WVAS

West Virginia
ACADEMY of SCIENCE

Founded 1924

The 85th Annual Meeting

of the West Virginia Academy of Science

April 10, 2010

College of Engineering and Mineral Resources **West Virginia University** Morgantown

General Chairman Donald D. Gray, Ph.D.

Welcome

I am pleased to welcome you to the College of Engineering and Mineral Resources at West Virginia University for the 85th Annual Meeting of the West Virginia Academy of Science. Since its founding in 1924, the Academy has played an important role in advancing learning and scientific knowledge.

It is exciting to participate in this gathering of college and university faculty and students, industry professionals, science teachers, and members of the general public, all of whom share an interest in promoting science and scientific research. I hope that you will gain a great deal from today's presentations as well as from the interaction with your peers. Thank you so much for joining us today.

Best regards,

Gene

Gene Cilento Glen H. Hiner Dean
College of Engineering and Mineral Resources
West Virginia University

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Acknowledgements

The West Virginia Academy of Science gratefully acknowledges the support of:
WVU College of Engineering and Mineral Resources – meeting host
National Research Center for Coal and Energy – luncheon venue

Sponsor-level Support
WVU College of Engineering and Mineral Resources
WVU Research Corporation
NASA West Virginia Space Grant Consortium

Patron-level Support
WVU Davis College of Agriculture, Natural Resources, and Design
WVU Eberly College of Arts and Sciences

Without their generous support, this meeting would not be possible.

Thanks to the following individuals whose help has been critical to the preparations for this meeting:

Kay Gray	Dr. Roger Seeber	Kenny Claudio	Paige Nesbit
Dr. Jim Rentch	Paul Kritschgau	Susan Case	Dr. Lian-Shin Lin

Schedule of Events

MRB = Mineral Resources Building
ESB = Engineering Sciences Building
NRCCE = National Research Center for Coal and Energy

Time	Event	Location
8:00 am -12:30 pm	Registration	MRB Atrium
8:30 am – 9:30 am	Continental breakfast	MRB Atrium
9:00 am – 9:20 am	Judges meeting	MRB 280
9:30 am – 9:45 am	Welcome session	MRB 113
9:45 am – 11:00 am	Plenary session	MRB 113
11:00 am – 11:15 am	Coffee break	MRB Atrium
11:15 am – 12:30 pm	Oral sessions 1 - 7	MRB 105, 107, 109, 113, 205, 209 ESB G78B
12:30 pm – 1:45 pm	Buffet lunch and talk (ticket holders only)	NRCCE 101A/B
1:45 pm – 2:00 pm	break	
2:00 pm – 3:15 pm	Oral sessions 8-14	MRB 105, 107, 109, 113, 205, 209 ESB G78B
3:15 pm – 3:30 pm	Coffee break	MRB Atrium
3:30 pm – 4:15 pm	Poster session 1	ESB outside G39
4:15 pm – 5:00 pm	Poster session 2	ESB outside G39
4:45 pm – 5:15 pm	Business meeting	MRB 107
5:15 pm - adjourn	Awards ceremony	MRB 113

During events please mute cell phone ringers.

Instructions to Presenters and Session Moderators

1. Speakers in Oral sessions 1 through 7 should load their Power Point presentations on the computer in their assigned room prior to 9:30 am.

2. Speakers in Oral sessions 8 through 14 should load their Power Point presentations on the computer in their assigned room prior to 2:00 pm.

3. In order to facilitate judging, each speaker should state his or her name and whether they are an undergraduate or a graduate student.

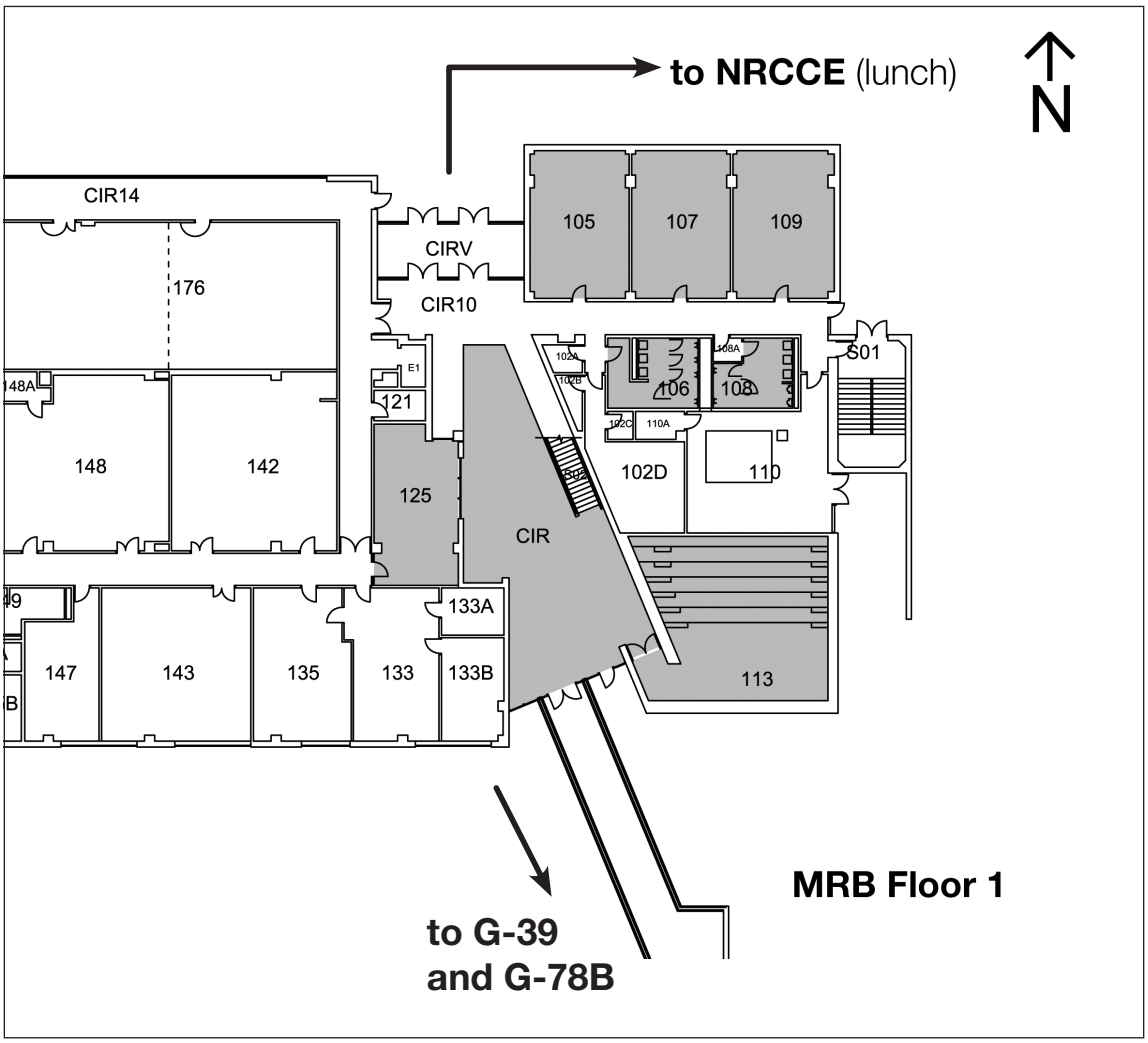
4. Oral presentations are scheduled for 15 minutes including questions.

5. Session Moderators are responsible for maintaining the published schedule so that persons can move between sessions if they wish to do so. Oral presentations must begin and end at the assigned times. In the event that a talk runs short or is not presented, the next talk must not begin until its assigned time.

6. All posters should be in their assigned spaces by 3:30 pm and should not be removed until 5:00 pm.

7. Presenters for Poster session 1 (odd numbered posters) should be at their posters from 3:30 pm until 4:15 pm.

8. Presenters for Poster session 2 (even numbered posters) should be at their posters from 4:15 pm until 5:00 pm.


to NRCCE (lunch)
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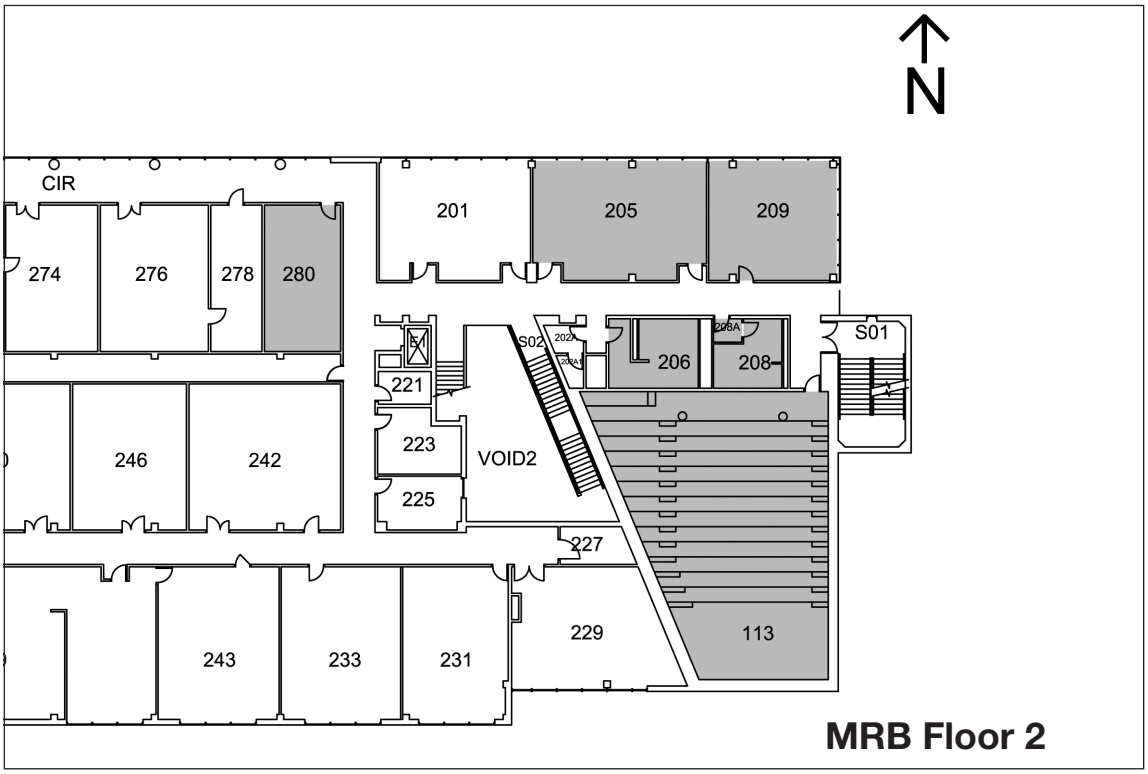
and G-78B
MRB Floor 1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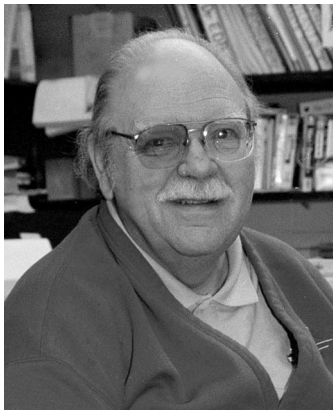
MRB Floor 2

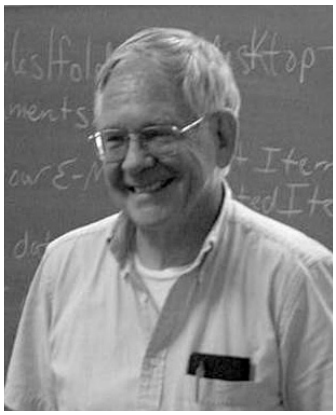
The 85th Annual Meeting is dedicated to the memory of three former West Virginia Academy of Science presidents.



Edward C. Keller, Jr.
1932-2010
President 1975-76
Proceedings Editor 1977-1993
Dr. Edward C. Keller, Jr., contracted poliovirus as a teenager, which led to a lifelong disability in his legs and to his becoming a champion for the disabled. He received his degrees from the Pennsylvania State University, culminating in a Ph.D. in Statistical Genetics & Statistics in 1961. Following positions at the University of North Carolina, the University of Maryland, and the NUS Corporation in Los Angeles, he became a Professor in the WVU Biology Department in 1968. He served five years as Chairman and published over 110 research articles, abstracts, and reports. He was awarded 52 governmental grants.

Dr. Keller received many awards including an honorary D.Sc. from Salem College (1978). In 2002 he was inducted into the Hall of Fame for Persons with Disabilities.

Ronald H. Fortney
1947-2009
President 2003-2004
Dr. Ronald Fortney was a botanist with a passion for wetlands. He completed his doctoral studies under Earl L. Core and researched the floristics and plant communities of Canaan Valley. He became the chief naturalist and later Chief Planner for the WV State Parks. He taught many biology and botany courses for the WV Graduate College, Salem-Teikyo University, and WVU. As a Research Professor in the WVU Department of Civil and Environmental Engineering he studied wetlands, roadside flora, and mined areas.



John R. Warner, Jr.
1936-2009
Treasurer 1974-1977
President 1979-1980
Proceedings Editor and **Assistant Treasurer**, 2003-2009

Dr. John Warner was a Professor at West Virginia Wesleyan College in the Department of Sociology. He was an ordained elder of the United Methodist Church, a contributing columnist for the Charleston Gazette, an Eagle Scout, and a swimming instructor.

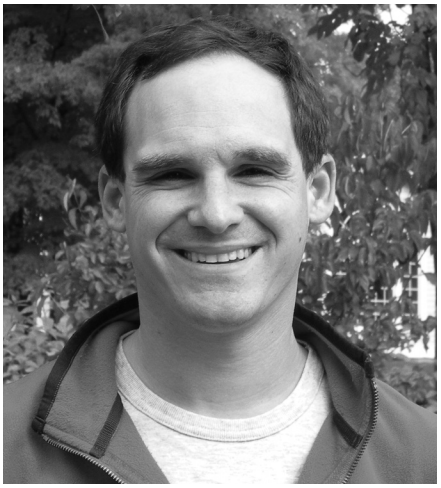
Plenary Session: The Invisible Universe
9:45 am – 11:00 am MRB 113

KAREN O'NEIL
Green Bank Observatory, National Radio Astronomy Observatory
Green Bank, WV, 24944

Faint Fuzzy Stuff – Examining Star Formation and Evolution in Diffuse Environments

Low surface brightness galaxies are diffuse spiral galaxies whose gas content is often at or below the density required to form stars. Yet low surface brightness galaxies cover a wide range of morphological types, from galaxies with bright central bulges and well defined spiral arms to amorphous blobs. I will describe the general properties of these galaxies and look at the possible evolutionary scenarios for these systems.

Karen O'Neil has been the Assistant Director for Green Bank Operations since 2008. Before that, Karen served as the Head of Program Development for Green Bank Operations. In that capacity, Karen was responsible for coordinating the development program for the GBT, which presently includes the Precision Telescope Control Project for developing the high frequency capability of the GBT, the MUSTANG bolometer camera, the K band (1.3 cm) Focal Plane Array, the GUPPI Pulsar Backend, and the Dynamic Scheduling Project. Karen is also the Project Manager and Project Scientist for the Dynamic Scheduling project, which has finished a successful test run over last summer. Karen has served in several previous capacities in Green Bank, including the GBT Spectrometer instrument scientist. Before coming to Green Bank, Karen was a scientist at the Arecibo Observatory. She received her Ph.D. in Physics at the University of Oregon.



D.J. PISANO
Department of Physics
West Virginia University
Morgantown, WV, 26506

Constraining Galaxy Evolution through Radio Observations

Eight billion years ago, luminous compact blue galaxies were relatively common with high rates of star formation. Today, they are exceedingly rare. What are these galaxies and what have they become? While we cannot study the distant luminous compact blue galaxies directly in high detail, we can study their local analogs. Using radio telescopes in West Virginia and around the world, we are able to learn about their star formation rates, their fuel for future star formation and their masses. I will present the initial results from our study of local luminous compact blue galaxies, and what it implies for the current nature and future evolution of these galaxies.

Dr. D.J. Pisano has been an assistant professor at West Virginia University and an adjunct assistant astronomer at the National Radio Astronomy Observatory since January 2009. He received his Ph.D. from the University of Wisconsin-Madison in 2001 where he searched for the gas clouds around isolated galaxies as a test of current models of galaxy formation. He extended this work to galaxy groups as a postdoc at the Australia Telescope National Facility from 2001-2004, the Naval Research Laboratory from 2005-2006, and at the NRAO in Green Bank, WV from 2006-2008. Dr. Pisano's current research involves using radio telescopes around the world to study the formation and evolution of galaxies, including our own Milky Way.

MAURA MCLAUGHLIN
Department of Physics
West Virginia University, Morgantown, WV, 26506

Detecting Ripples in Space-Time Using Radio Pulsars

Gravitational waves are ripples in the fabric of space-time caused by accelerating massive objects. Einstein predicted the existence of these waves in 1915 but they have never been directly observed. Radio pulsars are rapidly rotating highly magnetized neutron stars which can act as extremely precise celestial clocks. I will describe how we can use a network of radio pulsars distributed throughout the sky to detect gravitational waves. I will discuss the telescopes we use for this effort and in particular our work with the Green Bank Telescope in Green Bank, WV. I will show that a detection of gravitational waves through radio pulsar timing is possible within the next 5-10 years. This detection will transform astronomy and allow us to study the most extreme and exotic objects in the Universe.

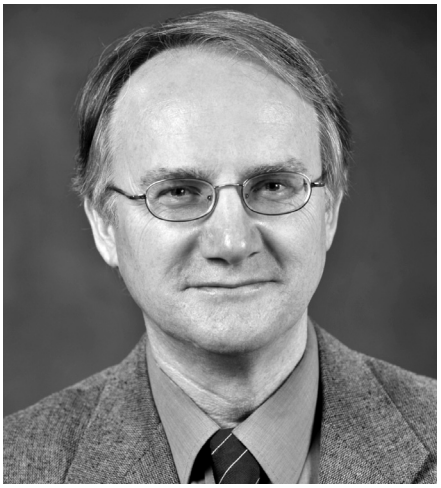
Maura McLaughlin received her B.S. from Penn State University in 1994 and her Ph.D. from Cornell University in 2001. She then spent five years working at the University of Manchester in England, first on an NSF Distinguished Research Fellowship and then on a University Research Fellowship. She started her current position as an Assistant Professor in the Department of Physics at West Virginia University in May of 2006, and she has an adjunct appointment at the National Radio Astronomy Observatory in Green Bank, WV. She has recently been awarded Sloan and Cottrell Fellowships for her research. Her research mainly involves studies of neutron stars, compact remnants of massive stars. Dr. McLaughlin studies these stars with X-ray and gamma-ray satellites and with some of the largest radio telescopes in the world.

Buffet Lunch: 12:30 pm – 1:45 pm, Rooms 101A/B

National Research Center for Coal and Energy

(The NRCCE is a leisurely 5 minute walk from the Mineral Resources Building.)

Luncheon speaker:



CHRIS ATKINSON
Director, Center for Alternative Fuels, Engines and Emissions
Professor, Department of Mechanical and Aerospace Engineering
West Virginia University, Morgantown, WV 26506

Future Automotive Technologies and Trends

The automotive industry has recently been subjected to the confluence of a number of powerful and conflicting forces, including adverse economic effects, the consequences of globalization, the existence of significant production overcapacity, stringent emissions and safety legislation, increasing calls for energy independence, and requirements for further fuel economy and vehicle fuel efficiency improvements. There have been and will continue to be profound shifts in vehicle technologies including the introduction of hybrid electric vehicles, the increased use of renewable fuels and added vehicle electronic content. The electrification of passenger vehicles represents one of a series of inexorable trends that will play out over the foreseeable future. The future of the light duty passenger car and truck, the heavy duty vehicle, and fuel industries will be discussed against this backdrop.

Chris Atkinson holds the degrees of B.Sc. Chemical Engineering from the University of Natal, South Africa, MSME from West Virginia University and Sc.D. in Mechanical Engineering from MIT. He holds the rank of professor in mechanical and aerospace engineering and is the director of the Center for Alternative Fuels, Engines and Emissions at WVU. His research interests lie in the areas of engine control, emissions reduction, alternative fuel utilization, and hybrid electric vehicle development. He has conducted research on behalf of a number of government agencies and automotive companies, has authored 23 archival journal publications and over 65 conference papers, and is co-inventor on one US patent.

John Warner Outstanding Teacher Award

The **Dr. John Warner Outstanding Teacher Award for 2010** is given to **Lois Ann Swineford** of Suncrest Middle School in Morgantown for her promotion of interest, achievement, and creativity in mathematics.

Since 1986, Mrs. Swineford has taught Algebra I, Geometry, and Pre-Algebra at Suncrest Middle School, as well as graduate and undergraduate math and math methods courses at West Virginia University.

She has an outstanding record of leadership in extracurricular math activities as a coach for MATHCOUNTS (a national math enrichment and competition program), Math Field Day, Math League (a state math competition) and the American Mathematics Competition (AMC8). Students are attracted to these programs by the warm, inviting, and intellectually stimulating atmosphere she provides before school every morning. The students she coaches are immersed in mathematics 5 to 12 hours a week outside of class. They voluntarily do hundreds of rigorous math problems every week, with the result that her students have consistently earned 1st place in county, regional and state competitions. She has been the state coach at the National MATHCOUNTS Competition for the past 8 years.

In August 2008, Mrs. Swineford held the first E = MC^2 (Excellence = Math Competition Camp) at her school. This was a weeklong, 6 hour day-camp for twenty 6th, 7th, and 8th graders. She is also the designer and sponsor of the SMS Teacher Academy in which she trains student tutors to work in the Morning Homework Room to help fellow students with missing assignments.

Mrs. Swineford's previous honors include the Edith May Sliffe Distinguished Mathematics Teaching Award in 2005 from the Mathematics Association of America, the student initiated Raytheon MathMovesU Math Hero Award in 2008, the Arch Coal Teacher Achievement Award, the Presidential Award for Excellence in Science and Mathematics, and the West Virginia Junior High Mathematics Teacher Award.

NASA
West Virginia Space Grant Consortium
G68, Engineering Sciences Building
PO Box 6070
Morgantown, WV 26506-6070
304.293.4099
http://nasa.wvu.edu

Dedicated to building research infrastructure and the promotion of science, technology, engineering and math education in West Virginia

The **NASA West Virginia Space Grant Consortium (WVSGC)** is a NASA sponsored organization which consists of **11 West Virginia academic institutions and 6 corporate and scientific partners**. WVSGC's primary focus is on **research**, **collaborations with high-technology industries**, **student fellowships**, **STEM education**, and **K-12 and public outreach programs**.

WVSGC is housed and partially supported by the College of Engineering and Mineral Resources at West Virginia University.

The Space Grant **national** network includes over 850 affiliates from universities, colleges, industry, museums, science centers, and state and local agencies. These affiliates belong to one of 52 consortia in all 50 states, the District of Columbia and the Commonwealth of Puerto Rico.

To learn more about the West Virginia Space Grant Consortium and to see our most up-to-date opportunities, please contact info@nasa.wvu.edu or call 304.293.4099.

WVSGC Affiliates

West Virginia University (Lead)
Bethany College
Bluefield State College
The Clay Center for the Arts and Sciences
Economic Development Administration
Fairmont State University
Marshall University
NASA Independent Verification and Validation Facility
NRAO Green Bank Facility
Polyhedron Learning Media, Inc.
Shepherd University
West Liberty State University
WV High Technology Consortium Foundation
West Virginia State University
WVU Institute of Technology
West Virginia Wesleyan College
Wheeling Jesuit University

Oral Presentation List

BOLD font indicates presenter.
* indicates undergraduate presenter.
# indicates graduate student presenter.

Session 1 — Applied Mathematics 1: Applications Through Solutions / Room ESB G78B
Convener and Moderator: Christopher E. Elmer, Ph.D.

11:15 ***JUSTIN EBERSOLE**, SCOTT FRAZIER, JR., and RAINA ROMERO, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443. **Gyroscopic effects on a bicycle.**

11:30 ***KARA CRESS**, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443, and LISA BLICKENSTAFF, Dept. of Education Mathematics (5-Adult), Shepherd University, Shepherdstown, WV 25443. **Weave's effect on the stability of a bicycle.**

11:45 ***LISA BLICKENSTAFF**, Dept of Education Mathematics (5-Adult), Shepherd University, Shepherdstown, WV 25443, and KARA CRESS, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443. **Unstable wobble mode.**

12:00 ***JEREMY THOMPSON**, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443, and JACOB HACKETT and DANIEL RIZER, Dept. of Education/Mathematics Shepherd University, Shepherdstown, WV 25443. **Torques in the golf swing.**

12:15 ***ROBERT AULD**, Dept of Computer Science and Mathematics, Shepherd University, Shepherdstown, WV 25443. **Mathematically modeling high altitude balloons.**

Session 2 — Astronomy and Geology / Room MRB 105
Moderator: Clarissa Mathews, Ph.D.

11:15 ***CALEB RICE** and JASON BEST, Shepherd University Observatory, Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443. **The study of the skyglow around the Shepherd University Observatory.**

11:30 ***DOMINIC A. LUDOVICI**, and DANIEL J. PISANO, Dept of Physics, West Virginia University, Morgantown, WV 26506. **A survey for neutral hydrogen in the loose group LGG140.**

11:45 **#TU H. TRAN**, Dept of Physical Science, Marshall University, Huntington, WV 25755, and SEUNGJIN LIM, Dept of Integrated Science and Technology, Marshall University, Huntington, WV 25755. **Bridging the digital divide in WV GIS systems.**

12:00 **#RAJ GONDLE** and HEMA SIRIWARDANE, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Geologic storage of carbon in coal seams.**

12:15 **E. RAY GARTON**, WV Geological Survey, Morgantown, WV 26508, ROBERT L. PYLE, Prehistoric Planet, Morgantown, WV 26505, and DAVE PHILLIPS, Sunset Fossils, Morgantown, WV 26505. **A new vertebrate fossil assemblage from the Ewing Limestone, Conemaugh, Pennsylvanian of West Virginia.**

Session 3 — Chemical Engineering / Room MRB 107
Moderator: Gary Morris, Ph.D.

11:15 **#MAYURI MUKKA**, EDWIN L. KUGLER and DADY B. DADYBURJOR, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26505. **Parametric study of the partial oxidation of propane over Ni and Pt based catalysts.**

11:30 **STEPHEN E. ZITNEY**, U.S. Department of Energy, National Energy Technology Laboratory, Collaboratory for Process & Dynamic Systems Research, Morgantown, WV 26507, and DEBANGSU BHATTACHARYYA and RICHARD TURTON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506. **Immersive 3D virtual training systems for advanced energy plant operations and control.**

11:45 **KIRAN CHAUDHARI** and RICHARD TURTON, Dept of Chemical Engineering, West Virginia University, Morgantown ,WV 26505, and CHRIS GUENTHER and RONALD BREAULT, National Energy Technology Laboratory, Morgantown, WV 26505. **Development of advanced coal gasification kinetics models for CFD (and process simulation) codes.**

12:00 **#S. J. KASULE**, D. BHATTACHARYYA and R. TURTON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506 and Collaboratory for Process and Dynamic Systems Research, U.S. Department of Energy, National Energy Technology Laboratory, Morgantown, WV 26507 and S. ZITNEY, Collaboratory for Process and Dynamic Systems Research, U.S. Department of Energy, National Energy Technology Laboratory, Morgantown, WV 26507. **On the modeling of a single-stage, downward-firing, entrained-flow gasifier using Aspen Custom Modeler.**

12:15 **#DUSTIN JONES**, DEBANGSU BHATTACHARYYA, and RICHARD TURTON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506 and STEPHEN E. ZITNEY, Collaboratory for Process & Dynamic Systems Research, National Energy Technology Laboratory, Morgantown, WV 26507. **Analysis of an air separation unit as part of an integrated gasification combined cycle power plant.**

Session 4 Civil, Environmental, and Mining Engineering / Room MRB 109
Moderator: Kumar Sivakumaran, Ph.D., J.D.

