

2015

# WEST VIRGINIA ACADEMY OF SCIENCE 90th Annual Meeting

April 11, 2015

West Liberty University, West Liberty, WV

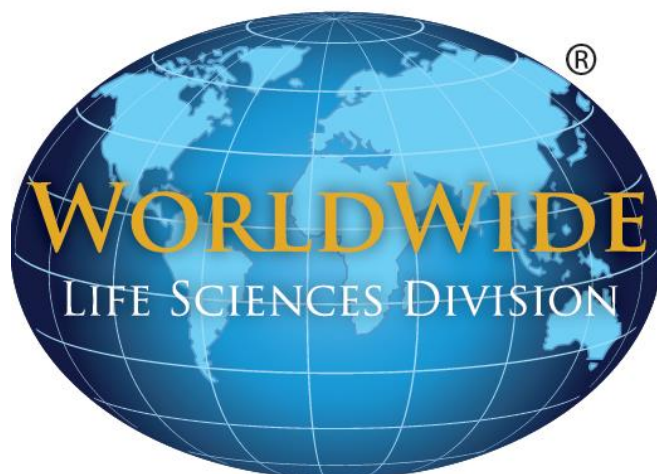


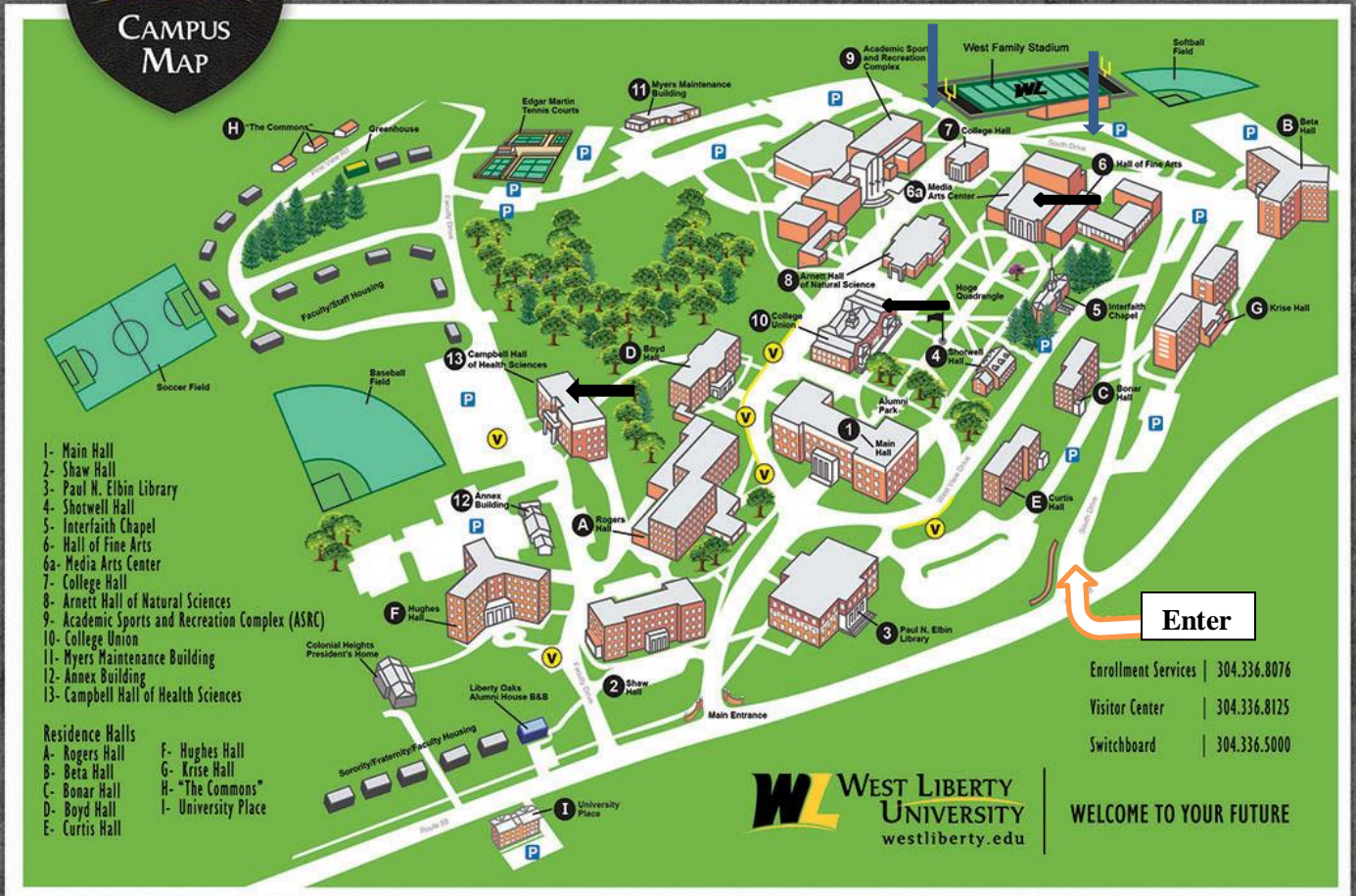
**West Virginia Academy of Science**

**90th Annual Meeting**

**April 11, 2015**

**EVERNT SPONSORS:**





**Student Union Grill Area** - enter the Union at the level of the gray porch, the Grill is on the south end of the second floor.

**Student Union Alumni Room** - is adjacent to the Grill area.

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## **Welcome to the WVAS Annual Meeting!**

On behalf of West Liberty University and the Department of Natural Sciences and Mathematics, we welcome you to the 2015 West Virginia Academy of Sciences Annual Meeting. We are excited to provide the venue for this meeting and hope you have an engaging and rewarding experience as you immerse yourself in scientific discoveries and discussions.

We are grateful to the host committee for planning this event, as well as the West Liberty University Maintenance Department, West Liberty University Information Technology Service Department and the sponsors: Perkin Elmer, Fisher Scientific, and WorldWide Life Sciences. We are also grateful to the students of West Liberty University's Chemistry Club, Biology Club, and Chi Beta Phi chapter for volunteering.

We truly hope you have a wonderful and productive meeting.

- Dr. Douglas L. Swartz II and Dr. Karen Kettler  
Co-Chairs of the Department of Natural Science and Mathematics

### **2015 WVAS Local Organizing Committee:**

Committee Chair: Dr. Roger Seeber (Biology Program)

#### Departmental Representatives

The Biology program:	Dr. Joseph Horzempa Dr. Zac Loughman Dr. Natalia Omelchenko Dr. Deanna Schmitt
The Chemistry program:	Dr. Douglas Swartz
The Mathematics program:	Dr. Fuhua Chen
The Physical Science program:	Dr. Norman Clampitt
Student representative:	Mr. Jesse Hall

Special thanks to Joe Nolan (Biology Program) for his technical assistance.

