assessment of Siegel Marsh

Laura Frischkorn and Katherine Whitby (Lisa Mangel), Penn State Behrend, School of Science - Biology

An avian population/habitat assessment was conducted at Siegel Marsh. The objective of this study was to obtain population information and assess avian habitat. The assessment was performed with a target list that contained 15 species of birds of special concern that were known inhabitants of similar marshes. The assessment followed the Pennsylvania Game Commission protocol for secretive wetland birds. The data showed that a majority of the target species were not detected in the wetlands of Siegel Marsh. One of the proposed reasons for the absence of the target species in this region was the close proximity to major roadways. It was also observed that a significant flock of geese also regularly inhabited most of the marsh throughout the breeding season. The major trend for all of the target species that were observed was an overall decrease in detection around mid-June. Due to the lack of previous data, along with the small numbers of target birds observed, no other trends could be concluded. Overall, the avian habitat and population assessment for Siegel Marsh has provided a first look into the region, and the data collected will help serve the Pennsylvania Game Commission for future management purposes.

**Medicinal Plants: Educating Students and Community**

H. Ryan Lilly (Paul Barney Jr.), Penn State Behrend, School of Science - Biology

The arboretum and herbarium at Penn State Erie, The Behrend College, gives students and the community the opportunity to increase their knowledge of the plant sciences. Along with learning techniques such as tissue printing and pressing tree samples, my work with the arboretum and herbarium took me in the direction of alternative medicine and the importance of medicinal plants. Medicinal plants are of major concern because as the popularity of alternative medicine increases globally, so does the demand for medicinal plants and herbal medicines. This leads to increased harvesting of desired plant products, pushing many species to the edge of extinction. Overharvesting is currently affecting many developing nations and rural areas of the world that rely mostly, if not entirely, on medicinal plants for healthcare. Thus, the information gathered on the medicinal properties of plants within the arboretum and herbarium will not only show students and the community the importance of maintaining the plant population and biodiversity at the local level but will also serve as a database of information on global issues concerning alternative medicine and medicinal plants.

**A Survey of Farm Management Techniques and the Potential for Control of Parasitic Nematodes in Horses**

Kolby McIntyre (Margaret Voss), Penn State Behrend, School of Science - Biology

It has been proposed that farm management affects parasitic nematode loads in horses. Nematodes that parasitize horses possess the following lifecycle: female worms in the large intestine lay eggs, which are passed in feces. If environmental conditions are favorable, the eggs hatch and larvae migrate to nearby blades of grass. Horses then consume the grass, inevitably ingesting the parasites. Three local farms with varying management techniques were selected for this study. Throughout summer and fall 2008, random grass samples from the pastures on each farm and manure from each horse involved with the study were collected. Baermann funnels were used to extract larval worms from each grass sample: 50 g of grass was placed into each funnel and placed under a heat lamp for 48 hours. Worms collected were placed in alcohol to await quantification. Centrifugal flotation in 1:1 Karo Syrup:tap water was used to remove encysted eggs from 2 g of manure; cysts were then identified and quantified. Though incomplete, results obtained suggest that a difference in nematode load exists between experimental farms. Final quantification results will be compared to management techniques used on each farm to produce final results for the project.

### Greenhouse Gas Emissions Inventory of Mercyhurst College Main Campus

Brittany Prischak (J. Michael Campbell), Mercyhurst College - School of Natural Sciences and Mathematics - Biology

The purpose of this research was to gather data necessary to complete a comprehensive inventory of the Greenhouse Gases (GHG) emitted by annual operations of the Mercyhurst College campus in Erie. The inventory was prompted by the American College & University Presidents Climate Commitment signed by Mercyhurst College’s President, Dr. Thomas Gamble. The collected data were used to calculate total GHG emissions from 2001/2002 through the 2007/2008 academic years. Inventory results indicate that electricity consumption is the largest source of GHG emissions by the college campus, followed by natural gas burned for heating. The emissions inventory will be used to support a planning effort to decrease the college’s carbon footprint by instituting a carbon neutrality plan for campus that will build upon progress already made in reducing emissions by purchasing electricity from renewable sources.

**An Investigation of the Hemotoxicity of the Secretion of the Duvernoy’s Gland of the Northern Water Snake (*Nerodia sipedon*)**

Daniel Ranayhossaini (Margaret Voss and Michael Campbell), Penn State Behrend, School of Science - Biology

The northern water snake (*Nerodia sipedon*) preys primarily on fish and other aquatic organisms in an environment where constriction is no longer an effective method of killing prey. Previous research has connected the Duvernoy’s gland with toxin production. Salivary swabs and Duvernoy’s gland secretions were collected and compared. During the collection of the samples, a pocket between the back of the jaw and the lip of *N. sipedon* was identified that yielded higher volume samples that represent nearly pure Duvernoy’s gland secretions. This pocket was then observed to be absent in *Lampropeltis mexicana, Elaphe guttata*, and *Pituophis melanoleucus.* It is possible that this could be a product of evolution that functions as a primitive venom gland, but continued research would be necessary to further verify this claim. Salivary swabs were quantified by a Bradford protein assay. It was established that there was between 5 and 10 ug of protein per salivary swab. The proteins from the salivary swabs were then subjected to a SDS-PAGE that yielded proteins of molecular weights 150, 59, 24, 22, 19, and 17 kDa. The 59 kDa protein was observed in much greater amounts in samples directly from the Duvernoy's gland. Hemolytic activity was observed though light microscopy of erythrocytes from Notropis atherinoides mixed with salivary samples from *N. sipedon*. Invaginations and cup-shaping of erythrocytes mimicked the toxic action of cyclodextrins, indicating that the toxic component of the saliva may not be a protein as originally thought. Future research will investigate this possibility.

**The Effect of Anthropogenic Noise Disturbance on the Developing Avian Immune System**

### Craig Richards (Margaret Voss), Penn State Behrend, School of Science - Biology

This experiment tested the theory that human disturbance and elevated noise levels negatively impact House Wren (*Troglodytes aedon*) reproductive effort. Nest boxes were set up near Kanty Pond in different areas to reflect a wide range of noise levels. Each box was checked at least twice a week and all new eggs were recorded. Eggs were weighed and marked shortly after they were laid. Once eggs hatched and baby birds were about 6 grams, it was given a USGS band to track locally and internationally. Of 186 eggs laid, 46% hatched and fledged, 48% were predated, and 5% hatched but died. Normal predation rates for wren nests range from 0% to 38%, but on the Kanty Pond site almost half of the eggs were predated. The high level of predation may be linked to high levels of stress on the site due to noise and high density nesting. Since all birds were stressed, it would take a high toll on their bodies. Predatory female wrens may increase the chance of their offspring surviving because a) they receive nutrients from eggs they predate and b) nest predation may reduce intraspecific competition for resources.

**Methods to Renovate Paths in Wintergreen Gorge by Examination of Erosion Patterns**

Andrew Stauffer (Anthony Foyle and Michael Naber), Penn State Behrend, School of Science - Geography/GIS

The goal of the research was two-fold. The first objective was to establish a base map of Wintergreen Gorge’s hiking paths and waterways. The second objective was to study the topography of the area to examine runoff-caused erosion and to suggest possible methods to address the issues identified in order to minimize erosion maintenance costs. Runoff causes damage to hiking paths in a relatively short period of time, especially on steep terrain. With the use of LIDAR (Light Detection and Ranging) data, the gorge’s terrain was closely examined to identify areas of erosion. With LIDAR data and GIS software, a hypothetical path was created to avoid as much water damage as possible. A review of several methods to divert water off paths was examined, such as outsloping and the use of waterbars, for use on current paths. The LIDAR data helped to show paths of least resistance of water flow and aid in forming new paths. A comprehensive review of common water removal practices will aid in repairing the current hiking trails. Combined, the proposals will offer strategies of how to minimize the maintenance costs of Wintergreen Gorge.

### The Effects of Thermoregulation on Foraging in *Anolis carolinensis*

Lara Trozzo (Margaret Voss), Penn State Behrend, School of Science - Biology

Small lizards exhibit behavioral thermoregulation. These animals repeatedly shuttle between a warm basking site and a cooler foraging site. When hungry, they face the challenge of finding food and returning to their basking site before their internal body temperature drops too low to support metabolism. This project examines the limits placed on foraging by the need to behaviorally thermoregulate in Carolina anoles (*Anolis carolinensis)*. I measured anoles’ internal body temperatures while timing basking, feeding, and traveling between foraging and basking sites. I analyzed these data in a foraging model to better understand the trade-off between the physiological functions of basking and feeding. Anoles were able to forage longer at warmer temperatures. I also examined the relationship between temperature and metabolic rate using respirometery. Data showed that metabolic rate increases with temperature, as expected, and that there is an upper limit after which metabolism decreases. It was observed that body size and gender (females are generally smaller than males) had an effect; smaller animal metabolism is more affected by environmental temperature fluctuations. Further analysis is underway, including comparisons between thermoregulation in anoles and a much larger ectotherm, the marine iguana.

**Walking Routes for the Penn State Behrend Arboretum**

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

The Arboretum on the Penn State Behrend campus contains many different tree species from around the world. The research used GPS data and tree-identification to generate information on the exact location of each tree on campus, as well as the tree species, scientific name, and common name. The data are being used to create maps of five different walking routes for visitors, students, faculty members, and staff members to view the trees of the Arboretum. Walking routes will be designed for specific lengths of time and to view specific species groupings, for example, the entire Arboretum, native, non-native, deciduous, and coniferous species. The outcome of this research will provide visitors to the campus or to the Arboretum a Web site with an accurate location of all trees in relation to the buildings on campus, useful information linked to each tree, and several possible walking routes depending on time available to the visitor.