11:15 **RAY LIANG**, HOTA GANGARAO and DANIEL STANISLAWSKI, Constructed Facilities Center, West Virginia University, Morgantown, WV 26506, and YING LEI, YANHAO LI, and YONGQIANG JIANG, School of Architecture and Civil Engineering, Xiamen University, Xiamen, China, 361005. **Material and structural response of historic Hakka rammed earth structures.**

11:30 **#STEVEN McCLELLAND** and JOHN ZANIEWSKI, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **A history of the Fuller curve.**

11:45 **JAMES M. STILES**, Limestone Engineering, 1766 Limestone Road, Parsons, WV 26287. **AMD remediation options for large-scale watershed remediation.**

12:00 **#YA-MEI YANG** and MITCHELL J. SMALL, Dept of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA 15213, EGEMEN O. OGRETIM and DONALD D. GRAY, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506, and GRANT S. BROMHAL, National Energy Technology Lab, Department of Energy, Morgantown, WV 26507. **Probability of leak detection for soil CO_2 flux measurement under different geologic carbon sequestration site conditions.**

12:15 YI LUO and #**BIAO QIU**, Dept of Mining Engineering, West Virginia University, Morgantown, WV 26505. **A fracture mechanics based longwall chain pillar stress prediction program.**

Session 5 Conservation of West Virginia Nongame Wildlife 1 / Room MRB 205
Convener and Moderator: Zachary Loughman

11:15 **ELIZABETH A. BYERS**, JAMES P. VANDERHORST and BRIAN P. STREETS, West Virginia Division of Natural Resources, Elkins, WV 26241. **Natural Heritage assessment of upland red spruce communities in West Virginia.**

11:30 **CRAIG W. STIHLER**, WV Div. of Natural Resources, Elkins, WV 26241. **White-Nose Syndrome: A new threat to the West Virginia's cave-dwelling bats**

11:45 **CRAIG W. STIHLER**, WV Div. of Natural Resources, Elkins, WV 26241.
The conservation of Virginia big-eared bats (*Corynorhinus townsendii virginianus*) in West Virginia.

12:00 **#ZACHARY LOUGHMAN**, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074 and Biology Graduate Program, Indiana State University, Terre Haute, IN 47801, DAVID FOLTZ, EVAN HEWITT, MATTHEW MCKINNEY, and NICOLE GARRISON, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and STUART WELSH, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown WV 26506-6125. **Rediscovery and discussion for future conservation efforts of *Cambarus* (*P.*) *veteranus* (Big Sandy Crayfish) in West Virginia.**

12:15 **#KATHRYN R. P. McCOARD** and JAMES T. ANDERSON, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506. **A year in the lives of West Virginia's Wood Turtles.**

Session 6 Ecology / Room MRB 207
Moderator: Jim Rentch, Ph.D.

11:15 **BEN LOWMAN**, West Virginia Dept of Environmental Protection, Charleston, WV 25304. **Impacts of selenium bioaccumulation on freshwater fishes in West Virginia.**

11:30 **#NATHAN R. BEANE** and JAMES S. RENTCH, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506. **Using maximum entropy to model current red spruce forest habitat in West Virginia.**

11:45 **ERIC HEITZMAN**, SEAN DOUGHERTY, and JAMES RENTCH, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506, STEVE STEPHENSON, Dept of Biology, University of Arkansas, Fayetteville, AR, and STEVE ADAMS (ret.), Dabney Lancaster Community College, Clifton Forge, VA. **Long-term changes in stand structure and tree ring patterns in old-growth red spruce (*Picea rubens*) forests in West Virginia.**

12:00 ***JESSICA CURTIS** and PETER VILA. Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443. **Survey of herpetofauna in three West Virginia counties: Berkeley, Jefferson, and Morgan.**

12:15 **#SAMANTHA TAYLOR**, Dept of Integrated Science & Technology, Marshall University, Huntington, WV 25755. **Mitochondrial DNA phylogeography of *Rhinichthys* species in West Virginia.**

Session 7 Improving Student Learning / Room MRB 113
Convener and Moderator: Mary Ruth Griffin, Ph.D.

11:15 **JOHN ROBINSON** and MARY R. GRIFFIN, Dept of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304. **Improving student learning through active learning strategies.**

11:30 **AMY ELLIS** and BETH PAULEY, Dept of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304. **Helping students overcome math anxiety.**

11:45 **DAVID O'DELL**, Dept of Science and Mathematics, Glenville State College, Glenville, WV 26351. **Predicting student success in the first semester of college chemistry.**

12:00 **MARY RUTH GRIFFIN**, Dept of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304. **Student test-taking anxiety and the application of intervention learning techniques.**

12:15 **BETH PAULEY**, Dept of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304. **Program evaluation of a departmental initiative focused on improving student learning.**

Session 8 Applied Mathematics 2: Applications Through Solutions / Room ESB G78B
Convener and Moderator: Christopher E. Elmer, Ph.D.

2:00 **MARY ANN DRUMRIGHT-CLARKE**, Dept of Mathematics, West Virginia University, Morgantown, WV 26506. **A review of partial differential equation weak solution formulation used in finite element software construction.**

2:15 ***CHASE DOWLING**, QING WANG and ZHIJUN WANG, Shepherd University, Dept of Computer Science, Mathematics, and Engineering, Shepherdstown, WV 25443. **The reproductive ratio of pandemic H1N1/09 influenza virus in active duty military personnel.**

2:30 **#JORDAN MUSSER**, Dept of Mathematics, West Virginia University, Morgantown, WV 26506, MARY ANN DRUMRIGHT-CLARKE, West Virginia University, Morgantown, WV 26506, and JANINE GALVIN, National Energy Technology Laboratory, Albany, OR 97321. **Development of a discrete mass inflow boundary condition for MFIX.**

2:45 **BRIAN J. ANDERSON**, National Energy Technology Laboratory, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506. **Multiscale modeling: molecular, thermodynamic, reservoir, and economic modeling of energy systems**

3:00 **#R. DALE BILLER** AND DEWEY D. SANDERSON, Department of Geology, Marshall University, Huntington, WV 25755. **Water budget of the Coal River Basin 2009.**

Session 9 Biochemistry / Room MRB 107
Moderator: Carl Welstead, Ph.D.

2:00 ***TRACY LEE** and KENNETH CUSHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and ERIN KELLEY, RYAN C. KENNEDY and HEATHER N. CUSHMAN, Dept. of Biology, Washington and Jefferson College, Washington, PA 15301. **Effects of intramuscular acid injections on ASIC3 and Nav1.9 expression.**

2:15 ***LUCAS A. DVORACEK**, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, HUEY MIIN LEE, Dept of Statistics, West Virginia University, Morgantown, WV 26506, MELINDA S. DETRICK, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and ROBERT KREISBERG, College of Sciences, West Liberty University, West Liberty, WV 26074. **Statins may be beneficial in reducing heart disease by inhibiting the inflammatory response that causes atherosclerosis**.

2:30 **#SUMANTH MANOHAR**, Biotechnology Graduate Program, West Virginia State University, Institute, WV 25112, MATTHEW HARLOW and CHRISTOPHER RYAN MACKIE, Dept of Biochemistry, Marshall University, Huntington, WV 25755, GERALD R HANKINS, Biotechnology Graduate Program, West Virginia State University, Institute, WV 25112 and MAIYON PARK, Dept of Biochemistry, Marshall University, Huntington, WV 25755. **Nuclear-mediated function of Chmp1A in the regulation of ATM signaling activity for the control of human pancreatic tumor cell growth.**

2:45 ***JANE R. OOSTHUIZEN**, PHILIP HOFFMAN and KEVIN L. EVANS, Dept of Mathematics and Science, Glenville State College, Glenville, WV 26351. **Synthesis of triacid and triamide amphiphiles.**

3:00 ***WESTLEY MULLINS**, JANE OOSTHAIZEN, KAITLYN BOWMAN, Dept. of Science and Mathematics, Glenville State College, Glenville WV 26351, HOWARD WHITE, Dept. of Physiological Sciences, Eastern Virginia Medical School, Norfolk VA 23510, and GARY Z. MORRIS, Dept. of Science and Mathematics, Glenville State College, Glenville WV 26351. **Synthesis of (7-diethylaminocourmarin-3-ester)-3'-adenosine 5'-triphosphate (or DeacesterATP).**

Session 10 Conservation of West Virginia Nongame Wildlife 2 / Room MRB 205
Moderator: Convener and Moderator: Zachary Loughman

2:00 **THOMAS K. PAULEY**, Dept of Biological Sciences, Marshall University, Huntington, WV 25755. **Conservation issues of amphibians and reptiles in West Virginia.**

2:15 **JOE GREATHOUSE**, Curator of Animals, Oglebay's Good Zoo, Wheeling, WV 26003. **Conservation of the Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*) in the northern panhandle of West Virginia.**

2:30 **DAN CINCOTTA**, WV Division of Natural Resources, Wildlife Resources Section, Elkins WV 26241, and STUART A WELSH, US Geologic Survey, WV Cooperative Fish and Wildlife Research Unit, Morgantown, WV 26506. **Conservation status of imperiled West Virginia fishes.**

2:45 **JOE GREATHOUSE**, Curator of Animals, Oglebay's Good Zoo, Wheeling, WV 26003, and THOMAS K. PAULEY, Dept of Biology, Marshall University, Huntington, WV 25755. **Surveillance of the amphibian chytrid fungus (*Batrachochytridium dendrobatidis*) in West Virginia amphibians.**

3:00 **ELIZABETH BYERS**, West Virginia Division of Natural Resources, Elkins, WV 26241. **Assessing the climate change vulnerability of West Virginia's rare species.**

Session 11 Environment / Room MRB 207
Moderator: Lian-Shin Lin, Ph.D.

2:00 ***CARA SCHILDTKNECHT**, Institute of Environmental Studies, Shepherd University, Shepherdstown, WV 25443. **Developing new methodology for trapping upstream migrating adult Pacific lamprey (*Lampetra tridentate*) and western brook lamprey (*Lampetra richardsoni*) to estimate species abundance.**

2:15 **MICHAEL HENDRYX** and KEITH J. ZULLIG, Dept of Community Medicine, West Virginia University, Morgantown, WV 26506. **Population health disparities in central Appalachian mountaintop coal mining counties.**

2:30 **R. SCOTT LEMONS**, JOHN WIRTS and PAT CAMPBELL, Dept of Environmental Protection, Division of Waste and Water Management, Charleston, WV 25304. **Dunkard Creek fish kill: Golden Algae and water chemistry.**

2:45 **#CHENJIE WU** and LIAN-SHIN LIN, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Long-term climate trend in Mid Atlantic Highlands Region and its correlation with regional landscape attributes**.

3:00 **#R. TRISTAN GINGERICH** and JAMES T. ANDERSON, Div. of Forestry and Natural Resources, Wildlife and Fisheries Resources Program, West Virginia University, Morgantown, WV 26506. **Decomposition rates in created and natural wetlands of West Virginia.**

Session 12 Mechanical and Materials Engineering / Room MRB 109
Moderator: Xianchao Wei, Ph.D.

2:00 **#SONG CHEN**, XUEYAN SONG, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506, YUN CHEN and HARRY FINKLEA, Dept of Chemistry, West Virginia University, Morgantown, WV 26506, and GREG HACKETT and KIRK GERDES, National Energy Technology Laboratory, DOE, 3610 Collins Ferry Road, Morgantown, WV 26507**. Microstructure and chemistry of the anode active layers in the anode supported Solid Oxide Fuel Cell.**

2:15 **#SOHEIL RAZMYAR**, KATARZYNA SABOLSKY and EDWARD M. SABOLSKY, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Microstructural control and characterization of BICUVOX ceramics.**

2:30 **#PINGEN CHEN**, HAILIN LI, W. SCOTT WAYNE and NIGEL N. CLARK, Center for Alternative Fuels, Engines and Emissions, West Virginia University, Morgantown, WV 26506, and XIAOHUA ZENG, College of Automotive Engineering, Jilin University, Changchun, Jilin, P.R. of China. **Optimization of a heavy-duty hybrid bus operated under transient cycles.**

2:45 **#SHIYU LIU**, HAILIN LI, CHET-MUN LIEW, TIMOTHY GATTS, SCOTT WAYNE, BENJAMIN SHADE and NIGEL CLARK, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **An investigation of NO_2 emission of a H_2-enriched heavy-duty diesel engine.**

3:00 **#PAUL J. KREITZER** and JOHN M. KUHLMAN, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Spray cooling simulation implementing time scale analysis and the Monte Carlo Method.**

Session 13 Potpourri / Room MRB 105
Moderator: Ray Liang, Ph.D.

2:00 **CLARISSA R. MATHEWS**, EDWARD M. SNYDER, and JOHN J. SMITH, Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443. **Comparison of solar photovoltaic technology performance at the Shepherd University Renewable Energy Demonstration Site.**

2:15 **#RODNEY DEVER** and DONNA FORD-WERNTZ, Dept of Biology, West Virginia University, Morgantown, WV 26506. **Taxonomy of the *Allium cernuum* complex in Appalachia.**

2:30 ***YOONJA MORTENSEN** and RAINA ROMERO, Dept of Education, Shepherd University, Shepherdstown, WV 25443. **Mathematical analysis of the bistable equation for modeling electric potential propagation along the axon of a neuron.**

2:45 **#KYLE PHILLIPS**, EMILY CALANDRELLI, MIKE NUSSBAUM and JOHN M. KUHLMAN, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **West Virginia University (WVU) Short Microgravity Research Facility (SMiRF) drop tower development.**

3:00 **#TU TRAN** and ANDREW LOWE, Dept of Physical Science, Marshall University, Huntington, WV 25701. **Landsat I imagery conversion and enhancement.**

Session 14 The Science of Assessment / Room MRB 113
Convener and Moderator: John H. Hull, Ph.D.

2:00 **KATRINA COOPER**, Dept of Psychology/ Director of First Year Studies, Bethany College, Bethany, WV 26032. **The science of assessment: using first year experience assessment results to improve the program.**

2:15 **JOHN H. HULL**, Dept of Psychology, Bethany College, Bethany, WV 26032. **The science of assessment: assessing majors.**

2:30 **DEBRA HULL**, Dept of Psychology, Wheeling Jesuit University, Wheeling, WV 26003. **The science of assessment: assessing service serves assessment.**

2:45 **GARY KAPPEL** and ALEECE C. GRESHAM, Bethany College, Bethany, WV 26032. **Tales from the dark side: a non-scientist's adventures in the land of assessment.**

3:00 **ALAN D. SMITH**, Dept of Management, Robert Morris University, Pittsburgh, PA 15219-3099. **Gender perceptions of smoking and cessation via technology, incentives, and virtual communities.**

Poster List

BOLD font indicates presenter.
* indicates undergraduate presenter.
# indicates graduate student presenter.
ODD numbered posters are in Poster Session 1 (3:30 – 4:15).
EVEN numbered posters are in Poster Session 2 (4:15 – 5:00).

1 #**VIKAS AGARWAL** and BRIAN J. ANDERSON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506. **An integrated model to compare net electricity generation for CO_2- and water-based geothermal systems.**

2 ***STEPHANIE ANDERSON**, DAVONNA DEMPSTER, ROGER SEEBER and JARRETT S. AGUILAR, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Extraction and quantification of hypericin and hyperforin from *Hypericum perforatum* callus.**

3 #**ASHISH S. BAMBAL**, ALA'A H. KABABJI, and VIDYA SAGAR GUGGILLA, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506, TODD H. GARDNER, U.S. Dept of Energy, National Energy Technology Laboratory, 3610 Collins Ferry Road, Morgantown, WV 26507-0880, and EDWIN L. KUGLER and DADY B. DADYBURJOR, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506. **Fischer-Tropsch synthesis with a chelating agent modified Co/SiO_2 catalyst.**

4 ***JESSICA BEADENKOPF** and ***RYAN MANUEL**, Dept of Biology, Shepherd University, Shepherdstown, WV, 25443, PETER VILA, Dept of Environmental Studies, Shepherd University, Shepherdstown, WV, 25443, and CAROL ZYGAR PLAUTZ, Dept of Biology, Shepherd University, Shepherdstown, WV, 25443. ***Lymnaea palustris* as a model organism for developmental, reproductive, and toxicological studies.**

5 **VAGNER A. BENEDITO**, Genetics and Developmental Biology Graduate Program, Plant and Soil Sciences Division, West Virginia University, Morgantown, WV 26506, and IGOR KRYVORUCHKO and MICHAEL UDVARDI, Plant Biology Division, Samuel Roberts Noble Foundation, Ardmore, OK 73401. **Identification and functional analyses of organ-specific membrane transporters of the S-type anion channel (SLAC) family in the model legume *Medicago truncatula*.**

6 **JASON BEST**, Shepherd University Observatory, Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443. **Structure analyses of the 2dF Galaxy Redshift Survey and 2dF Quasar Redshift Survey.**

7 #**RENU BHALLA** and BENOIT VAN AKEN, Dept of Civil and Environmental Engineering, Temple University, Philadelphia, PA 19122. **Toxicity of polychlorinated biphenyls and their metabolites from bacterial transformation.**

8 #**ISABEL CARDONA** and XINCHAO WEI, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Selenium removal by magnetite impregnated diatomaceous earth.**

9 ***VICTOR L. CARPENTER JR.** and KEVIN L. EVANS, Dept of Science and Mathematics, Glenville State College, Glenville, WV 26351. **Developing an inquiry-based organic experiment to study electrophilic aromatic substitution.**

10 ***ASHLEY M. CARROLL** and KENNETH A. CUSHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Localization of a nonfunctional ASIC in CHO Cells.**

11 JAMES C. CAVENDER, Dept of Environmental and Plant Biology, Ohio University, Athens, OH 45701, **JOHN LANDOLT**, Dept of Biology, Shepherd University, Shepherdstown, WV 25443 and STEVE STEPHENSON, Dept of Biological Sciences, University of Arkansas, Fayetteville, AR 72701. **Dictyostelid cellular slime molds of Africa.**

12 ***LINA CUI**, NIANQIANG WU, and LIAN-SHIN LIN, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Feasibility of using hydroxyl radical production rate as a measure of photocatalytically bactericidal effects of various titanium oxide nanomaterials.**

13 ***MALIA J. DESHOTEL**, Dept of Chemistry, Shepherd University, Shepherdstown, WV 25443 and BRETT E. ZIRKLE and CAROL ZYGAR PLAUTZ, Dept of Biology, Shepherd University, Shepherdstown, WV 25443. **Establishment of a role for transcriptional cofactor Xldb1 in Xenopus lens development.**

14 *__JESSE DOLINAR__ and JOSEPH L. ALLEN, Dept of Physical Sciences, Concord University, Athens, WV 24712-1000. **Micro-XRF applied to natural friction melts.**

15 *__IAN DOUGLAS__ and LETHA J. SOOTER, Dept of Biology, West Virginia University, Morgantown WV 26506. **In vitro selection of SPIONs.**

16 *__HEATHER DOVE__, CHRISTINA SMITH and MILAN VAVREK, Dept of Land Resources, Glenville State College, Glenville, WV 26351. **Salt tolerance of Tree of Heaven (*Ailanthus altissima*).**

17 #__JUSTIN ELLIS__, Dept of Physics, West Virginia University, Morgantown, WV 26506. **A new method for constraining the stochastic gravitational wave background.**

18 ***DAVID FOLTZ**, EVAN HEWITT, MATTHEW MCKINNEY, NICOLE GARRISON, and ZACHARY LOUGHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and STUART WELSH, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown WV 26506-6125. **Crayfishes of the West Virginia Elk River basin: conservation and natural history.**

19 *__MEGHAN FRANCIS__ and ROBERT KREISBERG, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and RAVI SUBRAMANIAN, JULIA WILDSCHUTTE, and JOHN COFFIN, Dept of Microbiology, Tufts University, Boston, MA 02111. **Antibody detection of human endogenous retrovirus env proteins in breast cancer.**

20 #__MANOHAR GADDIPATI__ and BRIAN J. ANDERSON, National Energy Technology Laboratory, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506. **Methane production from complex gas hydrate reservoirs: effects of reservoir heterogeneity on gas production.**

21 #__NAGASREE GARAPATI__, SRINATH CHOWDARY VELAGA and BRIAN J. ANDERSON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506. **Predictions of phase equilibrium data of mixed hydrates using the cell potential method.**

22 AARON C. GOOLEY, Dept of Biological Sciences, Marshall University, Huntington, WV 25755, JAYME L. WALDRON, Dept of Biological Sciences, University of South Carolina, Columbia, SC 29208, and **THOMAS K. PAULEY**, Dept of Biological Sciences, Marshall University, Huntington, WV 25755. **The behavioral responses of West Virginia turtles to passing vehicles on a simulated divided highway.**

23 **CHRISTOPHER J. GUERRIERO**, Dept of Biological Sciences, University of Pittsburgh, Pittsburgh, PA 15261, KUNIO NAKATSUKASA, Division of Biological Science, Nagoya University, Nagoya, Japan, and JEFFREY L. BRODKSY, Dept of Biological Sciences, University of Pittsburgh, Pittsburgh, PA 15261. **Defining the chaperone requirements for the endoplasmic reticulum-associated degradation (ERAD) of novel substrates.**

24 L. M. HARRIS and **S. J. SAWYER**, Dept Science and Mathematics, Glenville State College, Glenville, WV 26351. **The affect of temperature shock length on integrin distribution in the tropical sea anemone, *Aiptasia pallida*.**

25 *__EVAN HEWITT__, DAVID FOLTZ, MATTHEW MCKINNEY, NICOLE GARRISON, and ZACHARY LOUGHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Conservation of West Virginia's Ohio and Kanawha River bottomland primary burrowing crayfishes: species relationship to forest community structure with an emphasis on *Fallicambarus fodiens*.**

26 **BRIDGET D. HINES**, JOURDAN T. AROMIN and LETHA J. SOOTER, Dept of Biology, WV Nano Initiative, West Virginia University, Morgantown, WV 26505. **Use of optical properties to probe the interaction of molecular recognition elements with single-walled carbon nanotubes.**

27 DEBRA HULL, LAUREN COOK, JOAN COTTER, STEFANIE MERTZ, and *__LINDSAY MOFFATT__, Dept of Psychology, Wheeling Jesuit University, Wheeling, WV 26003. **The effect of body size on the way others perceive personality characteristics.**

28 *__NOELLE JULIANO__, HAITAO LUO, and YI CHARLIE CHEN, Natural Science Division, Alderson-Broaddus College, Philippi, WV and BING-HUA JIANG, Mary Babb Randolph Cancer Center, Robert C. Byrd Health Sciences Center of West Virginia University, Morgantown, WV 26506**. Kaempferol inhibits expression of VEGF and HIF-1α in human cancer cells.**

29 #__CRISTY KING__, Dept of Atmospheric Science, University of Arizona, Tucson, AZ 85721. **Longwave and shortwave cloud radiative forcing on the spatial and temporal scale of a tropical storm or hurricane.**

30 **JOHN LANDOLT**, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443, STEVE STEPHENSON and CARLOS ROJAS, Dept. of Biological Sciences, University of Arkansas, Fayetteville, AR 72701. **Dictyostelid cellular slime molds from aerial microhabitats.**

31 #**SHIYU LIU**, CHET-MUN LIEW, JOHN NUSZKOWSKI, TIMOTHY GATTS, RICHARD ATKINSON, HAILIN LI, and NIGEL CLARK, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **An experimental investigation of the combustion process of a heavy-duty H_2-diesel dual fuel engine.**

32 #**MAYURI MUKKA**, EDWIN L. KUGLER and DADY B. DADYBURJOR, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26505. **Parametric study of the partial oxidation of propane over Ni and Pt based catalysts.**

33 ***WESTLEY MULLINS**, JANE OOSTHAIZEN, and KAITLYN BOWMAN, Dept. of Science and Mathematics, Glenville State College, Glenville WV 26351, HOWARD WHITE, Dept of Physiological Sciences, Eastern Virginia Medical School, Norfolk VA 23510, and GARY Z. MORRIS, Dept of Science and Mathematics, Glenville State College, Glenville WV 26351. **Synthesis of (7-diethylaminocourmarin-3-ester)-3'-denosine 5'-triphosphate (or DeacesterATP).**

34 ***CASEY NASSIF**, West Virginia University, Morgantown, WV 26506, and LETHA J. SOOTER, Dept of Biology, West Virginia University, Morgantown, WV 26506. **Detection of molecular recognition elements using yeast library of surface displayed peptides.**

35 ***LEVI R. NAYLOR** and JOHN H. HULL, Dept of Psychology, Bethany College, Bethany, WV 26032. **You CAN tell a book by its cover (at least somewhat): information provided by covers of books written for children**.

36 ***B. OOSTHUIZEN** and S. J. SAWYER, Dept Science and Mathematics, Glenville State College, Glenville, WV 26351. **Sampling of the Elk River to assess macroinvertebrate abundance and diversity and water quality.**

37 ***JANE R. OOSTHUIZEN**, PHILIP HOFFMAN, and KEVIN L. EVANS, Dept of Mathematics and Science, Glenville State College, Glenville, WV 26351. **Synthesis of triacid and triamide amphiphiles.**

38 ***JEREMIAH PEPPER**, OSMAN GUZIDE, and WEIDONG LIAO, Dept of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV 25443. **A universal communication bridge between high level languages and spreadsheets.**

39 ***RACHEL POLING** and RICO GAZAL, Dept of Land Resources, Glenville State College, Glenville, WV 26351. **Seasonal fluctuation in leaf structure and chlorophyll of *Ailanthus* and its co-occurring native species in an Appalachian forest.**

40 #**DARCEY N. POWELL**, KATHERINE KARRAKER, MARION YOUNG, and JESSICA STOLTZFUS, Dept of Psychology, West Virginia University, Morgantown, WV 26506. **Adults' liking of infant names**.

41 #**DARCEY N. POWELL**, KATHERINE KARRAKER, MARION YOUNG, and JESSICA STOLTZFUS, Dept of Psychology, West Virginia University, Morgantown, WV 26506. **Adults' perceptions of infants depicted through names and photographs.**

42 #**CHRISTOPHER R. RACINE**, MOLLY E. SEIDLER, DUSTIN L. MOORE and GERALD R. HANKINS, Dept of Biology, West Virginia State University, Institute, WV 25112. **In vitro screening of *Hibiscus sabdariffa* extracts for anti-tumor properties.**

43 **JAMES RENTCH**, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506. **Do trees fall downhill? Relationship between treefall direction, slope aspect, and wind in eight old-growth oak stands in the Central Hardwood Forest.**

44 ***DANIEL RIZER**, JACOB HACKETT, and JEREMY THOMPSON, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443. **Golf swing as a double pendulum.**

45 ADAM W. ROLLINS and RONALD CALDWELL, Dept of Math and Natural Sciences, Lincoln Memorial University, Harrogate, TN 37752, **JOHN C. LANDOLT**, Dept of Biology, Shepherd University, Shepherdstown, WV 25443, and STEVEN L. STEPHENSON, Dept of Biological Sciences, University of Arkansas, Fayetteville, AR 72701. **Dictyostelid cellular slime molds of southern Belize.**

46 *__RAINA ROMERO__, SCOTT FRAZIER, JR., and JUSTIN EBERSOLE, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443. **Understanding bicycle stability.**

47 *__KAYLA D. SAUNDERS__, ZACHARY R. HARTMAN, and JARRETT S. AGUILAR Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Molecular dynamics and site-directed mutagenesis of a Glu300 mutation in Cytochrome P450 2C9.**

48 *__JUSTIN SHELINE__ and DAN K. EVANS, Dept of Biological Sciences, Marshall University, Huntington, WV 25755. **Riparian stability, vegetation, vegetative zone width, and aquatic macrophytes, Winfield and Marmet pools, Kanawha River, West Virginia.**

49 *__ANDREW W. SMITH__ and SARAH M. UMPHRESS, Dept of Biology, West Virginia University Institute of Technology, Montgomery, West Virginia 25136. **Lethal and sub-lethal effects of selenium (selenite, selenate), an environmental toxicant, on a freshwater oligochaete, *Lumbriculus variegates*.**

50 __CLIFFORD E. STARLIPER__ and BARNABY J. WATTEN, USGS Leetown Science Center, 11649 Leetown Road, Kearneysville, WV 25430. **Control of aquatic invasive microorganisms: method development for ship ballast applications and laboratory studies on fish pathogenic and environmental bacteria.**

51 #__JESSICA STOLTZFUS__ and KATHERINE KARRAKER, Dept of Psychology, West Virginia University, Morgantown, WV 26506. **Father-infant play is influenced by infant temperament and sex.**

52 *__SHANNON STRALEY__, KAITLIN MARPLE, MEGAN SMITH, ALYSSA PENA, HAITAO LUO, and YI CHARLIE CHEN, Natural Science Division, Alderson-Broaddus College, Philippi, WV. **Time course of antibody-antigen reactions.**

53 *__BRIANA D. VECCHIO__, ANTHONY GIOVENGO, and LETHA J. SOOTER, Dept of Biology, West Virginia University, Morgantown, WV 26506. **Evolution of single-stranded DNA molecular recognition elements via CE-SELEX: detection of TNT and biosensor applications.**

54 #__SRINATH VELAGA__, NAGASREE GARAPATI, and BRIAN J. ANDERSON, National Energy Technology Laboratory, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506. **Calculation of N_2 hydrate reference parameters and cell potential parameters to analyze the N_2-CO_2 and N_2-CH_4 three phase equilibrium and structural transitions.**

55 #__RYAN WILLIAMS__ and LETHA J. SOOTER, Dept of Biology, West Virginia University, Morgantown, WV 26506. **Prostate cancer detection by molecular recognition elements.**

56 __AMY WITHROW__ and SARAH M. UMPHRESS, Dept of Biology, West Virginia Institute of Technology, Montgomery, WV 25136. **Prolonged exposure to sound wave frequencies, harmful to the California blackworm or not?**

57 *__JOHN D. WYATT__, ZACHARY R. HARTMAN, and JARRETT S. AGUILAR Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Molecular dynamics and site-directed mutagenesis of mutated cytochrome P450 2C9 T304A.**

58 #__MARION E. YOUNG__, Dept of Psychology, West Virginia University, Morgantown, WV 26506, SUSAN LYNCH, MARK POLAK, and SUSAN RITCHIE, Dept of Pediatrics, West Virginia University, Morgantown, WV 26506, and KATHERINE KARRAKER and HAWLEY MONTGOMERY-DOWNS, Dept of Psychology, West Virginia University, Morgantown, WV 26506. **Maternal perceptions of their premature infant's sleep.**

Abstracts for Oral Presentations

The abstracts for the oral presentations arranged in alphabetic order by the first author's last name. The time and place of each oral presentation is specified in the Oral Presentation List.

