

Undergraduate Research at the Capitol - Pennsylvania



Tuesday, October 20th, 2009

**East Wing
Rotunda and Atrium**



October 20, 2009

Dear Friends:

Welcome to the fifth semi-annual **Undergraduate Research at the Capitol – Pennsylvania** poster conference. The knowledge and skills gained in college last a lifetime and spread benefits far beyond the individual. Nothing illustrates the importance of a college education more powerfully than the innovative and significant research projects presented in this conference.

The analytical skills and artistic talent that went into these undergraduate projects is a tribute to the caliber of students that attend Pennsylvania's colleges and universities and a reflection of the dedication, professionalism and care of the faculty who mentored these students.

Few things bode more favorably for the future of economic growth and cultural enrichment in the Commonwealth than the prospect of these students graduating and moving on to take their place as informed citizens.

Sincerely,

KEITH R. McCALL

The Speaker

122nd Legislative District

Undergraduate Research at the Capitol - Pennsylvania

Undergraduate Research at the Capitol - Pennsylvania is a poster conference that showcases outstanding and award-winning research projects by undergraduate students from Pennsylvania. The event provides an opportunity to bring together college students, faculty and Pennsylvania legislators and staff to share the experiences of students engaged in research or scholarship at their colleges and universities.

The event has two goals: To demonstrate that participating in research as an undergraduate is important to the educational development of college students; and to show that undergraduate students can produce important and valuable research results that enrich the knowledge, cultural heritage and economic well-being of our communities, our state and our nation.

The URC-PA website is:

<http://www.widener.edu/urc-pa/default.asp>

Organizers

Co-Chairs

David Dunbar, Cabrini College

Terry Winegar, Susquehanna University

Organizing Committee

Pavel Azalov, Penn State Hazleton

Lee Coates, Allegheny College

Dave Coughlin, Widener University

Joseph Grabowski, University of Pittsburgh

Christina Van Buskirk, Dickinson College

Stephanie Wallach, Carnegie Mellon University

Former Lead Organizer

Carl Salter, Moravian College

URC-PA Website Administrator

Dave Coughlin, Widener University

Additional Support

Office of the Speaker of the House of Representatives

Jeanne Schmedlen, Director of Special Projects and Chief of Protocol

Pennsylvania Association of Colleges and Universities (PACU)

Susanne Walker, Administrative Officer

Association of Independent Colleges and Universities (AICUP)

Mary Young, Vice President of Government Relations

Legislative Office for Research Liaison (LORL)

Mike King, Executive Director

Colette Fazzolari, Administrator

Barb Stone, Copy Editor

Institution Index and Poster Location

Albright College	14
Allegheny College	11, 26
Cabrini College	1, 7
Carnegie Mellon University	8, 24
Dickinson College	4, 9
Keystone College	3
Moravian College	2, 10
Muhlenberg College	27
Pennsylvania State University, Berks College	7
Pennsylvania State University	6, 12, 16, 20
Saint Vincent College	15
Saint Francis University	25
Susquehanna University	13, 21
University of Pittsburgh	5, 17, 22
Villanova University	18
Waynesburg University	19
York College of Pennsylvania	23

Author Index (Institution) and Poster Location

Allen, Brett L. (University of Pittsburgh)	5
Amchin, Arielle (The Pennsylvania State University)	6
Bair, J. Ryan (Saint Francis University)	25
Barnes, Tedesha (Susquehanna University)	13
Boyer, Morgan (Pennsylvania State University, Berks College)	7
Brown, Amanda K. (The Pennsylvania State University)	12
Carey, Paula (Allegheny College)	26
D'Alessandro, Lara (Cabrini College)	7
Daniels, Lisa (York College of Pennsylvania)	23
Donaghue, Adrienne (Villanova University)	18
Dretel, Cynthia (Moravian College and Theological Seminary)	2
Galinato, Charity (York College of Pennsylvania)	23
Greeno, Emily (University of Pittsburgh)	17
Harbold, Deneen (York College of Pennsylvania)	23
Hartz, Erica (Dickinson College)	4
Holsopple, Kerri (Waynesburg University)	19
Kantor, Ellen (University of Pittsburgh)	22
Keddie, Matthew (University of Pittsburgh)	5
Laux, Jillian (Dickinson College)	9
Lewis, Dana (Cabrini College)	7
McDonough, Colleen (The Pennsylvania State University)	16
Miller, Morgan (Cabrini College)	1
Nobles, Jonathan (Saint Vincent College)	15
Ondeck, Abigail (Carnegie Mellon University)	8
Ottalagano, Dana (Susquehanna University)	13
Rinaldi, Paul (The Pennsylvania State University)	6
Rohrbach, Valerie (The University of Pennsylvania)	20
Rukat, Mitchell (The Pennsylvania State University)	6
Ryu, KyungJoo (University of Pittsburgh)	17
Smith, Peter (The Pennsylvania State University)	6
Stalneck, Clint (Albright College)	14
Stanley, Heather (Cabrini College)	7
Stoker, Matthew (Susquehanna University)	21
Straus, Elizabeth (Allegheny College)	26
Trunzo, Ali (Allegheny College)	26
Verespy, Stephen (Keystone College)	3
Walton, Elise (Carnegie Mellon University)	24
Wayman, Sandra (Allegheny College)	11
Wright, Meredith (Moravian College)	10
Zehner, Tiffany (Muhlenberg College)	27
Zueger, Joshua (University of Pittsburgh)	17

BANNING YouTube: TRENDS IN GLOBAL CYBER-CENSORSHIP

Authors: *Morgan Miller, Dr. Janice Hau Xu*

Advisor: Dr. Janice Hua Xu

Institution: Cabrini College
Communications Department

Through comparative analysis of recent cases involving restriction of YouTube access in China, US, Thailand, Iran, Pakistan and Turkey, the study offers a global perspective to Internet censorship practices and different motives behind the policies. The researcher uses a content analysis method by reviewing major newspaper stories and news wire reports from 2007 to 2009, accessed primarily through the LexisNexis database. The total amount of articles is estimated around 150-200. Cases in different countries were coded by 1) lengths and forms of restriction, 2) reasons offered by authorities, 3) references to past censorship practices, 4) response of internet users. The author finds that a majority of the blocking, whether the reasoning was given outright or hinted at, is in relation to politics, though “other” option can often times stand for a cover-up for the real reason, which typically falls under one of the listed categories of political, cultural or religious.