## BIOLOGY - Molecular Biology Section

**Determining the Role of N-Glycans in Apical Sorting within Polarized Epithelial Cells**

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

Polarized epithelial cells contain two distinct domains to which proteins are sorted. The apical domain is in contact with external environments, while the basolateral domain is in contact with the internal environments. Apical proteins are delivered to specific domains depending on the presence of a specific sorting signal, which include trans-membrane domains, N- and O-glycans and glycosylphosphatidylinositol lipid anchors. The way in which N-glycans mediate sorting is currently unknown. To gain insight into how N-glycans mediate apical sorting, the sialomucin endolyn, a lysosomal protein, is being used as a tool. Prior endolyn studies have shown that two N-glycans at a disulfide loop play a role in apical sorting. This experiment is set up to determine if the secondary disulfide loop structure is necessary for the recognition of endolyn’s N-glycans. Site directed mutagenesis has been used to modify and disrupt the disulfide loop and trafficking has been and will continue to be monitored using immunofluorescence, western blot, and biotinylation.

**A Co-Immunoprecipitation Approach to Identifying N-Glycan-Dependent Sorting Machinery in Polarized Cells**

### Laura Cirillo (Beth Potter), Penn State Behrend, School of Science - Biology

The organs of the body along with gastrointestinal and respiratory tracts are lined with polarized epithelial cells. These cells uniquely possess two distinct membrane subdomains, the apical and basolateral. Thus an important job in these cells is to determine how to get proteins to the correct surface. For some apical proteins, N-glycans have been shown to be important for delivery. For the sialomucin endolyn, it has been shown that the terminal processing of two of its eight N-glycans is necessary for apical delivery. Previous studies suggest that endolyn’s delivery may also involve a receptor. In this study, the goal is to co-immunoprecipitate the receptor with endolyn.

**Genetic Diversity of RD22 Genes in Arabidopsis thaliana**

Alexander Dewey (Michael Campbell), Penn State Behrend, School of Science - Biology

The diversification of BURP (BNM2, USP-Like, RD22, PG1B) proteins are encoded by a large gene family that is represented by diverse expression patterns in plant cells. BURP genes are characterized by a molecular structure consisting of a C-terminal BURP domain that contains several conserved amino acids, a hydrophobic transit peptide, and a variable internal region that can be repetitive in nature. BURP genes have variable expression with an unknown impact on plant cells. The diversity of BURP genes was found by searching EST (Expressed Sequence Tag) databases associated with GenBank. RD22 is a desiccation-responsive class of BURP genes commonly found in plants. Known nucleotide and putative protein sequences of RD22 were compared to other similar sequences. This was done by performing an indepth BLAST (Basic Local Alignment Search Tool) analysis of the GenBank database. Sequences with similarities were ranked based on E-values. These sequences were compared using ClustalW2 which resulted in a cladogram that showed the relatedness between GenBank accessions. These comparisons help in determining the diversity of the BURP genes. Characterization of the BURP family will allow us to design primers specific to BURP family members and therefore enable us to elucidate gene expression patterns for individual members of the family.

**Analysis of Folate Metabolism and its Effects on Neural Tube Development in the Early Zebrafish (*Danio rerio*) Embryo**

### Wes Flynn (James Warren Jr.), Penn State Behrend, School of Science - Biology

Folate is an essential B vitamin in the human diet, usually obtained in the diet from green leafy vegetables and legumes or folic acid supplements. It is important as a coenzyme in nucleic acid synthesis, regeneration of methionine, and various metabolic reactions involving one carbon transfers. Low plasma levels of folate have been linked to a wide array of diseases and disorders, as well as increased plasma concentrations of homocysteine (Hcys). In an attempt to gain an understanding of the mechanisms underlying low folate levels to disorders, specifically neural tube defects, zebrafish embryos were treated with Hcys to simulate a folate deficiency. Experiments conducted to estimate the toxicity of Hcys have indicated that the compound exhibits a low level toxicity at concentrations well above physiological levels. Survivorship rates of embryos, at 72 h are: control (87.6%), 1 mM Hcys (88.9%), 10 mM Hcys (91.1%), 50 mM Hcys (91.0%), 100 mM Hcys (88.9%), and 200 mM Hcys (74.0%). We found that a 50 mM Hcys treatment was optimal in production of observable morphological defects, while maintaining a high survivorship (91.0%). Significant recurrent phenotypes observed in 50 mM Hcys treated embryos were: abnormal pigmentation (20.3%), small misshapen heads (15.3%), truncated torsos/tails (10.3%), and enlarged pericardial sacs (8.8%). Analysis of treated embryos using fluorescent antibodies has shown that Hcys decreases embryonic mitotic activity and produces abnormalities in the developing nervous system. Future studies will address the molecular mechanisms of these recurrent phenotypes.

**Real-Time PCR Analysis of NDP1 and OHP2 Expression in NDP1 Knockout Mutants Over a 24-hour Light Cycle**

Bennett Giardina (Michael Campbell), Penn State Behrend, School of Science - Biology

The clone NDP1 (At5g02130) was isolated from a cDNA library produced from dormant potato meristems. It is hypothesized that NDP1 encodes for a putative kinesin light chain associated with chloroplast movement. NDP1 shares a cis-antisense orientation with the gene for one helix protein (OHP2;At5g01202). In *Arabidopsis thaliana*, there is an overlapping region of the two genes, *NDP*1 and *OHP*2. The extent of antisense regulation in overlapping genes is unknown, but these genes tend to be co-expressed and/or inversely expressed at a higher frequency than expected by random chance. We propose to use real-time PCR to determine expression levels of NDP1 and OHP2 in an *Arabidopsis thaliana* NDP1 mutant. Previous studies indicate that OHP2 and NDP1 expression is inversely correlated during light/dark transitions in the wild-type plant. Expression levels will be compared in order to determine if the functional knockout of NDP1 has an effect on OHP2 expression.

**Auxin Effects on Defense Responses during Establishment of the Arbuscular Mycorrhizal Symbiosis in Tomato**

### Meredith Hanlon (Catharina Coenen), Allegheny College - Biology

The arbuscular mycorrhizal (AM) symbiosis is one of the oldest and most prevalent relationships in nature, occurring between different species of AM fungi and over 80% of terrestrial plants. This 400 million year old relationship is thought to have assisted in the evolution of plants from water to land-based environments, with the fungus helping to provide the plants with nutrients, specifically phosphorus. The role of auxin, a plant hormone involved in nearly all aspects of plant growth and regulation, in the AM symbiosis was investigated by examining fungal colonization levels and patterns in tomato plants that are either auxin resistant, *diageotropica*, or auxin hyper-transporting, *polycotyledon*, grown both in the greenhouse and as excised tissue culture roots. The mutants showed altered colonization levels and patterns as compared to wild-type plants grown under identical conditions. These differences indicate that auxin may have a role in either signal perception or the ability of the plant to properly respond to allow for fungal colonization. Peroxidase activity was also analyzed in root tissue for each sample, and an increase in peroxidase activity in wild type roots prior to colonization confirms the occurrence of signal exchange between the fungus and its plant host.

**Expression Patterns and Functional Analysis of SK3 in Zebrafish Embryos**

Kaitlin Hoyt (Heather Jones and James Warren Jr.), Penn State Behrend, School of Science - Biology

The objective of this study was to define the role of KCNN channels in zebrafish development and their role in the nervous system. In order to determine if the KCNN channels are expressed in the zebrafish genome, BLAST comparisons were done using the entire zebrafish genome and the DNA and amino acid sequences of the KCNN channels. Results of the comparisons showed that the third member of the KCNN family, SK3, demonstrated the most sequence homology in the zebrafish genome. Next, zebrafish embryos were isolated and a SK3 primary antibody was used on the zebrafish embryos to see if the protein was present. A secondary fluorescent antibody was used to visually detect the SK3 protein. Results showed expression patterns similar to background fluorescence, suggesting that the SK3 antibody was unable to detect the SK3 protein. The antibody used is specific to the rat version of the protein and may not have been specific to a zebrafish variant of the channel. Therefore, I will carry out *in situ* hybridization using a fluorescently labeled primer specific for SK3 to elucidate the expression patterns of this channel in zebrafish.

### Optimizing Protocol for the Raising of Baby Zebrafish (*Danio rerio)*

Julie Ober, Moriah Johngrass, and David Stull Jr. (James Warren Jr.), Penn State Behrend, School of Science - Biology

Our research laboratory focuses on deciphering the molecular mechanisms of embryonic development in the vertebrate model system, the zebrafish (*Danio rerio).* With the acquisition of a confocal microscope by Penn State Behrend, an increasingly important tool in our research is the use and generation of transgenic lines of zebrafish. This approach will allow us to link regulatory regions of genes of interest to the reporter gene green fluorescent protein (GFP), allowing us to visualize changes in gene expression in different developmental pathways in “real time.” Given that stable, germ-line transmission of DNA constructs is achieved in only 2-5% of injected embryos, we have optimized our laboratory’s baby-raising protocols in order to successfully generate the transgenic lines we desire. Pre-existing baby-raising protocols were tested and modified. The use of live food in the form of paramecia has proven to be crucial for optimal survival, which also required us to optimize a paramecia culturing method. This poster will summarize the results of the different baby-raising protocols tested, and detail the optimized protocol that uses a combination of paramecia and dried larval food to achieve up to 72% survival rates. It will also outline some of the future transgenic studies planned.

**Acute Effects of Dimethylbenz[*a*]anthracene (DMBA) on Zebrafish (*Danio rerio*) Embryos**

### Dennis Paskorz (Sarah Ewing and James Warren Jr.), Penn State Behrend, School of Science - Biology

Cancer is the number two killer of Americans behind heart disease. Detection and treatment of varying cancers is aided through an understanding of tumorgenesis at a cellular and molecular level. Researchers use the zebrafish (*Danio rerio*) as a cancer model due to shared homology with humansas well as inexpensive, easy upkeep*.* The acute effects of carcinogens used to induce tumors in zebrafish are unknown. We propose to measure acute effects in zebrafish embryos after carcinogen 7,12-dimethylbenz[*a*]anthracene (DMBA) treatment such as changes in gene expression of the C/EBPα and C/EBPβ genes, which are known to play an important functional role downstream of carcinogen treatment and are often altered in human and rodent tumors. The C/EBPα and C/EBPβ genes were chosen for their known expression in zebrafish embryos and function in response to tumorgenesis and DNA damage signalling pathways . This study has the potential to provide novel insight into the cellular and molecular responses to acute carcinogen treatment in zebrafish.