BRIAN J. ANDERSON, National Energy Technology Laboratory, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506.

Multiscale modeling: molecular, thermodynamic, reservoir, and economic modeling of energy systems.

Although researchers have, for decades, been able to model and simulate systems of different scales independent of each other, the ability to bridge multiple time and length scales between such models is still at the cutting edge of modeling capabilities. The ability to establish a direct connection between the models that are used to simulate the different scales can provide insight into the important parameters between scales in real systems. Current methods of modeling generally focus on one time- or length-scale, and any step change in dimension typically necessitates the introduction of new governing equations. Modeling multiple dimensions in space is a challenge in and of itself. Not only are we attempting to model all spatial dimensions, but these spatial dimensions over varying length and time scales with added complexities such as molecular interactions and economics. National-scale economic models of Geothermal Systems and their potential for U.S. electricity production as well as the coupling of molecular, thermodynamic, reservoir, and economic modeling in the area of natural gas hydrates will be presented. Enabled by the incorporation of *ab initio* calculations on the interactions of guest gas and host water molecules, molecular dynamic simulations are being used to predict the dissolution of hydrates in the presence of small driving forces. Thermodynamic models of natural gas hydrate phase equilibria have been improved upon, and economic modeling techniques for studying infant technology diffusion have been developed. Finally, the connection to nature's heterogeneity and production rates from arctic gas hydrate reservoirs will be discussed.

CHRIS ATKINSON, Director, Center for Alternative Fuels, Engines and Emissions, and Professor, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506.

Future automotive technologies and trends.

The automotive industry has recently been subjected to the confluence of a number of powerful and conflicting forces, including adverse economic effects, the consequences of globalization, the existence of significant production overcapacity, stringent emissions and safety legislation, increasing calls for energy independence, and requirements for further fuel economy and vehicle fuel efficiency improvements. There have been and will continue to be profound shifts in vehicle technologies including the introduction of hybrid electric vehicles, the increased use of renewable fuels and added vehicle electronic content. The electrification of passenger vehicles represents one of a series of inexorable trends that will play out over the foreseeable future. The future of the light duty passenger car and truck, the heavy duty vehicle, and fuel industries will be discussed against this backdrop.

ROBERT AULD, Dept of Computer Science and Mathematics, Shepherd University, Shepherdstown, WV 25443.

Mathematically modeling high altitude balloons.

The purpose of this project is to allow insight into the dynamics of high altitude flight so as to provide the ability to predict a high altitude balloon's position at any given time during the duration of its flight. The model created in this project takes into account near-current wind velocities at different levels in altitude based on previous data recovered, temperature and pressure values at these altitudes, maximum balloon fill capacity/ starting volume of gas, weight of payloads, and many other factors. The program created for this project allows relevant parameters to be defined and with the help of a previous National Weather Service flown high altitude weather balloon, will create a depiction of exactly what will go on during the flight of a future balloon. This model should allow a user to know where he or she will be going for retrieval of their high altitude balloon. Although more testing needs to be done, I believe this program provides a working model for actual high altitude balloon flight. This project is supported by NASA.

NATHAN R. BEANE and JAMES S. RENTCH, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506.

Using maximum entropy to model current red spruce forest habitat in West Virginia.

Red spruce (*Picea rubens* Sarg.) characterizes niche communities at higher elevations throughout the Appalachian Mountain Region (AMR) and is a relic species of the central and southern Appalachians. The reduction of approximately 90% of spruce habitat in West Virginia, due to exploitative logging, has led to the listing of the federally endangered cheat mountain salamander (*Plethodon nettingi* Green) and the recently delisted Virginia northern flying squirrel (*Glaucomys sabrinus fuscus* Miller). This loss of habitat is crucial for these species as well as many other species of conservation concern, and serves as an indicator of an ecosystem in need of restoration. The objective of our research was to use a maximum entropy (MAXENT) modeling approach to construct a habitat suitability map for red spruce. A total of 43 variables were incorporated into our model, with 19 bioclimatic variables examined. Preliminary analyses indicated

maximum temperature of the warmest month, slope position, mean temperature of the coldest quarter, and soil type to be important factors for predicting suitable habitat. The habitat suitability maps created from this modeling effort will help guide future restoration efforts as well as aid with identifying areas in need of conservation management.

R. DALE BILLER and DEWEY D. SANDERSON, Department of Geology, Marshall University, Huntington, WV 25755.
Water budget of the Coal River Basin 2009.
In 2009 a study of the 890 square mile Coal River watershed in West Virginia, a tributary of the Kanawha River, was conducted in an effort to characterize the water budget of the basin. A total of 13 rain gauging stations provided input precipitation data to the basin. A USGS stream gauging station at Tornado provided outflow data for 863 square miles upstream. Three rainfall interception sites were established in the basin and were revisited around 50 times during the course of the year. Relative leaf cover was estimated throughout the year.
The effective yearly rainfall across the basin as calculated by the Thiessen polygon method was 42 inches of which 20 inches or 48% left the basin through the Coal River, 33% was intercepted by foliage and 19% reached the ground and was lost by evapotranspiration.
Stream discharge was separated into overland and base flow components by both manual and digital filtering techniques. The base flow index (BFI) which is the ratio of the base flow to the total stream flow was calculated on a daily basis and averaged on a monthly basis. For a month of a 2 inch rainfall the BFI was around 80% and dropped to 40% when the rainfall topped 8 inches. The BFI was also calculated for daily flow data from 1961-2009 and was found to have no trend over nearly 50 years.

LISA BLICKENSTAFF, Dept of Education Mathematics (5-Adult), Shepherd University, Shepherdstown, WV 25443, and KARA CRESS, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443.
Unstable wobble mode.
Through research and experimentation in bicycle dynamics we determined what causes a wobble oscillation in the front wheel of a bicycle. During our research, we looked at various equations to calculate wobble and its relationship to speed. We also used programs such as Matlab to enforce our results. Our research is ongoing and will eventually consider the combination of both wobble and weave. We would like to thank Dr. Elmer and NASA for their ongoing support to our research.

ELIZABETH A. BYERS, JAMES P. VANDERHORST and BRIAN P. STREETS, West Virginia Division of Natural Resources, Elkins, WV 26241.
Natural Heritage assessment of upland red spruce communities in West Virginia.
Upland red spruce communities in the Allegheny Mountains of West Virginia provide unique habitats for wildlife and plant species. As part of a statewide vegetation classification effort, West Virginia Division of Natural Resources personnel used Natural Heritage methodology to assess the upland red spruce ecosystem. Five associations were classified, peer-reviewed, and published in the U. S. National Vegetation Classification (USNVC). The five red spruce forest and woodland associations are all ranked as high state and global conservation priorities. Documented species occurrences in the study area include 850 animal species and 373 plant species. Rare taxa include 15 mammals, 16 breeding birds, 2 reptiles, 4 amphibians, 7 land snails, 2 crayfish, 17 butterflies, 10 moths, and 9 vascular plants. This report complements a recently completed assessment of 41 high elevation wetland communities within the Allegheny Mountains of West Virginia, and together these two reports complete the USNVC classification of red spruce ecosystems in West Virginia.

ELIZABETH BYERS, West Virginia Division of Natural Resources, Elkins, WV 26241.
Assessing the climate change vulnerability of West Virginia's rare species.
Resource managers are increasingly asked to identify which of the species on the lands and waters they oversee are most vulnerable to climate change-induced declines. Comparing vulnerabilities across species is difficult, however, because species respond differently to change and because climate change is likely to impact species through direct and indirect pathways, many of which could influence the success of potential management strategies. The West Virginia Division of Natural Resources is currently assessing rare species in the state using NatureServe's newly developed Climate Change Vulnerability Index, which provides a rapid, scientifically defensible assessment of species' vulnerability to climate change. The index is based on down-scaled climate exposure predictions combined with natural history and distribution factors that are associated with sensitivity to climate change. The list of target species is drawn from those identified in the West Virginia Wildlife Conservation Action Plan as being in greatest need of conservation, in addition to species that are considered imperiled throughout their range. Results of the assessment will include ranking of taxa and taxonomic groups, identification of geographic regions of the state most vulnerable to climate change extinctions, and identification of common risk factors. Based on these data, recommendations for monitoring, conservation, and/or management of vulnerable species and their habitats will be prepared for the West Virginia Wildlife Conservation Action Plan. Taxonomic experts interesting in contributing to this on-going assessment are encouraged to contact the author.

KIRAN CHAUDHARI and RICHARD TURTON, Dept of Chemical Engineering, West Virginia University, Morgantown ,WV 26505, and CHRIS GUENTHER and RONALD BREAULT, National Energy Technology Laboratory, Morgantown, WV 26505.

Development of advanced coal gasification kinetics models for CFD (and process simulation) codes.

The objective of this research is to implement detailed kinetic expressions for the gasification of a wide variety of coals in existing CFD codes such as MFIX. These expressions describe the fundamental steps taking place in the gasification of coal, namely, coal devolatilization, tar-gas chemistry, soot formation, the heterogeneous and homogeneous gasification reactions along with combustion reactions. For this purpose, the data generated by PC Coal Lab licensed by Niksa Energy Associates LLC will be used to simulate the gasification of various coals in CFD codes. The CFD code of most interest is MFIX, which is used to describe the hydrodynamics, heat transfer and chemical reactions in the reacting fluid-solids systems comprising the contents of a gasifier. The implementation of coal gasification kinetics in MFIX is currently done through a set of subroutines making up the module Carbonaceous Chemistry for Continuum Modeling (C_3M) code. C_3M has default gasification kinetics for only a few coals. While on the other hand, PC Coal lab can predict the gasification kinetics for over 2000 coal species. Therefore this project focuses on the development of a seamless connection between PC Coal Lab and the C_3M .The interface will be designed to allow MFIX to transfer information through C_3M to PC Coal Lab, run PC Coal Lab with the input data from MFIX, send kinetic information back to C_3M in a form that allows C_3M to update and continue the MFIX simulation using updated parameters from PC Coal Lab. Project is funded by department of energy.

PINGEN CHEN, HAILIN LI, W. SCOTT WAYNE and NIGEL N. CLARK, Center for Alternative Fuels, Engines and Emissions, West Virginia University, Morgantown, WV 26506, and XIAOHUA ZENG, College of Automotive Engineering, Jilin University, Changchun, Jilin, P.R. of China.

Optimization of a heavy-duty hybrid bus operated under transient cycles.

Hybrid vehicles have been recognized as a viable technology having the potential to improve fuel economy substantially and to reduce exhaust emissions in urban areas. In principle, the success of hybrid technology relies on the efficient recovery of the vehicle kinetic energy during the braking process and energy management between the battery system and engine. The optimization of the power control strategy makes it possible to run the engine with best fuel economy while complying with emissions regulations, although the engine may not operate in the same way as in a conventional bus. The main objective of this research was to simulate and optimize the operation of a heavy-duty hybrid bus operated under typical transient bus cycles. Component data and operation maps of a prototype parallel hybrid bus were employed in the Powertrain Systems Analysis Toolkit (PSAT) developed by Argonne National Laboratory. The model was validated against preliminary experimental data measured using the China bus driving cycles. The validated model was then used to simulate the performance of its operation under multiple US transient bus emission cycles. The simulation results indicated the potential of hybrid bus control strategy optimization in reducing the fuel consumption and greenhouse gas emissions. Compared to the fuel consumption obtained with the original control strategy, the optimized strategy had the potential to reduce the fuel consumption by 5.3%, 7.7% and 3.37% when operated through the Manhattan Bus Cycle, the Central Business District Cycle and the New York Bus Cycle, respectively.

SONG CHEN, XUEYAN SONG, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506, YUN CHEN and HARRY FINKLEA, Dept of Chemistry, West Virginia University, Morgantown, WV 26506, and GREG HACKETT and KIRK GERDES, National Energy Technology Laboratory, DOE, 3610 Collins Ferry Road, Morgantown, WV 26507.

Microstructure and chemistry of the anode active layers in the anode supported Solid Oxide Fuel Cell.

In order to examine the microstructure and chemistry of the anode supported solid oxide fuel cell (SOFC), the SOFC was operated in coal syngas containing H_2, CO, CO_2, H_2O, N_2 and CH_4 at a current load of 0.25 A/cm^2 at 800°C for 45 h. After operation, transmission electron microscopy (TEM) was employed to examine the microstructure and chemistry of the anode active layer. In this study, we focused on the region where is about 5 μm away from the interface of the anode and the electrolyte. The TEM results showed that a bi-layer structure surface layer is present and this layer covers the interface between the pores and Ni and YSZ grains and separated the original triple-phase boundary (TPB) site from gas phase. The select area diffraction (SAD) patterns associated with energy dispersive spectroscopy (EDS) reveal that this bi-layer structure composed of an amorphous layer and a polycrystalline layer with fine NiO nano grains. A long ribbon phase was also observed between Ni and YSZ grains. The SAD confirmed this ribbon phase is NiO phase.

DAN CINCOTTA, WV Division of Natural Resources, Wildlife Resources Section, Elkins WV 26241, and STUART A WELSH, US Geologic Survey, WV Cooperative Fish and Wildlife Research Unit, Morgantown, WV 26506.

Conservation status of imperiled West Virginia fishes.

West Virginia waters contain a fairly rich and unique ichthyofauna. Of the approximately 180 species among 24 families found within the state, no fishes are listed as endangered and threatened pursuant to the federal Endangered Species Act of 1973 (ESA). In 1996 the US Fish and Wildlife Service (FWS) discontinued the use of the ESA designation of Category 2, which was the list of "candidate" species. Fishes and other biota within this former group are now regarded as "species of concern" and to list species via the Act became more comprehensive and difficult. Partly in response to the changes in ESA, fish conservation groups compile independent lists to supplement the law, and to keep data current in the event of a potential ESA listing. Species of concern in West Virginia, formerly listed via Category 2, are the lake sturgeon (*Acipenser*

fulvescens), paddlefish (*Polydon spathula*), Kanawha minnow (*Phenacobius teretulus*), Cheat minnow (*Rhinichthys bowersi*), blue sucker (*Cycleptus elongatus*), crystal darter (*Crystallaria asprella*), spotted darter (*Ethesostoma maculatum*), candy darter (*E. osburni*), eastern sand darter (*E. pellucidum*), longhead darter (*Percina macrocephla*), and the Bluestone sculpin (*Cottus* sp.). The American Fisheries Society Endangered Species Committee (AFS) recently reviewed the status of the North American fauna. In doing so they updated former AFS conservation lists and attempted to clarify the population status of all fish species on the continent by utilizing the terms endangered, threatened, vulnerable, extinct, possibly extinct, extirpated in nature, and delisted. Relative to West Virginia, this documentation maintained that all "species of concern" mentioned above were still in potential jeopardy, except the Kanawha and Cheat minnows (i.e., delisted); moreover, several species were added to their checklist. This presentation will discuss: 1) historical and current status of the all AFS listed species for West Virginia; 2) the merit of maintaining independent State rare species checklists; and, 3) the potential problems associated with the recent AFS effort.

KATRINA COOPER, Dept of Psychology/ Director of First Year Studies, Bethany College, Bethany, WV 26032.
The science of assessment: using first year experience assessment results to improve the program.
Using the Bethany College First Year Experience as a model, issues in assessment will be explored. These include using multiple assessment tools to get an accurate portrait of students, the importance of articulating clear program goals, and "closing the assessment loop" by taking action. The First Year Experience at Bethany College requires incoming students to complete three courses; a first year seminar, a course dealing with transitions to college (both in the fall), and a January Term experience. Together, these courses are meant to provide students with a mentor who helps them to improve reading, writing and research skills, familiarizes them with the academic life of the college, and provides a bridge between high school and college, both inside and out of the classroom. Each course is evaluated by the student, with additional information provided by the NSSE, and independently assessed writing samples taken throughout the semester. Based upon the feedback from earlier years, changes to the First Year Experience program are being made. These changes include the institution of a weekly brown bag session for faculty involved in the program and the adoption of a community learning model for some sections. Assessment data demonstrate a positive effect of attendance at the brown bag series on student writing and student evaluations. As the learning communities will not be instituted until the fall of 2010, no data are yet available, but issues in gathering and using data for the creation and promotion of success of this program will be discussed.

KARA CRESS, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443, and LISA BLICKENSTAFF, Dept. of Education Mathematics (5-Adult), Shepherd University, Shepherdstown, WV 25443.
Weave's effect on the stability of a bicycle.
Have you ever wondered how a bicycle stays upright when you ride it? One effect that keeps the bicycle upright is called weave, an oscillation of the rear end of the bicycle around the steering head axis. As part of this research, we experimented with bicycles and solved the differential equations dealing with weave and its effect on the stability of the bicycle. We found the eigenvalues of the underlying equations and used these to make conclusions about the stability of the bicycle. We would like to thank NASA and Dr. Chris Elmer for their help and support throughout the project.

JESSICA CURTIS and PETER VILA. Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443.
Survey of herpetofauna in three West Virginia counties: Berkeley, Jefferson, and Morgan.
An updated qualitative herpetological survey of the Eastern Panhandle was conducted from Spring to late-summer 2009 at 274 sites. The survey objective was to provide basic information about the current distribution of native reptiles and amphibians. Sampling was opportunistic and habitats were grouped into 1) on or next to roads, and 2) other habitats including riparian areas, mature deciduous forest, ephemeral pools, and edge habitats such as residential edges. Species were observed and identified as live or dead animals (road mortality), or by audible calls. A total of 15 species of reptiles and 17 species of amphibians were identified. This is a marked increase from a 2005 study with fifty-nine sites that identified 12 species of reptiles, and 7 species of amphibians. All species except one were native to the region and none are listed as threatened/endangered. However, five species are considered Species of Concern by the state of West Virginia. Approximately 26 species of amphibians and 35 species of reptiles are expected in the survey area. High rates of development and a long history of heavy agricultural use in the area has fragmented suitable habitats for many species. Most expected species likely still occur in the Eastern Panhandle, but in Jefferson and Berkeley counties, many species may occur in disjunct habitats that are difficult to sample.

RODNEY DEVER and DONNA FORD-WERNTZ, Dept of Biology, West Virginia University, Morgantown, WV 26506.
Taxonomy of the *Allium cernuum* complex in Appalachia.
The *Allium cernuum* complex in Appalachia potentially consists of three taxa: *A. cernuum* Roth (nodding onion), *A. allegheniense* Small (Allegheny onion) and *A. oxyphilum* Wherry (acid-loving onion). Some botanists have held that these onions are three distinct species whereas others regarded the putative taxa as synonyms of *Allium cernuum*. This issue presents a conservation concern as *A. oxyphilum* and *A. allegheniense* are both considered rare and possibly threatened in West Virginia and Virginia. This research is clarifying the ambiguous classification of these onions by assessing variation in their morphology, ecology, anatomy, and cytology. A survey of 852 specimens from 18 eastern U.S. herbaria

is being conducted to reveal locations of populations. Characters such as the size of leaves, scapes, pedicels, tepals and capsules are being examined in addition to shapes and colors of the perianth. Morphological variation will be evaluated using a multivariate statistical analysis. The vascular anatomy can be useful diagnostically in *Allium*. Scape and leaf sections from field collections are being investigated for bundle number and pattern. To detect cytological variation among localities, somatic chromosomes are being examined in root tip cells. A common garden experiment, done in the summer of 2009, established that the observed morphological variation is primarily genotypic.

CHASE DOWLING, QING WANG and ZHIJUN WANG, Shepherd University, Dept of Computer Science, Mathematics, and Engineering, Shepherdstown, WV 25443.

The reproductive ratio of pandemic H1N1/09 influenza virus in active duty military personnel.

Influenza A (H1N1), a virus of much academic scrutiny, was declared a pandemic flu by the World Health Organization in 2009. Here we analyze the reproductive ratio of the virus as of February/March 2010. The basic reproductive ratio, R_0, is defined as the number of secondary cases generated by a typical infected individual in a completely susceptible population. Essentially, the reproductive ratio describes the rate at which the virus spreads, if at all. This value provides us with valuable insight into the behavior of the virus; with this value we can predict the longevity and magnitude of the pandemic and effectively determine courses of action to control it. In this study, we use comprehensive data regarding influenza-like symptoms and confirmed H1N1 cases arising in active duty military personnel to determine a reproductive ratio with a special system of differential equations: an SIR model (Susceptible/Infected/Recovered.) We compare this experimentally derived value of the reproductive ratio, up until now, to previously forecasted and more recently derived values of the reproductive ratio, and also forecast the ratio into the coming months as the pandemic comes to a close. We determine if this Defense Intelligence Agency data set effectively models influenza virus on a national scale, given the skewed characteristics of the active duty military population the ratio is based on. Also, given the virus' known behavior, we determine whether or not we can use our results to forecast the virus' future behavior outside of the data set's population.

MARY ANN DRUMRIGHT-CLARKE, Dept of Mathematics, West Virginia University, Morgantown, WV 26506.

A review of partial differential equation weak solution formulation used in finite element software construction.

Finite element methodology is a classic applied mathematics technique used to manage the solution of partial differential equations (pde). One foundational means to construct a finite element framework for any pde is through the analysis and formulation of a weak solution. In the field of fluid dynamics, there are several publically available software packages that utilize finite element methodologies (like Fluent ®) to solve the Reynolds Averaged Navier-Stokes (RANS) equations. While these packages are phenomenally useful as predictive tools, it is an unfortunate truth that most package-users are unaware of how or why the software works. While the material is not new, the presenter will review the basic tenets of weak formulation for the Stokes equation, and demonstrate the construction of a finite element solution methodology on a simple grid system. The methodology will be generalized to the extent that other pde of engineering interest (that are not available in commercial solvers) can similarly be investigated.

LUCAS A. DVORACEK, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, HUEY MIIN LEE, Dept of Statistics, West Virginia University, Morgantown, WV 26506, MELINDA S. DETRICK, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and ROBERT KREISBERG, College of Sciences, West Liberty University, West Liberty, WV 26074.

Statins may be beneficial in reducing heart disease by inhibiting the inflammatory response that causes atherosclerosis.

Coronary heart disease is the leading cause of death in the United States. The principal cause of heart disease is atherosclerosis, the accumulation of plaque on arterial walls. In the past, low density lipoprotein (LDL) has been villainized as the immediate cause of this disease, but recent findings have linked atherosclerosis with a chronic inflammatory response at the arterial endothelial cell level. The apparent initiator of this response is minimally-modified LDL (mm-LDL), a partially oxidized form of LDL. In our laboratory, human aortic endothelial cells (HAECs) treated with oxidized 1-palmitoyl-2-arachidonoyl-*sn*-phosphatidylcholine (oxPAPC; a principal bioactive component of mm-LDL) demonstrated increased message for IL-6 and IL-8, two pro-inflammatory cytokines with roles in atherosclerosis. This effect was reversed by lovastatin. Statins are prescribed as inhibitors of cholesterol biosynthesis, thus diminishing serum LDL and ultimately retarding atherosclerosis. The work presented illustrates statins may also function at the endothelial cell level downregulating pro-inflammatory cytokines in cells affected by mm-LDL/oxPAPC. Furthermore, lovastatin-mediated reversal of oxPAPC effects was abolished with mevalonate (both cytokines) or geranylgeranyl pyrophosphate (IL-8). This evidence suggests lovastatin has an anti-inflammatory effect on endothelial cells through which inhibition of mevalonate production and subsequent reduction of geranylgeranyl pools available for IL-8 and potentially IL-6 upregulation signaling is accomplished. The reported effects strengthen evidence for prophylactic statin use in decreasing the incidence of atherosclerosis through a two-prong approach: limiting the availability of LDL for oxidation by reducing biosynthesis and downregulating production of pro-inflammatory cytokines within arterial endothelium ultimately lessening inflammation underlying atherosclerotic plaque formation.

JUSTIN EBERSOLE, SCOTT FRAZIER, JR., and RAINA ROMERO, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443.

Gyroscopic effects on a bicycle.

The objective of this study was to determine if gyroscopic forces stabilize a bicycle while in motion. By measuring the distribution of the masses of a bicycle wheel, we discovered both its center of gravity and its angular momentum; we obtained values for gyroscopic forces. We observed their effect on the stability of a moving bicycle. We will also be creating a computer model to compare our findings with expected values derived from accepted equations. Do gyroscopic forces hold up a bicycle? Come and see. Special thanks to Dr. Christopher Elmer and NASA for their support in this project.

AMY ELLIS and BETH PAULEY, Dept of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304.

Helping students overcome math anxiety.

A brief overview of practical techniques shown to be helpful for students of all ages in overcoming their anxiety toward mathematics will be presented. Mathematics is a discipline often met with much anxiety. Many students enter the classroom with self-defeating thoughts which if not managed successfully can lower academic performance. Helping students change how they think about mathematics will lessen anxieties. By providing students with practical examples of how mathematics can be applied to everyday life and the use of a few simple techniques, such as preaching patience and persistence, pictures and diagrams and lots of scrap paper, math anxiety can be greatly reduced. General information concerning math test-taking will also be covered.

E. RAY GARTON, WV Geological Survey, Morgantown, WV 26508, ROBERT L. PYLE, Prehistoric Planet, Morgantown, WV 26505, and DAVE PHILLIPS, Sunset Fossils, Morgantown, WV 26505.

A new vertebrate fossil assemblage from the Ewing Limestone, Conemaugh, Pennsylvanian of West Virginia.

A few scraps of fossil bone were discovered in the fall of 2008, along a drainage ditch from a coal strip mine, in preparation for future highway construction. Highway construction progressed at a fast pace and could not be diverted or delayed. The authors spent considerable man hours prospecting the area and located a large deposit that contained several vertebrate forms including; teeth and spines of the shark Orthacanthus, teeth, spines, vertebra and skull plates from the lungfish Sagenodus, and other fishes. Several jaws and teeth from Labyrinthodonts, (amphibians), possibly a Temnospondyl or Anthracosaur have also been identified. At least one tooth of a Pelycosaur has been identified along with several vertebra of the amphibian Megamolgophis. In addition many vertebra centrum elements of an Embolomere form were found. Hundreds of cranial and postcranial elements were found. Although some bones were found in close association, no articulated specimens were found. The deposit originally covered about 1 acre and has been removed and distributed as fill for the new highway. The bone horizon is a few feet below what is tentively identified as the Harlem Coal at what would be the level of the Ewing Limestone. The Ewing is reported in the literature as a fresh or brackish water deposit and the vertebrate forms confirm this hypothesis. No invertebrate or plant fossils were found in the deposit.

R. TRISTAN GINGERICH and JAMES T. ANDERSON, Div. of Forestry and Natural Resources, Wildlife and Fisheries Resources Program, West Virginia University, Morgantown, WV 26506.

Decomposition rates in created and natural wetlands of West Virginia.

Wetland decomposition is influenced by numerous wetland functions and, in turn, is an important component of nutrient cycling. This makes wetland decomposition a good means of assessing wetland function. We measured plant litter decomposition rates, using leaf litter bags, in eight created and eight reference wetlands in West Virginia, from 2008 to 2009. A subset of those wetlands, three mitigated and three reference, were part of a more in depth study that occurred from 2007 to 2009. Four common wetland litter species were used: broadleaf cattail (*Typha latifolia*), common rush (*Juncus effusus*), brookside alder (*Alnus serrulata*), and reed canary grass (*Phalaris arundinacea*). A fifth litter type was created from a mix of common rush, brookside alder, and reed canary grass. Percent mass remaining and mean decomposition rate (k), after 728 days, were similar between mitigated (n=3, 38.1%, $k = 0.646\ yr^{-1}$) and reference (n=3, 32.2%, $k. = 0.710\ yr^{-1}$) wetlands ($P > 0.05$) and created (n=8, 55.9%, k= $0.526\ yr^{-1}$) and reference (n=8, 54.6%, $k = 0.517\ yr^{-1}$) wetlands after a year. Percent of mass remaining for reed canary grass (26.5%, $k = 0.92\ yr^{-1}$), the mixed litter (28.3%, $k = 0.77\ yr^{-1}$), and common rush (30.8%, $k = 0.61\ yr^{-1}$) were similar, but were significantly less than brookside alder (44.3%, $k = 0.673\ yr^{-1}$) and broadleaf cattail (45.8%, $k = 0.40\ yr^{-1}$). Our study indicates that mitigated wetlands had similar function, with regards to decomposition, as the reference wetlands.