Research Sponsor: SEPCHE

SCHOLARLY EDITIONS OF 18TH-CENTURY SACRED MUSIC FROM THE ARCHIVES OF EPHRATA CLOISTER AND THE MORAVIAN MUSIC FOUNDATION

Author: *Cynthia Dretel*

Advisor: Dr. Hilde Binford

Institution: Moravian College and Theological Seminary
Music Department

In 2009, I created modern performance editions of music for two 18th-century Pennsylvania religious communities: the Moravians and Ephrata Cloister. Working from manuscripts in the archival holdings at the Moravian Music Foundation and the Ephrata Cloister, I copied the music, transposed the instruments and voice parts, recreated parts where sections of music were missing, corrected mistakes and searched for discrepancies if there were multiple copies of the same part.

For the music of the Ephrata Cloister, I transcribed and edited 45 hymns found in the hymnbook of Conrad Beissel, the founder and leader of the Ephrata Cloister, an early Pietistic community in 18th-century Pennsylvania. The poster will feature two hymns, in full score form, in both manuscript and modern score form.

For the music of the Moravians, I created scholarly editions of four anthems by Moravian composer Johann Friedrich Peter. The anthems were written for a church choir and orchestra. The poster will feature a voice part and an instrumental part from two of the anthems and the first page of the modern score.

MODIFICATION OF GENTAMICIN'S STRUCTURE PROVIDES A NEWLY DERIVED ANTIBIOTIC

Author: *Stephen Verespy*

Advisors: Dr. Vicki Stanavitch, Dr. Christopher Bianca

Institution: Keystone College
Natural Science and Mathematics Department

This research focuses primarily on the antibiotic Gentamicin which is found in many ophthalmic drops, topical creams, ointments, and intravenous/intramuscular injections. The purpose of this particular research is to modify and combat bacterial resistance to this specific drug. The Gentamicin molecule will be subjected to several chemical reactions, ultimately resulting in the addition of a protease inhibitor substrate (N-Benzoyl-L-tyrosine ethyl ester) by means of regioselective Mitsunobu esterification. This mechanism specifically targets the low steric hindrance functional hydroxyl group on the third ring structure of the molecule yielding a semi-synthetic structure. To confirm positive regioselectivity, the product of the reactions will be analyzed by means of Liquid Chromatography/Mass Spectroscopy (LC/MS) and Fourier Transform-Infrared Spectroscopy (FT-IR). This allows for a qualitative and quantitative view of the empirical results. Once the product is analyzed, bacterial studies will be performed by subjecting *E. coli* and Gentamicin-resistant *E. coli* to the newly modified drug. If successful and the Gentamicin-resistant *E. coli* are affected by the drug, further studies to test the hypothesis will be quantified. This includes protein extraction, western-blot analysis of enzymes which cause drug inactivation, and extraction and isolation of the rRNA of the bacterial cells.

BIOSYNTHESIS AND CHARACTERIZATION OF NOVEL Au NANOPARTICLES

Author: *Erica Hartz*

Advisor: Dr. Sarah K. St. Angelo

Institution: Dickinson College
Chemistry Department

This project consists of the synthesis and characterization of Au nanoparticles as prepared by a “green” method, using a plant-based reducing agent: ginkgo leaf extract. By combining 1.00 mM HAuCl₄ with the ginkgo leaf extract in a 9:1 ratio, unique Au particle shapes, such as square-planar cubic and triangular particles, form as a result of a reduction reaction. A variety of particle syntheses conducted above and below room temperature will be discussed. Additionally, the effects of microwave radiation on the synthesis will be explored. Particles will be analyzed via UV-visible- near-infrared (UV-vis-NIR) spectroscopy. Scanning Electron Microscopy (SEM) will be used to visualize particles and determine the average sizes and populations of various particle shapes. Trends in particle sizes and populations with respect to temperature along with comparison of ambient and microwave conditions will be determined through SEM and UV-vis-NIR analyses.

TAILORING THE VOLUMETRIC PARAMETERS OF NITROGEN-DOPED CARBON NANOTUBE CUPS

Author: *Matthew Keddie, Brett L. Allen*

Advisor: Alexander Star

Institution: University of Pittsburgh
Department of Chemistry

The synthesis of nitrogen-doped carbon nanotube cups through chemical vapor deposition (CVD) has created an intriguing form of carbon nanostructures with potentially useful applications in energy and medicine. By performing CVD with iron catalyst, ethanol, and a nitrogen source of acetonitrile, graphitic multiwalled structures are synthesized in a “stacked-cup” conformation, capable of separation through mechanical grinding. Additionally, the presence of a nitrogen precursor during growth results in numerous nitrogen functionalities as an intrinsic characteristic of nanocups. We have observed through scanning electron microscopy (SEM), transmission electron microscopy (TEM), and atomic force microscopy (AFM) that the diameter of such nanostructures is contingent upon a proportional catalytic nanoparticle diameter. Furthermore, segment length appears to be heavily influenced by nitrogen concentration. Based upon these principles, we have tailored the physical parameters of individual segments through the controlled synthesis of monodispersed diameter distributions of iron nanoparticles. Additional work will be performed to increase the control of volumetric parameters by nitrogen doping. This work serves as a foundation for understanding and controlling the growth mechanism of a novel nanomaterial for engineered systems, such as storage media and biomedical applications.