**Sequence Comparison of *pal*, *wecA*, *lspA1*, and *lspA2* in Class I and II Strains of *Haemophilus ducreyi***

Emily Ricotta1and Nan Wang2 (Tricia Humphreys1,2), 1Allegheny College and 2Grinnell College - Biology

*Haemophilus ducreyi*, the etiologic agent of the sexually transmitted disease chancroid, is a gram-negative microaerophile which resists phagocytosis by the host immune system. Although rare in the United States, chancroid is strongly associated with the transmission of HIV, as it significantly increases virus transmission and acquisition. There are two classes of *H. ducreyi*, Class I and Class II, and genotypic and phenotypic differences have been noticed between them, specifically in putative virulence factors. This experiment surveyed four different virulence factors in 10 strains of *H. ducreyi* representing both classes of the bacterium. The genes were PCR-amplified and sequence comparisons were done for the DNA and the translated DNA sequences. Genes for *pal* and *wecA* both had three silent point mutations. *lspA1* could only be amplified in Class I strains, while *lspA2* showed a high number of mutations, including a 191 base pair truncation of *lspA2* in Class I strains. These mutations produce substantial amino acid changes. Further studies are necessary to determine if these changes in Class I and II *lspA* sequences are phenotypically relevant.

**Overexpression of Tomato Ribosomal Protein L9 Gene Reduces Height in *Arabidopsis***

Marcie Ryhal, Angelica Jones, and Julie Palmer (Yi-Hong Wang), Penn State Behrend, School of Science - Biology

In the last Sigma Xi conference, we presented a technique developed at Behrend to identify tomato genes that cause changes in *Arabidopsis*, a model plant related to canola, cauliflower, broccoli, kale, cabbage, brussels sprout, and mustard. We report here one gene (*ribosomal protein L9*---*RPL9*) that caused reduced overall height when expressed in *Arabidopsis*. This is due to reduced internode/pedicel length. The mutant also produces defective flowers which never open and produce shorter seed pods (silliques). The petal is underdeveloped although the male and female organs are normal. The flower phenotype is very similar to that caused by mutant defective in auxin transport. Further experiments are under way to test if *RPL9* is linked to auxin and to understand how RPL9 regulates auxin transport if the two are linked.

### Determination of Altered Potato Gene Expression after Treatment with 1,4 Dimethlynaphthalene

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

Prevention of sprouting in *Solanum tuberosum* as a means of increasing shelf life is accomplished through application of the chemicals CIPC (Isopropyl-N (3-chlorophenyl) carbamate) and DMN (1,4 dimethylnaphthalene) with the their molecular mechanisms of action currently unknown. To gain a better understanding, microarray analysis providing relative gene expression was performed on DMN and CIPC treated tissue. Microarray data has indicated significant gene changes associated with DMN and CIPC exposure. Real-time PCR was carried out using microarray derived gene specific primer sets and support of significant gene expression changes was correlated in about 40% of the genes associated with DMN and CIPC exposure. The commonality observed in the molecular function of CIPC and DMN involves the inducement of abscisic acid production which represses cell growth. Among abscisic acid regulation genes, the genes within the RD-22 gene family appear to show induction by the sprout inhibitors. The creation of primer sets for RD-22 specific genes to test in DMN-treated tissue serves as the basis for further research to better understand the molecular mechanism of DMN.

**Use of a Strongly Acidic Analog of the Plant Hormone Auxin Demonstrates an Intracellular Location of the Auxin Receptor**

### Stephen Shinsky (Catharina Coenen), Allegheny College - Biology

The plant hormone auxin coordinates plant development and growth processes, including cell elongation, ethylene synthesis, phototropism, and gravitropism. Indole-3-acetic acid (IAA) can enter cells via either passive diffusion or active transport through the AUX-1 uptake carrier. Conversely, the synthetic auxin 1-naphthalene-acetic acid (NAA) enters cells exclusively through passive diffusion. We hypothesized that the strongly acidic auxin, indole-3-methane sulfonic acid (IMS), which is deprotonated at any pH, can enter cells only through the uptake carrier. To test this hypothesis, we blocked the action of the uptake carrier with the synthetic competitive inhibitor, 1-napthoxy-acetic acid (NOA), and measured elongation of soybean hypocotyls in response to IAA and NAA. NOA fully inhibited IMS-induced hypocotyl elongation, whereas it had no effect on NAA-induced elongation. In addition to demonstrating the dependency of IMS effects on a functional uptake carrier, this result also suggested an intracellular location of the IMS receptor responsible for triggering cell elongation. To investigate whether this interaction between NOA and IMS also extends to auxin induced gene expression, we are now measuring light emission in transgenic tobacco hypocotyls expressing a *luciferase* reporter gene under the control of the specifically auxin-inducible *GH3* promoter. We have demonstrated that the time course of IMS-induced luminescence is slower than that for IAA, and are currently investigating the NOA sensitivity of the gene expression response to both auxins.

## BIOLOGY - Neuroscience Section

### The Examination of the Proposed Immunostimulatory Mechanisms of Immune DefenseTM

Deirdre Amos (Susan Sapone), Gannon University, Morosky College of Health Professions and Sciences - Biology

Dietary supplements exist outside the realm of the U.S. Food and Drug Administration’s monitoring, thus the determination of their efficacy, safety, and mechanism of action is not required as it is for prescribed medications. This study examined a mechanism by which the dietary supplement Immune DefenseTM**,** marketed by General Nutrition Corporation of Pittsburgh, Pennsylvania, may exert its proclaimed ability to enhance the immune response. Since macrophages play vital roles in both the innate and adaptive immune responses, it was postulated that perhaps the proposed immunostimulatory action of Immune DefenseTM  is initiated by its ability to activate macrophages. Because IL-6 is a cytokine commonly produced by activated macrophages its production was monitored as an indicator of macrophage stimulation. In this study human spleen macrophages (cell line CRL-9850 purchased from the American Type Culture Collection) were introduced to varying concentrations of Immune DefenseTM. The macrophages’ culture medium was then analyzed using a QuantikineTM ELISA protocol for the presence of IL-6. The comparison of the IL-6 production by the Immune DefenseTM-treated macrophages with that of the untreated macrophages indicated that Immune DefenseTM, at the concentrations evaluated, had no impact on the IL-6 production of macrophages.

**The Predisposition of VPA Sprague-Dawley Rats to PTZ-Induced Seizures**

Casey Brown and George Swinston (Jeff Cross), Allegheny College - Neuroscience/Psychology

Recent studies show that one out of 150 people have an autism spectrum disorder (ASD), and of these individuals, between 20 and 40% suffer from epilepsy. These statistics would lead one to believe that there is a predisposition of autistic individuals to epilepsy. The aim of this research was to create an animal model of autism using valproic acid (VPA), and introduce the rats to a convulsing agent, pentylenetetrazole (PTZ), to determine a seizure threshold compared to age, gender, and strain-matched controls. The hypothesis was that the VPA exposed rats would have a lower seizure threshold than matched controls. We expected subsequent seizures to occur more rapidly in the VPA animals than the controls. We found generally that the animals became sensitized to the PTZ after the first injection, then became slightly tolerant of it, and eventually lost their tolerance and became very sensitized to the drug. At a higher dose of PTZ, the controls exhibited a slightly higher, but not significant latency to seize than the VPA animals, suggesting that VPA animals may be predisposed to seizing.

**Dissociation of Function in the Dorsal Hippocampus: Spatial Working and Reference Memory**

### Lucas Glover (Jeffrey Cross and Amy Wiseman), Allegheny College - Neuroscience and Psychology

The dorsal hippocampus is necessary for normal spatial memory, where dorsal lesions produce an impairment in this mnemonic function. It is not known which specific subregions within the dorsal hippocampus mediate spatial memory. In the current study, rats were trained in the radial maze before bilateral neurotoxic lesions of dorsal CA3 (dCA3) or dorsal hippocampal lesions (dHPC). Post-operative testing showed that dHPC and dCA3 lesions impaired reference and working memory. The same rats were then tested for reference memory acquisition in the Morris Water Maze (MWM) and later tested on retrieval. All groups acquired the task equally, but only the dHPC, and not dCA3, group showed impaired retrieval. In subsequent working memory testing in the water maze, dHPC rats, but not dCA3, showed deficits. Analysis of behavioral data followed histological confirmation of lesion placement. These results suggest that dCA3 may mediate different aspects of spatial memory depending upon task delay and demands. Post-lesion MWM acquisition and performance suggest that spatial acquisition may only depend on the tissue available within the hippocampus and/or extra-hippocampal structures.

**The Effects of Membrane Permeant and Impermeant Carbonic Anhydrase Inhibitors on the Olfactory and Trigeminal Responses to CO2 in Mice**

Jessica Kenemuth, Ryan Hanson, and Shane Hennessy (E. Lee Coates), Allegheny College - Neuroscience

Physiological concentrations of CO2 (less than the 4-5% CO2 in expired air) have been shown to stimulate a small subset of olfactory receptor neurons, while CO2 concentrations (25% or above) that cause pain are known to stimulate trigeminal nerve endings in the nasal epithelia. Although the mechanism by which CO2 stimulates olfactory receptors or trigeminal nerve endings is not known it appears that the enzyme, carbonic anhydrase (CA), plays a role in the transduction mechanisms. The objective of this study was to record from olfactory receptors and trigeminal nerve endings in response to CO2 (0-50%) before and after application of membrane permeant (acetazolamide - AZ) or membrane impermeant (quaternary ammonium sulfanilamide - QAS) CA inhibitors. We found that topical application of 0.1mM QAS caused a small decrease in olfactory responses to CO2 while 0.1mM AZ eliminated the olfactory responses to all CO2 concentrations. Topical application of 0.1mM QAS or 0.1mM AZ caused only small decreases in the trigeminal nerve responses at each CO2 concentration. These results indicate that intracellular CA plays a critical role in the detection of CO2 by olfactory receptors and that extracellular and intracellular CA do not appear to play a major role in the detection of CO2 by trigeminal nerve endings.