RAJ GONDLE and HEMA SIRIWARDANE, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506.

Geologic storage of carbon in coal seams.

Geologic sequestration is one of the options for storage of carbon to reduce current levels of carbon dioxide emissions. The potential of CO_2 sequestration in a deep unmineable coal seam was evaluated based on a field injection and numerical modeling of overburden response. The field site was instrumented with high precision tiltmeters that can measure surface displacements in sub-millimeter range. Three dimensional coupled flow-deformation finite element analyses were performed to determine expected surface deformations during fluid injection. Moreover, numerical methods

were also developed to simulate fault activation and its influence on overburden response. Results from this study are presented in this paper. Results from this study can be used in developing monitoring technologies for geologic sequestration.

JOE GREATHOUSE, Curator of Animals, Oglebay's Good Zoo, Wheeling, WV 26003.

Conservation of the Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*) in the northern panhandle of West Virginia.

The Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*), the largest salamander in the Western Hemisphere is considered a rare or endangered species in each state that it inhabits. Surveys of this species have been conducted in the Northern Panhandle of West Virginia since 2005. These surveys have resulted in the capture of 112 hellbenders from eight geographically isolated populations in four Ohio River tributary streams. These surveys have yielded the first documented occurrence of the amphibian chytrid fungus (*Batrachochytridium dendrobatidis*) in West Virginia, the documentation of the first larvae of this species in West Virginia, and the first eight documented nests of this species in West Virginia. One of these nests was discovered with a portion of the clutch infected with *Saprolegnia spp.* in September, 2007. These eggs were taken to Oglebay's Good Zoo where the infected eggs were removed and discarded, and the remaining eggs were separated and cared for individually until the hatching of over 120 larvae. This was the first hatching of this species at any zoo or aquarium in the world. These individuals will be used in reintroduction efforts to determine if head-starting hellbenders would be an effective conservation strategy for this species. The majority of the support for this project has been provided by the West Virginia Division of Wildlife's Diversity Grants Program, and additional disease surveillance and captive husbandry support have been provided by Oglebay's Good Zoo, The Wilds, the Columbus Zoo and Aquarium, the Fort Worth Zoo, and Omaha's Henry Doorly Zoo.

JOE GREATHOUSE, Curator of Animals, Oglebay's Good Zoo, Wheeling, WV 26003, and THOMAS K. PAULEY, Dept of Biology, Marshall University, Huntington, WV 25755.

Surveillance of the amphibian chytrid fungus (*Batrachochytridium dendrobatidis*) in West Virginia amphibians.

The amphibian chytrid fungus (*Batrachochytridium dendrobatidis*) is a fungal pathogen that has decimated amphibian populations throughout the world, and is considered to be the worst disease in recorded history in terms of its ability to drive a species or populations of species to extinction. From 2008 – 2009 researchers from Marshall University and Oglebay's Good Zoo conducted surveys for this pathogen to determine its distribution in West Virginia. During this project, samples were collected from 483 individuals of 19 species from 31 sites in 17 different counties. Positive samples occurred in 7 of the 19 different species and at 6 of the 31 sites. When analyzing the presence of the pathogen geographically in West Virginia, 5 out of 7 sites north of U.S. Route 50 (71.4%) had positive test results, and 5 out of 9 sites near the Ohio River (55.6%) had positive test results. Conversely, only 1 out of 22 sites south of U.S. Route 50 in the montane region of the state (4.6%) had positive test results. This data should be used to develop appropriate hygiene protocols for amphibian researchers in West Virginia in order to attempt to prevent the movement of this pathogen within the state. Funding for this project was provided by the West Virginia Division of Wildlife's Diversity Grants Program.

MARY RUTH GRIFFIN, Dept of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304.

Student test-taking anxiety and the application of intervention learning techniques.

This interdepartmental study examined the physiological effects of test-taking and the efficacy of a biblio-technique intervention strategy. Test-taking anxiety is a serious problem which can negatively impact student performance. Test-taking anxiety can be the result of tension, worry, distraction and procrastination. In some cases test-taking anxiety can manifest as physical bodily symptoms such as sweating, headaches and nausea. This four-part project began with a survey to educate students about test-anxiety and test-anxiety types. A pre-intervention test was developed to determine the physiological response of students during a testing situation, after which an intervention was provided. The intervention was a biblio-learning technique which provided students with information and applicable strategies needed to overcome test anxiety. A post-intervention test was also conducted to determine if any improvement in bodily symptom reactions using physiological measurements could be detected.

ERIC HEITZMAN, SEAN DOUGHERTY, and JAMES RENTCH, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506, STEVE STEPHENSON, Dept of Biology, University of Arkansas, Fayetteville, AR, and STEVE ADAMS (ret.), Dabney Lancaster Community College, Clifton Forge, VA.

Long-term changes in stand structure and tree ring patterns in old-growth red spruce (*Picea rubens*) forests in West Virginia.

In the early 1980s, the stand structure and radial growth patterns of three, old-growth red spruce (*Picea rubens*) forests in West Virginia were documented. In 2007, we remeasured these stands to describe changes that occurred over 25+ years. The three case studies indicate that standing dead trees are a common feature of old-growth spruce stands. Spruce regeneration naturally regenerates under small- and large-scale disturbances, but can be inhibited by dense thickets of rhododendron. Declining radial growth trends characteristic of the 1980s were not always observed among current spruce trees.

MICHAEL HENDRYX and KEITH J. ZULLIG, Dept of Community Medicine, West Virginia University, Morgantown, WV 26506.

Population health disparities in central Appalachian mountaintop coal mining counties.

Previous research has identified significant population health disparities within Appalachian coal mining areas associated with socioeconomic and environmental risks. The objectives of the current research were to identify whether health disparities were unique to areas of central Appalachia where mountaintop mining (MTM) takes place. Secondary data covering the four central Appalachian states with MTM (KY, TN, VA, and WV) were collected and merged from multiple existing sources. Data included records of all live births in the years 1996-2004, CDC self-report survey data from 2006 on adult cardiovascular health and health-related quality of life, demographic variables from the US Census and other sources, and mining data from the Department of Energy and US Army Corp of Engineers. Counties were categorized into three groups: counties in MTM permit areas, other coal mining counties outside of MTM areas, and non-mining counties. Analyses included multilevel logistic regression modeling to examine associations between county group and health outcomes, controlling for other health risks. Results for all outcomes (babies born with congenital anomalies, and adult cardiovascular health and quality of life) showed significant health impairment in MTM counties. For example, the adjusted odds ratio for a congenital anomaly in 2004 in MTM areas was 2.68 (95% CI=2.24-3.20) compared to non-mining counties. Health disparities in non-MTM mining counties were intermediate and significantly impaired compared to non-mining counties for some but not all outcomes. Previously identified health disparities in Appalachian coal mining areas are concentrated in areas where MTM takes place. Limitations and future directions are briefly discussed.

DEBRA HULL, Dept of Psychology, Wheeling Jesuit University, Wheeling, WV 26003.

The science of assessment: assessing service serves assessment.

Assessing the impact of service/service learning experiences on students' college development presents some unique challenges. In this session, we will discuss two approaches to assessing service learning—asking students to tell us about the impact of their experiences, through the use of pre- post- surveys; and looking for evidence of change in their behavior, through the use of reflection papers, journal entries, and essay-item responses. In both cases we will attend carefully to how scientific principles of measurement can make the outcomes both more legitimate, defined as more reliable and valid with fewer potential confounds, and more helpful and meaningful to assessors. We will also present an extended example of how one can involve students in the assessment of service learning, at the same time teaching them experimental methods for answering real-world questions using primarily qualitative data.

JOHN H. HULL, Dept of Psychology, Bethany College, Bethany, WV 26032.

The science of assessment: assessing majors.

One difficulty with assessing academic majors and programs is addressing issues of external validity: To what extent do major requirements and students' experiences generalize to "real-world" expectations and standards? Further, how can assessment of academic majors and programs ultimately improve those majors and programs? We will discuss how the Department of Psychology at Bethany College is using data from its senior comprehensive examinations to demonstrate external validity in its assessment efforts, consider other potential sources of external validity, and share ideas about effective assessment methodology.

DUSTIN JONES, DEBANGSU BHATTACHARYYA, and RICHARD TURTON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506 and STEPHEN E. ZITNEY, Collaboratory for Process & Dynamic Systems Research, National Energy Technology Laboratory, Morgantown, WV 26507.

Analysis of an air separation unit as part of an integrated gasification combined cycle power plant.

Efficient design of a cryogenic air separation unit (ASU) and its optimal integration with the gas turbine (GT) can help to improve the overall efficiency of an integrated gasification combined cycle (IGCC) power plant. Because of the integration between the ASU and the GT, an elevated pressure ASU (EP ASU) is usually considered to be a better option than the conventional low pressure ASU (LP ASU) as O_2 to the gasifier and N_2 to the GT become available at a higher pressure. However, because of an increase in the operating pressure, the relative volatilities between O_2, N_2, and AR decrease along with a decrease in the differences between the liquid and vapor densities. This gives rise to a very challenging separation problem. In this study, the focus is on maximizing the overall process efficiency by investigating various configurations of an EP ASU, optimal integration of the ASU with the GT, and the effect of power cycle selection on the choice of the ASU cycle. The study has also investigated the possibility of an LP ASU with a pumped liquid oxygen cycle that can decrease the power requirement of the oxygen compressors significantly. For a steam injected GT, the study shows that an LP ASU is a better option compared to an EP ASU since no nitrogen injection is required. In addition, more air is available for extraction due to limitations in the mass and volumetric flow of the gas turbine. This work has been funded by the NETL.

GARY KAPPEL and ALEECE C. GRESHAM, Bethany College, Bethany, WV 26032.

Tales from the dark side: a non-scientist's adventures in the land of assessment.

As assessment of student learning becomes increasingly critical in accreditation of institutions of higher education, more and more faculty with little or no background in statistics, test design, or survey construction are nevertheless finding themselves called upon to take a crack at those things. While most assessment activities do not require an expert

knowledge of statistics, they do require a solid grounding in descriptive and inferential statistics. As for assessment instruments, critical questions include how to satisfy the expectations of accrediting agencies while maintaining control over your curriculum, i.e "To teach or not to teach to the test?" and "Just how many surveys will my students endure before they glaze over?" This presentation offers a highly unscientific, but utterly realistic journey of a temporarily mis-assigned historian masquerading as the Institutional Effectiveness director at a small liberal arts college as he tried to bring himself up to speed in these areas, and more importantly, what he learned about drawing on the expertise of his colleagues in a number of academic disciplines for support and advice.

S. J. KASULE, D. BHATTACHARYYA and R. TURTON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506 and Collaboratory for Process and Dynamic Systems Research, U.S. Department of Energy, National Energy Technology Laboratory, Morgantown, WV 26507 and S. ZITNEY, Collaboratory for Process and Dynamic Systems Research, U.S. Department of Energy, National Energy Technology Laboratory, Morgantown, WV 26507.
On the modeling of a single-stage, downward-firing, entrained-flow gasifier using Aspen Custom Modeler.
Coal-fired gasifiers are the centerpiece of integrated gasification combined cycle (IGCC) power plants. The gasifier produces synthesis gas that is subsequently converted into electricity through combustion in a gas turbine. Several mathematical models have been developed to study the physical and chemical processes taking place inside the gasifier. Such models range from simple one-dimensional (1D) steady-state models to sophisticated dynamic 3D computational fluid dynamics (CFD) models that incorporate turbulence effects in the reactor. The practical operation of the gasifier is dynamic in nature but most 1D and some higher-dimensional models are often steady state. On the other hand, many higher order CFD-based models are dynamic in nature, but are too computationally expensive to be used directly in operability and controllability studies. Thus lower-dimensional dynamic models are still useful in these types of studies. In the current study, a 1D dynamic model for a single-stage, downward-firing, entrained-flow gasifier is developed using Aspen Custom Modeler® (ACM), which is a commercial equation-based simulator for creating, editing, and re-using models of process units. The gasifier model is based on mass, momentum, and energy balances for the solid and gas phases. The chemical reactions considered in the model are devolatilization/pyrolysis, gasification, combustion, and the homogeneous gas phase reactions. In this presentation, preliminary results from the steady state non-isothermal gasifier model will be presented. Sensitivity studies will be presented for different types of coal and validation of the model with experimental data will be shown. This project is supported by NETL.

PAUL J. KREITZER and JOHN M. KUHLMAN, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506.
Spray cooling simulation implementing time scale analysis and the Monte Carlo Method.
Simulation capability for complex physical systems is expected to increase as computational power increases, with CFD leading the way. However, the complicated, multiphysics nature of spray cooling has resulted in recent 3-D CFD simulations of single droplet impingement using a serial PC which can take in excess of 30 days to solve (Selvam, 2009). Parallel processing shortened this time dramatically, but still requires over half a day. Therefore, there is a clear need for a comprehensive spray impingement simulation with adequate physical complexity to yield accurate results within a relatively short run time. The present work combines experimental and computational results with numerical correlations representing the physics that occurs on a heated impingement surface. The current simulation models the spray behavior of a Spraying Systems FullJet 1/8-g spray nozzle. Spray characteristics are indicated as follows: flow rate of 1.05×10^{-5} m^3/s, normal droplet velocity of 12 m/s, and Sauter mean diameter of 48 μm. This produces the following non-dimensional number ranges: We 300–1350, Re 750–3500, Oh 0.01–0.025. Numerical and experimental correlations have been identified that represent crater formation, splashing, film thickness, droplet size, and spatial flux distributions. A combination of these methods has resulted in a spray impingement simulation capable of simulating hundreds of thousands of drops. This represents approximately one millisecond and takes several hours to complete. A comparison of results from this code to experimental results shows similar trends in surface behavior and heat transfer. Partial support from the NASA WVSGC is appreciated.

TRACY LEE and KENNETH CUSHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and ERIN KELLEY, RYAN C. KENNEDY and HEATHER N. CUSHMAN, Dept. of Biology, Washington and Jefferson College, Washington, PA 15301.
Effects of intramuscular acid injections on ASIC3 and Na_V1.9 expression.
When acid is injected into the gastrocnemius of mice it causes long lasting hyperalgesia. We injected acidic solutions of varying pH into mice, to determine the behavioral and transcriptional effects. RNA was extracted from dorsal root ganglia and converted to cDNA using reverse transcription. We analyzed the mRNA levels of acid-sensing ion channel 3 (ASIC3), voltage gated sodium channel 1.9 (Na_V1.9) and cyclooxygenase 2 (COX2) with quantitative real time PCR. The data analyzed from the q-PCR from the cDNA of these proteins showed an up-regulation of ASIC3 in mice that were injected with acid compared to control mice and a decreased expression of Na_V1.9 in mice injected with acid compared to control mice. Q-PCR data showed very little COX2 transcript in the DRG.

R. SCOTT LEMONS, JOHN WIRTS and PAT CAMPBELL, Dept of Environmental Protection, Division of Waste and Water Management, Charleston, WV 25304.

Dunkard Creek fish kill: Golden Algae and water chemistry.

This presentation will discuss the events of a major fish kill in the Dunkard Creek Watershed, in northern West Virginia, during the early fall of 2009. It will include data from several years of water chemistry, macro-invertebrate sampling, and continuous monitoring data from before and after the event. Also included will be a brief histology of Golden Algae, *Prymnesium parvum*, which has been concluded to be the cause of the fish death.

RAY LIANG, HOTA GANGARAO and DANIEL STANISLAWSKI, Constructed Facilities Center, West Virginia University, Morgantown, WV 26506, and YING LEI, YANHAO LI, and YONGQIANG JIANG, School of Architecture and Civil Engineering, Xiamen University, Xiamen, China, 361005.

Material and structural response of historic Hakka rammed earth structures.

Rammed earth is a sustainable construction material with many positive attributes to the environment compared to concrete and steel. The in-service World Heritage Hakka rammed earth structures, i.e. Fujian Tulou of China, are historic and unique in design and performance. This presentation reports our findings from the studies of these buildings sponsored by National Science Foundation. The material and structural responses of five rammed earth buildings have been field-investigated. All field studies were conducted in a nondestructive manner using techniques such as infrared thermography, rebound hammer, ultrasonic testing, strain data from load tests on roof trusses and floors, and thermal data from thermocouples. The data collected from the field trip were further processed for their implications and the samples collected are being further tested at WVU for thermal, mechanical and morphological properties, including carbon dating for the age of buildings. Those material and structural responses are also being simulated through FE modeling for better understanding. The sustainability of Hakka village dwellings built hundreds of years ago and still in-use today might provide us with exemplary lessons with reference to green building movement including Leadership in Energy and Environmental Design (LEED) program. Upon completion of the research we wish to emulate the Hakka Tulou Technologies with appropriate modifications, for implementation in modern construction leading to: 1) energy-efficient and green buildings with thermal comfort; 2) disaster resistant structural configurations; 3) innovations of affordable housing and multi-story buildings; and 4) development of durable rammed earth material systems and construction techniques.

SHIYU LIU, HAILIN LI, CHET-MUN LIEW, TIMOTHY GATTS, SCOTT WAYNE, BENJAMIN SHADE and NIGEL CLARK, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506.

An investigation of NO_2 emission of a H_2-enriched heavy-duty diesel engine.

This paper investigates the effect of H_2 addition on the nitrogen dioxide (NO_2) emission of a 1999 Cummins ISM370 diesel engine. The preliminary data measured using the 13-mode European Stationary Cycle (ESC) demonstrated the significant effect of H_2 addition on the emissions of NO_2. The detailed effect of H_2 addition on NO_2 emissions was investigated at 10-70% of maximum load at 1200 RPM. The addition of a small amount of H_2 was shown to substantially increase the emissions of NO_2 but slightly reduce the NO emissions especially at low load. Portion of the NO formed in combustion process was converted to NO_2. When operated at 10% load, the maximum NO_2/NO_x ratio of 60% was observed with the addition of 4% H_2. Further increasing the addition of H_2 beyond the point at which maximum NO_2 emissions occurred still produced more NO_2 than diesel operation. Increasing the engine load inhibited the enhancing effect of H_2 on the conversion of NO to NO_2 with the maximum NO_2/NO_x ratio observed with the addition of less H_2. The maximum NO_2 emissions obtained under H_2-diesel dual fuel operation were 3 (70% load) to 5 times (10% load) that of diesel operation. It was concluded that the engine load and combustion temperature were not the main factors dominating the formation of NO_2 in dual fuel engine. The preliminary analysis demonstrated the dependence of the NO_2/NO_x ratio of the H_2-diesel dual fuel engine on the emissions of the unburned H_2 and its combustion efficiency.

ZACHARY LOUGHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074 and Biology Graduate Program, Indiana State University, Terre Haute, IN 47801, DAVID FOLTZ, EVAN HEWITT, MATTHEW MCKINNEY, and NICOLE GARRISON, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and STUART WELSH, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown WV 26506-6125.

Rediscovery and discussion for future conservation efforts of *Cambarus* (*P.*) *veteranus* (Big Sandy Crayfish) in West Virginia.

The crayfish fauna of West Virginia has received a resurgence of attention, with the majority of this work focusing on determining the conservation and taxonomic status of the 24 species that occur within the state. *Cambarus veteranus* (Big Sandy Crayfish) has been a focal species of this work due to its rarity when the state received its initial statewide census in the mid 1980's. Jezerinac et al. determined that *C. veteranus* likely would be extirpated due to land use practices and stream degradation in the West Virginia coal fields. Several investigators have focused on determining the conservation status of *C. veteranus* in the last decade in West Virginia; during these efforts zero *C. veteranus* were observed. In the summer of 2009, all historic locations (n = 17) and several additional locations, determined through a probabilistic site selection design, were surveyed in the Guyandotte, Bluestone, and Tug Fork river basins to determine if the West Virginia population had been extirpated. Resultant of this effort, *C. veteranus* was discovered at 1 historic station for the species, in Pinnacle Creek, Wyoming County. In addition to the rediscovery of the Pinnacle Creek population, an unknown population was discovered in Dry Fork, a tributary to the Tug Fork River. This population represents a new basin record for

the species in West Virginia and appears to be more stable than the Pinnacle Creek population. Potential causes of decline are evaluated, and future conservation efforts for the species are discussed.

BEN LOWMAN, West Virginia Dept of Environmental Protection, Charleston, WV 25304.
Impacts of selenium bioaccumulation on freshwater fishes in West Virginia.
In respect to the USEPA's draft whole fish tissue body burden criterion for selenium, the West Virginia Department of Environmental Protection (WVDEP) has studied selenium bioaccumulation among fishes residing in the State's lakes and streams since 2005. Additionally, due to concern regarding fish population health at locations subjected to elevated selenium inputs, the WVDEP has collected and examined bluegill sunfish, *Lepomis macrochirus*, larvae (ichthyoplankton) from selected waterbodies since 2007. Also, in 2009, WVDEP began acquiring data about selenium concentrations within fish eggs, which is often used as a predictor of larval deformity rates. Average whole fish tissue concentrations of selenium in fishes collected from study locations ranged from 1.03 ppm (mg/L) at Elk Fork Lake, a reference impoundment, to 40.43 ppm at Little Scary Creek, which is influenced by upstream fly ash deposition. Larval deformity rates were variable throughout the study duration but were nonetheless associated with waterborne selenium exposure; reference locations produced larval bluegill with deformity rates between 0% and 1.27%, while locations with elevated selenium inputs exhibited bluegill ichthyoplankton deformity rates ranging from 0% to 47.56%. Concentrations of selenium within fish eggs also varied according to study location and ranged from <0.8 mg/kg dry weight among bluegill eggs at the control site to 64.62 mg/kg dry weight among largemouth bass, *Micropterus salmoides*, eggs collected from selenium-enriched waters.

DOMINIC A. LUDOVICI, and DANIEL J. PISANO, Dept of Physics, West Virginia University, Morgantown, WV 26506.
A survey for neutral hydrogen in the loose group LGG140.
The majority of galaxies are contained in loose groups. Loose groups are collections of galaxies containing a few large galaxies, as well as tens of smaller galaxies spread out over approximately three million light years. These loose groups may also contain gaseous remnants of galaxy formation in the form of neutral hydrogen (HI) clouds that are devoid of stars. These clouds are analogous to those found around the Milky Way. To date, no free-floating HI clouds have been found away from bright galaxies, though many gas-rich dwarf galaxies have been found. We conducted a survey of the loose group LGG 140 with the Westerbork Synthesis Radio Telescope (WSRT) for neutral hydrogen HI emission from dwarf galaxies, HI clouds, and extended low column density structures. LGG 140 is a loose group that is rich in spiral galaxies, and is located at a distance of 208 million light years away. This cluster contains a total of 8 known members. The survey has sensitivity to detect diffuse HI clouds, dwarf galaxies, and extended HI structures. Thus far in the survey, we have detected four previously known members of the group, as well as four new HI-rich objects in the group. We examine the properties of the new HI detections in the group, and characterize them. The detections in this survey show that there are more signatures of ongoing galaxy interaction then seen in previous observations of this group.

YI LUO and BIAO QIU, Dept of Mining Engineering, West Virginia University, Morgantown, WV 26505.
A fracture mechanics based longwall chain pillar stress prediction program.
Inadequately designed chain pillar system could result in frequent failures of the mine structures including pillars, roof and floor. Under some adverse conditions, such mine structural failures could be in a catastrophic manner such as a bump or burst imposing serious safety hazards to miners and/or interrupting the mining operations. On the other hand, over-designed chain pillar system could lead to vast waste of the coal resources. Rational design relies on accurate prediction of the stress distribution in the chain pillars. Traditionally, the prediction is performed using an over-simplified tributary area method or complicated numerical analysis methods both incapable of considering the yield zone nears the pillar ribs. In order to offer the mining engineers a simple, quick and reliable tool in their mine design tasks, the principles of fracture mechanics and stress superposition are applied to develop an analytical model for determining the vertical stress in the chain pillar system. In the model development, the mine entries and longwall gobs are treated as Mode I cracks in an infinite plate while the resistance of gob material and the characteristics of the pillar yield zone are considered as the distributed forces on the surface of the cracks. Based on the mathematical model, a small program has been developed in VC++ to facilitate the required computations. Compared to numerical methods, this approach offers the same, if not better, accuracy but requires significantly less expertise and computer hardware and software to apply.

SUMANTH MANOHAR, Biotechnology Graduate Program, West Virginia State University, Institute, WV 25112, MATTHEW HARLOW and CHRISTOPHER RYAN MACKIE, Dept of Biochemistry, Marshall University, Huntington, WV 25755, GERALD R HANKINS, Biotechnology Graduate Program, West Virginia State University, Institute, WV 25112 and MAIYON PARK, Dept of Biochemistry, Marshall University, Huntington, WV 25755.
Nuclear-mediated function of Chmp1A in the regulation of ATM signaling activity for the control of human pancreatic tumor cell growth.
Chromatin modifying protein 1A/Charged multivesicular body protein (Chmp1A) is a member of the Endosomal Sorting Complex Required for Transport (ESCRT)-III family that functions in the sorting of membrane proteins. Chmp1A was shown to regulate cell cycle progression and chromatin condensation. Our reports indicate that Chmp1A over-expression leads to inhibition of cell and xenograft tumor growth, and that nuclear localization of Chmp1A is required for the mediation of the inhibitory effects of all-trans retinoic acid (ATRA) on human pancreatic tumor cells. Chmp1A appears to regulate

tumor cell growth through the stabilization of P53. P53 is a substrate of ataxia-telangiectasia mutated (ATM) kinase and the dynamics of ATM activation are closely related to chromatin condensation. Thus, we hypothesize that Chmp1A, through its nuclear localization, regulates ATM signaling activity and subsequently pancreatic tumor growth. Our preliminary data indicates that Chmp1A over-expression led to an increase in phospho-ATM. Immunostaining identified the co-localization of ectopically induced Chmp1A with phospho-ATM and P53 whose intensity closely reflected that of Chmp1A expression. ATM kinase assay indicates that Chmp1A over-expression increased ATM kinase activity as shown by an increase in the level of phospho-P53 compared to control. In addition, ATM inhibitor-treatment partly abolished Chmp1A mediated-growth inhibition and P53 stabilization. We are testing the significance of nuclear localization signal (NLS) of Chmp1A by using various deletion constructs. We will discuss the significance of the NLS domain of Chmp1A on ATM, P53, and tumor cell growth. This research is supported by NIH 5P20RR016477, WV-INBRE and RR020180-02, COBRE.

CLARISSA R. MATHEWS, EDWARD M. SNYDER, and JOHN J. SMITH, Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443.

Comparison of solar photovoltaic technology performance at the Shepherd University Renewable Energy Demonstration Site.

Performance of two polycrystalline silicone solar photovoltaic modules (BP and Mitsubishi) was compared in a ground mount configuration in Shepherdstown, WV, holding constant PV collection area, module orientation (39°), circuit resistance, shading, ambient temperature, and solar irradiance. Preliminary work characterizing climatic variation and module responses at 5 min intervals (11:00 to 14:00 hrs, July, 2009) showed a range in solar irradiance across 3 d (94.0 - 995.0 W/m^2). Although module performance (mA/m^2) and ambient temperature (°C) was correlated (N = 106; BP: ρ = -0.558, P < 0.0001; Mitsubishi: ρ = -0.530, P < 0.0001), module performance and solar irradiance (W/m^2) were not correlated. A second study tested manufactures' claims regarding sub-optimal conditions, measuring module performance (mA), solar irradiance (W/m^2), and ambient temperature (°C) at 30 min intervals (8:00 to 16:00 hrs; 5 d, July – August, 2009). Manufacturer significantly affected performance at solar noon (12:00 to 12:30 hr: F = 3831.97; P < 0.0001; ndf = 1; ddf = 4), high temperatures (35°C or >: F = 6178.97; P < 0.0001; ndf = 1; ddf = 22), and low solar irradiance (< 100 W/m^2: F = 2845.57; P < 0.0001; ndf = 1; ddf = 11), with BP significantly out-performing Mitsubishi under all climatic conditions (LSD; α = 0.05). These findings suggest that PV production at Shepherd University could be optimized by utilizing BP's manufacturing process. This research was funded, in part, through support from the West Virginia EPSCOR program and a NASA West Virginia Space Grant Consortium award.