Research Sponsor: National Energy Technology Laboratory

SEARCH ENGINE MARKETING FOR ECONOMIC AND WORKFORCE DEPLOYMENT FOR SMBs IN PENNSYLVANIA

Authors: *Arielle Amchin, Peter Smith, Mitchell Rukat, Paul Rinaldi, Dr. Jim Jansen*

Advisor: Dr. Jim Jansen

Institution: The Pennsylvania State University
College of Information Sciences and Technology

This undergraduate student research project is an eight-month long economic and workforce deployment effort to leverage keyword marketing involving four small to medium size businesses (SMBs) in Pennsylvania. The project uses search engine keyword advertising to expand the potential customer base for these businesses and to increase their ability to compete in the online marketplace. The students leading this research project leverage knowledge gained in a keyword marketing course, tying the classroom to the real world. In addition to development and implementation, there is a training component to transition the advertising campaign from the students to the SMB at the conclusion of the project. The educational component helps ensure long term viability of the program. This research venture is funded by a \$25,000 Penn State Outreach Grant, and three of the SMBs are members of the Penn State Technical Assistance Program, tying the university to the local community.

Research Sponsor: Penn State Outreach

SMALL SUBUNIT RIBOSOME GENE DIVERGENCE IN *HALOSIMPLEX CARLSBADENSE* IS AN ADAPTATION TO DIFFERENT GROWTH CONDITIONS

Authors: *Dana Lewis, Heather Stanley, Lara D'Alessandro,
Morgan Boyer**

Advisors: Dr. David A. Dunbar, Dr. Tami Mysliwiec*

Institutions: Cabrini College
Science Department

*The Pennsylvania State University, Berks College
Science Division

Halosimplex carlsbadense is a halophilic archaeon that was isolated from a 250 million year old salt crystal from the Salado formation in New Mexico. This rod shaped gram-negative obligate aerobe lacks the ability to grow on complex media. Previous growth studies have shown that *H. carlsbadense* is unable to use carbohydrates, amino-acids, fats or nucleic acids as a source for energy production. The inability to use these molecules as nutrients suggests two possibilities; either that *H. carlsbadense* possesses novel catabolic pathways or lacks membrane transport enzymes necessary to utilize such substrates. A detailed growth curve analysis was performed in order to gain more insight into the basic biology and to compare the growth characteristics of *H. carlsbadense* to that of other halophilic microorganisms. *H. carlsbadense* was grown in a defined glycerol-acetate medium containing 25% NaCl with a pH of 7.4. Results from these studies indicate optimal growth characteristics similar to that of other members of the Halobacteriaceae family. In addition to the unique biochemistry of *H. carlsbadense*, this organism displays unique molecular characteristics. *H. carlsbadense* has two divergent 16S rRNA genes A and C. Reverse-transcriptase (RT)-PCR experiments were performed demonstrating expression of both genes A and C. Interestingly, under ideal salt conditions, gene A is preferentially expressed but under altered salt conditions, gene C is preferentially expressed.

SHAPE AND SIZE CONTROLLED SYNTHESIS NANOPARTICULATE CATALYSTS: PATHS TO AN ECOLOGICALLY-FRIENDLY ENVIRONMENT

Author: *Abigail Ondeck*

Advisor: Dr. Nisha Shukla

Institution: Carnegie Mellon University
Department of Chemical Engineering
Institute of Complex Engineered Systems

Nanotechnology has many different applications in the science world. This area of study has been used to create new medicines and improve electronics. A new branch of nanotechnology has been discovered pertaining to nanoparticulate catalysts. When creating a catalyst, the surface area to volume ratio should be high, allowing reactions to occur faster on the surface of the catalyst or help us to use smaller quantities. Nanoparticulate catalysts, with a typical diameter of 10 to 100 nanometers in diameter, are the solution to the perfect catalysts because they allow for a large surface area to volume ration. The goal of this project is to generate and determine which materials at a certain controlled shape and size produce the best catalysts in reactions. An example of how nanoparticulate catalysts have been applied in real day situations is the improvement in the efficiency of hydrogen fuel-cell vehicles. Also gold nanoparticulate catalysts have been produced to clean exhaust at temperatures less than 200°C. With continued research and development in this area, nanoparticulate catalysts will be used to form a more ecologically friendly environment.

Research Sponsor: Intel Corporation through a grant to Carnegie Mellon University

IDENTITY FORMATION AND THE FOREIGN EXCHANGE EXPERIENCE

Author: *Jillian Laux*

Advisor: Dr. Kristine Mitchell

Institution: Dickinson College
Department of Political Science

Is it possible for the citizens of the European Union's (EU) member states to think of themselves as not only citizens of their respective countries, but also as European? This research project addresses this question by focusing on the following topics: why is identity important for the EU, how has education been involved in the process of identity formation, and most specifically, to what extent does the Erasmus program facilitate the formation of European identity. It is hypothesized that studying abroad in an EU country, through the Erasmus program, influences these students to identify themselves with the European Union and its diverse people. Conversely, non-Erasmus students are less likely to view themselves as European. In order to test these hypotheses, a survey in English and French was created and was sent by email to Erasmus and non-Erasmus students studying at five main universities in Toulouse, France, during the period from January to May 2009. By turning from theoretical discussion to concrete analysis, this research intends to test the strength of three factors, which are believed to help create a European identity among students enrolled in an Erasmus program, and their overall effect on the European community.

ANNOTATED BIBLIOGRAPHY OF THE PALMERTON ZINC SUPERFUND SITE AND THE LEHIGH GAP IN PENNSYLVANIA

Author: *Meredith Wright*

Advisors: Dr. Diane Husic, Dan Kunkle*

Institutions: Moravian College
Biological Sciences/Environmental Studies

*Lehigh Gap Nature Center

For over 80 years, the New Jersey Zinc Company operated two smelting facilities at the base of Blue Mountain in Palmerton, Pennsylvania. During their time of operation, neither adequate pollution control technology nor air quality regulations were in place, so the smelting operations filled the atmosphere with pollutants, including sulfur dioxide and various heavy metals, primarily zinc, lead, and cadmium. As a result, the land around Palmerton was highly contaminated, vegetation along the Kittatinny Ridge was lost, and the ecosystem was destroyed. In 1983, this 2,000-3,000 acre area was placed on the National Priorities List, and designated the Palmerton Zinc Pile Superfund Site. Preliminary restoration work was only partially successful. In 2002, a group of citizen volunteers purchased 756 acres of land within the Superfund site and received approval to try revegetation efforts with warm season (prairie) grasses. The site, now known as the Lehigh Gap Nature Center and Wildlife Refuge, has received state and national acclaim for these revitalization efforts, and is a thriving center for conservation, education, recreation, and ecological research (www.lgnc.org).