**The Effects of the Acetylcholine Antagonist Mecamylamine on Obsessive-Compulsive Behaviors in Orbitalfrontal Cortex-Lesioned Sprague-Dawley Rats**

###  Summer Mazur (Jeffrey Cross and Rodney Clark), Allegheny College - Neuroscience

There is much evidence to believe that acetylcholine levels are abnormally elevated in individuals with Obsessive-Compulsive Disorder. An animal model of OCD using bilateral excitotoxic lesions to the orbitofrontal cortex produced compulsive behavior in the form of excess lever-pressing in seven Sprague-Dawley rats. After 30 days of treatment post-test with either saline or the acetylcholine antagonist mecamylamine, saline rats showed significantly greater lever-pressing behaviors than mecamylamine rats, which showed no change in the amount of lever-pressing. This suggests that an acetylcholine antagonist may be a successful future treatment for OCD.

**The Effects of Matrine on Cancer Cells Compared with Normal Cells**
Megan Osborne and Elizabeth Clymer (Durwood Ray), Grove City College - Molecular Biology

Matrine is the main active component of the dried roots of *Sophora flavescens* and has been found to hold many medical applications, including cancer treatment. In this study, a metastatic mouse lung cell line, *T4PA*, and normal *NIH* *Swiss* mouse cells were grown in DMEM and treated with matrine at concentrations ranging between 0 and 1 mg/ml matrine. Cell counts were taken over time by using grid plates and taking pictures of pre-determined sections of the plates. An average percent change in cell number from each individual grid was then calculated over time. The purpose was to find whether matrine showed a significant inhibitory effect that was selective for the cancer cells, as well as to determine whether the counting method proved reliable. Results from this method showed that matrine significantly inhibits both Swiss and T4PA cells in a dose dependent manner. Further studies are in progress in order to determine whether there is a significant dose difference between the effects of matrine on normal versus cancer cells. We also plan to test matrine on other cell lines such as human breast cancer.

**The Effects of Nicotine on the Ventilatory Response to CO2 in Neonatal Mice: Implications for Sudden Infant Death Syndrome**

Marina Rezk (E. Lee Coates), Allegheny College - Neuroscience

Sudden Infant Death Syndrome (SIDS) is a leading cause of infant mortality in North America. While the cause of SIDS is not known, it appears that nicotine exposure during gestation may be a major risk factor. A triple-risk model suggests that SIDS may occur if a vulnerable infant is exposed to an exogenous stressor during a critical developmental period. This study investigated the triple-risk model in mice, by using maternal nicotine consumption via drinking water to create a vulnerable infant and measured the ventilator response to CO2 (exogenous stressor) during critical developmental periods. Ventilatory responses to CO2 were tested by placing mice in a plethysmograph on days 1, 2, 3, 5, 7, 9, and 11 (day 0 = day of birth) and exposing them to one minute of 0%, 4%, and 8% CO2. The main result was that administration of 8% CO2 caused significant increases in ventilator frequency starting on day five for the control pups, but not until day 9 for the nicotine-treated pups. These results indicate that nicotine causes a delay in the development of the ventilator response to CO2, making the infant more vulnerable, and at a higher risk for SIDS.

### Unearthing a Conotoxin that Targets the T-Type Calcium Channel Cav3.2

Ashleigh Welko (Lauren French and E. Lee Coates), Allegheny College - Neurobiology

T-type calcium channels are low-voltage-activated channels that are vital to a number of physiological processes. Cav3.2 is a splice variant of T-type calcium channels that is linked to the etiology of several diseases, including insulin-dependent diabetes mellitus (IDDM) and certain types of epilepsy. In this study, the venoms of predatory marine snails were tested on Cav3.2 channels expressed in *Xenopus laevis* oocytes. Oocytes were injected with Cav3.2 mRNA, incubated, and run through a series of depolarizing steps in a two-electrode voltage clamp setup. It was found that the crude venom of *Conus striatus* significantly decreased the current expressed by the Cav3.2 channels, and through the fractionation of the venom it may be possible to isolate the specific peptide that targets the channel in future studies.

## CHEMISTRY, BIOCHEMISTRY, AND PHYSICS

**Synthesis and Study of the Photophysical Properties of Dendron-Containing Molecules for Potential Use in Organic Light-Emitting Diodes**

### Alexandra Bogart and Katy Sherlach (Caroline Pharr), Mercyhurst College - Chemistry

Red and green light-emitting organic molecules have been synthesized with sufficiently long life-times and stability to be used in organic light-emitting diodes (OLED). However, blue light-emitting organic molecules are frequently less stable and short lived. The next generation of high-definition flat-panel displays requires the synthesis of a stable, long-lasting blue-emitting organic molecule. A family of molecules will be synthesized and their luminescent properties studied in the hope of forming a stable, long-lasting blue emitter. Synthesis of the parent molecule, which consists of a polyphenyl dendron and diphenylacetylene-bonded to a central carbazole moiety, has begun. Diphenylacetylene will be synthesized through Sonogashira-Hagihara Coupling from phenylacetylene and 1-bromo-4-iodobenzene. The carbazole will be formed through Cadogan reductive ring-closure of 4,4’-dibromo-2-nitrobiphenyl. The polyphenyl dendron will be formed through Diels-Alder cycloaddition of an arylethynyl derivative and tetraphenylcyclopentadienone. The three parts of the molecule are to be combined through Suzuki Coupling. Characterization of the components and the molecule will performed using 1H and13C NMR, as well as MS, and the luminescence will be examined through fluorescence spectroscopy. Future work will examine the effect of different derivatives of the subunits on the luminescent properties of the molecule.

**Crosslinking Cellulase Enzyme for Post-Enzymatic Recovery**

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

Cellulose and starch are polysaccharides made purely of glucose. They differ primarily in the type of chemical linkages found between the glucose monomers. Cellulase is an enzyme that can break down cellulose from plants to produce free glucose by hydrolytically cleaving these polymers. Few organisms, such as fungi, can digest cellulose because they produce cellulase. The glucose monomers produced by this hydrolysis can be fermented into ethanol. Thus, with the use of this enzyme, cellulose could be used to produce ethanol from plant scraps, such as grass clippings and corn stalks. Using this waste would decrease the impact that ethanol product currently has on food prices. Cellulase is commercially available from Worthington Biochemical. Unfortunately, cellulase is expensive and, with current methods, is difficult to recover after its use. One of the main purposes of this study is to find a way to easily recover the enzyme making it more cost effective to produce cellulosic ethanol. The enzyme is soluble in the reaction mixture and is therefore hard to reclaim after the completion of the reaction. This difficulty can be eliminated by attaching it to a solid material by a process called crosslinking.

**The Design of SPME Fibers Using Thermoresponsive Polymer Nanoparticles**

### Kimberly Clarke (Clinton Jones), Mercyhurst College - Chemistry

Hydrogel nanoparticles (microgels) have been researched for applications in medicine, biomaterials, and analytical techniques. *N*-Isopropylacrylamide (NIPAm) microgels respond to solution temperature changes by changing volume; concomitantly, there is a transition from a hydrophilic to a hydrophobic state with increasing temperature. This property can be used to extract hydrophobic molecules due to favorable interactions between large organic molecules and the hydrophobic polymer. We are currently investigating the application of pNIPAm microgels for use as solid-phase micro-extraction (SPME) fibers. By extracting hydrophobic molecules with such a fiber, analyte extraction could be achieved without the use of large quantities of organic solvent. This would reduce the need for additional organic waste; a consequence of current extraction techniques.

**Determining the Size of Casein Micelles under Acidic Conditions Using Dynamic Light Scattering: A Laboratory Experiment**

Sara Driscoll (Clinton Jones), Mercyhurst College - Chemistry

Dynamic light scattering (DLS), a spectroscopic technique, allows researchers to determine the size of suspended particulate matter in solution within a range of a few nanometers to several micrometers. This technique, widely used in laboratories, is not part of most undergraduate science programs. We developed an experiment that uses DLS to measure the size of protein micelles in bovine milk. Commercially available milk is an emulsion of fat, lipids, and proteins. The dominant colloid found in the milk emulsion is the casein micelle. Casein micelles are composed of α-, β-, and κ- casein surrounding calcium to provide a hydrophilic shell around the hydrophobic calcium. Normally, casein micelles range in size from 0.03 to 0.3 µm in diameter but this can vary depending on pH. A simple filtering procedure isolated the casein micelles from fat globules that interfere with the DLS results. The casein solution was acidified using dilute hydrochloric acid. When the solution pH reached the isoelectric point of 4.6, κ-casein becomes destabilized, causing the α- and β-casein to aggregate around the fat globules becoming visible to the naked eye. This size range of casein micelles is ideal for demonstrating the DLS technique and gives students experience using DLS technology.

**Monitoring the Oxygenation of Blood from Ingesting Wheatgrass Juice during Exercise**

Michele Handzel and Jonathan Sibert (Candee Chambers), Mercyhurst College - Biochemistry

Although wheatgrass juice is believed to act as an ergogenic aid (performance enhancer), little research has been done to prove its credibility. The purpose of this study was to explore one possible mechanism by which wheatgrass juice improves the human body—blood oxygenation. The ability of wheatgrass juice to increase blood oxygen saturation in the human body during exercise was observed via pulse oximetry. Participants ran on a treadmill for 20 minutes at 75-85% intensity, calculated by each participant's heart rate reserve, on two separate occasions. The first session acted as a control and the second session involved the ingestion of 2 ounces of wheatgrass juice 20 minutes prior to exercise.