## Schedule Overview

### Saturday April 11

8:00 am – 11:00 am	Poster Setup for <b>only</b> Session 1- The grill area of the Student Union Hall
8:00 am – 12:00 pm	Registration/Check-In – Entryway of the Hall of Fine Arts <b>(All presentations will be loaded onto our computers at this time)</b>
9:00 am – 9:15 am	Opening Ceremony – The theater in the Hall of Fine Arts <b><u>Welcoming Remarks:</u></b> Dr. Jason Best, President, West Virginia Academy of Science Dr. Brian Crawford, Provost, West Liberty University <b><u>Plenary Session:</u></b> Dr. Susan Leopold, Executive Director of United Plant Savers <b>“Science and Activism and the Situation with Wild American Ginseng.”</b> Dr. Antonio DiGiandomenico, R&D Medimmune, Division of Infectious Disease <b>“When Antibiotics Don’t Work: Development of Novel Monoclonal Antibodies for Serious Bacterial Infections.”</b>
9:15 am – 9:45 am	
9:45 am – 10:15 am	
10:15 am – 10:30 am	Morning Break
10:30 am – 11:00 am	Dr. Matt Lamanna is Assistant Curator of Vertebrate Paleontology at Carnegie Museum of Natural History in Pittsburgh, PA. <b>“Awakening the Titans: Discovering Giant New Dinosaurs in the Southern Continents”</b>
11:00 am – 11:15 am	Judges and Moderators Meeting- The Alumni Room of the Student Union
11:15 am – 2:15 pm	Vendors - The grill area of the Student Union
11:15 am – 12:15 pm	<b>Poster Session 1</b> -The grill area of the Student Union (Posters are to be removed at 12:15)
12:15 pm – 1:15 pm	Lunch – The Ballroom of the Student Union. ( <b><u>Posters for session 2 are to be put up during this hour</u></b> ) <b>Poster Session 2</b> -The grill area of the Student Union
1:15 pm – 2:15 pm	WVAS Annual Business Meeting- Alumni Room of the Student Union
1:15 pm – 1:45 pm	
2:30 pm – 3:45 pm	<b>Oral Presentations Session 1</b> - Campbell Hall
3:45 pm – 4:00 pm	Afternoon Refreshments –South entrance to Campbell Hall
4:00 pm – 5:15 pm	<b>Oral Presentations Session 2</b> - Campbell Hall
5:30 pm -	Closing Ceremony, Awards & Presentation of the Dr. John Warner Outstanding Teacher Award (Dr. Jason Best) – <b><u>College Hall</u></b> , theater

## **Plenary Session:**

**Title: “Science and Activism and the Situation with Wild American Ginseng”**

### **Dr. Susan Leopold, Executive Director of United Plant Savers.**

Susan Leopold, is an ethnobotanist and passionate defender of biodiversity. She did her doctorate on the decline in ethnobotanical knowledge in the Bull Run Mountains of Virginia. She is currently the director of United Plant Savers, [www.unitedplantsavers.org](http://www.unitedplantsavers.org), dedicated to medicinal plant conservation of the United States and Canada. United Plant Saver's has a botanical sanctuary in southern Ohio, [www.goldensealsanctuary.org](http://www.goldensealsanctuary.org). She also serves on the board of Botanical Dimensions and the Center for Sustainable Economy and is an advisory board member to American Botanical Council.

**Title: “When Antibiotics Don’t Work: Development of Novel Monoclonal Antibodies for Serious Bacterial Infections”**

### **Dr. Antonio DiGiandomenico, R&D Medimmune LLC Division of Infectious Disease.**

Antonio (Tony) DiGiandomenico is the scientific leader of the *Pseudomonas* research program at MedImmune, which is a member of the AstraZeneca group. Dr. DiGiandomenico has authored over 15 primary literature articles, many of which are found in top-tier journals including PNAS, the Journal of Experimental Medicine, Molecular Microbiology, Science Signaling, and Science Translational Medicine. Moreover, Tony is an inventor on five patents and has been invited to present his work to expert audiences across the globe. Dr. DiGiandomenico is truly a leader in the field of *P. aeruginosa* immunotherapies and vaccine design.

Tony began his graduate studies investigating pilin glycosylation of *Pseudomonas aeruginosa* under the mentorship of Dr. Peter Castric. At Duquesne, Tony was named the “Most Outstanding Graduate Student” and received additional accolades for research accomplishments. Tony continued his investigations on *P. aeruginosa* at the University of Virginia in the laboratory of Joanna Goldberg. Here, Tony developed several lines of investigation that focused on *P. aeruginosa* including the application and characterization of a novel vaccine and lipopolysaccharide biology of this fascinating bacterium. At the University of Virginia, Tony’s success continued as he was bestowed the Robert R. Wagner Outstanding Graduate Student Research Award. This and other honors propelled Tony to a prominent postdoctoral position at Vanderbilt University in the laboratory of Jacek Hawiger. Here, Dr. DiGiandomenico received a National Research Service Award from the National Institutes of Health and was appointed to Research Assistant Professor. In 2011, Tony accepted a position with MedImmune and currently thrives as a trailblazer in *P. aeruginosa* immunotherapy.



**Title: "Awakening the Titans: Discovering Giant New Dinosaurs in the Southern Continents"**

**Dr. Matt Lamanna Assistant Curator of Vertebrate Paleontology, Carnegie Museum of Natural History in**

Dr. Lamanna is an Assistant Curator of Vertebrate Paleontology and the principal dinosaur researcher at Carnegie Museum of Natural History in Pittsburgh, Pennsylvania, and an Adjunct Assistant Professor in the Department of Geology and Planetary Science at the University of Pittsburgh.

Originally from the Finger Lakes region of upstate New York, Matt received his B.Sc. from Hobart College in 1997 and his Ph.D. from the University of Pennsylvania in 2004. His research interests involve exploring the effects of large-scale geographic and environmental changes on dinosaur evolution, distribution, and diversity, especially in the Southern Hemisphere continents. Within the past fifteen years, he has directed or co-directed field expeditions to Antarctica, Argentina, Australia, China, and Egypt that have resulted in the discovery of multiple new species of dinosaurs and other Cretaceous-aged organisms. Foremost among these finds is one of the largest land animals ever discovered, a 95-million-year-old titanosaurian sauropod (long-necked plant-eating dinosaur) from Egypt that Matt and colleagues named *Paralititan stromeri* in 2001. The discovery of *Paralititan* received extensive national and international media coverage and was documented in *The Lost Dinosaurs of Egypt*, a film that aired on the A&E network in 2002. Matt also consulted on and narrated The Science Channel's documentary *Rise of the Feathered Dragons*, which chronicled his team's discovery of exquisite new specimens of the Cretaceous bird *Gansus yumenensis* in northwestern China.

Matt served as the principal scientific advisor to Carnegie Museum of Natural History's \$36M *Dinosaurs in Their Time* exhibition renovation project. More recently, in 2014, he led a team that named *Anzu wyliei*, the most complete oviraptorosaurian theropod dinosaur yet found outside of Asia, and co-authored a paper that named another giant titanosaur, *Dreadnoughtus schrani*.

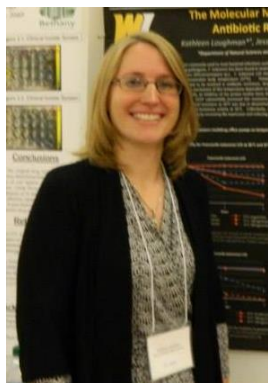


## The John Warner Outstanding Teacher Award



**Dr. John R. Warner, Jr. (1936-2009)**

John was a professor at West Virginia Wesleyan College in the Department of Sociology and had many interests including being a contributing columnist for the Charleston Gazette, Eagle Scout, swimming instructor, painting, photography, traveling, gardening and of course his family. He was a member of the WV Academy of Science for many years, with his service to the Academy starting in 1975 when he took over the role as treasurer. His final Executive office was as our editor from 2004-2009 when single handedly he plowed through a back log of our Proceedings to bring us back on track. This effort and his long commitment to the West Virginia Academy of Science is honored in this award.



**Kathleen Vopal Loughman**

Mrs. Kathleen Loughman is a secondary education biology teacher at John Marshal High School in Glen Dale, WV where she has taught since the fall of 2007. Prior to her current position, taught science at both St. Vincent de Paul School (2005-2006) and Wheeling Middle School (2006-2007) in Wheeling, WV. Kathleen received a B.S. degree from West Liberty State College in Biology, where she graduated Suma Cum Laude in 2002. Kathleen pursued graduate studies in environmental microbiology at Marshall University under the direction of Dr. Charles Summerville. The focus of her master's research was determining the impact impoundments in the Big Sandy watershed of Kentucky, Virginia, and West Virginia were having on the prevalence of antibiotic resistant fecal coliform bacteria. After receiving her M.S. in Biology, Mrs. Loughman determined her professional calling was education. She completed Wheeling Jesuit University's fast track certification program in the fall of 2005. In 2009, Mrs. Loughman had earned an additional 45 hours of graduate course work in science towards her certification

(MA +45). While at John Marshall High School, Kathleen has taught Physical Science, Biology, Biology II, Microbiology, and Anatomy. From 2011 through 2014, Kathleen was one of two HSTA instructors at John Marshall High School. She personally mentored 20+ students in health science related independent projects. During her 2013 and 2014 summers, Kathleen participated in the WV-INBRE Summer Research program for High School Science Educators where she worked in Dr. Joseph Horzempa's laboratory at West Liberty University studying how microbes become resistant to antibiotics, ultimately presenting this work at two conferences. Results of this research are currently being prepared for publication. Because of these accomplishments, and the impact she has had on the hundreds of students she has instructed at John Marshall, Mrs. Kathleen Loughman is the West Virginia Academy Science's Outstanding Teacher of the year for 2015.