The historical significance of the Lehigh Gap and River and the amazing story of resilience and restoration have all resulted in reams of documents – none of which had been previously cataloged. The goal of this project was to create an annotated bibliography to serve as a resource for various audiences. The searchable bibliography, created with the software Reference Manager®, includes close to 500 different references, including federal reports, abstracts, journal articles, books, theses, websites, fact sheets, magazines, newspaper articles, PowerPoint presentations, letters, videos, maps, photographs, and more.

Research Sponsor: Moravian College and the Lehigh Gap Nature Center

THE SECRET UNDERGROUND LIFE OF SWITCHGRASS: EXPLORING BELOWGROUND PROCESSES

Authors: *Sandra Wayman, Dr. Richard Bowden*

Advisor: Dr. Richard Bowden

Institution: Allegheny College
Environmental Science Department

Switchgrass (*Panicum virgatum*) is a native perennial prairie grass with great potential for alternative energy production as biofuel and biomass. Compared with corn, which is traditionally used for ethanol production, switchgrass can be much more efficient. This research examines two beneficial belowground processes in switchgrass: nitrogen retranslocation and carbon sequestration. Nitrogen retranslocation is the recycling of nitrogen between the shoots and the roots for the next growing season. We aim to calculate the fertilizer savings gained from nitrogen retranslocation and determine if it is economically better to harvest in the spring or fall. We will also compare nitrogen concentrations in different plant tissues. The second belowground benefit of switchgrass is the amount of carbon sequestered in the soil. Our study of belowground carbon found a 1:1 ratio of aboveground biomass to belowground biomass in switchgrass. We determined the concentration of carbon belowground and calculated its carbon-trading value per acre. The goal of these projects is to maximize the sustainability of switchgrass production.

Research Sponsor: Ernst Conservation Seeds

PASSIVE REMEDIATION OF “HIGH RISK” ACID MINE DRAINAGE USING CRAB SHELL CHITIN AS A SUBSTRATE AMENDMENT

Authors: *Amanda K. Brown, Dr. Rachel A. Brennan*

Advisors: Dr. Rachel A. Brennan

Institution: The Pennsylvania State University
The College of Engineering, Civil Engineering

Roughly 2000 miles of Pennsylvania streams are contaminated with acid mine drainage (AMD), causing an estimated annual loss of \$93 million in state revenue. Although passive treatment wetlands offer a low cost alternative for treating these discharges, recent guidelines from the Pennsylvania Department of Environmental Protection (PA DEP) indicate that they often fail when treating “high risk” AMD containing net acidity and high metal loading due to clogging with metal precipitate. Traditionally, spent mushroom compost (SMC) is used as the substrate in these systems; however, recent laboratory and field studies indicate that the sustainable waste product, crab shell chitin, is highly effective at boosting alkalinity while simultaneously reducing sulfate and dissolved metals. In side-by-side field trials treating moderately strong AMD, crab shell chitin has not clogged with yellow boy ($\text{Fe}(\text{OH})_3$), while other substrates have. This study evaluated the performance of crab shell chitin for treating high risk water both on its own, and as a lower cost, fractional amendment to SMC. This presentation will highlight the results of this 50-day laboratory experiment, which indicate that substrate ratios containing >30% chitin perform equal to or better than the traditional SMC and limestone with respect to alkalinity addition and metals removal.

Research Sponsor: National Science Foundation

PERCEIVED VERSUS ACTUAL CHEATING: DIFFERENCES BY DEMOGRAPHICS

Authors: *Tedesha Barnes, Dana Ottalagano, Dr. Barbara Lewis*

Advisor: Dr. Barbara Lewis

Institution: Susquehanna University
Psychology Department

The main purpose of this research was to examine the relationship between perceptions of cheating and actual academic dishonesty and to compare student and faculty perceptions of cheating and of actual cheating behavior. Another purpose was to compare members versus non-members of various campus organizations on these variables. Seventy-nine students from psychology classes and sixteen faculty members from a variety of departments participated in this study. Students completed a demographic questionnaire, a perception of cheating survey, and an actual cheating survey. Faculty completed a demographic questionnaire and the same perception of cheating survey that students completed. Students and faculty differed significantly in their perceptions of cheating and in their views about actual cheating behavior. Faculty were much stricter in their determination of what constitutes cheating than were the students. Members of athletic teams, Greek organizations, and religious groups also were stricter about defining cheating; the fact that members of these groups cheated less supports the claim that perceptions of what constitutes cheating influence cheating behavior. This conclusion suggests that anti-cheating programs should include a strong educational component.

AN INVESTIGATIVE STUDY OF β AND γ - CYCLODEXTRIN INCLUSION COMPLEXES USING COMPUTATIONAL AND SPECTROSCOPIC METHODS

Authors: *Clint Stalnecker; Jeffrey P. Wolbach, PhD*

Advisors: Jeffrey P. Wolbach, PhD; Pamela G. Artz, PhD

Institution: Albright College
Chemistry and Biochemistry Department

Three cyclodextrins (β -cyclodextrin, 2,6-O-methyl- β -cyclodextrin and γ -cyclodextrin) were explored as encapsulating agents for small hydrophobic molecules. Inclusion complexes were investigated computationally and with NMR spectroscopy. Cyclodextrins are cyclic oligosaccharides formed from various numbers of α -D-glucopyranoside subunits. The cyclodextrins used in this study consisted of seven (β -cyclodextrin and 2,6-O-methyl- β -cyclodextrin) or eight (γ -cyclodextrin) subunits. The cyclodextrins were the "host" molecules for the inclusion complexes, and the "guest" molecules investigated were vitamin K1, vitamin K3, caffeine, benzene, and benzoic acid. The complexation energies of the inclusion complexes were calculated using the ONIOM method of the Gaussian 03' software. The ONIOM method has the advantage of allowing the host molecule, which is relatively larger than the guest, to be treated with a different model chemistry than the guest molecule enabling the computations to be conducted in a reasonable amount of time. The chemical shift dispersion method and the Nuclear Overhauser Effect (NOE) were utilized to analyze the physical samples of the host-guest complex. The trend of complex energies obtained from the computations revealed that the smaller molecules were more favorable to complex except in one case. The experimental results were deemed inconclusive due to solubility issues and lack of significant chemical shift dispersion.