**Isomerization of Itaconic Anhydride to Citraconic Anhydride by Dimethyl Sulfoxide**

### Kyle Hart (Jack Williams), Mercyhurst College - Chemistry

Citraconic anhydride is a product of increasing demand in industry. It has for several decades formed the subject of much research in order to define the most economical processes for its manufacture. The isomerization of itaconic anhydride to citraconic anhydride has been recorded using amines as a catalyst, or using organic catalysts (pKa between 4 and 10). Dimethyl sulfoxide (DMSO) is an important polar aprotic solvent, and somewhat acidic (pKa=35). To see if DMSO will isomerize itaconic anhydride, spectra of a saturated solution of itaconic anhydride (DMSO, and TMS) were obtained at intervals (immediately, one week, two weeks, and three weeks) on a room temperature sample, which were compared to a control sample without DMSO. The ratio of the concentration of itaconic anhydride to citraconic anhydride gradually increased with respect to time; therefore, a successful partial isomerization was completed with only DMSO in itaconic anhydride. A proposed mechanism closely resembles that for diethyl malonate, which is well documented.

**A Novel Empirical Measurement of Silicon Nitrogen Complex Interaction Energies Using Matrix Isolation Infrared Spectroscopy**

### Frederick Hunziker (Jay Amicangelo), Penn State Behrend, School of Science - Chemistry

Previous research in Dr. Amicangelo’s lab has studied the formation and characterization of silicon- and nitrogen-containing transient species formed by hydrogen lamp photolysis of silane (SiH4) using matrix isolation infrared spectroscopy. The transient species H2SiN2, HSiN2, Si(N2)2, and SiN2, which were trapped in a nitrogen (N2) matrix at 12 K, proved to be unstable at higher temperatures. Therefore, the current project encompasses a new study of the kinetics, and by extrapolation, the energetics of these transient molecules using matrix isolation infrared spectroscopy. After a sufficient deposition period to produce the transient species, the matrix was warmed to a temperature between 20 K and 30 K, where the decompositions of the species listed above have an observable rate. Infrared spectra were then recorded at a consistent time interval for an overall time long enough time to observe several half-lives of the decomposition. The spectral data were analyzed by measuring the peak heights of the specific infrared absorption bands due to each species as a function of time. From the infrared peak heights, the rate constants of the decomposition reactions for each species were determined at several temperatures. H2SiN2 proved to have the largest rate constant, followed by Si(N2)2, then HSiN2, and finally SiN2, which suggests an opposite trend in the complex interaction energies. The activation energies, *Ea*, of the processes were then determined for each species by employing the Arrhenius equation. These energies were then found to compare favorably to theoretical calculations performed using density functional theory at the B3LYP/aug-cc-pVTZ level.

**Investigations of *N*-Isopropylacrylamide Microgel Behavior Based on Co-Polymerization with Allylamine**

Kayla Lincoln (Clinton Jones), Mercyhurst College - Chemistry

The purpose of this study was to monitor volume changes of spherical crosslinked *N*-isopropylacrylamide microgels co-polymerized with allylamine as a function of changes in local solution temperature. The co-polymer, allylamine (AAm), was added at various times after initiation of precipitation polymerization in order to radially localize the AAm co-polymer into individual particles. The thermoresponsive behavior of the microgels was determined *via* dynamic light scattering, where the hydrodynamic radii were obtained at temperatures ranging from 25-60 °C. Microgels containing 0% AAm exhibited a significant change in hydrodynamic radius at approximately 32 °C, whereas the AAm co-polymerized microgels exhibited a proportional change in radius at approximately 34 °C. This is an indication that the allylamine is present and changes the behavior of the microgels. It is hoped that the AAm will allow the microgels to be crosslinked together; however, further testing must be conducted to ensure the presence of allylamine before any crosslinking attempts will take place.

**Preparation and Study of the Optical Properties and Hydrophobicity of Styrene-*co-N-*Isopropylacrylamide Microgel Colloidal Crystals**

Richard Pompei (Clinton Jones) Mercyhurst College - Chemistry

We report on the synthesis and optical properties of thermoresponsive polymer microgels with varying degrees of hydrophobicity. Microgels composed of (styrene-*co*-*N*-isopropylacrylamide) (pSty-*co*-NIPAm) were synthesized *via* temperature-induced free-radical precipitation polymerization in aqueous solution. A control synthesis was performed using a 95% NIPAm and 5% of the crosslinker *N,N’*-methylene(bisacrylamide). During the synthesis, only the molar amount of styrene monomer was varied to adjust the hydrophobicity. Each synthesis was performed under nitrogen gas at 70 ºC, and styrene monomer was added just prior to initiation. The temperature-induced volume change of these particles was investigated using dynamic-light scattering (DLS), exhibiting an increased radius indicating the presence of styrene. Particles were concentrated *via* centrifugation and UV-vis spectroscopy was used to analyze Bragg diffraction exhibited by the resultant colloidal crystals.

### The Photochemical Properties of Acetylfuroin

Michelle Robinson (Naod Kebede), Edinboro University of Pennsylvania, School of Science, Management and Technology - Chemistry

Acetylfuroin is a cyclic structure with photosynthetic properties after exposure to light. Acetyl furoin was synthesized in the lab after researching the appropriate mechanism. The final product was tested for accuracy using TLC plating and Gas Chromatography analysis. Once the acetylfuroin product was identified, a solution of 10E-5M was made using acetonitrile as the solvent. Using a 300 nm UV irradiation reactor, a time-lapse photolysis was recorded over a 30-minute period using a UV spectrometer. A relatively large peak started out around 300nm. As time passed, after each irradiation the peak began to shrink, meaning the photochemical effects of the UV light was changing the acetylfuroin. Off to the left it can be seen that a smaller peak is starting to form as time continues, meaning the acetylfuroin is forming into another compound.

**The Effect of Riping Methods on the Lycopene Concentration of Tomatoes**

Janine- Sade Squire (Marlene Cross), Mercyhurst College - Biochemistry

Lycopene is a carotenoid that is predominantly found in tomatoes but is present in lower concentrations in other red-pigmented fruits and vegetables such as guava and watermelon. Lycopene, known for its strong antioxidant properties, is twice as strong as beta carotene, and has potential health benefits, especially with respect to prostate cancer. Tomatoes are usually subjected to different post-harvest treatments to ensure that quality and appearance are maintained during shipping. To determine if these treatments affect the nutritional value of the fruit, three different varieties of tomatoes were used: Better boy, Health Kick and Black Krim. Tomatoes were grown in a randomized design outdoors. Fruits were tagged and harvested during the same week. They were vine-ripened, shelf-ripened or ethylene-ripened. Ethylene-ripening mimics the method commonly used in commerce. Lycopene was extracted from the fruits and the concentration of lycopene for each treatment was measured using high performance liquid chromatography (HPLC). Lycopene concentration was found to be lower in ethylene-ripened tomatoes than in vine-ripened tomatoes. Ethylene treatment, therefore, may not result in tomatoes with the same health benefits as vine-ripened tomatoes.

### The Chemistry of a High Power Yet Simple Household Electrochemical Cell

Jennifer Taylor, Susmita Patel, Anthonie Campbell, and Robert Dye (Ping Furlan), University of Pittsburgh at Titusville - Chemistry

In a previous study, our students have demonstrated that a high power electrochemical cell can be constructed using household materials including aluminum, copper, table salt and Drano. In this study, we investigate the major cell reactions that are responsible for the high electrical power output the cell provides. The cell reaction is carried out for two hours and the precipitate formed is filtered, washed, dried, and weighed. The amount of aluminum ions formed is determined by employing back titration using EDTA. The amounts of hypochlorite ions and hydroxide ions are determined using a potentiometric titration. The effect of adding hydroxide ions on electric power output is also examined. Possible half-cell reactions are proposed based on the results.

**Spectroscopic Characterization of Brooker’s Merocyanine in Sodium Y**

Jessica VanderWeele (Jennifer Holt), Penn State Behrend, School of Science - Chemistry

Host-guest chemistry allows for the exhibition of new properties by a host molecule with the introduction of a guest molecule. A zeolite-dye system is an example of a host-guest system that has the potential to generate new optical materials for use in non-linear optics or as sensors. Dye molecules have the potential to interact with host zeolites in such a way, allowing the properties of the new material to be controlled. The material that was studied involves a conjugated dye molecule known as Brooker’s merocyanine that is very sensitive to its environment. This dye was inserted into a sodium Y zeolite, which is a silicon-aluminum crystallite that has basket-shaped micropores. The host-guest system was studied by UV/VIS and ATR-FTIR spectroscopy to understand the dye behavior in the zeolite pores, in order to characterize possible dye aggregate formation within the micropores. Results indicate a strong interaction between the dye and zeolite, and unique spectral characteristics for the host-guest system. The dimer structure and geometry of the dye was also characterized using a mathematical molecular modeling program called Gaussian and compared to spectroscopic features.

### Patterning and Shaping Materials through Soft Lithography

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

Soft lithography is a collective name for a group of fabrication techniques for patterning and shaping materials that make use of a patterned elastomer as a mask, stamp, or mold. Compared to the conversional fabrication photolithography, soft lithography is rapid, low-cost, and versatile and will find increased applications in all areas of science and engineering. In this report, we investigate how different experimental factors affect the self-assembly of material building blocks, such as polyaniline nanofibers, into forming desired structures or the creation of predetermined patterns on the surfaces of materials, such as polycaprolactone, using various soft lithography techniques. While lightweight and conductive polyaniline nanofibers can find applications in nanoelectronics, low melting point polycaprolactone can be used to demonstrate surface patterning techniques for creating functional nanodevices.