STEVEN McCLELLAND and JOHN ZANIEWSKI, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506.

A history of the Fuller curve.

The gradation (size distribution of aggregate particles) in Portland cement and hot mix aggregate concrete is important to their strength, performance and economy. Fuller developed mathematical functions, based on empirical evidence, for determining maximum density gradation blends of aggregates. Over the subsequent century, Fuller's methodology is cited as the seminal research that has lead to the current state of the practice. Fuller's original research reports were consulted in an attempt to better understand the methodology. Fuller actually proposed two different but similar curves and a physical test procedure in order to produce workable, dense Portland Cement concrete using the most widely available aggregates in the turn of the 20th Century New York City area. In the 1920s Richard Grun, a German Portland cement researcher, accepted Fuller's curve based on a trade journal summary of Fuller's research. Fuller's caveat of fitting the curve to each aggregate or combination of aggregates seems to have been dropped. In the early 1940s, L.W. Nijboer, a Dutch asphalt researcher, adopted the Fuller curve from Grun's work and tested asphaltic mixes using triaxial testing. Based on his research he proposed changing the curve to a different power and plotting it logarithmically. This gave rise to a different ideal form (a straight line instead of a parabola). In the early 1960s American researchers Goode and Lufsey proposed adopting Nijboer's results. This form of the Fuller curve has remained unchanged for over 45 years. The Fuller curve is now far enough from its origins that it needs to be revalidated for its present use or be replaced.

KATHRYN R. P. McCOARD and JAMES T. ANDERSON, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506.

A year in the lives of West Virginia's Wood Turtles.

Wood Turtles (*Glyptemys insculpta*) were listed in 2008 by the Endangered Species Coalition as one of 10 threatened/endangered species in the United States most in need of Endangered Species Act protection. This species is considered to be very rare and imperiled (S2) in West Virginia. Wood Turtle ecological studies have largely occurred in the northern portions of the species' geographic range, which extends from eastern West Virginia and northern Virginia north to Nova Scotia, Canada and west to eastern Minnesota. Consequently, little is known about Wood Turtle ecology in West Virginia, at the southern portion of the range. The study objective was to track adult and juvenile Wood Turtles with radio-telemetry to determine activity and habitat preferences depending on season. Date, time, GPS coordinates, gender, observed activity, and local vegetation were recorded for each capture. Twenty-nine turtles were fitted with transmitters epoxied to the back right of the carapace and tracked once a month to twice a week, depending on season. Home ranges (95% MCP) ranged from 0.48-12 ha. Turtles were predominantly terrestrial (97%) in late spring, but entirely aquatic (100%) by winter. Activity varied by season, including sitting in vegetation (wingstem [*Verbesina alternifolia*] was the

dominant vegetation type) in the spring and burrowing under surface litter or mating in the fall. Mating males were significantly larger than mating females in four morphological characteristics (p-value < 0.5). This information is important for filling in geographical data gaps for Wood Turtles in order to better manage and conserve their declining populations.

MAURA MCLAUGHLIN, Dept of Physics, West Virginia University, Morgantown, WV, 26506.

Detecting ripples in space-time using radio pulsars.

Gravitational waves are ripples in the fabric of space-time caused by accelerating massive objects. Einstein predicted the existence of these waves in 1915 but they have never been directly observed. Radio pulsars are rapidly rotating highly magnetized neutron stars which can act as extremely precise celestial clocks. I will describe how we can use a network of radio pulsars distributed throughout the sky to detect gravitational waves. I will discuss the telescopes we use for this effort and in particular our work with the Green Bank Telescope in Green Bank, WV. I will show that a detection of gravitational waves through radio pulsar timing is possible within the next 5-10 years. This detection will transform astronomy and allow us to study the most extreme and exotic objects in the Universe.

YOONJA MORTENSEN and RAINA ROMERO, Dept of Education, Shepherd University, Shepherdstown, WV 25443.

Mathematical analysis of the bistable equation for modeling electric potential propagation along the axon of a neuron.

Much research exists to model the voltage propagation along the axon of a neuron. This research aids in our understanding of the nervous system. The model used for electric potential propagation along the axon of a neuron is the bistable equation. The bistable equation is however resistant to solving using an analytic approach. The transformation of variables is introduced to make this partial differential equation a solvable ordinary differential equation. It is assumed that the voltage along the axon travels at a constant speed. The MATLAB package is used to find the solution numerically since this transformed ordinary differential equation is not solvable analytically. The solution of the voltage along the axon behaves differently depending on the magnitude of the speed of propagation. For example, with high propagation speed the waveform does not oscillate but with low propagation speed the waveform shows an oscillating behavior. The solutions of the bistable equation show the voltage wave propagation phenomena along the axon of a neuron clearly. This project was an experience in transforming partial differential equations into ordinary differential equations and exposed us to mathematical modeling.

MAYURI MUKKA, EDWIN L. KUGLER and DADY B. DADYBURJOR, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26505.

Parametric study of the partial oxidation of propane over Ni and Pt based catalysts.

Hydrogen production through the partial oxidation of propane over CeO_2 supported Pt and Ni catalyst was studied. The aim of the study was to investigate the sequence of different reactions during propane oxidation over two catalysts. The reaction runs were performed in a fixed-bed reactor at reaction temperature of 600 °C and a feed ratio (O_2: C_3H_8) of 1.78. The effect of space velocity on the reaction rates was evaluated by varying total inlet flow (100 to 400 SCCM) and catalyst weights. The outlet gases from the reactor were analyzed by an online gas-chromatogram (GC). At 600 °C, six species (C_3H_8, O_2, H_2, CO, CO_2 and C_3H_6) were detected at the reactor outlet. Ten reaction sets containing four independent reactions each (which would yield the six species) were found by the Gaussian elimination process. For each set, a material balance on the six outlet compositions measured obtained the extents of each of the four reactions in the set. Rate of each reaction in all the ten sets was calculated using MATLAB least square regression technique. Sets with negative reaction rates were eliminated. To confirm the validity of sets, reactions representing dry reforming, steam reforming and water gas shift were further carried out over the catalysts. Finally, the effect of weight hourly space velocity on the reaction rates for each of the catalyst was evaluated.

WESTLEY MULLINS, JANE OOSTHAIZEN, KAITLYN BOWMAN, Dept. of Science and Mathematics, Glenville State College, Glenville WV 26351, HOWARD WHITE, Dept. of Physiological Sciences, Eastern Virginia Medical School, Norfolk VA 23510, and GARY Z. MORRIS, Dept. of Science and Mathematics, Glenville State College, Glenville WV 26351.

Synthesis of (7-diethylaminocourmarin-3-ester)-3'-adenosine 5'-triphosphate (or DeacesterATP).

Hydrolysis of adenosine-triphosphate (ATP) produces chemical energy that can be used by a cell to do work. The kinetics involving ATP hydrolysis in muscle cells is studied using fluorescent ATP analogs, and actin and myosin proteins. Actin and myosin are proteins found in muscle fibres that do the mechanical work of muscle contraction. A very efficient fluorescent ATP analog for studying myosin-actin kinetics is 3'-(7-diethylaminocoumarin-3-carbonylamino)-3'-deoxy-ATP (deac-aminoATP or DeacATP), which undergoes a 20-fold increase in fluorescence emission intensity when bound to the active site of myosin. This fluorescent ATP analogue is composed of a coumarin tag attached to ATP at the 3' position thorough an amino group. DeacATP has to be made in its entirety from scratch through seven different reactions. Here we propose an alternative to DeacATP which is to attach the coumarin tag to ATP through an ester. ATP already has an alcohol at the 3' position this process should require fewer steps and be less expensive; instead of seven reactions, only two reactions are necessary. Coumarin is first activated through mixing with tributylamine (solvent), and isobutyl chloroformate (leaving group). ATP is then added to the activated coumarin producing the new fluorescent ATP molecule (DeasetserATP) carbon dioxide, and the isobutyl chloroformate leaving group. This specific fluorescent ATP analog has

not been synthesized before. TLC, NMR, FTIR, HPLC and UV-Vis are being used to monitor synthesis of the new compound and the effect of temperature and light on product yield is being determined.

JORDAN MUSSER, Dept of Mathematics, West Virginia University, Morgantown, WV 26506, MARY ANN DRUMRIGHT-CLARKE, West Virginia University, Morgantown, WV 26506, and JANINE GALVIN, National Energy Technology Laboratory, Albany, OR 97321.

Development of a discrete mass inflow boundary condition for MFIX.

MFIX (Multiphase Flow with Interphase eXchanges) is an open source software package developed by the National Energy Technology Laboratory (NETL) used for modeling the chemical reactions, heat transfer, and hydrodynamics of fluid-solid systems. Currently, the stable publically available release of MFIX does not include a discrete mass inflow boundary condition (DMIBC) for its discrete element method (DEM) package. Inflow boundary conditions are useful for simulating systems where particles are consumed through chemical reactions and an incoming feed is necessary to sustain the reaction. To implement the DMIBC an inlet staging area is designated outside the computational domain and particles are passed through the wall region associated with the inlet. Forces incurred on entering particles, generated from collisions with particles already in the system, are ignored whereas, particles already in the system respond to contact forces and react accordingly, moving away from the inlet. This approach prevents any unphysical overlap between new and existing particles. It also ensures that particles entering the system will enter the computational domain regardless of opposing forces. Once an incoming particle is fully within the domain, it reacts appropriately to any and all contact force. This approach for a DMIBC has been implemented and is available within the current development version of MFIX.

DAVID O'DELL, Dept of Science and Mathematics, Glenville State College, Glenville, WV 26351.

Predicting student success in the first semester of college chemistry.

General chemistry completion rates may be improved by early identification of students who are in need of support services such as tutoring or study skills counseling. The objective of this study was to develop a model to predict student success (a final grade of C or better) using data available prior to the beginning of the course. Five years of general chemistry courses taught by three different instructors were studied, yielding a data set of approximately 150 students. Multiple linear regression was used to determine the effects of ACT subject and composite scores, high school grade point average, and high school rank on the grade received in the first semester of general chemistry. High school grade point average and ACT science scores were not significantly correlated to course grade in the model, while high school rank and ACT math scores were significantly but weakly correlated to course grade. While the model correctly identified most of the students who received grades lower than C, the model also predicted a grade of C for many of the students who received grades of A or B. Overall the model was a poor predictor of student success, and tended to predict lower grades than those assigned. Student success in the course is affected by factors other than those included in the model.

KAREN O'NEIL, Green Bank Observatory, National Radio Astronomy Observatory, Green Bank, WV, 24944.

Faint fuzzy stuff – examining star formation and evolution in diffuse environments.

Low surface brightness galaxies are diffuse spiral galaxies whose gas content is often at or below the density required to form stars. Yet low surface brightness galaxies cover a wide range of morphological types, from galaxies with bright central bulges and well defined spiral arms to amorphous blobs. I will describe the general properties of these galaxies and look at the possible evolutionary scenarios for these systems.

JANE R. OOSTHUIZEN, PHILIP HOFFMAN and KEVIN L. EVANS, Dept of Mathematics and Science, Glenville State College, Glenville, WV 26351.

Synthesis of triacid and triamide amphiphiles.

Amphiphiles are compounds that possess both hydrophilic and hydrophobic properties. Amphiphiles have practical applications in both industry and medicine. Industry is particularly interested in amphiphiles for their ability to inhibit corrosion and as flotation collectors, which is especially useful in mining. From a medical standpoint amphiphiles are being investigated as a new type of antibiotic. Two series of amphiphiles were synthesized during this research – the triamide and the triacid. Each synthesis involved the condensation of a secondary amine with an isocyanate. Four triamide amphiphiles were synthesized by the condensation of triamide isocyanate with *N*-methylalkylamines of different alkyl chain lengths (12, 14, 16 and 18 carbons). The triacid amphiphile was synthesized with *N*-methyloctadecylamine and weisocyanate. Attempted purification of the compounds included recrystallization and thin layer column chromatography. Characterization of the triacid and triamide amphiphiles included ^{1}H and ^{13}C NMR, FTIR, and melting point.

BETH PAULEY, Dept of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304.

Program evaluation of a departmental initiative focused on improving student learning.

Assessment is essential to evaluate any student learning program. In order to identify strengths and weaknesses of a departmental learning initiative, a program evaluation model was developed. First, the mission of the biology department was identified and aligned with the educational mission of the university. Second, student learning outcomes were identified and assessment instruments were developed that enable collection, analysis, and reporting of data. This

program evaluation model enabled the focusing of programmatic activities of the departmental learning initiative and allowed for the development of additional intervention strategies and creative assessment opportunities.

THOMAS K. PAULEY, Dept of Biological Sciences, Marshall University, Huntington, WV 25755.
Conservation issues of amphibians and reptiles in West Virginia.
Forty-four years of field research on amphibians and reptiles in West Virginia reveal that some species may have declined in numbers, some ranges have expanded, and some species have changed little in numbers and distribution. Climate changes, habitat destruction, habitat degradation, and habitat fragmentation may have contributed to alterations in population sizes and ranges. Data were collected by on-site surveys and road mortalities. Results of road mortality data will be the major emphasis of this presentation.

KYLE PHILLIPS, EMILY CALANDRELLI, MIKE NUSSBAUM and JOHN M. KUHLMAN, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506.
West Virginia University (WVU) Short Microgravity Research Facility (SMiRF) drop tower development.
West Virginia University (WVU) has committed itself to developing the Short Microgravity Research Facility (SMiRF) drop tower on its campus to increase direct access to inexpensive and repeatable microgravity research. A drop tower is essentially a tall structure from which experimental payloads are dropped and experience microgravity, or "weightlessness," during free fall. There are several ways to conduct scientific research in microgravity including drop towers, parabolic flights, sounding rockets, suborbital flights, NanoSats, CubeSats, full-sized satellites, and the International Space Station (ISS). However, none of the aforementioned techniques is more inexpensive or has the capability of frequent experimentation repeatability as drop tower research. These advantages can allow a wide variety of experiments to become inexpensively certified through repeated, reliable research that permits experiment modification and re-testing. Therefore, WVU has begun to develop the SMiRF drop tower through a WVU Research Corporation Program to Stimulate Competitive Research (PSCoR) grant. Development of SMiRF, or any drop tower, includes the design of several main components, namely the payload release mechanism, the payload deceleration system, the payload hoisting and transfer system, the drop tower structure, and the drop tower instrumentation and controls system, as well as a standardized drop tower payload frame for use by those researchers who cannot afford to spend money on a frame. After design and construction of the WVU SMiRF is complete, an initial calibration payload and experimentation will prove the accuracy of the drop tower, so that open operation will begin in the Fall of 2010.

D.J. PISANO, Dept of Physics, West Virginia University, Morgantown, WV, 26506.
Constraining galaxy evolution through radio observations.
Eight billion years ago, luminous compact blue galaxies were relatively common with high rates of star formation. Today, they are exceedingly rare. What are these galaxies and what have they become? While we cannot study the distant luminous compact blue galaxies directly in high detail, we can study their local analogs. Using radio telescopes in West Virginia and around the world, we are able to learn about their star formation rates, their fuel for future star formation and their masses. I will present the initial results from our study of local luminous compact blue galaxies, and what it implies for the current nature and future evolution of these galaxies.

SOHEIL RAZMYAR, KATARZYNA SABOLSKY and EDWARD M. SABOLSKY, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506.
Microstructural control and characterization of BICUVOX ceramics.
The widespread commercialization of solid-oxide fuel cells (SOFCs) and solid-oxide electrolyte cells (SOECs) is primarily limited by materials degradation issues related to the required high temperature operation (>800°C). Research is required to develop the next generation of solid ionic electrolytes for these applications that display ionic conductivities exceeding 10^{-2} S/cm at temperatures <800˚C. The typical approach is through the doping of various fluorite, perovskite, and pyrochlore structured materials to alter ionic vacancy concentration and order. Relatively few researchers have explored methods of manipulating the microstructure of bulk ceramic oxides to control diffusional kinetics. The proposed approach may lead to electrolyte ceramics with enhanced ionic conduction and mechanical strength. Research on controlling grain orientation and grain growth kinetics of $Bi_2Cu_xV_{1-x}O_{5.5-z}$ (BICUVOX) will be presented. Discussions will focus on the effect of processing variables, like liquid phase content, powder characteristics and thermal conditions on density, grain growth, orientation, and mechanical strength.

CALEB RICE and JASON BEST, Shepherd University Observatory, Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443.
The study of the skyglow around the Shepherd University Observatory.
The Shepherd University Observatory is centrally located on campus in order to provide easy access to the campus community. However, recent construction has added additional skyglow, which has dimmed the visibility of celestial objects. This research examines the skyglow in the night sky over the observatory. Data from prior research, and the findings of this project, will be incorporated into future studies in order to better understand the impact of the skyglow on images taken from the observatory. We acquired overlapping images at multiple elevations and orientations covering the

entire observable sky as seen from the observatory. We took sections from these images and analyzed them for various qualitative and quantitative comparisons. Qualitatively, we find little difference in the brightness once elevation has exceeded 60 degrees. Surprisingly, however, nonparametric tests reveal statistical differences even at the higher, qualitatively similar, elevations.

JOHN ROBINSON and MARY R. GRIFFIN, Dept of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304.

Improving student learning through active learning strategies.

A brief overview of a departmental wide ongoing five-year project involving the development of a comprehensive program targeted at improving overall student learning. Active learning strategies incorporated by the Department of Natural Sciences and Mathematics were the Cornell method of note-taking, reading strategies, identification of test-taking anxiety types and test-anxiety alleviation techniques. Additional outside classroom activities were developed such as formal and small group study sessions to review for graduate admissions tests. Formal sessions were led by faculty members. Small groups were initiated by students and facilitated by the department using guided study materials. Reading and vocabulary worksheets were distributed weekly to students to improve scores on post graduate examinations. Courses also were developed to include interview techniques and recognition of current scientific events.

CARA SCHILDTKNECHT, Institute of Environmental Studies, Shepherd University, Shepherdstown, WV 25443.

Developing new methodology for trapping upstream migrating adult Pacific lamprey (*Lampetra tridentate*) and western brook lamprey (*Lampetra richardsoni*) to estimate species abundance.

Survival of Pacific lamprey, *Lampetra tridentata,* and western brook lamprey, *L. richarsoni*, is a major concern for the Pacific Northwest as these two native species are an important component of the ecological system. Due to the invasive species of lamprey in the Great Lakes area, the focus and status of development of methodologies for lamprey sampling has been for capture and destruction. Moreover, traps for estimating abundance are typically concerned with juvenile lamprey. Thus, designs are not desirable to complete abundance sampling in the Pacific Northwest and new methodologies for capturing adult lamprey are necessary to evaluate adult abundance. The purpose of this study was to develop a trap to sample for adult lamprey abundance. This study adapted a weir used by Maori to capture lamprey during their upstream migration. The Maori used the trap to capture lamprey as a major food source. The trap utilizes knowledge of the life cycle of lamprey in order to anticipate movements and trap adults as they complete their upstream migration prior to spawning. The design was modernized for this study, utilizing a fyke net, live cart, and weir fences constructed from wood and hardware cloth. The trap was placed at two different rivers in Washington State. Sites were sampled thirteen and nine times, respectively between 9 July and 31 July 2009. Preliminary data tested the usefulness of the trap design and collected 11 adult individuals and 12 juveniles. Collections indicated a successful trap design that efficiently sampled adult abundance of upstream migrating lamprey.

ALAN D. SMITH, Dept of Management, Robert Morris University, Pittsburgh, PA 15219-3099.

Gender perceptions of smoking and cessation via technology, incentives, and virtual communities.

There are many studies that have tried to evaluate some of the determining factors in smoking cessation, but with limited success. In particular, the present study deals with these concerns within the context of the current global recession and the roles of technology and social networking as moderating variables in the examination of smoking working professionals' relationships between people's background experiences with smoking, their self-reported perceptions about health, economic, and social aspects of smoking, and their perspectives on quitting. The empirical section examines current opinions of smoking analogues as alternatives to cessation and identify whether these opinions were influenced by negative perspectives of smoking in general. Several hypotheses and factor analyses related to smoking cessation statistically evaluated assumptions that economic and social considerations had more affects on quitting than health concerns; personal experience with smoking leads to less confidence in cold turkey quitting; and that technology-based solutions and virtual communities can gain wide acceptance despite the chemical addictiveness of tobacco-related products.

CRAIG W. STIHLER, WV Div. of Natural Resources, Elkins, WV 26241.

White-Nose Syndrome: A new threat to the West Virginia's cave-dwelling bats.

White-Nose Syndrome (WNS), a condition that appears to be caused by the fungus *Geomyces destructans*, has killed many thousands of cave-dwelling bats in the Northeast since it was first observed near Albany, NY in 2006. The fungus was first documented in West Virginia in 2009 when it was seen in four caves in Pendleton County and bat mortality was observed at one of these caves. In 2010, WNS was found in additional caves in Pendleton County, including the state's most important bat hibernaculum, Hellhole. Samples collected from a Pocahontas County cave in 2010 tested positive for *G. destructans*. At this time, samples from additional counties are being examined. The bat species most affected have been *Myotis lucifugus* and *Perimyotis subflavus*, but affected specimens of *M. septentrionalis* and the endangered *M. sodalis* have also been observed. To date, no affected *Corynorhinus townsendii virginianus,* have been observed even though this bat hibernates in caves that are positive for this fungus; *C.t. virginianus* is an endangered species with the largest concentration in the world occurring in Pendleton County. The caving community is helping to monitor the spread of WNS by monitoring cave entrances for unusual bats behavior often associated with this WNS (i.e., bats flying out of the

cave in winter even during the daytime and dead bats found outside the cave entrance). It appears likely that WNS will spread throughout the karst areas of West Virginia, and populations of cave-dwelling bats are may be severely impacted.

CRAIG W. STIHLER, WV Div. of Natural Resources, Elkins, WV 26241.
The conservation of Virginia big-eared bats (*Corynorhinus townsendii virginianus*) in West Virginia.
The Virginia big-eared bat (*Corynorhinus townsendii virginianus*), an eastern subspecies of Townsend's big-eared bat, was listed as federally endangered in 1979. The largest concentration of *C.t. virginianus* is found in the Pendleton County area of West Virginia. A major factor in the listing of this bat was disturbance of cave roosts from increased recreational entry into caves by humans. Beginning in the early 1980s, disturbance in important caves was reduced through seasonal cave closures, including the fencing and gating of cave entrances. Summer maternity colonies have been monitored annually using infra-red lights and night-vision equipment to enumerate bats as they leave the caves in the evening to forage. The number of bats in the seven maternity colonies known in 1983 increased 76.7 % from 1983 to 2009; three maternity colonies found after 1983 contained 1,816 bats in 2009. The total number of *C.t. virginianus* in maternity colonies in West Virginia is estimated at 7,245 bats. *C.t. virginianus* hibernacula are monitored biennially by entering the caves and counting the hibernating bats. The number of bats hibernating in caves in West Virginia in 2010 was estimated at 12,059 individuals. Although the numbers of *C.t. virginianus* in West Virginia caves have increase over the past decades, a new threat, White-Nose Syndrome (WNS), a condition associated with the fungus *Geomyces destructans*, threatens the continued existence of this bat. To date, no *C.t. virginianus* have been seen exhibiting the signs of WNS even in caves where the presence of the fungus has been confirmed.

JAMES M. STILES, Limestone Engineering, 1766 Limestone Road, Parsons, WV 26287.
AMD remediation options for large-scale watershed remediation.
Monday Creek of the Hocking River has a 116 square mile drainage basin in southeastern Ohio, and since the middle of the 19th century, extensive portions of the watershed have been subjected to underground and surface coal mining. A recent survey of the watershed has identified over 4,300 point sources of acid mine drainage which have rendered a number of stream reaches within the watershed sterile and unable to support diverse, aquatic life. In 2003, the author developed a computer model of those aspects of water quality related to Acid Mine Drainage (AMD) for the watershed using the TAMDL computer program developed by the author at West Virginia University. TAMDL was designed to model stream water quality in watersheds affected by AMD and its treatment by simulating the evolution of stream pH, net acidity, and the concentrations of aluminum, iron, and manganese. The model was then employed by the author to develop strategies for the treatment of AMD in the watershed. The objective of this new project was to recalibrate the TAMDL model created in 2003 for the new conditions in the watershed and use this recalibrated model to design a revised cost effective treatment strategy to bring the water quality conditions from their current level up to the remediation target conditions. This research was funded by the Huntington District of the U.S. Army Corps of Engineers.

SAMANTHA TAYLOR, Dept of Integrated Science & Technology, Marshall University, Huntington, WV 25755.
Mitochondrial DNA phylogeography of *Rhinichthys* species in West Virginia.
Blacknose dace are an abundant cyprinid minnow distributed widely in West Virginia and throughout North America. For more than 25 years the taxonomy of the blacknose dace species complex (*Rhinichthys*) has been an area of disagreement. Recently a reclassification of the members of this species complex has taken place. The objective of our study is to analyze mitochondrial and genomic DNA variation to try to resolve relationships within the species complex. Samples: Ninety-two fish (33 *R. atratalus,* 26 *R.obtusus obtusus,* 33 *R. obtusus meleagris*) were electrofished from streams within three watersheds (Atlantic, Upper and Lower Ohio R.) throughout central West Virginia. Methods: DNA was purified from individual fish. Conserved PCR primers were used to amplify mitochondrial cytochrome *b* gene. Primers were redesigned based on sequence analysis of these fish. DNA sequences were analyzed using Sequencher software. Clustal W was used for developing a phylogram tree. The conserved primers only amplified half the fish DNA. Redesigned primers amplified the remaining fish. The resulting tree has three distinct branches within the species complex, corresponding to the three species. All three species were found in one stream and two species were found in several other streams. We are currently analyzing RAG2 genomic sequences to determine if the three different species may be interbreeding in streams where mixed populations occur.

JEREMY THOMPSON, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443, and JACOB HACKETT and DANIEL RIZER, Dept. of Education/Mathematics Shepherd University, Shepherdstown, WV 25443.
Torques in the golf swing.
Have you ever wondered how professional golfers make the golf swing look so effortless while still hitting the ball incredibly far? The answer, they have trained their bodies to apply the various torques involved in the golf swing in the most efficient manner possible. There are numerous torques involved in the golf swing including two applied torques, as well as several other torques produced by diverse means such as gravity; however, all of these torques may be combined into two general torques, the torque in the arms and the torque on the club. Throughout this project we have been studying how these various torques, mostly the applied torques, affect other aspects of the golf swing, such as velocities and accelerations associated with the club and arms. After much research and experimentation, we were able to produce quantitative results to demonstrate to what degree these torques influence the other quantities in the golf swing. We

would like to thank Dr. Chris Elmer and NASA for their continuing support throughout this project.

TU H. TRAN, Dept of Physical Science, Marshall University, Huntington, WV 25755, and SEUNGJIN LIM, Dept of Integrated Science and Technology, Marshall University, Huntington, WV 25755.

Bridging the digital divide in WV GIS systems.

Many government agencies in WV such as the Raleigh County Assessor's office, Dept. of Revenue, and Rahall Transportation Institute, have difficulties in sharing and reusing information across their GIS systems due to the lack of interoperability both at the application and the database layers. This study focuses on developing an efficient and cost effective solution to the aforementioned problem by which the agencies can share data easily and henceforth provide the public access to information at convenient locations. As a result, we present a data management solution based on the OpenGIS standard at the database layer and a middleware based application development. This approach enables us to save time and storage space. Based on our study, Raleigh County in Beckley launched a new distributed, replicated Metro GIS system in 2009 which allowed the EMS Center, the Raleigh County Assessor's office, and the County Commission Board to share GIS information efficiently. As a result, the employees at these agencies can access any shared GIS data at their locations. In addition, we will migrate the backend platform to open source technologies to save the ownership cost of the system, provide a GIS Web-based application layer to allow the public to access and process information through the internet at home, and add customizable middleware for developers to have a greater flexibility in developing user interfaces and applications using open source libraries such as Proj4, GEOS, and PostGIS while securing a high degree of interoperability and information share.

TU TRAN and ANDREW LOWE, Dept of Physical Science, Marshall University, Huntington, WV 25701.

Landsat I imagery conversion and enhancement.

The use of satellite imagery is valuable; however, satellite images in analog format taken by the "Landsat I" in 1972 were gathering dust in the basement of a university for years. A low-quality scanner was used by this university in an attempt to convert the image to a digital format. As a result, the output image was not adequate for remote sensing research since the scanning process created excessive noise, and there are also clouds on the sky at the moment when the photos were taken. The idea of this study was to turn these films into usable data that could be used for academic research. The method in this research used many remote sensing and image processing techniques from ER Mapper to the openCV library to enhance and process images after they were scanned. By creating a median filter, all possible noises are reduced to apply a geometry correction function on ERMapper to fix the unclear edges of the area of interest. Meanwhile, OpenCV with Visual Studio 2005 were used to perform a special histogram analysis to narrow the value range on the images for uses with unclassified extraction methods to extract the roads, cities, towns, and the water bodies on the interested area. After the images are processed, they will be compared with recent images to recognize the changes of the transportation systems and the changes of the city along the area of the Ohio River from Evansville to the Shawnee national forest.