## **LIST OF POSTERS SESSION- I**

11:15-12:15 GRILL AREA OF THE UNION

**BOLD** INDICATES PRESENTOR

# INDICATES AN UNDERGRADUATE

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1- **GRANT BASAGIC<sup>#</sup>** and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV. 26201. **Alcohol induced single strand breaks recruit elevated XRCC1 proteins associated with DNA damage repair in neuronal stem cells.**

2- **MEGAN BRADFELD<sup>#</sup>** and ROBERT WARBURTON, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443 **Antibody epitope mapping of murine H-2K<sup>b</sup> MHC molecules as a means to study the effects of mutation on B-cell recognition.**

3- **LAUREL BRAGG<sup>#</sup>** and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Detection of isoform changes in exons 5 and 11 of the Spastin gene associated with Hereditary Spastic Paraplegia.**

4- **MICHAEL FAGIOLA<sup>#</sup>**, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443, TAICHENG ZHOU, YIZENG YANG, and JONATHAN P. KATZ, NIH Center for Molecular Studies in Digestive and Liver Diseases & the Division of Gastroenterology; Department of Medicine, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, 19104. **Regulation of mesothelin and kallikrein-related peptidase 5 in human esophageal keratinocytes by the zinc-finger transcription factor Krüppel-like factor 4.**

- 5- **JAMES GAINER<sup>#</sup>** and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alcohol induced alterations in protein-protein interactions of transcription factors associated with proliferation changes in FASD and Alcoholism.**
- 6- **ASHLEY HUREY<sup>#</sup>** and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alcohol increases double stranded DNA breaks and reduces nucleosome formation in a dose dependent manor in rat cortical stem cells.**
- 7- **KELLY MACHUCA<sup>#</sup>** and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alcohol induced changes to replication fork helicase complex (MCM) may induce DNA damage in rat neuronal stem cells.**
- 8- **PATRICK MILKOWSKI<sup>#</sup>** and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Effects of alcohol exposure on the binding of transcriptional factor E2F1 to DNA consensus sequence.**
- 9- **KATHERINE VECCHIO<sup>#</sup>**, MEGANN BOONE, and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alcohol induced alterations in DNA and RNA synthesis in rat cortical stem cells relate a possible mechanism for slowed stem cell growth and increased apoptosis.**
- 10- **MICHAEL BATES<sup>#</sup>**, JOSH BENFIELD, JON SERRA, and THEUNIS VAN AARDT, Department of Natural Science and Mathematics, West Liberty University, West Liberty, WV, 26074. **Synthesis of *trans*-Pterocarpans.**
- 11- **NANCY ISNER<sup>#</sup>** and JON SERRA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074 **Calculation of the heat of combustion of different grades of gasoline.**
- 12- **TIA LEMASTER<sup>#</sup>** and KEVIN L. EVANS, Department of Science and Mathematics, Glenville State College, Glenville, WV, 26351. **Effect of UV radiation on anti-Markovnikov hydrobromination of alkenes.**
- 13- **BALEY LOY<sup>#</sup>**, Department of Biological Sciences, Shepherd University, Shepherdstown, WV, 25443, and JORDAN MADER, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443. **Preparation of p-mercaptostyrene/divinylbenzene copolymer foam and its removal of arsenic from groundwater.**

- 14- JAMES HORNER, MCKENSIE MASON<sup>#</sup>, JON SERRA and THEUNIS VAN AARDT, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Synthesis of *trans*-Pterocarpans from 2-hydroxy benzaldehyde.**
- 15- CAYSON PARKER<sup>#</sup>, Department of Chemistry, Fairmont State University, Fairmont, WV, 26554; MARTIN CHRIST, West Virginia Department of Environmental Protection, and MATTHEW SCANLON, Department of Chemistry, Fairmont State University, Fairmont, WV, 26554. **Diffusion of CO<sub>2</sub>, a novel method to analyze CO<sub>2</sub> in acid mine drainage.**
- 16- JENNI PERKINS<sup>#</sup>, JULIA OLIVETO, SEAN HARWELL, and ERICA HARVEY, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. Solar Army, West Virginia Brigade: **Beta-testing the Solar Hydrogen Activity Research Kit (SHaRk) and new techniques for metal oxide distribution.**
- 17- ANDREW PHILPOTT<sup>#</sup>, ASHLEY HOFFMASTER, DANIELLE GRODI, and ERICA HARVEY, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Molecular dynamics simulations of detergent micelles.**
- 18- REBECCA BARNES<sup>#</sup>, DEANNA M. SCHMITT, TRICIA L. GILSON, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **The role of the erythrocyte cytoskeleton protein spectrin during invasion by *Francisella tularensis*.**
- 19- HEATHER BROWN<sup>#</sup>, RUTH CONLEY, and ELIZABETH ROBINSON, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Vocalizations with syllables and motifs in *Aleuropoda insignis*, the Madagascan flat-horned hissing cockroach.**
- 20- JENNIFER BROWN<sup>#</sup>, RUTH CONLEY, and SHER HENDRICKSON, Department of Biology, Shepherd University, Shepherdstown, WV, 25401. **Evolution of cockroach communication by hissing.**
- 21- SAMUEL CANFIELD<sup>#</sup>, Department of Science, Glenville State College, Glenville, WV, 26351, JENNIFER RUDGERS, Department of Biology, University of New Mexico, Albuquerque, NM, 87131, JOSHUA LYNN, Department of Biology, University of New Mexico, Albuquerque, NM, 87131, and ROSS CONOVER, Department of Science, Glenville State College, Glenville, WV, 26351. **Northern pocket gopher activity across elevation gradients.**
- 22- EVAN COLLINS<sup>#</sup>, Department of Biology, Wheeling Jesuit University, Wheeling, WV, 26003. **Standardization of *E. coli* coliform counting for the determination of stream health from combined sewer outflows along Wheeling Creek.**

- 23- **AMANDA CORBEL<sup>#</sup>**, Department of Biology, Shepherd University, Shepherdstown, WV, 25443, SEAN O'BRIEN, ELENA CHERTOVA, MAC TRUBEY, JULIAN BESS, JR., and BRANDON KEELE, AIDS and Cancer Virus Program, Leidos Biomedical Research, Inc., Frederick National Laboratory for Cancer Research, Frederick, MD, 21702. **Imaging Human/Simian Immunodeficiency Virus infectivity using fluorescently functional fusion partners.**
- 24- **MACKENZIE L. DAVIS<sup>#</sup>** and JOSPEH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Resorufin acetate has potential for use as a novel antibiotic against tularemia.**
- 25- **ALEKSANDR FLORJANCZYK<sup>#</sup>** and JOSPEH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **A *Penicillium* sp. isolate inhibits the growth of the American chestnut blight fungus, *Cryphonectria parasitica*.**
- 26- **ASHLEY GEORGE<sup>#</sup>** and CAROL Z. PLAUTZ, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Cloning of key steroidogenic pathway elements in the mollusk *Lymnaea palustris*.**
- 27- **TRICIA L. GILSON**, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **The role of IglC in erythrocyte invasion by *Francisella tularensis*.**
- 28- **JESSE HALL<sup>#</sup>**, SAMANTHA KNOWLTON, KATHLEEN LOUGHMAN, DEVIN SINDELDECKER, COURTNEY WOOD, TRICIA GILSON, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **The molecular mechanism of the temperature-dependent antibiotic resistance of *Francisella tularensis*.**
- 29- **ASHLEY HAUGHT<sup>#</sup>**, TAYLOR ROGERSON, TRICIA GILSON, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Inhabiting the intracellular space of an erythrocyte protects *Francisella tularensis* from the low pH environment associated with the gut of a tick.**
- 30- **LEXIE KEDING<sup>#</sup>**, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **A high throughput screen of a natural product library for the discovery of novel antibiotics.**
- 31- **EVAN VENS KosKE<sup>#</sup>**, DANIEL MEYER, NICOLE SADECKY, and HEATHER KALB, Department of Biology, West Liberty University, West Liberty, WV, 26074. **Preliminary survey of turtles in the West Liberty Reservoir, West Liberty, WV.**