## COMPUTER SCIENCE, ENGINEERING, AND ENGINEERING TECHNOLOGY

**Graphical Authentication Password System**Richard Anderson and Jeffrey Karstaedt (Gary Walker), Penn State Behrend, School of Science - Computer Science

Currently, password entry on most portable computing devices is accomplished using a series of text characters. With the complexity and power of mobile technology increasing, a new style of authentication system can take advantage of popular modern hardware configurations. We created a new graphic-based authentication mechanism, which incorporates the touch screens that are built into these devices. The authentication procedure has the user click a series of points on a background picture of their choice. The underlying algorithm for authentication is based on the angle and distance of each point in relation to the first point. It also uses a ratio system to allow for the user to scale the password. This allows the user the ability to change the resolution without having to recreate the password. This security scheme creates an intuitive authentication system for these devices. The user no longer has to click letters, which should decrease the chance of an observer easily spotting the password.

**Two-Dimensional Heat Conduction Simulated through Electrical Potential to Illustrate Principles of Heat Transfer**

Timothy Demetrio (Bob Edwards), Penn State Behrend, School of Engineering - Mechanical Engineering Technology

An important principle in heat transfer is that of two-dimensional heat conduction. However, this concept is difficult to visualize, and difficult to measure using traditional temperature-measuring devices. A relationship between Fourier’s Law of heat flow and Ohm’s law of current flow exists in which a voltage potential through a medium is proportional to a temperature gradient through the same material. This project uses that relationship to create a visual representation of two-dimensional heat flow through a medium. A voltage difference is much less affected by surrounding temperatures and air currents, which makes it much easier to measure than surface temperature. Test apparatus was built and tested in order to provide proof of concept. Multiple configurations were adapted to allow representation of various heat application types. A laboratory exercise was then created to be used by heat transfer classes. This simple exercise offers an accurate representation of two-dimensional heat conduction, yet remains simple to set up, operate, and is generally independent of surrounding conditions.

### Modeling of Electrostatic Fringe Fields and Misalignment Effects

Laura DeWalt (Oladipo Onipede), Penn State Behrend, School of Engineering - Mechanical Engineering

Many microelectromechanical (MEMS) devices, such as comb drives are driven using electrostatic forces. The standard way of calculating the electrostatic force produced is based on computing the capacitance between two parallel plates while ignoring the fringing fields produced at the sides and ends of the plates. This is generally a good assumption as long as the surfaces remain parallel and the distance between them is small when compared to the overall dimensions. The parallel-plate model also does not account for misalignment of the comb drives which would cause the force to be higher depending on the amount of misalignment. The numerical method that will be discussed includes both the contribution to the capacitance of the fringing fields and the effects of misalignment on the electrostatic force. To properly drive and control the comb drive, it is important that the proper driving voltage is predicted and applied. If there is an error in the predicted driving voltage, the system may not function as desired. A better understanding of the capacitance of the comb drive will allow a more accurate prediction of the driving voltage and pull-in voltages, which could lead to more robust and accurate designs of comb drives.

**Graph Algorithm Visualizer**

Christopher Hoffman and Jack Horst (Gary Walker), Penn State Behrend, School of Science - Computer Science

The Graph Algorithm Visualizer was designed as an aide to teach graph and algorithm theory. Users can visually learn how and why algorithms work on various graphs through animations. The Graph Algorithm Visualizer allows a user to create a two-dimensional graph of nodes and edges. Several graph algorithms can be executed upon the created graph. The system ensures the graph meets the requirements of the selected algorithm. The algorithms are animated to show the graph as it is altered by the step-by-step process. Detailed information about the algorithm and important statistics are provided during this process.

**Development of a Photographic-Based Method for Analyzing Spinnaker Shapes**

Kyle Markwardt (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

Research is currently being performed on computer simulations to predict the flying geometries of spinnakers. However, the simulation results need to be compared to experimental data. The purpose of this research was to develop an effective method for measuring the position of a spinnaker model. The method chosen was to arrange two cameras at known positions from a defined origin to take simultaneous pictures of the spinnaker from different angles. Then, using the two 2-D pictures, the 3-D location of any point in both photos could be determined. Because of the space available in the testing area, it was not practical to arrange the cameras orthogonally, which would yield the best results and simplest solution. Instead a more generalized relation between the pictures and true position was derived, making camera positioning more versatile. The results will be compared to other experimental data collected through a mechanical probe, which is being designed by another student.

**Development of a Mechanical Device for Sail Model Geometry Analysis**Ken Matsushita (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

Much research has already been done to determine the forces on a sail of a known solid shape. Unfortunately the aero-elastic nature of spinnaker sails causes the shape and forces acting on the sail to be co-dependent; that is, the force depends on the shape and the shape depends on the force. The purpose of this research was to develop a method for determining the final shape of a spinnaker in flight. A sail model was previously constructed to simulate the adjustable rigging on a sail boat as well as its associated spinnaker. Two possible methods were considered to obtain the coordinate points on the spinnaker; a mathematical model based on photographic techniques and a mechanical probe. This research pursued development of the mechanical probe. In developing the probe, a number of concerns were addressed, such as ensuring that the probe did not disturb the sail while in flight and that the probe itself was not disturbed by vortex shedding. Other considerations were probe lifespan and accuracy. The measurements themselves are accurate to within 0.1 mm, and this accuracy includes any deflections seen by the probe while in use.

### Statistical Arbitrage Investing

David Miller, Tim Herzog, and Tom Zajac (Joseph Previte and Ronald DelPorto), Penn State Behrend, School of Science - Computer Science

Statistical arbitrage techniques have been applied to the stock market for many years with mixed results. Our project involves Bayesian Theory with a goal of returning a profit on 60% of trades. Our computer-based, data-collection system will track high liquidity stocks and store data every second. After data collection, we will model the data using mathematical theory. Our system displays the accumulated data to serve as a graphical output that allows users to analyze stock market behavior.

**A More Efficient Model for Computing the Stability of Square-Rigged Vessels**

Daniel Syiek (William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

The U. S. Brig Niagara is a historical square-rigged sailing vessel. In order to keep the vessel afloat, the wind speed that might knock it over must be taken into account. By using a CFD analysis program and focusing on the foresails, their respective bracing angles, and the apparent wind angle, simulations are being performed that output the lift force on the sails as well as the drag force. Using these forces, the side-force coefficients for the fore sails are being calculated. Covering the full range of apparent wind angles and bracing angles, the side-force coefficients for the fore topsail alone have already been calculated. Following this, the foretopgallant sail was recently added to the model. Analysis of the data acquired so far is that the side-force coefficients on the foretopsail are not altered by a significant amount with the addition of the foretopgallant sail for the smallest and largest set of apparent wind angles. There is a noticeable variation in side-force coefficients for the fore topsail at the mid-range apparent wind angles. As more simulations are performed more side-force coefficients will be calculated. The ultimate objective of the research will be to be able to select an appropriate side-force coefficient for a particular combination of sails, apparent wind angle, and sail-bracing angles in order to prevent the Niagara from being blown over by the wind.

**Multi-threaded Modeling of Amorphous Materials**

Joseph Synowka (Blair Tuttle and Ronald McCarty), Penn State Behrend, School of Science - Computer Science

Simple amorphous materials can be modeled using Continuous-Random-Networks. These models are generated using modified versions of the Wooten, Winer, and Weaire (WWW)algorithm. Improvements to the WWW algorithm have allowed for the simulation of models containing several thousand atoms. Ms. Alicia Klinvex wrote software that models amorphous materials using a modified WWW algorithm under the supervision of Dr. Blair Tuttle and Mr. Ronald McCarty. This software adequately handles systems of low complexity, but fails to model systems with greater complexity. The purpose of this research was to expand the functionality of the Klinvex software package. This software package is now multi-threaded and capable of modeling more complex interactions between elements. Also added to this software are new bonding algorithms and the capability of animation of the heating and cooling of a model.

**Determining the Stability of the *Pride of Baltimore II***

Diana Tinlin(William Lasher), Penn State Behrend, School of Engineering - Mechanical Engineering

Previous research has shown the possibility of developing a simpler model for determining the side forces of a traditionally rigged sailing vessel, the *Pride of Baltimore II,* by developing equations for the lift and drag coefficients. Because many factors affect the side force, this is not a useful way to determine the side-force coefficient. From this previous research, it was shown that as the apparent wind angle (AWA) increases, the side-force coefficient for the jib topsail decreases drastically compared to the other sails. Many factors could have caused this, such as the changing of the camber of the sails or the interaction experienced from the other sails. From this research, it has been shown that the lift vector becomes more vertical as the AWA increases which in turn causes the side-force coefficient to decrease. To determine the reasons why the coefficient decreases, the camber of the sails was changed in order to see its effect. It is yet to be determined how the interaction between sails could have a role on the coefficient. The side-force coefficient was determined by running computational fluid dynamic (CFD) simulations which provided lift and drag data for the sail being analyzed.

## PHILOSOPHY

### Steps to Achieve a Smoking Ban on Campus

Melinda Jo Anderson (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

Research shows that environmental tobacco smoke, or second-hand smoke, causes cancer, irritates asthma, and can cause respiratory infections. Approximately 126 million non-smokers in the United States are exposed to at least 250 known toxic chemicals, 50 of which are cancer causing. I propose to give a poster presentation in which I will make a case for a smoking ban at Penn State Erie, The Behrend College. More specifically, my presentation discusses two points. First, I draw on a variety of sources—such as medical reports and interviews with public health officials—to make a case for the need for a smoking ban at Penn State Behrend. Second, I report on the research I have collected on the steps students would need to take to enact a smoking at Penn State Behrend as well as alternative proposals for dealing with second-hand smoke should a ban be impossible for students to achieve.