Research Sponsor: Albright Creative Research Experience

ESTABLISHING IN VITRO CULTURE SYSTEMS FOR SCREENING COMPOUNDS THAT CAN PROMOTE OPTIC NERVE REGENERATION

Author: *Johnathan Nobles; Oljora Rezhdo; * Zheng-Zheng Bao, PhD**

Advisor: Bruce Bethke, PhD

Institution: Saint Vincent College
Biology Department

*University of Massachusetts Medical School
Department of Medicine and Cell Biology

Nervous system injuries affect over 90,000 people each year. It is estimated that spinal cord injuries alone affect 10,000 each year. There is currently no treatment for recovering human nerve function after injury to the central nervous system. Therefore, creating in vitro culture systems by which to screen compounds for regenerative capabilities is of great importance in determining the underlying mechanisms that make nerve regeneration possible. This was achieved utilizing retinal ganglion cells derived from *Rattus Norvegicus* in cell culture and exposing them to different compounds for several days. This study has found evidence suggesting that the compound SK 1009 stimulates neuroregeneration via significantly increasing the lengths of RGC neurites in addition to the percentage of cells with neurites. A concentration dependent study was also performed which indicated that 3mM SK 1009 produces the greatest amount of nerve regeneration in a simple and well-controlled method that can be used to screen factors that promote nerve regeneration.

THEATRE OF DECAY

Authors: *Colleen McDonough; Ute Poerschke, PhD*

Advisors: Ute Poerschke, PhD; Robert Keal; Scott Wing

Institution: The Pennsylvania State University
The College of Arts and Architecture

The program for this competition is the insertion of an experimental theater on the site of the vacant Bethlehem Steel Plant blast furnace in Bethlehem, Pennsylvania. Concrete masonry (“concrete block”) is stipulated by the program sponsors as the primary building material for design research and experimentation. Research objectives include new means of deploying concrete masonry and incorporating the blast furnace and its history into the building. The walls are composed of recycled concrete masonry units and windows mirroring the standard dimensions of concrete block. Long, rectangular windows are inserted into masonry walls making transparent “voids” marking the absence of concrete block. The glass voids suggest the aging and erosion of the Bethlehem Steel Plant. The resulting transparent walls and symbols of erosion merge nature with the manmade artifact of the blast furnace. The theater embraces the decay of the blast furnace while seeking a balance between new and old. The main stage lies under a canopy of hollowed-out furnaces. Several ancillary stages levitate above the surrounding structural truss systems. The result amplifies the perception of the individual building elements composing the stage, referring back to the existing blast furnace that precisely exhibits each element of its intricate assembly of parts.

EWOD-PROPELLED ROBOT POWERED WIRELESSLY BY INDUCTIVE COUPLING

Authors: *Joshua Zueger, KyungJoo Ryu, Emily Greeno, SangKug Chung*

Advisors: SangKug Chung, SungKwon Cho

Institution: University of Pittsburgh
Swanson School of Engineering
Department of Mechanical Engineering and Materials Science

With the recent discoveries in the field of electrowetting-on-dielectric (EWOD), miniaturized autonomous swimming robots are on the horizon with applications for environmental monitoring and bio-sensing/surgery and drug delivery inside the human body. To date, three separate EWOD propulsion mechanisms have been proposed and tested for swimming and floating robots. However, the previous experiments with these devices typically used wired power supplies or demonstrated a limited distance of propulsion. In order to facilitate total freedom of movement for swimming or floating robots, a new propulsion mechanism using EWOD actuated oscillating bubbles is integrated with a wireless power system. Key contributions in this paper are as follows: (1) we designed and realized a wireless power transmission system that specifically meets the requirements of EWOD actuation (high voltage (> 60 V) at low frequency (< 100 Hz)); (2) we achieved wireless EWOD operations with droplets and bubbles, including the wireless propulsion of a centimeter-scale boat.

Research Sponsor: National Science Foundation Grants
ECCS-0601470/0725525 and CMMI-0730460

QUANTITATIVE PCR TO ACCESS PATHOGENS IN GOOSE CREEK

Author: *Adrienne Donaghue*

Advisors: Dr. John Komlos, Dr. Metin Duran

Institution: Villanova University
Civil and Environmental Engineering

Fecal contamination poses a major threat to the quality of water that serves as the source for drinking water and recreational facilities. Microbial pollution stems from a variety of sources including leaking septic systems, sewage overflows, agricultural runoff, and wildlife. An innovative method has recently been developed called Microbial Source Tracking (MST) which can determine the source of fecal bacteria by matching specific microbes from a polluted site to an animal source. MST is significant in that it pinpoints the specific host of these pathogens using molecular microbiology. Identification and distribution of microbial pollution can aid in making mitigation of the issue easier and economical. The premise of this project was based on previous publications that explored and validated 16s rRNA based assays from the order *Bacteroidales* to differentiate between the sources of fecal contamination. A human specific assay was used along with quantitative PCR (q-PCR), a technique that rapidly amplifies and quantifies trace amounts of DNA, to amplify human fecal pollution in Goose Creek, a major tributary of the Chester Creek water shed. Results proved the human assay having 100% efficiency. The assay also amplified human specific PCR product in the most densely microbial populated urban sample site which was determined via traditional plate count analysis for fecal coliform concentrations.