## **LIST OF POSTERS- SESSION II**

1:15-2:15 GRILL AREA OF THE UNION

- 1- **JACOB KEENEY<sup>#</sup>** and RACHEL WADELL, Department of Biology, Wheeling Jesuit University, Wheeling, WV, 26003. **Chronic toxicity of crude 4-methylcyclohexanemethanol to the crustacean *Ceriodaphnia dubia*.**
- 2- **EVAN LAU**, E. JOSEPH NOLAN, HANNAH E. CREWDSON, ZACHARY W. DILLARD, MARCUS A. KINKER, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074, and HONGWEI YU, Department of Biochemistry and Microbiology, Marshall University, Huntington, WV, 25755. **Microbial diversity and abundance of the sputum of younger Cystic Fibrosis patients using Illumina MiSeq multiplex 16S rRNA sequencing.**
- 3- **ANDREW LEICHLITER<sup>#</sup>**, MARQUEZ GIBSON, ALICE MAGRO and ALBERT MAGRO, Department of Biology, Fairmont State University, Fairmont, WV 26554. **Temozolomide's effectiveness upon the invasiveness of glioblastoma cells.**
- 4- **DANIEL LUKICH<sup>#</sup>** and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. ***Cambarus bartonii bartonii* (Common Crayfish) in Virginia's James River basin: one species or two?**
- 5- **LEANNE MAZZELLA<sup>#</sup>**, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Erythrocyte invasion by *Francisella tularensis* increases colonization of *Ixodes* ticks.**
- 6- **TYLER MURPHY<sup>#</sup>**, PHILLIP YEAGER, and MARK FLOOD, Department of Biology, Fairmont State University, Fairmont, WV, 26554. **Determination of the effects of acid mine drainage remediation in the Three Fork Creek drainage.**
- 7- **WILLIAM NACE<sup>#</sup>** and NATALIA OMELCHENKO, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Do food and physical exercise alter the cognitive performance in the morning?**
- 8- **TINA NGUYEN<sup>#</sup>**, Department of Biology, Shepherd University, Shepherdstown, WV, 25443, MARY DAVIS, MACKENZIE NEWMAN, and HAN GANG YU, Department of Physiology and Pharmacology, West Virginia University School of Medicine, Morgantown, WV, 26506. **Mechanism of leptin resistance-induced cardiac arrhythmias.**
- 9- **JESSICA PAYNE<sup>#</sup>**, **AUSTIN CUSICK<sup>#</sup>**, ADAM KENNEY, ROGER SEEBER, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Survival of *Francisella tularensis* in a nectar surrogate and the colonization of mosquitoes.**

10- **ELIZABETH ROBINSON<sup>#</sup>**, RUTH CONLEY, and HEATHER BROWN, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Courtship behavior of *Aeluropoda insignis*, the flat-horned hissing cockroach.**

11- **STEVEN SAGUN<sup>#</sup>**, ELLIOT COLLINS, CALEB MARTIN, E. JOSEPH NOLAN, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Antimicrobial properties of trans-2-octenal and trans-2-decenal, the major aldehydes responsible for the scent of *Halyomorpha halys*, the brown marmorated stink bug.**

12- **DEREK SCHOPPERT<sup>#</sup>** and CAROL Z. PLAUTZ, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Exploration of memory formation and disruption in the pond snail, *Lymnaea palustris*.**

13- **ERIC TENNANT<sup>#</sup>**, SPENCER BELL, ZACHARY DILLARD, LUKE SADECKY, NICOLE SADECKY, ERIC TIDMORE, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Phylogenetic analysis of *Cambarus robustus* in the north, middle, and south forks of the Kentucky River.**

14- **EVAN VENS KosKE<sup>#</sup>**, CLARISSA DAMIS, and ZACHARY LOUGHMAN, Department of Biology, West Liberty University, West Liberty, WV, 26074. **Isopod diversity survey in the Northern Panhandle of West Virginia.**

15- **LORI M. PETRAUSKI<sup>#</sup>**, GREGORY A. GOOD, THOMAS RODD, GEORGE CONSTANTZ, and JAMES T. ANDERSON, Department of Wildlife and Fisheries Resources, West Virginia University, Morgantown, WV, 26505. **Using archival data to analyze patterns of bird breeding and flowering dates of wildflowers to create a baseline phenological database for the West Virginia University Natural History Museum.**

16- **MARIO ANDRIC<sup>#</sup>**, JOHN SPARKS, and WEIDONG LIAO, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **A survey of embedded computer systems and their applications.**

17- SERDAR BILGILI, **HALEY MORELLA<sup>#</sup>**, and V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506. **Effect of internal flame structure on the flame dynamics.**

18- **DI WANG<sup>\$</sup>**, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV, 26506, BOYI HU, Department of Industrial Engineering, West Virginia University, Morgantown, WV, 26506, FEI DAI, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV, 26506, and XIAOPENG NING, Department of Industrial Engineering, West Virginia University,



Morgantown, WV, 26506. **A sensor-based factorial experiment on low back disorder (LBD) risk factors among roofers.**

19- **CHRISTINE LEPINE<sup>#</sup>**, PETER VILA, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown, WV, 25443, LAURA CHRISTIANSON, KATA SHARRER, and STEVE SUMMERFELT, The Conservation Fund's Freshwater Institute, Shepherdstown, WV 25443. **Impact of hydraulic retention time on nitrogen removal in a woodchip bioreactor receiving aquaculture effluent.**

20- **BRITTANY ARAGON<sup>#</sup>**, JAMES WEEKLEY, and MATTHEW SCANLON, Department of Chemistry, Biology, and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Gunshot residue (GSR) analysis using atomic absorption spectroscopy.**

21- **JENNIFER CLYMER<sup>#</sup>**, Department of Forensic Science, Fairmont State University, Fairmont, WV, 26554. **Comparison of round nose and hollow point blood spatter analysis.**

22- **MITCHELL HAINES<sup>#</sup>** and ANDREAS BAUR, Department of Chemistry, Biology, and Geoscience, Fairmont State University, Fairmont, WV, 26554. **High performance liquid chromatography method development for the analysis of selected phenolic acids in plant extracts.**

23- **JACKIE TURNER<sup>#</sup>**, Forensic Science Program, Fairmont State University, Fairmont, WV, 26554. **Analysis of GSR particles post firing and post laundering.**

24- **HOLLY CHILES<sup>#</sup>** and NATALIA OMELCHENKO, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Improving the clinical evaluation: two-point discrimination threshold is strongly influenced by stress**

25- **KELSEY ROBERTSON<sup>#</sup>** and NATALIA OMELCHENKO, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Improving the clinical evaluation: palpatory sensibility is strongly influenced by wearing gloves**