**When did Morals Equate to Religion?**

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

A few decades ago John F. Kennedy had to promise the American people that his religion, Catholicism, would not get in the way of running the country. Today, President Obama continually reminds Americans that he is a Christian, and yet, despite his assurances, some Americans did not vote for him because they still believed that he is a Muslim. Nowadays, it seems, Americans expect their president to be a Christian, or, at the very least, that religion play a new role in American politics. Randell Balmer argues in Thy Kingdom Come that Americans today rely on religion to determine whether politicians have moral integrity. My research questions this tendency to equate morality with religion. I argue that there is no significant connection between a person’s moral integrity and their religiosity. Religion is not a sufficient condition for being a morally good person. (One can be religious yet still perform unethical actions, such as holy bombings.) Nor is it a necessary condition for being morally good. (One can be a caring, compassionate person but not believe in God.) My research critically evaluates the role that religion has come to play in American politics.

**Can Science-Based Sex Education Lower Teen Pregnancy in Erie, PA?**

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

Within the School District of the City of Erie, the Student Parenting Program reported in 2007-2008 that there were no fewer than 117 live births by students in grades 7 through 12. Shockingly, children as young as 11 and 12 years old were responsible for some of these births. Currently the Erie school district does not offer a science-based sex education class to prevent teen pregnancy or risky behaviors that lead to teen pregnancy. My research questions whether science-based sex education classes can lower teen pregnancy rates in the School District of the City of Erie. I argue that a science-based program would help reduce teen pregnancy by comparing the Union City School District’s Modern Living Program, which has a sex education component, with the School District of the City of Erie’s Mother and Father Incentive Program, a program for teen mothers and fathers.

**Re-Defining Socio-Cultural Norms: Breaking through the Myths of Gender**

Jared Lindenberger, Kariann Yori, and Michael Nick (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

Various factors influence how young men and women construct their beliefs, particularly their beliefs about gender. Many of the messages about gender that they receive from the media and from their peers can have a harmful effect on them. Young women are encouraged to base their self-esteem on whether they are sexually attractive, while young men are encouraged to think that emotions, beside anger, are not masculine. A disproportionate number of these messages about sexuality, responsibility, and self-identity are harmful to adolescents by promoting teen pregnancy, the spread of STDs, sexual violence against women, and parental abandonment. This project addresses this crisis by teaching adolescents how to think critically about gender messages found in the mainstream media. We propose to give a poster presentation in which we will report on a workshop we have developed for both young women as well as young men. Our workshop teaches teens how to analyze media depictions of gender, and about how these depictions affect each sex differently, through an age-appropriate presentation and a series of instructor-led group discussions.

### Skepticism and Stereotyping

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

Philosophic skepticism argues that everyone is locked into their own perspective and therefore unable to understand another person’s perspective. The skeptic concludes that it is impossible to prove any general philosophic truths because one can never step outside of one’s own personal perspective. Skepticism has been dismissed as an impractical philosophy and way of life – one that cannot be used to solve real-world ethics dilemmas. However, my research shows how skepticism can be applied to ethics. To do this, I show how skepticism can be used to explain why stereotyping is morally wrong. For example, the skeptic would critique stereotyping on the grounds that seeing one act in a certain way gives no proof to the motivations of those actions and that there is no grounds to assume that a similar person would act in a similar way. Of course, it is widely accepted that discrimination based on stereotyping is wrong for more obvious ethical reasons. Nonetheless, my aim is to show that the skepticism can be used to solve ethical dilemmas by demonstrating that it helps us identify less obvious reasons for being concerned about stereotyping.

**The Ethics of Smoking and Practical Implementation of a Campuswide Smoking Ban**

Neil Rufenacht, Leah Benjamin, and Kyle Molloy (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

The 1964 Surgeon’s General Report established the negative effects of smoking on health. Due to increasing pressure over the past few years, it is becoming common for colleges to implement smoking bans. In this study, a cumulative analysis of the smoking issue was completed, including a summary of the ethical implications of smoking, legal cases related to the issue, and proposed solutions to the smoking dilemma. We show that a complete smoking ban on campus is the only ethical solution and include the steps needed to implement a smoking ban on the Penn State Behrend campus. Statistical data will be included that show the acceptability of such a policy by Penn State Behrend students and faculty members. Contact information will be presented for Erie organizations willing to help implement a campuswide smoking ban. The contents of this study will be kept in the Student Government Office for future reference.

**Raising Awareness of Sexually Transmitted Diseases and Providing Contraceptives**

Katie Shrock and Adam Nero (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

Recent interviews with the Penn State Behrend Health and Wellness Center revealed that the major health problem on campus is the spread of sexually transmitted diseases (STDs). Our research focuses on factors that contribute to this health problem. More specifically, it identifies these factors in order to develop effective projects for resolving it. We propose to give a poster presentation on two such projects. One factor that contributes to the spread of STDs is lack of condoms. Our first project involves returning condom machines to campus. A second factor is lack of awareness about how easy it is to obtain an STD. Our second project is a workshop we have developed that raises awareness of this issue—one that we are in the process of instituting as a mandatory workshop for Resident Assistants working in first-year halls to do once a year during a sexually active awareness month.

### Understanding the Anonymities of Addiction

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

So far two major schools of thought have dominated discussions about addiction in ethics, philosophy, and psychology.  One says that addiction is purely physical.  The other says that addiction is purely psychological and social.  According to this second school of thought, a college student who uses a so-called addictive substance may be less likely to become addicted to it than someone living in poverty even though the substances possess the same physical properties. My research attempts to find an alternative to these two extreme views by posing a basic question: What is addiction?  I argue in my presentation that the above views err in the conclusions they draw about addiction because they do not define clearly enough what constitutes addiction itself.  My research draws on writings from both philosophy and psychology to develop a definition of addiction that allows me to assess the extent to which it is physical, the extent to which it is social, and to draw more informed conclusions about the ethical dilemmas raised by addiction.

**Smoking Culture: How Education Can Decrease the Amount of Smokers**

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

Prohibitions on tobacco are often defended on the grounds that tobacco must be regulated because it is physically addictive. My research analyses smoking rates in Asian countries to determine the extent to which smoking is more of a cultural phenomenon and to assess whether regulation is the best way to address the problem of smoking. Asian countries have among the highest percentages of smokers, and smoking rates are rising in some of them, especially China. These facts raise a question about what role cultural influences play in smoking. My research compares data on smoking in Asian countries to data on smoking in the United States to argue that smoking is primarily a cultural phenomenon instead of a physical dependency. I draw on this research to assess whether prohibitions are the most effective way to reduce smoking. Based on my research, I argue that education on smoking is a more effective way to reduce smoking than prohibitions or regulation of tobacco.

**Cutting Costs for Medical Expenses**

Nicole Weisenbach, Joe Johnson, Mike Johnson, and Breanna Williams (Joshua Shaw), Penn State Behrend, School of Humanities and Social Sciences - Philosophy

As of 2006, 16% of Americans were uninsured and for over half of those people the reason was cost. Our economy has dropped dramatically since then and more and more people are unable to pay costly medical bills even if they are insured. Our research addresses this crisis by identifying two areas where average Americans can reduce their medical expenses. First, many Americans are unaware of the variety of opportunities available to them to reduce medical expenses such as hospital visits. Second, many do not take advantage of services that reduce the costs of prescription drugs. For example there are prescription discount cards that can help someone save up to an average of 39% off the retail price. These cards, however, are infrequently used. Based on our research, we have developed a pair of pamphlets that give Americans the information they need to take advantage of these opportunities and services. We propose to give a poster presentation in which we share our findings.

## PSYCHOLOGY AND SOCIOLOGY

**Does the Brain Hear The Truth? Prosody and Detection of Sarcasm**

LaSheena Barnes, Danielle Wilson, Paris Norwood, and Jesse Eisert (Victoria Kazmerski and Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Sarcasm is commonly used but little understood. Individuals often signal sarcastic intent by changing the prosody, intonation, vowel length, and stress patterns of their voices. The process of understanding sarcasm is complex and involves many factors including inference making and attitude and intention assessment. In the current study, we used event-related brain potentials (ERPs) to examine the processing of words spoken in either a sarcastic or sincere prosody. Participants were asked to listen to a series of words and determine if each was sarcastic or sincere. Even small differences in ERP readings indicate that sarcastic and sincere prosody are processed differently. Data collected so far indicate that there are distinct differences in ERP readings for sarcastic and sincere prosody especially noted around 1000 ms. Earlier work suggested that relationally aggressive individuals process sarcasm differently. We believe that there may be individual differences in sensitivity to sarcastic prosody between those with higher and lower relational aggression, which we will examine upon continuation of the study.

### Tattoos and their Social Side Effects

Tim Campbell (Kathleen Mastrian), Penn State Shenango - Sociology

The study will attempt to uncover what side effects a tattoo may have and how tattoos may affect a person socially. This study is not only for those looking for a tattoo but those who do not want or have one. The researcher’s goal is to help inform everyone how tattoos are perceived and how they may affect a person’s career and social standing. This study is important to society because it shows how people perceive those with tattoos and the potential problems that arise with them. Also this study may help everyone develop a better understanding about why tattoos are popular and how to approach this subject in a more understanding way. The results of this study may help people make a more informed and intelligent decision about tattoos. The researcher plans to interview 20 participants. The researcher anticipates a wide variety of ages from 18 to 99. The researcher will strive for an equal representation of gender and ethnic backgrounds. The health status of the participant is not a consideration for participation in the study.