CHENJIE WU and LIAN-SHIN LIN, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506.

Long-term climate trend in Mid Atlantic Highlands Region and its correlation with regional landscape attributes.

This study focuses on detecting climate changes and effects in Mid Atlantic Highlands Region, an important ecological system in the US and the world. Climate data from 25 stations with daily measurements for more than 100 years from the National Climate Data Center are analyzed. The primary aim of this study is to examine the trends of the air temperature and precipitation time series for all the available stations in the region using Mann Kendall statistical test. Z statistic for each season as well as the whole time period is calculated. The median slope of trends is estimated by Sen's method. Regional trends are formed by statistically combining the results of the Mann Kendall test for each individual trend. Extreme events are defined and analyzed as well. The secondary objective of this study is to detect relations between landscape attributes (e.g., elevation, altitude, forestry) and the long-term trend using correlation analysis. The analyses are expected to provide information that can help answer questions related to regional climate changes such as elevation-dependent climate changes in this Highlands Region. All statistical analyses are conducted using SAS software 9.1 and SYSTAT 12. Results indicated variations between stations. Both negative and positive trends for all parameters are detected. Magnitude and direction of the trends are also found relative to elevation.

YA-MEI YANG and MITCHELL J. SMALL, Dept of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA 15213, EGEMEN O. OGRETIM and DONALD D. GRAY, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506, and GRANT S. BROMHAL, National Energy Technology Lab, Department of Energy, Morgantown, WV 26507.

Probability of leak detection for soil CO_2 flux measurement under different geologic carbon sequestration site conditions.

Near-surface monitoring is an essential component of leak detection at geologic sequestration sites, and soil CO_2 flux monitoring provides a simple and direct estimate of CO_2 exchange between the soil and the atmosphere. This paper presents a methodology for integrating soil CO_2 flux monitoring data with modeling of CO_2 migration to infer the probability that a CO_2 leak has occurred at a sequestration site under different site conditions. Possible near-surface flux rates for

CO_2 as a function of distance from the leakage point are generated by TOUGH2, a multiphase groundwater flow model, given different leakage rates and permeabilities. The natural near-surface CO_2 flux measured at the ZERT demonstration site in Montana is used to determine critical values for leak inference and to calculate the probabilities that a leak of a given size will be detected by the monitoring network. Detection maps for detecting CO_2 leakage given different permeabilities and leakage rates are generated by combining simulations from the TOUGH2 model and soil flux monitoring data at the ZERT site. The results show that the probability of detecting a leak increases for larger leakage rates but not necessarily with larger permeability. We also show how increasing the monitoring density increases the probability of detection for a leak of a given size with different site conditions. The detection maps for different permeability and leakage rate at a given location clarify the likelihood of leak detection and also the necessary monitoring density for a given monitoring technique. We thank the U.S. Department of Energy, National Energy Technology Laboratory, for funding this research under Contract No. TSK.41817.606.04.03.

STEPHEN E. ZITNEY, U.S. Department of Energy, National Energy Technology Laboratory, Collaboratory for Process & Dynamic Systems Research, Morgantown, WV 26507, and DEBANGSU BHATTACHARYYA and RICHARD TURTON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506.

Immersive 3D virtual training systems for advanced energy plant operations and control.

In today's business environment, the process and energy industries are pushing their operating plants to their limits, while at the same time; both processes and control systems are becoming increasingly more complex. Operator training systems (OTS) provide one of the best ways to train plant operators and engineers. Immersive 3D virtual reality adds another dimension of realism to real-time dynamic OTS systems and extends the training scope to both control room and outside operators, allowing them to work as a team. The benefits of a high-fidelity immersive training system (ITS) go beyond those of traditional simulation and include more realistic scenarios for plant startup, shutdown, and power load following, improved communication and collaboration among work crews, off-line evaluations of procedures, and training for safety-critical tasks and rare abnormal situations. The U.S. Department of Energy's (DOE's) National Energy Technology Laboratory (NETL) and West Virginia University (WVU) are collaborating with software, industry, and research partners to develop a state-of-the-art dynamic simulator and immersive 3D virtual training system for a next-generation, zero-emission integrated gasification combine cycle (IGCC) power plant with carbon capture. The combined IGCC OTS/ITS solution will be deployed and operated at NETL's Dynamic Simulator Research and Training (DSR&T) Center and at WVU's National Research Center for Coal and Energy, both in Morgantown, WV. The world-class DSR&T Centers will offer unique R&D, training, and education opportunities for the operation and control of advanced energy plants with carbon capture.

Abstracts for Poster Presentations

The abstracts for the poster presentations arranged in alphabetic order by the first author's last name. The time and place of the poster sessions are specified in the Poster List.

VIKAS AGARWAL and BRIAN J. ANDERSON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506.

An integrated model to compare net electricity generation for CO_2- and water-based geothermal systems.

Utilization of supercritical CO_2 as a geothermal fluid instead of water has been proposed by Brown (2000) and its advantages have been discussed. This work concentrates to assess the net electricity which could be generated by using supercritical CO_2 as a geothermal working fluid and compares it with water under same reservoir conditions of temperature and pressure. This procedure provides a method of direct comparison of water and CO_2 as geothermal working fluids, in terms of net electricity generation over project lifetime. An integrated model has been developed to determine net electricity generation for CO_2- and water-based geothermal reservoirs. This model consists of a wellbore model, reservoir simulation and surface plant simulation. To determine the bottomhole pressure and temperature of the geothermal fluid (either water or CO_2) in the injection well, a wellbore model was developed using fluid-phase thermodynamic equations of state, fluid dynamics, and heat transfer models. A computer program was developed that solves for the temperature and pressure of the working fluid (either water or CO_2) down the wellbore. For the reservoir simulation the TOUGH2 code has been used to model the temperature and pressure characteristics of the working fluid in the reservoir over project lifetime. The surface plant is simulated using CHEMCAD to determine net electricity generated. A binary organic Rankine cycle is simulated for CO_2 and flash power plant cycle for water. The calculated net electricity generated for the optimized water and CO_2 systems are compared over the working lifetime of the reservoir.

STEPHANIE ANDERSON, DAVONNA DEMPSTER, ROGER SEEBER and JARRETT S. AGUILAR, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074.

Extraction and quantification of hypericin and hyperforin from *Hypericum perforatum* callus.Saint John's Wort, *Hypericum perforatum*, contains the active chemicals hypericin and hyperforin, both of which exhibit anti-depressive properties. St. John's Wort has been used as an herbal supplement in the treatment for depression, a photodynamic cancer therapy treatment, an antiseptic, and an antiviral. Four different genetic varieties of St. John's Wort were used to produce callus. Hypericin and hyperforin were extracted from one of these strains, New Stem 001, using methanol. These extracts were analyzed using High Pressure Liquid Chromatography (HPLC) and quantified with a standard curve. This data will be used to determine if a given strain of St. John Wort callus has mutated into an overproducing strain for one or both of the active compounds. Propagation of an overproducing strain will lead to future work involving explanting the callus to establish a more efficient St. John's Wort plant, which would benefit both consumers and researchers.

ASHISH S. BAMBAL, ALA'A H. KABABJI, and VIDYA SAGAR GUGGILLA, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506, TODD H. GARDNER, U.S. Dept of Energy, National Energy Technology Laboratory, 3610 Collins Ferry Road, Morgantown, WV 26507-0880, and EDWIN L. KUGLER and DADY B. DADYBURJOR, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506.

Fischer-Tropsch synthesis with a chelating agent modified Co/SiO_2 catalyst.

The present study investigates the surface-structure characteristics and Fischer-Tropsch synthesis (FTS) activity of Co/SiO_2 catalysts. A solid state reaction between cobalt and silica support could result in cobalt silicate formation, which does not catalyze FTS. Therefore, a strong interaction of cobalt with a support is undesired and must be minimized. In this study, two different chelating agents, nitrilotriacetic acid and ethylenediaminetetraacetic acid, were used to modify the support during incipient-wetness impregnation with cobalt nitrate. The physical characterization of catalysts was performed by XRD, XPS, TPR and N_2-adsorption. The FTS was carried out in a fixed-bed reactor at 230°C, 2.0 MPa and 3Nl/g cat/h, using syngas with a $H_2/CO = 2.0$. The operating conditions were selected to maximize diesel-range hydrocarbons (C_9-C_{20}). The presence of a Co_3O_4 phase was confirmed by the data from XRD studies. The reduction of Co_3O_4 into metallic Co is shown to proceed in two steps, based on two strong peaks observed in TPR study. Finally, catalyst performance was evaluated based on selectivities towards C_5^+ hydrocarbons and CO conversions.

JESSICA BEADENKOPF and RYAN MANUEL, Dept of Biology, Shepherd University, Shepherdstown, WV, 25443, PETER VILA, Dept of Environmental Studies, Shepherd University, Shepherdstown, WV, 25443, and CAROL ZYGAR PLAUTZ, Dept of Biology, Shepherd University, Shepherdstown, WV, 25443.

***Lymnaea palustris* as a model organism for developmental, reproductive, and toxicological studies.**

The freshwater gastropod mollusc *Lymnaea palustris* is a useful laboratory organism since it is easily obtained, bred, and maintained year-round. We designed experiments to establish the suitability of this organism both as an experimental system and as a model for the developmental biology teaching laboratory. However, development from fertilization

through hatching takes place inside an egg capsule of albuminous fluid and in order to manipulate the embryo for valuable embryological techniques such as blastomere separation or microinjection, the capsule must be punctured or removed entirely. We have established the viability of the embryo following such disruption, and tested a variety of methods to sustain and enhance survival of the embryos. *Lymnaea* can also be used as a model for toxicological studies, using both adults and embryos. Environmental contaminants are of great concern to the health of aquatic organisms. Herbicides, pesticides, and fertilizers contribute to nutrient and contaminant runoff and accumulate in streams and groundwater. We established mesocosms containing sublethal concentrations of two fertilizers, the herbicide glyphosate, the insecticide permethrin, and a fungicide. Starting concentrations were based on EPA MCL (Maximum Contaminant Level) for each substance if available; in parallel, animals were exposed to 5-fold higher concentrations. Adult organisms' growth, viability, and fecundity were monitored regularly. Embryos were subjected to the same or higher concentration of these substances, and their developmental abnormalities recorded. Our data demonstrate that adults and embryos respond to the contaminants tested in a dose-responsive manner, and that at concentrations legally permissible in drinking water, severe abnormalities result.

VAGNER A. BENEDITO, Genetics and Developmental Biology Graduate Program, Plant and Soil Sciences Division, West Virginia University, Morgantown, WV 26506, and IGOR KRYVORUCHKO and MICHAEL UDVARDI, Plant Biology Division, Samuel Roberts Noble Foundation, Ardmore, OK 73401.

Identification and functional analyses of organ-specific membrane transporters of the S-type anion channel (SLAC) family in the model legume *Medicago truncatula*.

The only member of the slow anion channel family (SLAC) was functionally characterized in plants is the malate efflux channel *SLAC1* (At1g12480) from Arabidopsis, which is involved in stomatal closing, being specifically expressed in guard cells and localized in the plasma membrane. Other four additional SLAC-like (SLAH) genes are present in the Arabidopsis genome, but their physiological roles remain elusive. Our genome-wide studies in *Medicago truncatula*, a model legume species, revealed three members of this family, each one with an organ-specific gene expression pattern: leaves (*MtSLAC1*, probably the functional ortholog to Arabidopsis *SLAC1*), roots (*MtSLAC2*) and nodules (*MtSLAC3*) (Benedito et al., 2010; http://bioinfo.noble.org/gene-atlas/v2/). In our preliminary phylogenetic analyses, *MtSLAC2* and *MtSLAC3* cluster together with *SLAH1* (which is expressed in vascular cells and is able to rescue the *slac1* phenotype in Arabidopsis), as well as with *SLAH4*. The physiological role of *MtSLAC3* in nodules may have striking implications in the symbiotic nitrogen fixation, since plant cells feed nitrogen-fixing bacteroids with reduced carbon as C-4 dicarboxylates, such as malate and succinate, and membrane transporters are involved in delivering these substances to the symbiosomes. Transposon-tagging mutant lines have been identified for all three Medicago SLAC genes from the *Tnt*1 mutant population (Tadege et al., 2008) and functional analyses are underway. This project is supported by the Agriculture and Food Research Initiative competitive grant from the USDA National Institute of Food and Agriculture.

JASON BEST, Shepherd University Observatory, Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443.

Structure analyses of the 2dF Galaxy Redshift Survey and 2dF Quasar Redshift Survey.

This work presents results of an ongoing analysis of the structure of the 2dF Galaxy Redshift Survey, which contains approximately 250,000 galaxies, as well as preliminary results of an analysis of the 2dF Quasar Redshift Survey, which contains approximately 25,000 quasars. For these analyses, I have used the pointwise dimension, which has been previously used to study cluster interiors, galactic distributions, and cluster distributions. Among the most significant of the findings: I find that the 2dF galaxy catalog does not show a tendency towards homogeneity out to scales of 100 Mpc. Furthermore, the environments of early-type and late-type galaxies, as defined by spectral parameters, show significant distinction from each other in brighter magnitude ranges, but not in fainter magnitude ranges. Finally, quasar environments show significant evolution on multiple scales. This final result is consistent with the results of recent research of this author and collaborators conducted on the Sloan Digital Sky Survey Quasar Catalog.

RENU BHALLA and BENOIT VAN AKEN, Dept of Civil and Environmental Engineering, Temple University, Philadelphia, PA 19122.

Toxicity of polychlorinated biphenyls and their metabolites from bacterial transformation.

Polychlorinated biphenyls (PCBs) are persistent toxic organic pollutants that tend to accumulate in the environment. PCBs constitute a class of 209 different congeners, with one to 10 chlorine atoms attached to the biphenyl ring. Microbial metabolism of PCBs typically converts parent compounds into hydroxylated metabolites that can be easily further transformed. The objective of this research is to determine whether microbial metabolism of PCBs, including hydroxylation, could result in an increase of toxicity. In a first phase, the toxicity of PCB-3 and its hydroxylated metabolites (2'-OH, 3'-OH, and 4'-OH) were tested using Microtox® assay. Preliminary results showed that PCB-3 (50 mg L^{-1}) does not exhibit observable toxicity, although its hydroxylated metabolites showed high levels of toxicity: EC_{50} after 5 min = 5.9 mg L^{-1} for 2'-OH, 3.1 mg L^{-1} for 3'-OH, and 4.2 mg L^{-1} for 4'-OH. In a second phase, different PCB congeners, including PCB-3, PCB-15, PCB-28, and PCB-77, and the mixtures Aroclor-1242 and Aroclor-1254 are incubated in the presence of different bacterial strains and products of the microbial metabolism of PCBs are tested for their toxicity. Bacterial strains used for biodegradation experiments include *Pseudomonas putida, Burkholderia xenovorans,* and *Acinetobacter sp*. PCB biodegradation and the metabolites produced are analyzed by GC-MS. Results obtained in the first phase of this investigation revealed that hydroxylated metabolites of PCB-3 exhibit a higher toxicity than the parent congener. Results

from the second phase of this research are expected to provide further insights about the potential toxicity of microbial metabolites of PCBs, which has potential important implications for bioremediation of PCBs.

ISABEL CARDONA and XINCHAO WEI, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506.

Selenium removal by magnetite impregnated diatomaceous earth.

The purpose of this study was to remove selenium from aqueous solution using magnetite-impregnated diatomaceous earth as an adsorbent. The adsorbent was prepared at the laboratory with a ratio magnetite/DE of 10%. Batch adsorption experiments were conducted to evaluate the effects of pH, temperature, concentration, selenium speciation, contact time and presence of competing anions on selenium removal efficiency in conjunction with studies on adsorption kinetics, isotherms, and adsorptive thermodynamics. Rapid adsorption occurred within 30 min and selenium uptake decreased with increase in temperature. Low pH values (i.e. 2 – 4) favored selenium adsorption onto magnetite-impregnated DE as expected for anion adsorption but the adsorption of selenate (Se(VI)) was more strongly dependent on pH than that of selenite (Se(IV)). The adsorption isothermal and kinetic data of selenium were well fitted to the Freundlich isotherm and pseudo-second-order kinetic models. The magnetite-impregnated DE showed an adsorption capacity of 0.5 mg-Se/g for selenite and 0.25 mg-Se/g for selenate at pH 3.0. At an initial selenium concentration of 250μg/L, more than 96% removal of selenite and 50% removal of selenate were achieved. It was observed that selenate adsorption was significantly affected by the presence of competing anions such as chloride, nitrate and sulfate, whereas selenite removal was only affected by the presence of sulfate in the solution.

VICTOR L. CARPENTER JR. and KEVIN L. EVANS, Dept of Science and Mathematics, Glenville State College, Glenville, WV 26351.

Developing an inquiry-based organic experiment to study electrophilic aromatic substitution.

When substituted arenes undergo electrophilic substitution, the substituent(s) already attached to the aromatic ring effects the rate and the site of the substitution. The aromatic substituents are classified are either activating or deactivating. Activating substituents accelerate the rate of reaction. Whereas, deactivating substituents make the molecule less reactive than benzene. The substituents are also classified based on how the substituent directs the incoming electrophile. Ortho/para-directing substituents direct the incoming electrophile into the ortho and/or para positions. Meta-allowing substituents direct the incoming electrophile to the meta position. This research developed a general nitration procedure for substituted arenes that is suitable for a sophomore organic chemistry laboratory experiment. The students will combine their knowledge of electrophilic aromatic substitution and spectroscopic identification (IR, 1H and 13C NMR) to identify the major isomer(s). The students will attempt to quantify the percentage of each isomer formed from the crude product, and then fully characterize the major product after purification. The students in the class will study different molecules and share their data with each other. We will present our preliminary results in developing this laboratory experiment.

ASHLEY M. CARROLL and KENNETH A. CUSHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074.

Localization of a nonfunctional ASIC in CHO Cells.

Acid-sensing ion channels (ASICs) are ion channels that open and close due to pH changes in a tissue. It has been proposed that these channels are what allow one to sense ischemic pain. The D439A mutation of ASIC3 (Acid sensing ion channel 3) forms a nonconductive ion channel. It is uncertain why it is inoperable. Possible reasons for this include the protein not localizing to the plasma membrane or that the gate is not working correctly. In order to test this, we used an ASIC3-GFP fusion protein and made the D439A mutant using PCR. The ASIC3-GFP and D439A-ASIC3-GFP along with mCherry were then transfected into CHO cells; these cells were imaged on a laser scanning confocal microscope so we could determine localization. Our results showed protein expression of the mutant. Efforts to localize the mutant channel were inconclusive since the wild type ASIC3 showed abnormal targeting.

JAMES C. CAVENDER, Dept of Environmental and Plant Biology, Ohio University, Athens, OH 45701, JOHN LANDOLT, Dept of Biology, Shepherd University, Shepherdstown, WV 25443 and STEVE STEPHENSON, Dept of Biological Sciences, University of Arkansas, Fayetteville, AR 72701.

Dictyostelid cellular slime molds of Africa.

Dictyostelid cellular slime molds (dictyostelids) are an understudied group in Africa, but several recent surveys carried out in the context of a Planetary Biodiversity Inventory project funded by the National Science Foundation of the United States have added a considerable number of new records from several areas of the continent. Since Edgar Olive isolated *Polysphondylium pallidum* in Liberia at some point during the period between 1897 and 1900, at least 25 species of dictyostelids have been documented for continental Africa (30 different study sites) and about the same number for the island of Madagascar (11 different study sites). These totals include an appreciable number of forms that appear to be new to science. Most of what is now known about the dictyostelids of continental Africa has been derived from study sites in East Africa and South Africa. Only limited data exist for West Africa and Central Africa, and we are not aware of any records of dictyostelids from North Africa.

LINA CUI, NIANQIANG WU, and LIAN-SHIN LIN, Dept of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506.

Feasibility of using hydroxyl radical production rate as a measure of photocatalytically bactericidal effects of various titanium oxide nanomaterials.

Wide spread uses of engineered nanomaterials due to rapid development of nanotechnologies in recent years has raised public concerns for their potential cytotoxic effects. In particular, photocatalytic production of hydroxyl radical by nanomaterials is commonly considered one of the major reasons responsible for the effects. This study aims to investigate feasibility of using reactive oxygen species (ROS) production rate as a measure for characterizing the bactericidal effects of five titanium oxide nanomaterials with various shape, size, crystal structure, and chemical composition. Hydroxyl radical (×OH) and superoxide ion (O_2-) production rates were estimated using fluorometric and absorption measurements respectively. Inactivation of a pure bacterial culture (Escherichia coli) was quantified as a function of exposure time and ROS production rate. Bacterial inactivation rates of the tested nanomaterials were used as a biological response and estimated by a series-event kinetic model. Results showed that hydroxyl radical production efficiency (yield) decreased as the light intensity and nanomaterial concentration increased. Hydroxyl radical production rates were substantially higher than those of superoxide ion production rate of all the nanomaterials. However, no linear relationship was found between the hydroxyl radical production rate and bacterial inactivation rate across the different titanium oxide nanomaterials. Although produced at lower rates than hydroxyl radical, superoxide ion has a better correlation with bacterial inactivation. This suggests that it is not feasible to use hydroxyl radical generation rate as a sole indicator to predict the photocatalytically bactericidal effects of titanium oxide nanomaterials with different shape, size, crystal structure, and chemical composition.

MALIA J. DESHOTEL, Dept of Chemistry, Shepherd University, Shepherdstown, WV 25443 and BRETT E. ZIRKLE and CAROL ZYGAR PLAUTZ, Dept of Biology, Shepherd University, Shepherdstown, WV 25443.

Establishment of a role for transcriptional cofactor Xldb1 in Xenopus lens development.

Using an expression cloning strategy to isolate genes with lens-inducing activity, we isolated the previously identified transcriptional cofactor Xldb1. This, together with evidence for its nuclear dependence, suggested that its activity is due to an indirect mechanism. We thus proposed that Xldb1 mediates induction of an early lens gene in our functional assay by transcriptional activation of lens-inducing signals. Xldb1 was shown to be capable of activating genes of the presumptive lens, presumptive nose, and cement gland; however, it had not been demonstrated to be necessary for this process prior to our study. We microinjected morpholino oligonucleotides (MOs) directed against Xldb1 into zygotes, to block in vivo expression and study the role of Xldb1 in normal development. Our studies show that knocking down Xldb1 leads to decreased expression of early lens and retinal markers as assayed using in situ hybridization. We also show that their expression can be restored in MO injected embryos by rescuing with a truncated form of Xldb1 RNA that cannot be translationally blocked by the MO. The mortality rate in MO injected embryos was dramatically higher than in rescue RNA + MO coinjected embryos, suggesting the mortality was due to lack of Xldb1 activity and not MO toxicity. Surviving MO-injected embryos exhibited morphological abnormalities, most noticeably an enlarged cement gland. The data suggest that an Xldb1-regulated mechanism comprises the early signal for Xenopus lens induction.

JESSE DOLINAR and JOSEPH L. ALLEN, Dept of Physical Sciences, Concord University, Athens, WV 24712-1000.

Micro-XRF applied to natural friction melts.

This research utilized the Horiba XGT-5000 X-ray analytical microscope (XRF) to map and compare elements in migmatitic pelitic schist and gneiss samples taken from the Homestake shear zone (HSZ), Colorado, and granitoids taken from the Long Ridge Fault (LRF) in North Carolina. The purpose was to identify and compare the bulk major-element chemistry of earthquake-generated friction melts (pseudotachylyte) and host rock using a new technique. Micro X-Ray fluorescence offers an opportunity to examine element distributions at the hand-sample scale, and has potential to be particularly useful to the analysis of fine-grained fault rocks. Samples were cut from oriented hand samples to produce ~1 cm thick slabs less than 10 x 10 cm in area, and polished with 250 and 400 grit. Samples were manually cleaned with tap water and acetone. We used a 100 micron focused X-ray guide tube to simultaneously map 16 elements at 512 pixel resolution. Collection time varied depending on sample size but was generally 20 hours or more for optimal data collection. For our study, the XRF was most effective in mapping Fe, Si, K, Al, Ti, and Ca. Na and Mg were too light to effectively map. This device was particularly effective in mapping chemical zoning in friction melts as well as differentiating multiple generations of melt, both of which cannot be consistently identified in hand samples. Analysis indicates a depletion or enrichment of major elements at the melt boundary in the samples from LRF and HSZ. If this depletion or enrichment is indicative of friction melting, we observe only one generation of melt, which contradicts previous research suggesting multiple generations of melt.

IAN DOUGLAS and LETHA J. SOOTER, Dept of Biology, West Virginia University, Morgantown WV 26506.

In vitro selection of SPIONs.

In labs all over the world in vitro selection is in common use. This process can be explained in general by the filtering and copying of single-stranded DNA to find a specific molecule with a specific function. A critical part of this process happens in a Polymerase Chain Reaction or PCR. Lots of optimization is needed to get the PCR to run well. These can include temperature profile (i.e. annealing temp), concentration of reagents in the buffer, changing the concentration of MgCl2, the number of cycles, time period of cycles, etc. This process of in vitro selection results in molecular recognition elements.

These MRE's can be made of RNA, DNA, peptides, antibodies, etc. An MRE binds to a target with high affinity and specificity. Which means out of 107-1014 different molecules and many isolation and amplification steps are done to produce 1-5 molecules are found to exhibit the desired characteristic. The target for an in vitro selection can be anything; my target is SPIONs (Super Paramagnetic Iron Oxide Nanoparticles). These SPIONs were synthesized by Dr. Lloyd Carroll's lab in the WVU chemistry lab. SPIONs have biomedical applications, including drug delivery. An MRE that binds SPIONs can be combined with an MRE that will localize the SPIONs to a specific cell type or a specific location within a cell. Potentially these SPIONs can be infused with cancer drugs, injected into the body and brought to a localized point (i.e. cancer site) with the use of a magnet.

HEATHER DOVE, CHRISTINA SMITH and MILAN VAVREK, Dept of Land Resources, Glenville State College, Glenville, WV 26351.

Salt tolerance of Tree of Heaven (*Ailanthus altissima*).

Ailanthus altissima, Tree of Heaven, is an invasive species in West Virginia that rapidly colonizes and dominates disturbances in native forests. Perturbation by oil and gas exploration and production may provide an opportunity for exploitation by Tree of Heaven. However, petroleum production may also contaminate soils with produced water (brine) as a result of accidental spills. Consequently, colonization of well sites and pipeline right-of-ways by Tree of Heaven may depend, in part, on the ability to tolerate salt contaminated soils. Few tree species exhibit salt tolerance. A germination assay and assessment of seedling growth indicated that Tree of Heaven tolerates low to moderate concentrations of salt. Seeds germinated at 0, 4, 8, and 16 dS/m of salt. Germination was greatest at 0 and 4 dS/m ($p<0.05$). Seedlings transferred to pots in a greenhouse and treated with 0, 4, and 8 dS/m salt also grew in height and number of leaves at all concentrations, but the greatest growth rate occurred at 0 dS/m ($p<0.05$). Although less than ten percent of Tree of Heaven seedlings continued to grow at 8 dS/m, establishment of only one or two Tree of Heaven individuals may be required to eventually dominate a disturbance due to its rapid growth rate and root sprouting. Therefore, oil and gas sites may promote the spread of Tree of Heaven within West Virginia forests. Washing vehicles and equipment between job sites may help control the spread of Tree of Heaven into these sites.

JUSTIN ELLIS, Dept of Physics, West Virginia University, Morgantown, WV 26506.

A new method for constraining the stochastic gravitational wave background.

Einstein's general theory of relativity predicts the existence of gravitational waves (GWs) in the form of distortions in the fabric of spacetime. Sources of low frequency GWs may include coalescing supermassive black hole (SMBH) binary systems, cosmic strings, and relic GWs from the early universe. The direct detection of GWs would both complement data provided by electromagnetic radiation as well as probe more deeply into areas unreachable by current methods. Despite many attempts in past decades only an indirect detection of GWs has been made. Direct detection of GWs through the use of pulsar timing arrays appears likely within the decade. Here we present a new method of constraining the amplitude of GWs due to a stochastic background of coalescing SMBH binary systems. This is done through a statistical comparison of timing data with simulated GWs and published data from very long baseline interferometry (VLBI) measurements. Using two of the highest precision pulsars, J0437-4715 and J1713+0747, we obtain a 2 sigma upper limit on the dimensionless amplitude of A=9.1e-14. While these preliminary results are not as constraining as the most recently published limits, they are consistent and give an independent upper limit on the background strength.