Research Sponsor: Villanova University Undergraduate Program

PARTICLE CIRCULATION IN SPOUTED FLUIDIZED BEDS

Author: *Kerri Holsopple*

Advisor: Dr. Jack Halow

Institution: Waynesburg University
Chemistry Department

This project utilizes an innovative magnetic particle tracking method to determine the motion of particles in a spouted fluidized bed. Spouted fluidized beds are widely used in drying, coating, and processing granular solids including grains, coffee beans, chemical fertilizers, pharmaceuticals, and other products. When a stream of air is passed through layers of particles, they are forced upward through the surface of the bed in a stream that resembles a spout from which the term spouted bed arises. The tracking method uses a small neodymium magnet embedded in a polymer placed in the particle bed. As it moves around in the bed with the other bed particles, its position and motion is detected with external magnetic field detectors. By tracing the motion of the magnetic particle in this way, it was possible to calculate the recirculation rate of the particles of interest. Data was collected as the tracer followed the movement of the bulk of the particles. An autocorrelation of the vertical position data was calculated and a recirculation rate determined. Recirculation rates were determined for a variety of particles of various densities and sizes and for a range of airflow rates. A correlation of the recirculation rates was developed.

Research Sponsor: Center for Research and Economic Development, Waynesburg University

FACING THE PAST TO CREATE A BETTER FUTURE: TRANSITIONAL JUSTICE AND DEMOCRACY

Author: *Valerie Rohrbach*

Advisor: Gretchen Casper, PhD

Institution: The Pennsylvania State University
The College of the Liberal Arts, Political Science Department

During a transition from a cruel autocratic regime to a democracy, societies often face the dilemma of how to finally confront the atrocities committed by the outgoing regime. In the latter half of the twentieth century, transitional justice tools such as human rights trials and truth commissions have been increasingly used to accomplish this task. This study seeks to empirically determine whether these transitional justice tools actually succeed in helping a society transition towards democracy. By building a dataset that includes over 100 countries that have used transitional justice mechanisms, I quantitatively determined the relationship between transitional justice and democracy. Furthermore, this study examines the specific stories of several countries' attempts at facing the human rights violations of the past in order to discover why and how exactly these tools help a society – or fail to do so.

WATER SUPPLY FOR MONROE MARKETPLACE AT HUMMELS WHARF, PENNSYLVANIA, AND CONCERNS ABOUT WATER-DEPLETION IN RESIDENTIAL WELLS

Author: *Matthew Stoker*

Advisor: Dr. Ahmed Lachhab

Institution: Susquehanna University
Earth and Environmental Sciences

A newly built 750,000 ft² Monroe Marketplace Plaza, in Shamokin Dam, Pennsylvania, has raised concern among residents after hearing about the high rate of two pumping wells which might cause water level drawdown in their wells. Several domestic wells around the pumping well have been selected and monitored since March 2008. The hydrology and a geological cross-section of this area have been investigated and developed. Given this information the problem can be solved in several ways; theoretically, through modeling and data collection. While a year and half of water level data collection can alone gave us an insight on the situation of the groundwater, this data was actually implemented to confirm and validate the previous two approaches. The aquifer was found to be unconfined implying the validity to use the Neumann and Witherspoon theoretical equation to calculate the drawdown caused by the pumping wells. GMS7.0 was used to construct a model of the aquifer using different hydraulic conductivities while calibrating to actual data. Initially a 20-foot drop was observed since measurements started. Analyses have showed that the pumping wells are the cause for the early water level drops. However, given the time, the high value of the aquifer specific yield and the climatic condition of this area, the aquifer has readjusted to the new hydrological arrangement which appears to overcome the drawdown gradually.

HAPTOGLOBIN GENOTYPE AND MORTALITY AFTER SUBARACHNOID HEMORRHAGE

Authors: *Ellen Kantor, SN; Yvette P. Conley, PhD; Dianxu Ren, MD, PhD; Hulya Bayir, MD;* J. Javier Provencio, MD;† Elizabeth A. Crago, MSN, RN; Michael Horowitz, MD;* Sheila A. Alexander, RN, PhD*

Advisors: Sheila A. Alexander, RN, PhD

Institution: University of Pittsburgh School of Nursing

*University of Pittsburgh

†Neuroinflammation Research Center, Cleveland Clinic, Ohio

Background: Haptoglobin binds hemoglobin, thereby inhibiting free radical production. It is presumed that haptoglobin $\alpha 2$ - $\alpha 2$ genotype is associated with worse functional outcome after aSAH related to its isoform's weaker affinity for hemoglobin binding.

Objective: The objective is to describe the relationship between haptoglobin genotype and functional outcome three months after aSAH.

Methods: A total of 192 subjects age 18-75 with a diagnosis of aSAH, Fisher Grade ≥ 2 , DNA and outcome data available and without pre-existing chronic neurologic disease/deficit were enrolled into an ongoing study (NR004339). Demographic and medical condition variables were extracted from medical records. Modified Rankin Score (MRS) was assessed at three months after hemorrhage. Data analysis included univariate analysis as well as multivariate logistic regression, controlling for covariates including age, sex, and severity of hemorrhage (Fisher grade).

Results: The sample was primarily female (n=137; 71.4%) with a mean age of 54.44 years old. The study was limited to Caucasians due to significant allele frequency differences noted between Caucasians and non-Caucasians and the insufficient sample size in non-Caucasians. Haptoglobin genotype was not significantly correlated with mortality, as defined by a MRS of six neither with univariate analysis (p=.40) nor after controlling for covariates (p=.50).

Conclusions: Haptoglobin genotype is not a significant predictor of mortality after aSAH. Further work should explore genetic variations in haptoglobin alleles related to recovery from aSAH.

BEST PRACTICE FOR EYE CARE IN THE SEDATED ICU PATIENT

Authors: *Lisa Daniels, Charity Galinato, Deneen Harbold*

Advisor: Karen S. March, PhD, RN

Institution: York College of Pennsylvania
Department of Nursing

The purpose of this evidence-based practice project was to review evidence supporting specific eye care protocols as best practice for care of the sedated patient in the intensive care unit (ICU). Critically ill, sedated ICU patients are vulnerable to developing eye complications due to the effects of sedative medications, mechanical ventilation, and muscle relaxants. These patients do not have control over normal protective mechanisms (opening and closing the eyelids) because of the effects of intravenous sedation and muscle relaxants. The blink reflex is rendered ineffective and eyelids often do not fully close. As a result, the eye becomes dry and is less than fully protected. Some of these eye complications may have devastating long-term effects for the patient. Evidence suggests that some attempts have been made to promote standardized eye care for intensive care patients. A number of eye care protocols and products have been tested with varying results. It is important for ICU nursing staff to utilize evidence-based practice in providing eye care to these patients to reduce the incidence of serious eye complications. Further evidence is needed in this area before a consensus can be made about best practice.