### The Visualization Project: Game Development and Outreach

Kaylee Curilla1, Jessica Schubert1, James Hodge1, Danielle Wilson1, Janice Jerome1, Neil Rufenacht1, Ashley Martin1, Terra Carrier1, Erin Bliley2, Aurora Blasko Drabik, Jon Alquist2, Sid Carson2, and Marika Whiting1 (1Dawn Blasko, 2Kathryn Holliday-Darr, and 1Jennifer Trich Kremer), Penn State Behrend, 1School of Humanities and Social Sciences and 2School of Engineering - Psychology

Interdisciplinary teams of psychology and engineering students developed games in order to improve spatial skills. For example, in one game we devised an outdoor Spatial Mystery game. We also developed a spatial jeopardy game encompassing such categories as mental rotation, spatial perception, and spatial visualization. These games and activities were used with two populations, high school women and minorities who attended a short-term summer training program, and college students intending to major in engineering that were enrolled in the first-year graphics course. The college students participated in a 1-credit supplemental course focusing on spatial skill development where they completed visualization software, workbook problems and hands-on spatial games. The results from both studies showed improvement from pre-test to post-test on some component of spatial skills. We will discuss the pattern of improvement for the groups and make suggestions for developing more effective training.

**Children’s Influence on Parental Spending**

Todd Dunlap (Kathleen Mastrian), Penn State Shenango - Sociology

Today, children seem to be wielding a large portion of the decision-making power in the American family. Significant evidence suggests that the children in the family have more spending power than the average person would think. The purpose of this study is to explore the influence children have on parental spending. As part of the rust belt of America, the Shenango Valley offers a unique parental demographic that might be impervious to the suggestive powers of children. The hypothesis is that because the rust belt portion is depressed, due to the void left when the steel industry moved, parents do not give as many choices to their children as the rest of the country. The beneficiaries of this study are sociologists, marketing companies, and parents.

### The Effect of Text Messaging on Driving Performance

Jesse Eisert and Melissa Punk (Victoria Kazmerski and Jennifer Trich Kremer), Penn State Behrend, School of Humanities and Social Sciences - Psychology

Prior research has established that talking on any type of cell phone while driving significantly impairs driving performance. With the increase in car technologies people are partaking in more activities that could cause driver distractions, which can in turn cause a decrease in driving safety. Our research examined the effects of text messaging on driver performance. We tested to see if text messaging caused significantly more impairment than driving while using a hand-held cell phone. We used the videogame Gran Turismo 5 Prologue on the Playstation 3 to test for driving performance with lead vehicle. We found that text messaging caused significantly more impairment than talking on a cell phone while driving and put the driver at a greater risk for accidents.

**The Influence of Cultural and Video-Game Experience on Spatial Task Performance**

Luis Fernandez and Jessica Schubert (Dawn Blasko), Penn State Behrend, School of Humanities and Social Sciences - Psychology

This study investigated how video game experience and cultural background influence spatial performance. Participants completed two versions of the MRT, a water level task, and a spatial attention task. Participants completed surveys assessing individual levels of gaming experience, and collectivistic versus individualistic perspectives. We hypothesized that the gamers will perform both faster and more accurately than non-gamers on all of the spatial tasks. We also believe that those participants belonging to the collectivistic culture will perform better and faster at the Uniform Field Of Vision (UFOV) task. If these results are established, this study could have implications for the need to train spatial skills, as well as provide insight into the factors which influence spatial ability.

### Media and Body Image

Tracy Hughes (Kathleen Mastrian), Penn State Shenango - Sociology

Why is body image so important to females? Mainstream media, such as television, movies, magazines, and the Internet, is one of the most important ways that we communicate, represent, and interpret the world around us. The media purposes an ideal body image through advertisements. Body image is or can be an important issue to women in general. Through the media this has brought on a struggle for women who deal with the issues of dissatisfaction related to body image. A previous research study demonstrated that exposure of thin media models had a negative effect on women’s body image. The current qualitative study extends previous research by examining women's perception of their body image and the influence that media images of women have on that perception. The data will be analyzed looking for themes and patterns that emerge about the influence of media on body image. The results of this study might help women to realize the potential manipulation of the media and the media's influence on body image.

**School Features and their Influence on Learning: Taking a Look at Green Kids**

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

Students who are in a “green school” are surrounded on a daily basis by environmentally friendly features. Therefore their environment is very enhancing to their learning experience. Comprehending an educational lesson not only depends on how the lesson is taught, it also depends on the environment in which the students are in. It is critical to students’ learning to be in an engaging learning environment. After teaching an environmental lesson and testing children’s knowledge, we hypothesized that students would perform higher on the material taught through direct instruction aided by a stimulating environment, opposed to simply learning through the average environment, but that they would do better on the information in the environment than material not present at all. Students answered bioswale and school questions significantly better than control questions. Our hypothesis was not supported when a non-significant result was found between the bioswale questions and the school questions; however it was supported in that the children performed better on material taught through direct instruction than all of the other forms of instruction.

**Making Silk Purses Out of Sows’ Ears: An Investigation of Inattention by Undergraduate Research Pool Participants**

Derek McKay, Jillian Mrozowski, and Amanda Tyler (Eric Corty), Penn State Behrend, School of Humanities and Social Sciences - Psychology

In this study, we investigated the quality of data provided by undergraduate research participants. The concern revolved around the idea that students in the research participation pool may not provide reliable data, either because they are inattentive or unmotivated. Researchers first administered a tedious task to bore participants. The participants were then left alone to complete a long (240 item) personality measure. A briefer personality measure was then administered face-to-face, as well as a measure of need for cognition. Data will be analyzed by splitting participants into two groups based on how much time it took to complete the 240-item personality measure and reasons for wishing to participate in the study. Correlations comparing the two personality measures will be calculated for each group. Results should indicate a difference between the correlations for the two groups.

**The Roles of Maternal Warmth and the 40 Developmental Assets as Resilience Factors in Children Witnesses of Domestic Violence**

Derek McKay, Jillian Mrozowski, and Amanda Tyler (Carl Kallgren), Penn State Behrend, School of Humanities and Social Sciences - Psychology

In this study, we attempted to replicate previous research in which the role of maternal warmth was found to be a possible resilience factor in children witnesses of domestic violence. We extended the research to include the 40 Developmental Assets. The Assets are positive experiences and qualities that help influence choices young people make and help them become caring, responsible adults. We hypothesized that the more assets a child possesses, the less negative behaviors they will exhibit. Research participants included a pair of one parent who had been a victim of domestic violence and one child who witnessed this violence. Those who did not fall in this category were placed in the control group. Children were asked to fill out a measure of the 40 Developmental Assets created by the researchers. Parents were asked to fill out the Conflict Tactics Scale, the Child Behavior Checklist, and the Parent Behavior Inventory. Data will be analyzed by examining scores from the measures within both the experimental and control group. Correlations will be made between the number of assets a child possesses, maternal warmth, and the number of externalizing and internalizing behaviors the child exhibits. Results should indicate a replication of previous research.

### Superstitions and Pregnancy

Alexandra Nagel (Kathleen Mastrian), Penn State Shenango - Sociology

If a woman during her pregnancy reveals that she is expecting before the first three months have passed, is this considered bad luck? Should a pregnant woman stay out of the sun so the baby does not get too hot? These are a few examples out of many superstitions that have been passed down from each generation to the next due to unavailability of information, or honest mistakes in reasoning. Some people believe these superstitions or “old wives tales” to be true in certain cultures or religions. The purpose of this study is to explore the many superstitions of pregnancy, the origins of these beliefs, and the behaviors associated with these beliefs. The researcher will use both qualitative and quantitative methodology to study this phenomenon. The data and research collected may be of interest for women who are pregnant, who plan to be pregnant, or for women in general who are interested in superstitions during pregnancy.

### Physiological Effects of Relational Aggression

Amie Pittner1,2 (Heather Jones1 and Charisse Nixon2), Penn State Behrend, 1School of Science and 2School of Humanities and Social Sciences - Psychology

The purpose of this study was to determine the physiological changes which occur when subjects are exposed to different types of aggression, specifically examining gender differences. Relational aggression includes actions that are designed to damage or threaten a relationship such as exclusion, rumor spreading, and ignoring someone. Whereas, physical aggression is the act of force against another person with the intent to injure the person and can include tripping, punching, kicking, and hair pulling. To perform the study, subjects were connected to electrocardiograph, respiratory, and galvanic skin monitors. A series of visual stimuli showing both physical and relational aggression in addition to passive control stimuli were watched while the physiological responses were recorded. Beta testing of nine subjects showed that heart rate and respiratory rate increased during scenes showing relational aggression in female subjects. Male subjects did not show major changes during the video stimuli. The galvanic skin recordings showed little change during the relational aggression clips, but increased from baseline during the physical aggression. These results suggest that subjects, specifically females, demonstrate physiological changes indicative of stress when exposed to relational aggression. Further studies will examine cortisol levels in subjects during video stimuli to examine more closely the stress responses caused by relational aggression.

**Usability Evaluation and Redesign of a College Alumni Web Site**

Neil Rufenacht and Justin Amrhein (Jennifer Trich Kremer), Penn State Behrend, School of Humanities and Social Sciences - Psychology

For this project, the Web site for the Lake Erie Chapter of the Penn State Alumni Association was evaluated. An updated design of the site was created based on human factors design principles. A usability survey was developed and administered to a sample of Penn State students and alumni. Based on the results of the usability survey, the Web site will be redesigned to maximize customer usability and satisfaction. All design changes will be implemented by the end of the spring 2009 semester. It is predicted that the new design will be perceived more positively by the organization and potential new alumni.

### Perception of NCLB Act of 2001

William Shollenberger (Kathleen Mastrian), Penn State Shenango - Sociology

The No Child Left Behind Act was signed into law in 2001 by the President of the United States, George W. Bush. This act’s main purpose was to improve the academic performance of primary and secondary schools. The NCLB ties primary and secondary school funding to the adoption of very specific programs such as phonics, phonic awareness, vocabulary, fluency, and comprehension. The purpose of this qualitative study is to examine the perceptions of how teachers and students perceive the NCLB act, and the effects of the act on their teaching and on the students’ learning. The potential benefit of this study is to increase awareness of the consequences and conflicts associated with the NCLB.