DAVID FOLTZ, EVAN HEWITT, MATTHEW MCKINNEY, NICOLE GARRISON, and ZACHARY LOUGHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and STUART WELSH, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown WV 26506-6125.

Crayfishes of the West Virginia Elk River basin: conservation and natural history.

Although crayfish of the Elk River were briefly sampled by Jezerinac in 1988, no intensive sampling of crayfishes has occurred the Elk River has taken place before. Survey efforts were initiated over the summer of 2009 to gather voucher material and provide a more intensive look into the basin's crayfish fauna. Recent collections provide new information regarding the distribution, natural and life history, taxonomy, habitat, and conservation status of *Cambarus carinirostrus, Cambarus bartonii cavatus, Cambarus elkensis, Cambarus monogalensis, Cambarus robustus, Cambarus sciotensis, Cambarus thomai, Orconectes cristavarius, Orconectes rusticus, Orconectes sanbornii,* and *Orconectes virilis* within the basin. Sampling of the basin revealed the presence of the invasive species *O. virilis* and *O. rusticus* within the lower mainstem of the Elk River and *O. virilis* within Sutton Dam reservoir. Diversity within the Elk River basins is a result of an elevational gradient within the Elk. High, moderate, and low elevations all maintain unique crayfish faunas. *Cambarus elkensis*, an Elk River endemic, currently is stable throughout the majority of the Elk River's headwaters.

MEGHAN FRANCIS and ROBERT KREISBERG, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and RAVI SUBRAMANIAN, JULIA WILDSCHUTTE, and JOHN COFFIN, Dept of Microbiology, Tufts University, Boston, MA 02111.

Antibody detection of human endogenous retrovirus env proteins in breast cancer.

HERVs are inactive remnants of ancient germ-line retroviral infections that may be transcribed. HERV-K members are expressed in breast cancer tumors but not in normal mammary epithelial cells[1]. Breast cancer begins with an abnormal growth of cells which may remain benign but may also advance into a carcinoma and metastasize throughout the body.

Studies analyzing viral RNA expression within breast cancer cell lines, representative of the three major subtypes of breast cancer, have not examined HERV protein expression. We will look at HERV protein expression in these subtypes. While approximately70 proviruses belong to the HERV-K family, only six express a full length Env protein required for entry into the host cell. Of those six, we used HERV-K108, a well-studied HERV whose Env is capable of mediating infection. The project goal was to investigate the biology of HERV-K proteins expressed in tumor cell by (1) examining the viral envelope glycoprotein of Env and (2) identifying HERVs that are exclusively expressed in tumor cell lines using an anti-Env antibody. These studies will allow us to determine potential marker genes associated with breast cancer. In order to achieve this goal, we measured endogenous Env expression in normal mammary epithelial cells and tumor cell lines to examine the link between Env expression and tumorigenesis. We also identified genes flanking HERV-K loci which potentially have roles in breast cancer development. From our results, the locus of provirus expression may be distinguished providing the location within the genome of a dysfunction leading to breast cancer.

MANOHAR GADDIPATI and BRIAN J. ANDERSON, National Energy Technology Laboratory, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506.

Methane production from complex gas hydrate reservoirs: effects of reservoir heterogeneity on gas production.

Natural gas is an important energy source contributing to 23% of the total energy consumption in United States. Development of new alternatives like natural gas from methane hydrate can play a major role in ensuring adequate future energy supplies in the United States. Methane hydrates are crystalline solids, very similar to ice, in which non-polar molecules are trapped inside the cages of water molecules. The National Energy Technology Laboratory (NETL) and the U.S Geological Survey (USGS) gas hydrate code comparison project is the first of its kind and it aims at a worldwide understanding of the hypotheses involved in the gas hydrate modeling and problem solving. The initial phase of the code comparison was achieved by simulating five problems of increasing complexity for five different reservoir simulators: CMG STARS, HydrateResSim, MH-21 HYDRES, STOMP-HYD, and TOUGH+HYDRATE. This paper presents the second phase of the Code Comparison Project involving long term simulations for three different model reservoirs. These three different model reservoirs are based on data available for Mt Elbert gas hydrate accumulation and Prudhoe Bay L-Pad accumulation. The objective of this work is to generate results for CMG STARS for these model reservoirs. A good agreement is obtained for CMG STARS with other simulators. The effect of reservoir heterogeneity on gas production is also studied. An increase in gas production was observed with increasing heterogeneity in the reservoir.

NAGASREE GARAPATI, SRINATH CHOWDARY VELAGA and BRIAN J. ANDERSON, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506.

Predictions of phase equilibrium data of mixed hydrates using the cell potential method.

Natural gas hydrates are likely to contain more carbon than in all other fossil fuel reserves combined. Most of the natural gas hydrate deposits contain CH4 along with other hydrocarbon and non-hydrocarbon gases. Thus, if CH4 stored in the natural gas hydrates can be recovered, the hydrates will become a potential clean energy resource for next 10,000 years. Current reservoir simulators are capable of predicting production rate from pure CH4 hydrate but natural gas hydrates are mixed hydrates, hence there is a need to modify the simulators for implementing the mixed hydrate data. Therefore, it is very important to predict accurately phase equilibria of mixed hydrates. Based on an analytical solution to the Lennard-Jones Devonshire approximation to the van der Waals-Platteeuw statistical mechanics model for hydrate equilibrium, the cell potential method is used to predict the phase equilibrium data of the mixed hydrate. The cell potential method developed by Anderson et al. (J. Phys. Chem. B. 2005, 109, 8153) is modified for variable reference parameters as it is found that the reference parameters varies with guest molecules. The cell potential parameters are calculated using ab initio calculation methods. The three- dimensional phase equilibria of CH4-C2H6, CH4-CO2 and CH4-N2-CO2 hydrates are predicted. The structural transitions that are known to occur in CH4-C2H6 mixed hydrate can also be predicted accurately. These phase equilibrium predictions can be incorporated into reservoir simulators to assess the production of CH4 from the hydrate reservoirs. The authors thank Department of Energy (DOE) and National Energy Technology Laboratory (NETL) for their financial support of this research.

AARON C. GOOLEY, Dept of Biological Sciences, Marshall University, Huntington, WV 25755, JAYME L. WALDRON, Dept of Biological Sciences, University of South Carolina, Columbia, SC 29208, and THOMAS K. PAULEY, Dept of Biological Sciences, Marshall University, Huntington, WV 25755.

The behavioral responses of West Virginia turtles to passing vehicles on a simulated divided highway.

Road mortality has been identified as a major threat to many turtle species; however, response to passing vehicles and general behavior while crossing roads has never been investigated in turtles. To investigate these factors, Midland Painted Turtles (*Chrysemys picta marginata*), Eastern Box Turtles (*Terrapene c. carolina*), and Stinkpots (*Sternotherus odoratus*) were collected and placed in a release box on the side of a closed road with an active road running parallel to it, released via a pulley-operated door facing the road, and their actions videotaped by an observer in a nearby blind. A vehicle was driven past crossing turtles to simulate passing traffic in the adjoining lane. Resulting videos were used to determine the frequency of responses and length of stops due to passing vehicles. Following trials, turtles were released at the original point of capture. Results show that Eastern Box Turtles stop on a divided highway due to the stimulus of an opposing lane vehicle more than either Stinkpots or Midland Painted Turtles (84.38%, 33.33%, and 22.22% respectively). All species reacted to a passing adjoining lane vehicle by stopping on the road; however, Eastern Box Turtles and Stinkpots averaged more time stopped than Midland Painted Turtles. These results indicate that Eastern Box Turtles

spend more time stopped on the road when crossing a divided highway than Stinkpots or Midland Painted Turtles and are thus at greater risk of mortality. Future trials conducted in the spring and summer of 2010 will include additional species and expand sample sizes.

CHRISTOPHER J. GUERRIERO, Dept of Biological Sciences, University of Pittsburgh, Pittsburgh, PA 15261, KUNIO NAKATSUKASA, Division of Biological Science, Nagoya University, Nagoya, Japan, and JEFFREY L. BRODKSY, Dept of Biological Sciences, University of Pittsburgh, Pittsburgh, PA 15261.

Defining the chaperone requirements for the endoplasmic reticulum-associated degradation (ERAD) of novel substrates.

Over one-third of all newly synthesized proteins in eukaryotes must traffic through the endoplasmic reticulum (ER), where they are folded before trafficking to their final destinations. However, various insults can cause defects in protein folding, including environmental stressors, translational defects, defects in post-translational processing, or genetic mutations. Improperly folded proteins in the secretory pathway can either eventually attain their proper conformations or be targeted by chaperones for ER-associated degradation (ERAD). ERAD not only disposes of misfolded proteins, but is also important for regulating protein levels. Understanding the inherent motifs within a substrate (degrons) that direct a protein toward ERAD is critical for understanding protein regulation during both normal and diseased states. Folding lesions can exist in a protein's membrane, cytosolic, or lumenal domains, which dictates the set of molecular chaperones available to mediate folding/degradation. The aim of this study is to characterize the machinery involved in the degradation of proteins with cytosolic lesions (ERAD-C). To elucidate the chaperones required for ERAD-C, we employed a novel ERAD-C degron in the model organism, *Saccharomyces cerevisiae*. To test the utility of this degron for studying ERAD-C, the stability of chimeric proteins including this motif was measured in mutant yeast strains by cycloheximide chase. These experiments revealed that degradation of the chimeras is dependent on the proteasome and on two E3 ubiquitin ligases, Hrd1p and Doa10p. These data support the use of this misfolded domain (degron) to further study the roles played by chaperones involved in ERAD-C.

L. M. HARRIS and S. J. SAWYER, Dept Science and Mathematics, Glenville State College, Glenville, WV 26351.

The affect of temperature shock length on integrin distribution in the tropical sea anemone, *Aiptasia pallida*.

Temperature-induced coral bleaching results from the loss of host cells contains the symbiotic dinoflagellate algae from the coral host. We have been investigating how temperature affects integrin distribution in the tropical symbiotic sea anemone, *Aiptasia pallida*. Integrins are cell substrate adhesion molecules, mediate signals between the extracellular matrix and the intracellular proteins, and are important in regulating apoptosis. Using immunohistochemistry, we have investigated the tissue localization of integrins using the anti-integrin antibody, CNb1. To see how the temperature shock affected the integrin distribution, the anemones were heat shocked at 30 ˚C for one, four, eight, 12, 24, and 48 hours. After the heat shock, the anemones were preserved, sectioned and then stained with an anti- integrin antibody. In control anemones, the greatest density of integrin staining is in the mesoglea area. The temperature shock affects integrin distribution disrupting the intense mesogleal band after the 12 hour temperature shock. Substantial disruption of integrin staining is seen between 24 and 48 after heat shock. Future work is focusing on the timing of the disruption of integrin staining and how this disruption is affecting the physiology of the animal.

EVAN HEWITT, DAVID FOLTZ, MATTHEW MCKINNEY, NICOLE GARRISON, and ZACHARY LOUGHMAN, Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074.

Conservation of West Virginia's Ohio and Kanawha River bottomland primary burrowing crayfishes: species relationship to forest community structure with an emphasis on *Fallicambarus fodiens*.

Crayfish conservation has witnessed an upsurge in activity over the past decade. Conservation efforts have been directed toward stream forms, while burrowing crayfishes have not received the same level of conservation intensity. In West Virginia, the pre-glacial Marietta River Valley in Cabell, Mason, and Putnam counties is a center of diversity for burrowing crayfishes. Burrowing crayfish occurring in bottomland forests in the region include *Fallicambarus fodiens* and *Procambarus acutus*, two species with limited ranges within West Virginia in need of conservation efforts. Identifying crucial ecological communities needed for these species is the first step towards their conservation. In order to identify specific forest communities harboring high levels of burrowing crayfish diversity, point quarter surveys were conducted in the nine remaining bottomland forest tracts along the Ohio and Kanawha River floodplains in previously mentioned counties. Relative density, relative cover, relative frequency and importance values were generated for tree species in each forest. Forest communities were identified by the top two important tree species. Oak /maple forests maintained the highest diversity levels, and were the only forest communities in which *Fallicambarus fodiens* occurred. *Procambarus acutus* occurred in oak / maple forests and buttonbush marshes, and had a more expansive range along the Kanawha River floodplain than previously thought. *Cambarus thomai* was present at all sites surveyed. The rarest forest type was oak / maple. *Fallicambarus fodiens*' apparent dependence on oak / maple forests and the high levels of diversity found within these forests warrant immediate conservation efforts.

BRIDGET D. HINES, JOURDAN T. AROMIN and LETHA J. SOOTER, Dept of Biology, WV Nano Initiative, West Virginia University, Morgantown, WV 26505.

Use of optical properties to probe the interaction of molecular recognition elements with single-walled carbon nanotubes.

Single-walled carbon nanotubes (SWCNTs) have unique optical properties that have shown to be useful in biological and chemical sensors. These highly aromatic hydrophobic nanomaterials interact with nucleic acids leading to individual dispersion in aqueous solutions. Our laboratory focuses on the use of single-stranded DNA as molecular recognition elements (MREs). We are working to optimize the interaction between MREs and SWCNTs. This attachment can alter the optical spectra of the SWCNTs giving a platform for chemical and biological detection. The optimization involves studying the optical properties of SWCNTs, particularly the near-infrared (NIR) fluorescence spectra. Once it is determined how hybridization of the MRE effects the optical spectra, the spectra can be used for a solution based-optical sensor. Our sensor platform involves the attachment of DNA that is complementary to an MRE against adenosine triphosphate (ATP.MRE). As in previous literature reports, the hybridization of the ATP.MRE produces changes in the NIR fluorescence spectra. Current efforts are to characterize the spectral shifts when the target (ATP) is added to the ATP.MRE hybridized to the DNA:SWCNT. Our results show that varying the DNA sequence used for sonication-mediated dispersion of SWCNTs shows shifts in NIR fluorescence spectra. These shifts indicate that the varied DNA sequences can interact with different chiralities of SWCNTs. These results suggest the possibility of using in vitro selection to develop MREs against separate SWCNT chiralities. These MREs would provide an easy and inexpensive method of purification of chiralities from the mixture developed in the production process.

DEBRA HULL, LAUREN COOK, JOAN COTTER, STEFANIE MERTZ, and LINDSAY MOFFATT, Dept of Psychology, Wheeling Jesuit University, Wheeling, WV 26003.

The effect of body size on the way others perceive personality characteristics.

Black and white human-figure line drawings, often used to measure body satisfaction, were selected in this study to assess personality stereotypes associated with different body sizes. College student participants looked at a selection of line drawings (chosen randomly) of men and women who ranged in body size from extremely thin to extremely obese, then rated those figures on 18 personality traits. Nine of the personality traits showed statistically significant differences among the body sizes. Generally, moderately-sized figures were rated most positively, with extremely thin and extremely obese figures rated more negatively. Obese figures were rated the most negatively. Male and female participants did not differ in how they rated the figures, nor were male and female figures rated differently on the personality characteristics. These results indicate that there are identifiable personality stereotypes based solely on body size. Future studies will investigate the impact that a participant's body size has on how that participant rates the personality characteristics of line drawings of figures with different body sizes.

NOELLE JULIANO, HAITAO LUO, and YI CHARLIE CHEN, Natural Science Division, Alderson-Broaddus College, Philippi, WV and BING-HUA JIANG, Mary Babb Randolph Cancer Center, Robert C. Byrd Health Sciences Center of West Virginia University, Morgantown, WV 26506.

Kaempferol inhibits expression of VEGF and HIF-1α in human cancer cells.

Kaempferol is a flavonoid found in apples, onions, leeks, citrus fruits, grapes, red wines, ginko biloba, St. John's wort, strawberries, and teas. HIF-1α is a protein that reacts to hypoxia in the body by stimulating VEGF expression. Inhibiting VEGF expression would hinder angiogenesis within tumors which would diminish growth and metastasis of cancer cells. The objective of our research is to determine the effect of kaempferol on cell proliferation, VEGF mRNA and protein expression in DU-145 prostate cancer cells; and HIF-1α protein expression in Ovicar-3 and CP-70 ovarian cancer cells. Our results indicated that cell proliferation was significantly reduced as prostate cancer cells were treated with increasing doses of kaempferol. ELISA and Western blot detected a decrease in VEGF, HIF-1α and linterleukin-6 protein expression in Du-145 cells. HIF-1α protein expression was reduced by kaempferol treatment in Ovicar-3 and CP-70 ovarian cancer cells.

CRISTY KING, Dept of Atmospheric Science, University of Arizona, Tucson, AZ 85721.

Longwave and shortwave cloud radiative forcing on the spatial and temporal scale of a tropical storm or hurricane.

Globally, net radiation on a monthly timescale in the tropics has long been concluded to be approximately 0 W/m2, with the longwave and shortwave radiation nearly cancelling each other out. However, it has yet to be determined whether or not longwave or shortwave radiation dominates on the spatial and temporal scale of a tropical disturbance such as a tropical storm or hurricane. Spatially, my domain is limited to the latitudes between 5-30 degrees N and longitudes 280-340 degrees E and my dataset spans the time period between 1985 and 2004. Establishment of an acceptable anomalous threshold is determined by a simple statistical histogram test, and all values greater than this threshold are considered to be significant. It is then determined to what distance any kind of significant values occur from the core of the storm. At present, there appears to be no relationship between a disturbance's categorization and its largest longwave cloud radiative forcing (LWCRF) or shortwave cloud radiative forcing (SWCRF) value; disturbances that are tropical storms may display the same LWCRF or SWCRF as a Category 5 hurricane. Spatially, however, there appears to be a difference, with the larger categorized disturbances showing a much broader spatial impact than the smaller categorized disturbances

JOHN LANDOLT, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443, STEVE STEPHENSON and CARLOS ROJAS, Dept. of Biological Sciences, University of Arkansas, Fayetteville, AR 72701.

Dictyostelid cellular slime molds from aerial microhabitats.

The leaf litter decomposition zone of forest soils is generally considered to be the primary microhabitat for dictyostelid cellular slime molds (dictyostelids), but these organisms also occur in other types of soils, including those in caves, and are sometimes coprophilous (i.e., associated with dung). The occurrence of dictyostelids in some types of aerial microhabitats has received relatively little study. However, these organisms can be surprisingly abundant in the mantle of dead organic matter (literally a "canopy soil") often found at the bases of epiphytes that grow on the larger branches and, to some extent, the trunks of trees in moist temperate and tropical forests. More than 400 samples collected from the canopy soil microhabitat in 11 different regions of the world have yielded more than 40 species of dictyostelids. In some instances, these organisms were just as abundant in samples of canopy soil as they were in samples of ground soil collected at the same locality. A few of the species recovered from canopy soil have been described as new to science, and at least two of these are not yet known from ground soil. This research was supported, in part, by grants from the National Geographic Society and the National Science Foundation.

SHIYU LIU, CHET-MUN LIEW, JOHN NUSZKOWSKI, TIMOTHY GATTS, RICHARD ATKINSON, HAILIN LI, and NIGEL CLARK, Dept of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506.

An experimental investigation of the combustion process of a heavy-duty H_2-diesel dual fuel engine.

This paper presents the combustion characteristics of a heavy-duty H_2-diesel dual fuel engine. The effects of H_2 addition on the cylinder pressure and combustion process were experimentally investigated at 15, 30 and 70% of the maximum load at 1200 rpm. The addition of up to 6% H_2 in the intake air contributed to as much as 77% of the total intake energy when operated at 15% load and as little as 31% at 70% load. When operated at 70% load, the addition of a relatively large amount of H_2 substantially increased the cylinder pressure and the heat release rate with their peak values observed at slightly advanced phasing. However, the addition of a large amount of H_2 at 15% load reduced the peak cylinder pressure and the peak heat release rate observed at premixed combustion but enhanced the heat release rate observed at diffusion process. When operated at 30% load, the addition of H_2 has mild effect on the cylinder pressure and heat release process. Compared to the featured two-stage combustion process of diesel engines, a three-stage combustion process of the H_2-diesel dual fuel engine was observed with the addition of a relatively large amount of H_2 at high load. The extremely high peak heat release rate represented a combination of diesel diffusion combustion and the premixed combustion of H_2 consumed by multiple turbulent flames. However, the addition of a H_2 under low load did not change the two-stage heat release process pattern.

MAYURI MUKKA, EDWIN L. KUGLER and DADY B. DADYBURJOR, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26505.

Parametric study of the partial oxidation of propane over Ni and Pt based catalysts.

Hydrogen production through the partial oxidation of propane over CeO_2 supported Pt and Ni catalyst was studied. The aim of the study was to investigate the sequence of different reactions during propane oxidation over two catalysts. The reaction runs were performed in a fixed-bed reactor at reaction temperature of 600 °C and a feed ratio (O_2: C_3H_8) of 1.78. The effect of space velocity on the reaction rates was evaluated by varying total inlet flow (100 to 400 SCCM) and catalyst weights. The outlet gases from the reactor were analyzed by an online gas-chromatogram (GC). At 600 °C, six species (C_3H_8, O_2, H_2, CO, CO_2 and C_3H_6) were detected at the reactor outlet. Ten reaction sets containing four independent reactions each (which would yield the six species) were found by the Gaussian elimination process. For each set, a material balance on the six outlet compositions measured obtained the extents of each of the four reactions in the set. Rate of each reaction in all the ten sets was calculated using MATLAB least square regression technique. Sets with negative reaction rates were eliminated. To confirm the validity of sets, reactions representing dry reforming, steam reforming and water gas shift were further carried out over the catalysts. Finally, the effect of weight hourly space velocity on the reaction rates for each of the catalyst was evaluated.

WESTLEY MULLINS, JANE OOSTHAIZEN, and KAITLYN BOWMAN, Dept. of Science and Mathematics, Glenville State College, Glenville WV 26351, HOWARD WHITE, Dept of Physiological Sciences, Eastern Virginia Medical School, Norfolk VA 23510, and GARY Z. MORRIS, Dept of Science and Mathematics, Glenville State College, Glenville WV 26351.

Synthesis of (7-diethylaminocourmarin-3-ester)-3'- denosine 5'-triphosphate (or DeacesterATP).

Hydrolysis of adenosine-triphosphate (ATP) produces chemical energy that can be used by a cell to do work. The kinetics involving ATP hydrolysis in muscle cells is studied using fluorescent ATP analogs, and actin and myosin proteins. Actin and myosin are proteins found in muscle fibres that do the mechanical work of muscle contraction. A very efficient fluorescent ATP analog for studying myosin-actin kinetics is 3'-(7-diethylaminocoumarin-3-carbonylamino)-3'-deoxy-ATP (deac-aminoATP or DeacATP), which undergoes a 20-fold increase in fluorescence emission intensity when bound to the active site of myosin. This fluorescent ATP analogue is composed of a coumarin tag attached to ATP at the 3' position thorough an amino group. DeacATP has to be made in its entirety from scratch through seven different reactions. Here we propose an alternative to DeacATP which is to attach the coumarin tag to ATP through an ester. ATP already has an alcohol at the 3' position this process should require fewer steps and be less expensive; instead of seven reactions, only two reactions are necessary. Coumarin is first activated through mixing with tributylamine (solvent), and isobutyl chloroformate (leaving group). ATP is then added to the activated coumarin producing the new fluorescent ATP molecule

(DeasetserATP) carbon dioxide, and the isobutyl chloroformate leaving group. This specific fluorescent ATP analog has not been synthesized before. TLC, NMR, FTIR, HPLC and UV-Vis are being used to monitor synthesis of the new compound and the effect of temperature and light on product yield is being determined.

CASEY NASSIF, West Virginia University, Morgantown, WV 26506, and LETHA J. SOOTER, Dept of Biology, West Virginia University, Morgantown, WV 26506.

Detection of molecular recognition elements using yeast library of surface displayed peptides.

Molecular recognition elements (MREs) are biomolecules that bind a target tightly and with high specificity. MREs can be created and used to detect a variety of substances. They are isolated through in vitro selection, where a target is exposed to 107 different organic molecules composed of peptides presented on common yeast (Saccharomyces cerevisiae). By using such a large number of potential MREs, we can offset the obstacle of needing to test random molecules for very specific properties. Each yeast cell holds approximately one thousand copies of a single peptide, and an individual yeast cell is used for each peptide being tested. This means that if 107 peptide combinations are tested, 107 yeast cells will be used. The peptide sequences, grown from a single chain fragment variable library, are attached to a hemagglutinin tag on the Aga2 protein of the yeast. To determine if the yeast are properly displaying peptides, fluorescent antibodies that bind specifically to the hemagglutinin tag are used in combination with a flow cytometer. Once this control has been run, the in vitro selection may begin. The selection consists of several cycles of positive selection, where the peptides that bind to that target molecule are isolated and amplified for the succeeding round of selection. My target is SPIONs, Superparamagnetic Iron Oxide Nanoparticles. They were synthesized by Dr. Lloyd Carroll at WVU. SPIONs have a variety of biomedical applications. Peptides that specifically bind to SPIONs can be used as highly-functionalized linkers for conjugation to other molecules of interest.

LEVI R. NAYLOR and JOHN H. HULL, Dept of Psychology, Bethany College, Bethany, WV 26032.

You CAN tell a book by its cover (at least somewhat): information provided by covers of books written for children.

Thirty-five college student participants viewed either clear (N=18) or pixilated (N=17) versions of covers of books marketed on Amazon.com to age ranges birth-toddler, 4-8 years, and 9-12 years. Books were listed as all-time bestsellers on Amazon.com. Pixilation included reversal, then rotation, of the pixilated image. There were 15 covers in each of the age categories, and the order of PowerPoint presentations was randomized. Each cover was evaluated by participants on three Likert-like scales ranging from 1-5: Very masculine-Very feminine, Very passive-Very active, and Very interesting-Very uninteresting. Mixed-design ANOVAS (repeated-measures variable: age category; between-participants variable: clear vs. pixilated PowerPoint) were conducted for each of the three scales. Results showed that both clear and pixilated versions of the book covers: were evaluated as significantly more masculine as age category increased; did not show significant age or clear-pixilated trends on the active-passive dimension; were rated as significantly most interesting in the 4-8 years category. Because our pixilation process removed virtually any cues except predominant colors of the book covers, yet the evaluations of clear and pixilated book covers were so similar, it may be that color is an important cue people use in selecting children's books. For example, there was a statistically significant correlation ($r(43)= 0.495$, $p<.005$) between masculine-feminine means for the 45 clear-pixilated cover pairs. Future research will address this possibility, include books for adults, as well as for children, and attempt to assess the relationship between book cover and book content, at least for children's books.

B. OOSTHUIZEN and S. J. SAWYER, Dept Science and Mathematics, Glenville State College, Glenville, WV 26351.

Sampling of the Elk River to assess macroinvertebrate abundance and diversity and water quality.

In order to assess the health of the headwaters of the Elk River, macroinvertebrate abundance and diversity and water quality were assessed at four locations over a two-mile stretch of the Elk River in Webster County. The four locations included two tributaries of the Elk River and each location was sampled periodically in the fall of 2008 and again in the fall of 2009. Macroinvertebrate abundance, diversity, nitrate and phosphate levels, dissolved oxygen concentration, and other water quality indicators as well as stream embeddedness were measured. All chemical water quality indicators remained relatively constant over the two-year sampling regime. Stream embeddedness increased at the headwater from 54% to 68% between the fall of 2008 and the fall of 2009. In addition, chironomid abundance increased from 38% to 54% over the sampling period. Numbers of other macroinvertebrates decreased slightly. This result could be explained by the opening of the trout hatchery at the surfacing springs of the river or an increase in fine particle load, both of which could affect the reproduction of macroinvertebrates. Future sampling could determine if the change in chironomid and embeddedness remains.

JANE R. OOSTHUIZEN, PHILIP HOFFMAN, and KEVIN L. EVANS, Dept of Mathematics and Science, Glenville State College, Glenville, WV 26351.

Synthesis of triacid and triamide amphiphiles.

Amphiphiles are compounds that possess both hydrophilic and hydrophobic properties. Amphiphiles have practical applications in both industry and medicine. Industry is particularly interested in amphiphiles for their ability to inhibit corrosion and as flotation collectors, which is especially useful in mining. From a medical standpoint amphiphiles are being investigated as a new type of antibiotic. Two series of amphiphiles were synthesized during this research – the

triamide and the triacid. Each synthesis involved the condensation of a secondary amine with an isocyanate. Four triamide amphiphiles were synthesized by the condensation of triamide isocyanate with *N*-methylalkylamines of different alkyl chain lengths (12, 14, 16 and 18 carbons). The triacid amphiphile was synthesized with *N*-methyloctadecylamine and weisocyanate. Attempted purification of the compounds included recrystallization and thin layer column chromatography. Characterization of the triacid and triamide amphiphiles included ^{1}H and ^{13}C NMR, FTIR, and melting point.