ART AS A MEDIATOR: BRINGING SUSTAINABLE SOLUTIONS TO URBAN COMMUNITIES

Author: *Elise Walton*

Advisor: Bob Bingham, MFA

Institution: Carnegie Mellon University
Fine Art Department

Installed on a community center in Wilkinsburg, Pennsylvania, my design project aims to find environmentally sound, inexpensive, and aesthetically pleasing ways to collect and use rainwater. The larger goals are to help raise the awareness of residents in Wilkinsburg regarding serious erosion in their community from flooding caused by poor infrastructure design. The installation offers ways that residents can combat the problems by utilizing rainwater.

The system that I have designed channels water across the house, down a rain chain, and into window boxes with chambers to store water and hydrate the plants. In addition to showing many different ways rainwater can be rerouted and retained the installation is easy for others to make.

Part of the goal for this project is to introduce local residents to sustainable living techniques. The project findings will be presented at the Hamnett Homestead Sustainable Living Center. A pamphlet demonstrating how to make different components of the installation will be published. Finally, workshops teaching people how to make rain chains will be conducted.

Research Sponsor: Undergraduate Research Office, Carnegie Mellon University

A PILOT STUDY INVESTIGATING THE EFFECTS OF EXERCISE INTENSITY ON INTRAVASCULAR HEMOLYSIS IN DISTANCE RUNNERS

Authors: *J. Ryan Bair; Patricia Fitzgerald, PhD; Stephen LoRusso, PhD*

Advisor: Patricia Fitzgerald, PhD

Institution: Saint Francis University
Department of Physical Therapy

Purpose: The purpose of this pilot study was to quantify the effects of increased exercise intensity on intravascular hemolysis as measured by changes in haptoglobin concentration in distance runners.

Methods: Four male distance runners and four female distance runners participated in the study. Three of the male runners completed 20-minute treadmill runs at 65% and 85% VO₂max; three of the female runners completed a 20-minute treadmill run at 65% VO₂max. Hemoglobin, hematocrit, haptoglobin, plasma free hemoglobin, and plasma lactic acid concentrations were assayed in blood samples drawn via venipuncture before, immediately after, and one hour after exercise.

Results: Decreases in haptoglobin concentrations were observed in both male and female distance runners, but analysis of variance tests revealed no time, intensity or gender effects (all $p > 0.10$). Although greater decreases in haptoglobin concentration were observed one hour post exercise when compared to pre-exercise values in the male 85% vs 65% group, Mann-Whitney non-parametric analysis revealed this difference is not significant ($p > 0.10$).

Conclusion: Although there were changes in haptoglobin concentrations in the expected direction, the changes were not significant. This result may of course be due to the small sample size, but regardless, these data fail to confirm that treadmill runs of increasing intensity results in intravascular hemolysis in these groups of subjects.

Research Sponsor: Saint Francis University Undergraduate Research Development Grant

FOREST EDUCATION FOR HIGH SCHOOL STUDENTS

Authors: *Ali Trunzo, Paula Carey, Elizabeth Straus,
Dr. Richard Bowden, Dr. Terrence Bensel*

Advisor: Dr. Richard Bowden

Institution: Allegheny College
Environmental Science

Educating the next generation of forest landowners is critical to maintaining the economic and ecological value of Pennsylvania's forests. We are preparing high school forest science modules to educate students on forest resource issues of critical concern to forest landowners. Modules will include topics on forest growth and measurement, air pollution and climate change, pests and invasive species, wildlife and forest interactions, and sustainable forest management. Designed to provide a hands-on experience, each module consists of common forestry and scientific equipment, topic-specific teaching aids, and one or more curricular activities that encourage thoughtful investigation. These modules will be available on loan to teachers at six locations across the state, ensuring that learning occurs in a local setting. We tested four of the modules' educational effectiveness and found a significant increase in knowledge, as well as a general appreciation for accomplishing a meaningful study outside the classroom. For example, students gave an average score of 3.6 out of 5 when asked what level of understanding they felt they gained. Teaching future landowners about sustainable forest management will help to ensure that this valuable resource remains an important part of our state's economy while continuing to provide invaluable natural services.

Research Sponsor: Rees Charitable Foundation, Center for Economic and Environmental Development, Wild Resource Conservation Program

PHYLOGENETICS OF THE NR2E NUCLEAR RECEPTORS

Author: *Tiffany Zehner*

Advisors: Dr. Bruce Wightman, Dr. Elizabeth McCain

Institution: Muhlenberg College
Biology Department

The production of proteins requires the interaction of other proteins, called nuclear receptors, which bind to DNA. The NR2E subclass of nuclear receptors is conserved from jellyfish to vertebrates. Family members such as *tailless* and *fax-1* have been shown to function in nervous system development and body patterning. Phylogenetic analysis identifies at least three major clades of NR2E-related nuclear receptors: the NR2E1/2 clade, which includes *nhr-67* and *tailless*; the NR2E3/5 clade, which includes *fax-1* and PNR; and a new group that includes *nhr-239* of *Caenorhabditis* and related genes in insects and the echinoderm *Strongylocentrotus*. The existence of a possible *nhr-239* ortholog in both protostomes and deuterostomes suggests that this class could have an ancient origin. The DNA binding domain of NR2E nuclear receptors is the most highly conserved domain. Due to the level of conservation within the DNA binding domains, I am using degenerate PCR to recover NR2E orthologs from mollusks and annelids in order to study the relationship of Lophotrochozoan nuclear receptors to the known vertebrate and Ecdysozoan genes. Real time PCR will be used to determine the level of expression of each gene in a mollusk and annelid. This work is supported by a grant from the NSF.