26- **ZULFIYA MURADOVA<sup>#</sup>**, DARRYL JOHNSON, QING WANG, ZHIJUN WANG, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443, and DAVID J. KLINKE, Department of Chemical Engineering and Department of Microbiology, Immunology and Cell Biology, West Virginia University, Morgantown, WV, 26506. **Analysis of Ebola SIR variant model.**

27- **CHRISTIAN SHIMER<sup>#</sup>**, DARRYL JOHNSON, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443; FRANK LIAO, Boonsboro High School, Boonsboro, MD; QING WANG, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443; and DAVID J. KLINKE, Department of Chemical Engineering, and Department of Microbiology, Immunology and Cell Biology, West Virginia University, Morgantown, WV, 26506. **Modeling of Japan's population by a Markov Chain Monte Carlo method.**

28- **ALANNA C. BEBECH<sup>#</sup>**, JOHN H. HULL, Department of Psychology, Bethany College, Bethany, WV, 26032, and DEBRA B. HULL, Department of Psychology, Wheeling Jesuit University, Wheeling, WV, 26003. **Sexual assault: Participants' knowledge, attitudes, and behavior.**

29- **JOHN H. HULL**, Department of Psychology, Bethany College, Bethany, WV, 26032, DEBRA B. HULL, Department of Psychology, Wheeling Jesuit University Wheeling, WV, 26003, and ALANNA C. BEBECH, Department of Psychology, Bethany College, Bethany, WV, 26032. **Interpreting a date rape situation with a male victim and a female perpetrator.**

30- **JOSEPH ROXBY<sup>#</sup>** and NATALIA OMELCHENKO, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **In pursuit of cyberconsciousness.**

31- **QING WANG** and ZHIJUN WANG, Department of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443. **Shepherd CME S-STEM program: enhancing academic performance and career preparation of CME students.**

## **LIST OF ORAL PRESENTATIONS- SESSION I**

**2:30-3:45 CAMPBELL HALL**

**BOLD** INDICATES PRESENTOR

**#** INDICATES AN UNDERGRADUATE

**\$** INDICATES A GRADUATE

### **Room 104 Title: Biology/Ecology**

Moderator - Zac Loughman

2:30-2:45 **KATELYN AMSPACHER<sup>#</sup>**, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Ecology of the invasive cereal aphid, *Metopolophium festucae cerealium*, in the Pacific Northwest.**

- 2:45-3:00 **SPENCER BELL<sup>#</sup>**, ZACHARY DILLARD, LUKE SADECKY, NICOLE SADECKY, ERIC TENNANT, ERIC TIDMORE, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **A pilot study into the habitation requirements of burrowing crayfish.**
- 3:00-3:15 **ZACHARY DILLARD<sup>#</sup>**, KATIE SCOTT, MATTHEW MCKINNEY, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Geospatial analysis of *Cambarus monongalensis* across a habitat gradient.**
- 3:15-3:30 **SHELBY HAYES<sup>#</sup>**, Department of Biology, Shepherd University, Shepherdstown, WV, 25404, and JEFFREY R. GROFF, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown, WV, 25404. **Assessment of a model population's sensitivity to collapse and extinction due to generational variance in adult survivorship.**
- 3:30-3:45 **GEORGE H. LAMBERT<sup>#</sup>**, SUSAN MARTINEZ, and SHER HENDRICKSON, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Species occurrence and genomic sampling of salamanders in the Eastern Panhandle of West Virginia.**

**Room 108 Title: Biology/Environment**  
Moderator - Deborah Beutler

- 2:30-2:45 **ELIZABETH ARNOLD<sup>#</sup>**, DEVIN HEITZ, TYLER MURPHY, PHILLIP YEAGER, and MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Assessing the impact of Marcellus shale drilling on stream health using *Daphnia magna* and benthic macroinvertebrates.**
- 2:45-3:00 **DEBORAH K. BEUTLER**, Department of Biology, West Virginia University Institute of Technology, Montgomery, WV, 25136. **Effects on benthic macroinvertebrates of limestone sand addition to Morris Creek to mitigate the damage caused by acid mine drainage.**
- 3:00-3:15 **SHENA EYE<sup>#</sup>** and MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Effects of prolonged exposure and short term exposure of different concentrations of bromoform on *Daphnia magna*.**
- 3:15-3:30 **DEVIN HEITZ<sup>#</sup>**, DANNIE ARNOLD, TYLER MURPHY, PHILLIP YEAGER, and MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Microbial testing of water quality near Marcellus shale drilling.**

3:30-3:45 **RYAN HOUSER<sup>#</sup>**, MARK FLOOD, and TONY MORRIS, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Determining the mutagenic effects of bromoform and its impact on the environment as a carcinogenic substance.**

**Room 110 Title: Biology /Molecular**

Moderator - Joseph Horzempa

2:30-2:45 **DEANNA M. SCHMITT**, TRICIA GILSON, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Characterization of resazurin derivatives as novel antimicrobial agents against *Francisella tularensis* and *Neisseria gonorrhoeae*.**

2:45-3:00 **ADAM KENNEY<sup>#</sup>**, AUSTIN CUSICK, JESSICA PAYNE, ROGER SEEBER, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Colonization of mosquitoes by *Francisella tularensis* via a nectar reservoir.**

3:00-3:15 **EVAN LAU**, E. JOSEPH NOLAN, HANNAH E. CREWDSON, ZACHARY W. DILLARD, MARCUS A. KINKER, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074, and HONGWEI YU, Department of Biochemistry and Microbiology, Marshall University, Huntington, WV, 25755 **Microbial *algU* and *muca* genes in contrast to *Pseudomonad* 16S rRNA gene diversity and abundances in patients with Cystic Fibrosis using Illumina MiSeq sequencing.**

3:15-3:30 **MEGANN BOONE<sup>#</sup>**, KATHERINE VECCHIO, and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alterations in DNA and RNA profiles from alcohol exposed cortical stem cells relate a possible mechanism for slowed proliferation and increased apoptosis.**

3:30-3:45 **DEANNA M. SCHMITT**, TRICIA GILSON, LEANNE MAZZELLA, MATTHEW FORD, REBECCA BARNES, TAYLOR ROGERSON, ASHLEY HAUGHT, JAMES BIRCH, and **JOSEPH HORZEMPA**, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. ***Francisella tularensis*, a bacterium that's no-bloody-good.**

**Room 204 Title: Chemistry/Computer Science**

Moderator – Joe Nolan

2:30-2:45 **JESSICA GEIERMANN<sup>#</sup>**, Department of Biological Sciences, Shepherd University, Shepherdstown, WV, 25443, and JORDAN MADER, Department of

Chemistry, Shepherd University, Shepherdstown, WV, 25443. **The synthesis of polystyrene foams via HIPE for arsenic remediation.**

- 2:45-3:00 **STEVEN PIFER<sup>#</sup>** and KEVIN EVANS, Department of Science and Mathematics, Glenville State College, Glenville, WV, 26351. **Anti-Markovnikov hydrobromination of alkenes.**
- 3:00-3:15 **CORY S. CRAMPTON<sup>#</sup>** and OSMAN GUZIDE, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **802.11ax HEW.**
- 3:15-3:30 **MAURO DOZA<sup>#</sup>**, HANS VOMEND, ZHIJUN WANG, QING WANG, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443, and DAVID J. KLINKE, Department of Chemical Engineering and Department of Microbiology, Immunology & Cell Biology, West Virginia University, Morgantown, WV, 26506. **Immunotherapy strategies of cancer via impulsive control.**
- 3:30-3:45 **MAURO DOZA<sup>#</sup>**, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Harnessing electrical energy from the body using thermoelectric energy and other methods.**