JEREMIAH PEPPER, OSMAN GUZIDE, and WEIDONG LIAO, Dept of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV 25443.

A universal communication bridge between high level languages and spreadsheets.

In this research project, we intend to investigate and analyze the Obba software that provides a communication bridge between Java classes and spreadsheets, including Excel and Open Office. The idea has been elaborated and extended to other programming language so that a universal communication bridge can be achieved. A comparison study between Obba and other similar software such as XLL4J, XLW, ExcelDNA will be conducted. Investigation will also be done to extend Obba package to work with Google spreadsheet. The research will benefit both software developers and end users. Software developers will be able to use the software package to access convenient functionalities from spreadsheet software. The end users, who are familiar with spreadsheet software, could access complex computation through simple command buttons.

RACHEL POLING and RICO GAZAL, Dept of Land Resources, Glenville State College, Glenville, WV 26351.

Seasonal fluctuation in leaf structure and chlorophyll of *Ailanthus* and its co-occurring native species in an Appalachian forest.

Success of invasives *Ailanthus* in invading forest areas may be attributed to its ability to exploit pulses of increased resource levels (i.e. soil moisture and light) throughout the growing season. We determined the seasonal fluctuations in specific leaf area (SLA), relative water content (RWC) and leaf pigments (chlorophyll) of *Ailanthus* and its co-occurring native species (black walnut, American elm, white ash and black cherry) in an Appalachian forest in Glenville, WV. *Ailanthus* had the largest leaf area among the species which makes it efficient in capturing light. While leaf area decreased in black cherry and *Ailanthus* through the peak of the summer, SLA increased in all species from June to August. *Ailanthus* had lower RWC (70-72%) compared to other native species (except American elm). This may explain why *Ailanthus* prefers areas where it has access to water resources so it will be able to allow low RWC. Low RWC in *Ailanthus* may also demonstrate its ability to sustain excessive water loss as long as it does not reach the critical point of desiccation (RWC< 40%). Total chlorophyll (chl a+b) was higher in June than August in white ash, black cherry and *Ailanthus* and remained the same for black walnut and American elm. Chlorophyll a:b ratio was similar for all the species in June but white ash and *Ailanthus* had the highest and lowest ratio among the species in August, respectively. This study reveals that leaf structure and chlorophyll concentration provide meaningful assessment of how plants compete for resources in the same environment. The ability of the plants to efficiently capture light, CO_2, absorb and lose water is reflected in their leaf structure while the ability of plants to absorb light that provides energy for photosynthesis and photoprotection is exhibited in the amounts of their leaf pigments.

DARCEY N. POWELL, KATHERINE KARRAKER, MARION YOUNG, and JESSICA STOLTZFUS, Dept of Psychology, West Virginia University, Morgantown, WV 26506.

Adults' liking of infant names.

Little research has addressed why some names are preferred over others. The goal of this study was to examine both characteristics of names and characteristics of adults that influence individuals' liking of particular names. Male (N=148) and female (N=464) college students were recruited from introductory psychology classes. They completed a demographic questionnaire, the Big 5 Personality Inventory, and indicated their liking of infant names in a list containing currently popular, previously popular, and unusual names for both boys and girls. Participants' openness and agreeableness scores significantly correlated with their average liking of all names, $r(609)=.10$, $p<.05$, and $r(608)=.08$, $p<.05$, respectively. Also, participants with more contact with infants were more variable in their liking of infant names. A Sex of Participant x Sex of Baby Name x Type of Baby Name Analysis of Variance found no main effects of Sex of Participant or Sex of Baby Name, but all other effects and interactions were significant, $p < .05$. Follow-up paired *t*-tests, $p < .05$, revealed the following: Both male and female participants liked unusual names less than currently popular and previously popular names, regardless of the sex of the name. Male participants liked currently popular and previously popular names equally, whereas female participants liked currently popular names more than previously popular names, again regardless of the sex of the name. These results suggest that individuals with more positive personality characteristics tend to be more positive and optimistic about infants and their names. In addition, the current popularity of names influences women's liking of names more than strongly than men's liking.

DARCEY N. POWELL, KATHERINE KARRAKER, MARION YOUNG, and JESSICA STOLTZFUS, Dept of Psychology, West Virginia University, Morgantown, WV 26506.

Adults' perceptions of infants depicted through names and photographs.

Previous studies have found that adults perceive other adults, college students, and children differently based on their names. A separate line of research has determined that the physical appearance of infants, children, and adults elicits

differential perceptions from others. The goal of the present study was to determine how adults' perceptions of infants are influenced by infants' names and physical appearance, both separately and in combination. Male (N=148) and female (N=461) college students, recruited from introductory psychology classes, rated the personality and behavioral characteristics of three male and three female infants. Participants were randomly assigned to one of three groups. One group (N=127) rated infants based only on the infants' names, another group (N=94) rated infants based only on photographs, and the third group (N=388) rated infants based on photographs with names, using combinations of the names and photographs rated by the first two groups. Ratings were summed to create a "positive traits" rating. The mean of these ratings across participants was calculated for each name alone, each photograph alone, and each name-photograph combination. The average positive traits rating of the name-photograph combination was significantly predicted by the average rating of the photograph included in the combination, $r(58) = .51$, $p < .001$, but not by the average rating of the name included in the combination, $r(58) = .08$, $p > .05$. Results indicate that infants' physical appearance is more predictive of adults' general perceptions of infants than are infants' names. These results are consistent with other research supporting the salience of physical appearance in interpersonal perceptions.

CHRISTOPHER R. RACINE, MOLLY E. SEIDLER, DUSTIN L. MOORE and GERALD R. HANKINS, Dept of Biology, West Virginia State University, Institute, WV 25112.

In vitro screening of *Hibiscus sabdariffa* extracts for anti-tumor properties.

Hibiscus extracts are used in traditional African and Chinese medicine to treat a wide variety of ailments. Previous studies have demonstrated medical properties, including anti-tumor activity, of select *Hibiscus sabdariffa* extracts including Hibiscus anthocyanins and polyphenol rich extracts. However, information is very limited about variations among different Hibiscus accessions. The accessions of *Hibiscus sabdariffa* can be separated by the color of the calyces, into four different groups: green, pink, red, and dark red. This study was designed to examine differences in vitro in anti-tumor properties among the accessions. NIH3T3, U87, A172, CH157, Neuro2A, PANC1, SW480 and SW620 cells were maintained in DMEM with 10% FBS. The cells were exposed for 24h to various concentrations (0.0, 1.0, 1.5, 2.5, 3.0, 3.5 and 4.0 mg/ml) of Dark Red, Red, Pink, and Green extracts (supplied by James Simon, Rutgers University) and Cell Titer Glo assays were performed. The results show a dose dependant decrease in cell proliferation (and/or increased cell death) after treatment with the dark red extract at a final concentration of 1.0mg/ml for all cell lines except A172 (2.5 mg/ml). The red extract decreased proliferation for most cell lines around 3.0 mg/ml. Pink showed data much closer to the dark red extract, significantly reducing cell proliferation between 1.0-2.5 mg/ml depending on cell line. The green extract was least effective in reducing cell proliferation with no significant decrease until 3.0-3.5 mg/ml. Support by USDA/CREES, NSF EPSCoR and the WV NASA Space Science Consortium is appreciated.

JAMES RENTCH, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506.

Do trees fall downhill? Relationship between treefall direction, slope aspect, and wind in eight old-growth oak stands in the Central Hardwood Forest.

This study examined the relationship between direction of treefall, slope-aspect and prevailing wind in eight old-growth stands where single-tree canopy gaps characterize the dominant disturbance regime. All live and downed trees were inventoried in 0.45 ha sample plots. To determine crown asymmetry, crown sizes of live trees were measured along two perpendicular axes. Directions of fall and slope-aspect of downed trees also were recorded. Regional prevailing winds and wind gusts were obtained from two nearby airports. We used circular statistics to determine if directions of treefall for each study stand had a mean direction or if the directions of fall were uniformly distributed. If directions of treefall had a true mean, they were then compared to mean slope aspect and mean wind directions. Mean crown asymmetry (ratio of long and short diameters) was 1.26, and there were no significant differences in asymmetry values when current gap border trees and non border trees were compared. At two stands, treefall directions were uniformly distributed (i.e., no mean direction). However, only one of eight stands showed a statistically significant similarity between mean slope aspect and mean direction of fall. None of the eight study stands showed significant similarities when wind directions and treefall directions were compared. While trees may fall downhill and downwind, the high variation in treefall direction and wind direction precluded establishing a significant relationship between these data sets. We suggest that crown asymmetry, resulting from differential crown growth on sloped-hillsides as well as within canopy gaps, exerts a larger influence on direction of fall than either slope aspect or wind direction.

DANIEL RIZER, JACOB HACKETT, and JEREMY THOMPSON, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443.

Golf swing as a double pendulum.

The idea of the golf swing as a double pendulum is not a new discovery; however, our approach to this problem is unique. We began our project by first designing a machine that could emulate the ideal golf swing. After our design was complete, construction of our model commenced. The first machine that was completed was the small scale model, which we used to run tests to determine if any aspects of the design needed to be acclimatized. In order to do this, we ran multiple tests to verify the structural integrity of the device as well as to produce numerical data. Meanwhile, we derived numerous equations including Kinetic Energy, Potential Energy, and Lagrangian Differential Equations of Motion for our rotational system. Upon completion of these derivations, we were able to use MATLAB to produce quantitative results. Our project is yet to be concluded, however, we are making progress towards our ultimate goal, which is modeling the ideal golf swing using machines, MATLAB, and differential equations of motion. Special thanks to Dr. Chris Elmer and NASA for help

throughout the project.

ADAM W. ROLLINS and RONALD CALDWELL, Dept of Math and Natural Sciences, Lincoln Memorial University, Harrogate, TN 37752, JOHN C. LANDOLT, Dept of Biology, Shepherd University, Shepherdstown, WV 25443, and STEVEN L. STEPHENSON, Dept of Biological Sciences, University of Arkansas, Fayetteville, AR 72701.

Dictyostelid cellular slime molds of southern Belize.

Samples for the isolation of dictyostelid cellular slime molds (dictyostelids) were collected during two periods (March 2009 and September 2009) from lowland tropical forest and savanna study sites located in the Toledo District of southern Belize. Samples were obtained from both ground soils and the "canopy soils" that occur at the bases of epiphytic plants. These samples yielded at least 11 described species of dictyostelids and an additional 5-6 forms that we are unable to assign to a particular taxon. Collectively, *Polysphondylium pallidum* and other "white-spored" members of this genus accounted for more than 50% of all clones. *Dictyostelium purpureum*, generally common in tropical and subtropical regions, was the most commonly recovered species of *Dictyostelium*. Dictyostelids were recovered as frequently from canopy soils as from ground soils. Moreover, the lowland tropical forest study site was characterized by greater species richness and diversity than the lowland tropical savanna study site. Interestingly, the plasmodia of myxomycetes were quite abundant, appearing in approximately 67% of the 95 samples collected for isolation of dictyostelids. This work was supported by a grant from the Lincoln Memorial University Mini-Grants Program.

RAINA ROMERO, SCOTT FRAZIER, JR., and JUSTIN EBERSOLE, Dept of Mathematics, Shepherd University, Shepherdstown, WV 25443.

Understanding bicycle stability.

For most people, learning to ride a bicycle is one of the great milestones of childhood, but how exactly does the bicycle stay up? This question has yet to be conclusively answered in the scientific community. We have attempted to solve this problem by examining known forces that act upon a bicycle in motion. We have conducted experiments on our bicycle and created computer programs in Matlab to predict expected results. Through the use of these tools, we are continuing to discover to what extent these forces are responsible for the stability of the bicycle. Thank you to Dr. Christopher Elmer and NASA for your support.

KAYLA D. SAUNDERS, ZACHARY R. HARTMAN, and JARRETT S. AGUILAR Dept of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074.

Molecular dynamics and site-directed mutagenesis of a Glu300 mutation in Cytochrome P450 2C9.

Within the liver, the enzyme Cytochrome P450 2C9 (CYP2C9) has been shown to hold multiple substrates in its active site simultaneously. This creates the potential for atypical kinetics and various drug interactions. Previous studies have involved various effector molecules (dapsone and dapsone analogs) docked in the active site with flurbiprofen, an NSAID. These studies correlate the distance between the H4' of flurbiprofen and the heme with the effectors' influences on the rate of metabolism of flurbiprofen. Due to the prevalence of hydrogen bonding between specific amino acids and the effector molecule, the current study involves mutating Glu300 to valine. The mutation eliminates the residue's ability to bond to the effector. The mutated enzyme demonstrated smaller distances between the site of metabolism of the substrate and the heme iron than in previous studies. Site-directed mutagenesis was performed to create the mutant to be used in obtaining kinetics data in the future.

JUSTIN SHELINE and DAN K. EVANS, Dept of Biological Sciences, Marshall University, Huntington, WV 25755.

Riparian stability, vegetation, vegetative zone width, and aquatic macrophytes, Winfield and Marmet pools, Kanawha River, West Virginia.

This study examines riparian habitat features along the Kanawha River with particular emphasis on the Winfield and Marmet pools. The study focuses on the effects that recent habitat improvements, including the installation of rock dikes at the land-water interface, have on riparian conditions and aquatic resources. Variables of canopy cover (percent shade), bank stability, bank vegetation protection, riparian zone width, and the distribution of aquatic macrophytes were evaluated numerically at 60 sites within the two pools. Data analysis suggests that canopy cover exhibited the greatest diversity in site conditions while aquatic macrophytes were more common at sites with rock dikes. Other variables were comparable at all sites in the two pools.

ANDREW W. SMITH and SARAH M. UMPHRESS, Dept of Biology, West Virginia University Institute of Technology, Montgomery, West Virginia 25136.

Lethal and sub-lethal effects of selenium (selenite, selenate), an environmental toxicant, on a freshwater oligochaete, *Lumbriculus variegates*.

Human activities such as coal mining and coal burning factories have been contaminating the environment with toxic heavy metals, such as selenium, which is readily leached into rivers by runoff. It has been reported that selenium concentrations in West Virginia Rivers downstream of mountaintop mining operations were in excess of current EPA standards. Selenium in reality is a double-edged sword for human physiology as it is an essential trace element but extremely toxic if taken in excess. In this study, we examined lethal and sub-lethal effects of selenium in a freshwater

oligochaete, *Lumbriculus variegatus*. These worms live in shallow water along edges of streams and ponds across the United States including West Virginia. Healthy adult *Lumbriculus variegatus,* in the size range of approximately 3-5cm, where chosen for use. Worms smaller or larger than 3-5cm were excluded from this study as were any worms that were in the process of asexual regeneration. Stock solutions of selenium compounds, selenite and selenate were individually dissolved in ddH_2O and diluted to specific testing concentrations prior to each experimental procedure. The median lethal concentration (LC50) after selenium exposure was determined for both selenite and selenate. Sub-lethal endpoints for both of these compounds focused on pulse rate, swimming behavior and asexual regeneration. Concentrations of selenium tested demonstrated an increase in basal pulse rate. Further, data demonstrated that at higher concentrations of selenium the swimming behavior was altered such that the individual *Lumbriculus variegatus* worms twisted and coiled with unsteady jerking motions leading to their death.

CLIFFORD E. STARLIPER and BARNABY J. WATTEN, USGS Leetown Science Center, 11649 Leetown Road, Kearneysville, WV 25430.

Control of aquatic invasive microorganisms: method development for ship ballast applications and laboratory studies on fish pathogenic and environmental bacteria.

Ship ballast (water) is a well-recognized conveyer of nonindigenous aquatic-borne species to the United States. The International Maritime Organization developed international legislation (D2 Standards) that specifies maximum numbers of indicator microorganisms that may be released via ballast water. Ships constructed during and after 2009 must decontaminate ballast on board and conform with new D2 Standards. We are developing hydroxide stabilization (i.e. hydrated lime, sodium hydroxide) as a ballast decontaminant to meet the D2 Standards. We developed controlled studies to determine endpoint treatment parameters (of pH 10-12 and duration up to 72h) to achieve our target 100 % (bactericidal) killing. Pure bacterial cultures were grown in broth on a rotary shaker at their optimum incubation temperatures. Viable cell counting determined efficacy. About 86 bacteria have been tested, including Gram-negatives, Gram-positives, coliforms, D2 Standards indicators, fish pathogens, and bacteria recovered from a ballast tank on a cargo ship used on the Great Lakes. Control cultures grew excellent, most to 1×10^9 cfu/mL or greater. Endpoints of pH and duration varied; however, we demonstrated 100 % killing to all bacteria within pH 12.0 at 72h. Many were killed within 4h at pH 10.0. Results for the D2 Standards bacteria were: *V. cholera* was killed within 4h at pH 10.0; *E. coli* within 12h at pH 10.0; and *Enterococcus faecalis* (a Gram-positive) within 72h at pH 12.0. In addition to excellent bactericidal efficacy, increased pH offers other advantages, namely, anti-rust properties, and favorable delivery and mixing processes, economics, and pH neutralization applications.

JESSICA STOLTZFUS and KATHERINE KARRAKER, Dept of Psychology, West Virginia University, Morgantown, WV 26506.

Father-infant play is influenced by infant temperament and sex.

In general, father-infant play is qualitatively different from mother-infant play. For example, father-infant play is often more physical and less predictable than mother-infant play. Fathers may find high levels of certain temperament traits, such as activity level, adaptability, and intensity, particularly amenable to their active play style. Participants were 373 fathers participating in the NICHD Study of Early Child Care. Temperament was assessed at 6 months of age using a maternal report measure. Father-infant play was assessed at 6, 15, and 24 months of age using a paternal report measure. Separate multiple regressions were conducted to predict fathers' play with their infants at each age from ratings of infant temperament. The regression was significant at 15 months, $F(5, 372)=2.32$, $p=.04$, $R^2=.03$, but not at 6 or 24 months. At 15 months, fathers reported playing and talking with their infants more if the infants were *less* intense ($\beta=-.12$), *more* approaching ($\beta=-.17$), and *less* adaptable ($\beta=.18$). Repeating analyses separately for fathers of boys and girls indicated that infant temperament and father play were related only for fathers of boys, $F(5, 192)=2.76$, $p=.02$, $R^2=.07$. Results suggest that, contrary to expectations that fathers would prefer to play with more intense and adaptable children, fathers interact more with *less* intense and adaptable infants. Moreover, these results were specific to boys. Observations of fathers' behaviors when interacting with their non-adaptable and mild boys and girls would allow for a better understanding of the mechanisms behind these findings.

SHANNON STRALEY, KAITLIN MARPLE, MEGAN SMITH, ALYSSA PENA, HAITAO LUO, and YI CHARLIE CHEN, Natural Science Division, Alderson-Broaddus College, Philippi, WV.

Time course of antibody-antigen reactions.

Despite the wide use of antibodies (Ab) in various assays for specific detection and quantification of antigens (Ag), little is known for the time needed for Ab-Ag reaction to reach equilibrium. The objective of this study is to time Ab-Ag reaction and provide a practical understanding of incubation time in future Ab-based assays. GAPDH mouse Ab served as an Ag in this system to be specifically recognized and bound by Goat-Anti-Mouse-Poly-HRP, and the bound Ab levels were analyzed by detecting its HRP activities with QuantaRed Enhanced Chemifluorescent HRP Substrate and a microplate reader.

Goat-Anti-Mouse-Poly-HRP can coat 90% of available sites by 4-6 hours incubation as compared to 24-hour coating, and prolonged coating time does not bring further coating effect. Blocking time (from 5-minute to 48-hour) does not affect the blocking effects of 1% BSA and 5% milk. For Goat-Anti-Mouse-Poly-HRP to recognize GAPDH mouse Ab, 6 hour incubation is needed to reach 93% of its binding of 24-hour incubation. Our results also suggest that Ab-Ag reaction at room temperature is slightly higher than that at 4 oC, but significantly better than that at 37 oC between 0.5-4 hour

incubation.
Overall, our data suggests that while blocking with BSA and milk is immediate, Ab-Ag binding is slow and the sensitivity of Ab-based assays may be improved by a longer incubation up to 6 hours at room temperature. This research was supported by grant P20 RR16477 from the National Center for Research Resources awarded to the West Virginia IDeA Network for Biomedical Research Excellence.

BRIANA D. VECCHIO, ANTHONY GIOVENGO, and LETHA J. SOOTER, Dept of Biology, West Virginia University, Morgantown, WV 26506.

Evolution of single-stranded DNA molecular recognition elements via CE-SELEX: detection of TNT and biosensor applications.

Molecular Recognition Elements or MREs are small biological polymers capable of binding a target with high affinity and specificity. We have sought to evolve single-stranded DNA MREs which bind the explosive, TNT. For our selection, we employed CE-SELEX or the Systematic Evolution of Ligands via Exponential Enrichment by Capillary Electrophoresis. While traditional SELEX requires immobilization of the target molecule, CE-SELEX allows for selection to be carried out in free solution. This decreases non-specific binding to the immobilization surface and thus increases overall affinity of the MRE for the target. In addition, CE-SELEX is much more efficient than conventional in vitro evolution methods as it produces high affinity MREs with fewer rounds of selection. CE-SELEX optimization for a single-stranded DNA library targeting TNT is currently underway. Once MREs have been evolved for this target, they will potentially be incorporated into biosensors for detection of improvised explosive devices. This work is funded as part of a cooperative agreement with the United States Army Research Laboratory.

SRINATH VELAGA, NAGASREE GARAPATI, and BRIAN J. ANDERSON, National Energy Technology Laboratory, Dept of Chemical Engineering, West Virginia University, Morgantown, WV 26506.

Calculation of N_2 hydrate reference parameters and cell potential parameters to analyze the N_2-CO_2 and N_2-CH_4 three phase equilibrium and structural transitions.

Gas hydrates reserves are receiving increasing attention as the potential source of CO_2 sequestration, but when pure CO_2 is used only 64% of the methane is recovered because of the less occupancy of CO_2 in the small cages. It has been proposed that the addition of the nitrogen in the swapping process of CH_4-CO_2 hydrates can increase the methane recovery. There is also been an increasing interest in the separation of green house gas from flue gas. Nitrogen hydrates form structure II hydrates. The nitrogen hydrate reference parameters and cell potential parameters are very important to understand the N_2-CO_2 and N_2-CH_4 mixed hydrate thermodynamics. Ab initio quantum mechanical calculations were used to obtain accurate intermolecular potentials. A potential energy surface (PES) between H_2O and N_2 was computed at the MP2/aug-cc-pVTZ level and corrected for basis set superposition error (BSSE), an error caused due to the lower basis set, by using the half counterpoise method. Intermolecular potentials were obtained by fitting Exponential-6 model to the ab initio PES. Reference parameters for structure II N_2 hydrate have been calculate with this site-site ab initio intermolecular potentials as = 1104 J/mol and = 1305 J/mol. The pure N_2 hydrate equilibrium pressure was predicted with an average absolute deviation of less than 2% from the experimental data. The small cage occupancy is more than 90% and large cage is fully occupied. Using these reference parameters and cell potential parameters, N_2-CO_2 and N_2-CH_4 three phase equilibrium and structural transitions are predicted accurately.

RYAN WILLIAMS and LETHA J. SOOTER, Dept of Biology, West Virginia University, Morgantown, WV 26506.

Prostate cancer detection by molecular recognition elements.

Prostate cancer is the most-diagnosed carcinoma among men in developed nations and is responsible for the second most cancer-related deaths. Current detection methods for the disease lack ideal specificity and sensitivity. A mechanism to selectively target prostate cancer for detection and improve upon current methods is necessary. This project aims to identify Molecular Recognition Elements (MREs) that specifically and preferentially bind to prostate cancer cells. Quantum dots will be attached to these MREs to signal binding to the target. It is expected that this complex will specifically bind to and signal the presence of these cells. In order to identify MREs specific for prostate cancer cells, a yeast-displayed scFv antibody pool will be used. This pool will be incubated with the prostate cancer cell line LNCaP. Molecules that bind the cells will be incubated with the benign prostate cell line BPH-1, discarding MREs that bind to it. The remaining molecules will be amplified and incubated with the cells again; this process continuing for ten rounds. The MREs will then be attached to quantum dots and excited with infrared waves. Fluorescent signaling dependent upon binding will indicate suitability as a non-invasive detection mechanism. This project aims to improve upon current prostate cancer detection mechanisms. They allow unabated tumor proliferation in some patients and unwarranted stress in many benign patients. Therefore, this research may reduce patient mortality while relieving fears due to false positive test results.

AMY WITHROW and SARAH M. UMPHRESS, Dept of Biology, West Virginia Institute of Technology, Montgomery, WV 25136.

Prolonged exposure to sound wave frequencies, harmful to the California blackworm or not?

People and animals come into contact with different sound frequencies everyday. For example, industrial mining machinery emits harmonic sounds including both low and high frequencies. We hypothesized that long term exposure to sound waves will modify *Lumbriculus variegatus*, California blackworm behavior. California blackworms are found

throughout the United States and world in shallow, muddy water along the edges of ponds and streams. In order to produce specific sound frequencies a function generator was used to create precise sine wave frequencies through an audio amplifier with speakers. California blackworms were exposed to these sounds for up to twenty-four hours. California blackworms, tested at the low frequency of 122Hz and the high frequency of 12 kHz, gravitated to the center of the containers and formed a ball shape. California blackworms were then given a cool down period to see if any would return to their stereotypical behavior. Stereotypical behavior for the California blackworms when in normal conditions is to break away from the ball formation in a corkscrew pattern of movement to explore their environment. California blackworms tested at a lower sound frequency of 122Hz showed an increased death rate and survivors demonstrate little to no movement during their cool down period. Low sound frequencies transmit sine waves that can travel extremely long distances. Data from this experiment highlights the possibility that these frequencies have a harmful effect on the California blackworm and therefore, what types of effects may these sound frequencies have on our environment?

JOHN D. WYATT, ZACHARY R. HARTMAN, and JARRETT S. AGUILAR Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074.

Molecular dynamics and site-directed mutagenesis of mutated cytochrome P450 2C9 T304A.

Cytochrome P450 2C9 (CYP2C9), a common liver enzyme, plays a major role in metabolizing xenobiotics and endogenous compounds. Previous studies have shown flurbiprofen and dapsone may be able to bind simultaneously in CYP2C9's active site, which results in atypical kinetics. Amino acid Thr304 has been shown to hydrogen bond with dapsone. Using molecular modeling techniques, Thr304 was mutated to alanine in order to remove the hydrogen bonding. Computer models show the mutated enzyme results in a reduction in the distance between flurbiprofen's 4' hydrogen and the heme iron by 1.9Å. Site-directed mutagenesis was performed to physically create a mutated enzyme. This mutated enzyme can be used to compare molecular dynamics and enzyme kinetics.

MARION E. YOUNG, Dept of Psychology, West Virginia University, Morgantown, WV 26506, SUSAN LYNCH, MARK POLAK, and SUSAN RITCHIE, Dept of Pediatrics, West Virginia University, Morgantown, WV 26506, and KATHERINE KARRAKER and HAWLEY MONTGOMERY-DOWNS, Dept of Psychology, West Virginia University, Morgantown, WV 26506.

Maternal perceptions of their premature infant's sleep.

Thirteen percent of infants born in the United States each year are delivered prematurely. Premature infants have more irregular sleep/wake patterns than those full-term infants. Mothers of premature infants view their child as more vulnerable than do mothers of full-term infants. The current study investigated mothers' sleep-related cognitions and perceptions of premature infants. Maternal cognitions and perceptions of infant sleep were assessed using the Maternal Cognitions about Infant Sleep Questionnaire (MCISQ) and the Vulnerable Child Scale (VCS). Lower VCS scores reflect greater belief of infant vulnerability. Higher MCISQ scores represent more negative concerns and doubts about infant sleep. Infant medical history data were collected. The sample consisted of 19 infants born at 29.3 (SD+8.5) weeks with birth weight of 3.1 (SD+2.1) pounds. The infants spent 35.9 (SD+ 40.7) days on oxygen and 16.5 (SD+15.1) days on mechanical ventilation. VCS scores were negatively correlated with the MCISQ ($r=-.47$, $p<0.05$). VCS scores were significantly different between infants who had never had reflux compared to those who had a history of or concurrent reflux ($t(17) = -16.3$, $p<0.01$). Mothers who viewed their infant as vulnerable were more likely to doubt their parental competency relating to their infant's sleep. Mothers viewed premature infants who had concurrent reflux as more vulnerable. Premature infants presenting with reflux tend to have less gastro-motility, making them fussier during the day and more restless during sleep. Reflux may contribute to both poor infant sleep and maternal perception that the infant is vulnerable.

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CONTACT INFORMATION
West Virginia University
College of Engineering and Mineral Resources
304.293.0396
www.cemr.wvu.edu

WVU Institute of Technology
Leonard C. Nelson College of Engineering and Sciences
304.442.3161
www.wvutech.edu