Research Sponsor: NSF

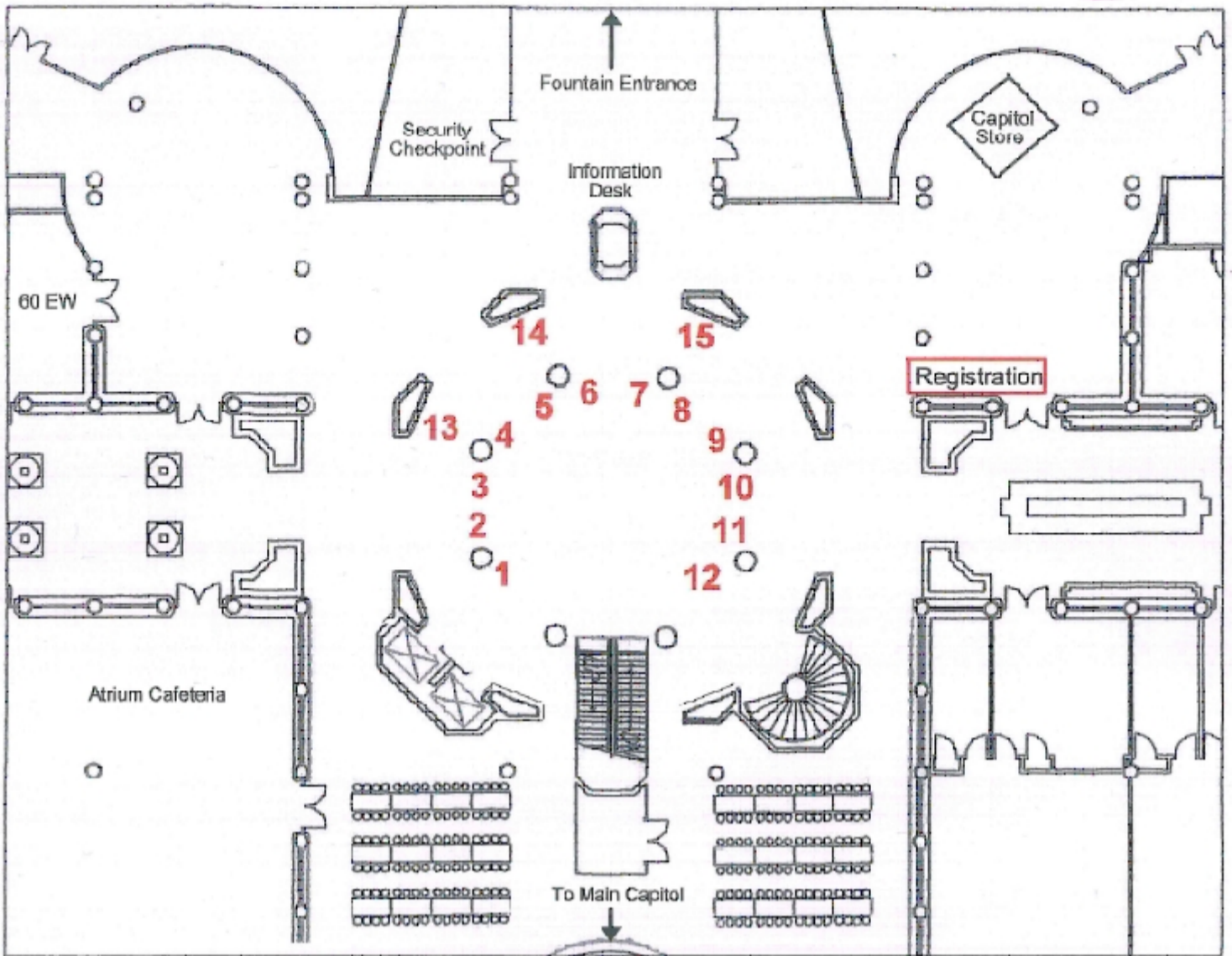
Title Index and Poster Location

Banning YouTube: Trends in Global Cyber-Censorship	1
Scholarly Editions of 18th-Century Sacred Music from the Archives of Ephrata Cloister and the Moravian Music Foundation	2
Modification of Gentamicin's Structure Provides a Newly Derived Antibiotic ..	3
Biosynthesis and Characterization of Novel Au Nanoparticles	4
Tailoring the Volumetric Parameters of Nitrogen-Doped Carbon Nanotube Cups	5
Search Engine Marketing for Economic and Workforce Deployment for SMBs in Pennsylvania	6
Small Subunit Ribosome Gene Divergence in Halosimplex Carlsbadense Is an Adaptation to Different Growth Conditions	7
Shape and Size Controlled Synthesis Nanoparticulate Catalysts: Paths to an Ecologically-Friendly Environment	8
Identity Formation and the Foreign Exchange Experience	9
Annotated Bibliography of the Palmerton Zinc Superfund Site and the Lehigh Gap in Pennsylvania	10
The Secret Underground Life of Switchgrass: Exploring Belowground Processes	11
Passive Remediation of "High Risk" Acid Mine Drainage Using Crab Shell Chitin as a Substrate Amendment	12
Perceived Versus Actual Cheating: Differences by Demographics	13
An Investigative Study of β and γ -Cyclodextrin Inclusion Complexes Using Computational and Spectroscopic Methods	14
Establishing in Vitro Culture Systems for Screening Compounds That Can Promote Optic Nerve Regeneration	15
Theatre of Decay	16
EWOD-Propelled Robot Powered Wirelessly by Inductive Coupling	17
Quantitative PCR to Access Pathogens in Goose Creek	18
Particle Circulation in Spouted Fluidized Beds	19

Title Index and Poster Location, Continued

Facing the Past to Create a Better Future: Transitional Justice and Democracy	20
Water Supply for Monroe Marketplace at Hummels Wharf, Pennsylvania, and Concerns About Water-Depletion in Residential Wells	21
Haptoglobin Genotype and Mortality After Subarachnoid Hemorrhage	22
Best Practice for Eye Care in the Sedated ICU Patient	23
Art as a Mediator: Bringing Sustainable Solutions to Urban Communities ..	24
A Pilot Study Investigating the Effects of Exercise Intensity on Intravascular Hemolysis in Distance Runners	25
Forest Education for High School Students	26
Phylogenetics of the NR2E Nuclear Receptors	27

East Wing Rotund (Lower Level)



East Wing Atrium (Upper Level)