**Room 208 Title: Engineering**

Moderator - Deepak Mehra

- 2:30-2:45 **MATTHEW S. THOMPSON<sup>\$</sup>**, SUSHANT AGARWAL, Department of Chemical Engineering, West Virginia University, Morgantown, WV, 26506, XUEYAN SONG, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506, and RAKESH K. GUPTA, Department of Chemical Engineering, West Virginia University, Morgantown, WV, 26506. **Effects of extensional flow cells and surface-modified nanoparticles on the morphology of immiscible polymers.**
- 2:45-3:00 **SERDAR BILGILI<sup>\$</sup>**, BERK DEMIRGOK, and V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506, and DAMIR VALIEV, Department of Physics, Umea University, Umea, Sweden. **Effect of Lewis number on flame acceleration scenario through channels.**
- 3:00-3:15 **SERDAR BILGILI<sup>\$</sup>**, ORLANDO UGARTE, and V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506. **Acoustical coupling of Kelvin-Helmholtz instability in reacting viscous potential flows.**

3:15-3:30 VACANT

3:30-3:45 VACANT

**Room 304 Title: Psychology/Miscellaneous**

Moderator - Erica Harvey

2:30-2:45 **CAITLYN BURT<sup>#</sup>** and TIFANI FLETCHER, Department of Social and Behavioral Sciences, West Liberty University, West Liberty, WV, 26074. **Framing Effects and the Influence of Social Cues on Decision Making.**

2:45-3:00 **TIFFANIE WILSON<sup>#</sup>** and TIFANI FLETCHER, Department of Behavioral and Social Sciences, West Liberty University, West Liberty, WV, 26074. **Priming and altruism behaviors: A replication based study.**

3:00-3:15 **MARQUEZ GIBSON<sup>#</sup>**, ANDREW LEICHLITER, ALICE MAGRO and ALBERT MAGRO, Department of Biology, Fairmont State University, Fairmont, WV, 26554. **Evolutionary basis for exaggerated anatomical proportions in artistic renditions of human form.**

3:15-3:30 **EMILY GRANT<sup>#</sup>** and STEVEN ROOF, Department of Biology, Chemistry, and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Osmosis investigations for elementary education majors.**

3:30-3:45 **CORYNN MCATEE<sup>\$</sup>**, MARIA WEBBER, Department of Biological Sciences, Marshall University, Huntington, WV, 25755, ANISHA VALLURI, Cabell Midland High School, Ona, WV, 25545 and LOGAN LAWRENCE, Department of Biological Sciences, Marshall University, Huntington, WV, 25755. **3D tumor model for testing anticancer drugs.**

**LIST OF ORAL PRESENTATIONS- SESSION II**  
**4:00-5:15 CAMPBELL HALL**

**Room 104 Title: Biology/Ecology**

Moderator - Zac Loughman

- 4:00-4:15 **LUKE SADECKY<sup>#</sup>**, NICOLE SADECKY, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Ecology of *Cambarus carinirostris* in Northern West Virginia: A baseline study.**
- 4:15-4:30 **NICOLE SADECKY<sup>#</sup>**, SPENCER BELL, ZACHARY DILLARD, ERIC TENNANT, ERIC TIDMORE, LUKE SADECKY, Department of Natural Science and Mathematics, West Liberty University, West Liberty, WV, STEWART WELSH, West Virginia University, Morgantown, WV, and ZACHARY LOUGHMAN, Department of Natural Science and Mathematics, West Liberty University, West Liberty, WV. **Determination of Crayfish Occupancy Rates Across the North, Middle, and South Forks of the Kentucky River.**
- 4:30-4:45 **ERIC M. TIDMORE<sup>#</sup>**, NICOLE SADECKY, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Epigeal crayfishes of the North, Middle, and South Forks of the Kentucky River: life history and ecology.**
- 4:45-5:00 **BEN M. STOUT III**, Department of Biology, Wheeling Jesuit University, Wheeling, WV 26003. **Wheeling, West Virginia experience with frackwater: what “brinewater” and “residual waste” trucks are really carrying.**
- 5:00-5:15 **SARAH METZ<sup>#</sup>**, ZACHARY FERGUSON, STEVEN ROOF, Dept of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV 26554. **Determining the retention factor of ink to develop a laboratory to be used in an introductory non-science major’s class.**

**Room 108 Title: Biology**

Moderator - Roger Seeber

- 4:00-4:15 **ZACHARY FERGUSON<sup>#</sup>**, SARAH METZ, STEVEN ROOF, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Determining the retention factor of ink to develop a laboratory to be used in an introductory non-science major’s class.**
- 4:15-4:30 **LINDSAY MILLER<sup>#</sup>**, HALLIE GUNNOE and DONALD TRISEL, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Historical and current diabetes mellitus treatment using medicinal plants.**



- 4:30-4:45 **HALLIE GUNNOE<sup>#</sup>**, LINDSAY MILLER, and DONALD TRISEL, Department of Biology, Chemistry, and Geoscience, Fairmont State University, Fairmont, WV, 26554. **The science and folklore of using medicinal plants to treat Diabetes Mellitus.**
- 4:45-5:00 **DANIEL LUKICH<sup>#</sup>**, NICOLE TURNER, THEUNIS VAN AARDT, and ROGER SEEBER, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Chemical analysis of American Ginseng's ginsenoside content from two sources.**
- 5:00-5:15 **KARA MCCULLOUGH<sup>#</sup>** and DONALD TRISEL, Department of Biology Fairmont State University, Fairmont, WV, 26554. **The science of medicinal plants used in treating fungal infections (*Candida albicans*) in humans.**

**Room 110 Title: Biology**

Moderator - Charles Puckett

- 4:00-4:15 **AMBER WOOTEN<sup>#</sup>** and MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Determining the short and long term effects of 4-Methylcyclohexanol exposure on aquatic species.**
- 4:15-4:30 **TIMOTHY PRACTH<sup>#</sup>** and MARK FLOOD, Department of Biology, Chemistry, & Geosciences, Fairmont State University, Fairmont, WV, 26554. **Determining the impact of Marcellus well drilling on stream ecology in Randolph County, West Virginia.**
- 4:30-4:45 **CAROL Z. PLAUTZ**, Department of Biology, Shepherd University, Shepherdstown, WV, 25443, **ALLISON BROOKS**, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443, and **COLLEEN J. NOLAN**, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Effects of Roundup on reproduction, steroid hormone levels, and the steroidogenic pathway in *Lymnaea palustris*.**
- 4:45-5:00 **ADAM P. FISCHER<sup>S</sup>** and SARAH L. MILES, Department of Biochemistry and Microbiology, Joan C. Edwards School of Medicine, Marshall University, Huntington, WV, 25755. **Vitamin C...not just for sailors: Examining ascorbate-mediated down regulation of hypoxia-inducible factor-1 in metastatic melanoma.**
- 5:00-5:15 **VICTORIA YOUNG<sup>#</sup>**, RICHARD GOODMAN, and CAROL Z. PLAUTZ, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Effects of caffeine on learning and memory in *Lymnaea palustris*.**

**Room 204 Title: Engineering**

Moderator - Don Gray

- 4:00-4:15 **SINAN DEMIR<sup>§</sup>**, HAYRI SEZER, West Virginia University, Morgantown, WV, USA, ALI S. RANGWALA, Worcester Polytechnic Institute, Worcester, MA, USA, VITALY BYCHKOV, Umea University, Umea, Sweden, and V'YACHESLAV AKKERMAN, West Virginia University, Morgantown, WV, USA **Theory and modeling of flame acceleration mechanisms for spatial variations of planar flame speed.**
- 4:15-4:30 **DONALD D. GRAY**, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV, 26506. **Three dimensional visualization of the specific head function of open channel hydraulics.**
- 4:30-4:45 **SEUNGHO HONG**, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV, 26506. **Scour downstream of a spillway.**
- 4:45-5:00 **JAD SADEK<sup>§</sup>**, Department of Mechanical and Aerospace Engineering, West Virginia University Morgantown, WV, 26506, VITALY BYCHKOV, Department of Physics, Umea University, Umea, Sweden, and V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506. **Theory of flame acceleration in open/vented obstructed pipes**
- 5:00-5:15 **SRI HARI RAMAKRISHNA CHALAGALLA<sup>§</sup>**, SINAN DEMIR, V'YACHESLAV AKKERMAN Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506, ALI S. RANGWALA Department of Fire Protection Engineering, Worcester Polytechnic Institute, Worcester, Massachusetts 01609, and VITALY BYCHKOV Department of Physics, Umea University, Umea, Sweden. **Predictive scenario for premixed methane-air flame spreading and explosion triggering in a mining passage.**

**Room 208 Title: Engineering/Miscellaneous**

Moderator - Jeffery Goff

- 4:00-4:15 **ORLANDO UGARTE<sup>§</sup>**, BERK DEMIRGOK, V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506 and DAMIR VALIEV, Department of Applied Physics and Electronics, Umea University, Umea, Sweden. **Flame propagation in micro tubes considering various constant wall temperatures.**
- 4:15-4:30 **ORLANDO UGARTE<sup>§</sup>**, BERK DEMIRGOK, V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506, VITALY BYCHKOV, Department of Physics, Umea University, Umea, Sweden; and DAMIR VALIEV, Department of Applied Physics and Electronics, Umea University, Umea, Sweden. **Flame propagation dynamics observed in obstructed micro tubes.**

- 4:30-4:45 **DARRYL JOHNSON<sup>#</sup>** and RALPH WOJTOWICZ, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Analysis of logical structure of topos quantum mechanics.**
- 4:45-5:00 **DARRYL JOHNSON<sup>#</sup>**, QING WANG, ZHIJUN WANG, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443, and DAVID J. KLINKE, Department of Chemical Engineering and Department of Microbiology, Immunology and Cell Biology, West Virginia University, Morgantown, WV, 26506. **Modeling the mechanism of Oxaliplatin and IL-12 cooperation.**
- 5:00-5:15 **EMILIE PIATEK<sup>#</sup>**, Department of Computer Science, Mathematics and Engineering, Shepherdstown, WV, 25443. **Applications of Big Data Technologies to Bio Informatics.**

### **Room 304 Title: Computer Science/Engineering**

Moderator - Osman Guzide

- 4:00-4:15 **RACHELLE HUFF<sup>#</sup>** and OSMAN GUZIDE, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Robotic operating system (ROS) used for swarm technology.**
- 4:15-4:30 **DESIRÉ MILLER<sup>#</sup>** and OSMAN GUZIDE, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Heartbeat sensors.**
- 4:30-4:45 **ANDY SHTANKO<sup>#</sup>** and OSMAN GUZIDE, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Indoor GPS systems.**
- 4:45-5:00 **THOMAS JONES<sup>#</sup>**, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown, WV, 25443, and JEFFREY R. GROFF, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown, WV, 25404. **Comparing the accuracy of polygon versus point classification training in Google Earth Engine.**

## Poster Abstracts- Alphabetical

MARIO ANDRIC, JOHN SPARKS, and WEIDONG LIAO, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **A survey of embedded computer systems and their applications.**

Embedded computer systems are nowadays seen everywhere in enormous forms, from everyday devices to computer systems themselves. Consumer electronics, such as TVs,

refrigerators, and utility meters, are now “smart” or computerized. Many cars and other automobiles have embedded processors to enable telecommunication and semi-automated driving. Even computer peripherals now are equipped with silicon chips so they could conduct certain tasks without the involvement of “main” processor. However, the answer seems unclear when people ask what embedded computer systems are, what distinguish them from regular computer systems, and what special design requirements are for embedded systems. In this poster, we provide an overview and classification of embedded systems and their contemporary application, and present a classification of current embedded systems and their design requirements.

BRITTANY ARAGON, JAMES WEEKLEY, and MATTHEW SCANLON, Department of Chemistry, Biology, and Geoscience, Fairmont State University, Fairmont, WV, 26554.

**Gunshot residue (GSR) analysis using atomic absorption spectroscopy.**

Discharged firearms expel airborne particles known as gunshot residue (GSR) which provides evidence that a person has discharged a firearm. Gunshot residue is known to contain lead, barium, and antimony. A modified testing method was developed using atomic absorption spectroscopy (AA) to find the mass percent of Pb and Sb in gunshot residue. Samples were collected by swabbing the hands of people immediately after firing a gun. The swabs were washed with 8 mL of nitric acid, and the washings tested using the AA. The results were compared to a calibration curve constructed from standards for lead and antimony ranging from 20 to 30 ppm. The mass percent of lead and antimony in the GSR samples are currently being analyzed. Being able to analyze precise concentrations of the components of GSR may help determine the type of ammunition that was discharged.

REBECCA BARNES, DEANNA M. SCHMITT, TRICIA L. GILSON, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **The role of the erythrocyte cytoskeleton protein spectrin during invasion by *Francisella tularensis*.**

*Francisella tularensis* is classified as a Category A bioterrorism agent by the Centers for Disease Control and Prevention. Inhaling as few as ten of these bacteria can cause acute, lethal pneumonia. Studies using mouse models of infection have shown that erythrocyte invasion is a novel feature of *F. tularensis* during infection; however, the mechanism by which this bacterium enters red blood cells is unknown. Cytoskeletal rearrangement of other host cells such as macrophages and hepatocytes is required for entry of *F. tularensis*. Therefore, in this study, we evaluated the role of the major erythrocyte cytoskeletal component, spectrin, in red blood cell invasion. To test this, human erythrocytes were treated with venom from the Blue-bellied black snake (*Pseudechis guttatus*), which disrupts the spectrin in the cytoskeleton. Treatment with this venom significantly reduced the number of intra-erythrocytic bacteria suggesting that spectrin is involved in erythrocyte invasion. Importantly, the concentration of venom used in this study did not reduce the number of intact erythrocytes. This is the first study showing the involvement of an erythrocyte protein during invasion by *F. tularensis*.

GRANT BASAGIC and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV. 26201. **Alcohol induced single strand breaks recruit elevated XRCC1 proteins associated with DNA damage repair in neuronal stem cells.**

Fetal Alcohol Spectrum Disorders (FASD) are associated with both facial and neurological phenotypes that are a result of changes in both proliferation and cell death within the neural crest stem cells. During development, cell losses in the region are attributed in part from oxidative stress, although the mechanism is still not known. Under normal DNA stress conditions, single stranded DNA breaks recruit the DNA repair protein XRCC1, which is involved in the repair of DNA damage by forming repair complexes with Pol- $\beta$ , Ligase III, and PARP. We suggest that alcohol causes a premature entry into S-phase that induces both double and single stranded DNA damage. Recruitment of repair mechanisms such as XRCC1 complexes would be the first line of response to damage. Under these conditions we suggest that XRCC1 protein expression changes would be elevated and recruited to multiple DNA damage sites. To examine the effects of alcohol on this repair mechanism we used rat cortical neuronal stem cells (derivatives of neural crest cells) with alcohol doses of 300 and 400 mg/dl over 8 hrs. exposure times. Cells were fixed in Hanks balanced salt solution and stained for DNA (DAPI and/or propidium iodide) and counter stained with antibody to XRCC1 with a FITC secondary. Microscopic examination shows alterations in both DNA integrity and XRCC1 expression. This suggests a mechanism of DNA damage associated with alcohol and suggest an unsuccessful mode of DNA that likely leads to apoptosis.

MICHAEL BATES, JOSH BENFIELD, JON SERRA, and THEUNIS VAN AARDT, Department of Natural Science and Mathematics, West Liberty University, West Liberty, WV, 26074. **Synthesis of *trans*-Pterocarpan.**

The objective of this research project is to synthesize *trans*-pterocarpan, a flavonoid that does not occur naturally. *Trans*-pterocarpan is of particular interest because they may display increased steroidal activity when compared to the naturally occurring *cis*-pterocarpan. First, a Williamson ether synthesis is performed using benzylchloride on the hydroxyl functional group of 2-hydroxy-4-methoxy-acetophenone. The protected acetophenone is then reacted with thallium trinitrate in order to rearrange the molecule into a protected phenylacetic acid compound. The protected phenylacetic acid is then combined with a similarly protected benzaldehyde via an aldol condensation. These aldol products are then converted to *trans*-pterocarpan through cyclization of the 5-membered ring followed by cyclization of the 6-membered ring using protection and deprotection methods. As of now, several methods of synthesizing the ether product are under investigation.

ALANNA C. BEBECH, JOHN H. HULL, Department of Psychology, Bethany College, Bethany, WV, 26032, and DEBRA B. HULL, Department of Psychology, Wheeling Jesuit University, Wheeling, WV, 26003. **Sexual assault: Participants' knowledge, attitudes, and behavior.**

Our study assessed participants' knowledge related to sexual assault, and focused on specific attitudes and behaviors of women and men regarding sexual assault. Participants were eighty-six undergraduates (52 women and 34 men). Participants completed 10 questions measuring knowledge of facts about sexual assault, and 11 statements designed to assess participants' attitudes about sexual assault issues, then read state legal definitions of sexual assault, sexual abuse, and sexual harassment, and indicated the degree to which they had experienced, and had perpetrated, each of the three. Single-sample *t*-tests showed participants did not have accurate knowledge about sexual assault, either significantly overestimating or underestimating nine of the 10 items. Independent-groups *t*-tests showed men averaged significantly higher on seven of

the attitude items, e.g., “Women should wear less suggestive clothing to reduce their chances of being raped,” while women averaged significantly higher on one item. Finally, independent-groups *t*-tests showed women reported significantly higher levels of having been victims of sexual assault, abuse, and harassment. Our results have clear implications for sexual assault and awareness programs. First, our participants varied widely – and generally inaccurately – in knowledge related to sexual assault. Second, men’s and women’s responses to the attitude items show substantial differences in most cases, with men more strongly supporting sexual assault myths, and perpetuating gender stereotypes about factors related to sexual assault. Finally, our results indicate that men need to become aware of, and control, behaviors related to sexual assault, abuse, and harassment.

MEGAN BRADFIELD and ROBERT WARBURTON, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443 **Antibody epitope mapping of murine H-2K<sup>b</sup> MHC molecules as a means to study the effects of mutation on B-cell recognition.**

The specific aim of the research presented here was to determine if a directly conjugated fluorescent (FITC) stained monoclonal antibody, used in a single-step binding assay, would be able to determine cell surface expression of wild type and mutant murine MHC Class I molecules, wild-type H-2K<sup>b</sup> and mutant H-2K<sup>bm19</sup>. It was determined that the efficacy of a one-step stain was comparable between the two H-2K<sup>b</sup> molecules but not as effective as the previously reported in the literature for a two-step system. It is hoped that future work will reinforce the results of this study and provide information on differences between the two MHC molecules relating structures, point mutations and epitope recognition by antibodies as a means to investigating differences in B-cell recognition. (*Funding supporting this project was received from West Virginia Higher Education Policy Commission Division of Science and Research SURE Grant Program.*)

LAUREL BRAGG and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Detection of isoform changes in exons 5 and 11 of the Spastin gene associated with Hereditary Spastic Paraplegia.**

Hereditary spastic paraplegias (HSPs) are an inherited set of diseases whose main phenotype is progressive stiffness and contraction in lower limbs as a result of peripheral nerve damage. This genetic disorder follows inheritance including autosomal dominant or recessive, or x-linked recessive. The mode has a direct impact on the chances of inheriting the disorder. HSP is caused by defects in protein transport mechanisms that aid movement through the cell. Long nerves are affected due to long distances of transport, and are particularly sensitive to defects. Genes that contribute to the disorder include; 72 spastic gait disease-loci and 55 spastic paraplegia genes (*SPGs*). Several genetic mutations have been identified which underlie various forms of HSP, and genetic testing is available and used to confirm clinical diagnosis. Testing does not include all genes or identify all the mutations of genes known to cause HSP. Many cases involve a mutation in the SPG4 (Spastin) gene, which controls the spasticity of the lower extremities. Yet the extent of mutation or variance is unknown. We wish to examine exon variants of the SPG4 gene at two distinct locations to see if splice variances contribute to the disease. Buccal swabs were collected from several consenting patients (control and affected) and PCR used to amplify differences in exons 5 and 11. A decrease in expression levels of the tested

gene indicates missing genomic sequence, increases mean extra DNA. We suggest this to be a possible diagnostic tool for specific forms of HSPs.

HEATHER BROWN, RUTH CONLEY, and ELIZABETH ROBINSON, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Vocalizations with syllables and motifs in *Aleuropoda insignis*, the Madagascan flat-horned hissing cockroach.**

*Aleuropoda insignis*, the flat-horned hissing cockroach, is a species of from Madagascar and has been found to produce hissing sounds when disturbed and during social encounters (Conley & Kanneh 2013). Courtship behaviors have been described for *Gromphadorhina portentosa* and vocalizations have been reported for both *G. portentosa* and *Eliptorhina chopardi* (Nelson & Fraser 1979, 1984, Sueur & Aubin 2006). In this study, we observed behaviors and vocalizations of *A. insignis* during courtship encounters. Audiovisual recordings of male and female *A. insignis* cockroach pairs were made during a 30 minute time period in a behavioral arena. Overall, the vocalizations can be described as ‘whistles’ and appear to be different than the whistles produced by *Eliptorhina chopardi* (Sueur & Aubin, 2006). Some of the hisses also have broadband components, yet appear to be different from the courtship hisses produced by *Gromphadorhina portentosa*. We used *Aleuropoda insignis* vocalizations preceding successful mating and categorized them into ‘syllables’ based on visual characteristics within spectrograms. Weiner’s entropy and Goodness of Pitch were calculated for each hiss using Sound Analysis Pro software and found to be significantly different between the ‘syllables’ (Tukey,  $p < 0.05$ ). The ‘syllables’ seem to be ordered into ‘motifs’, as described in many species of birds but has not been described in insects.

JENNIFER BROWN, RUTH CONLEY, and SHER HENDRICKSON, Department of Biology, Shepherd University, Shepherdstown, WV, 25401. **Evolution of cockroach communication by hissing.**

In hissing cockroaches, a pair of spiracles along the abdomen allow these species to generate hissing noises. This spiracle is elongated from the trachea, creating a distinct sound - vocalizations of hissing cockroaches come from this vocal apparatus (Nelson & Fraser, 1979). In the scientific literature, only hisses from *Gromphadorhina portentosa* and *Eliptorhina chopardi* have been characterized – however species of tribe Gromphadorhini (subfamily Oxyhaloinae), have been noted to produce hissing sounds (Conley, pers obs). *Gromphadorhina portentosa* vocalizations are described as “hisses”, while *Eliptorhina chopardi* vocalizations are described as “whistles” (Nelson & Fraser, 1984; Sueur & Aubin, 2006). These vocalizations are affiliated with courtship behavior - *Gromphadorhina portentosa* that do not hiss, do not mate (Nelson & Fraser, 1984). Hissing is also used during agonistic encounters to establish social rank within the colony (Nelson & Fraser, 1980; Clark & Moore, 1995). Using vocal characteristics, we examined the evolution of hissing communication in four genera of hissing cockroaches. We recorded vocalizations from three genera (*Gromphadorhina*, *Aleuropoda*, and *Princisia*) and examined vocal characteristics reported in the literature for two genera (*Gromphadorhina* and *Eliptorhina*). Using a selected subset of spectral features, vocalizations from each group were scored. We then performed cladistic reconstruction on a prior phylogeny based on five gene loci (Inward et al 2007). Results show similarities and differences among these taxonomic groups and provide indications of more primitive versus derived vocal patterns based on signal complexity across genera.



SAMUEL CANFIELD, Department of Science, Glenville State College, Glenville, WV, 26351, JENNIFER RUDGERS, Department of Biology, University of New Mexico, Albuquerque, NM, 87131, JOSHUA LYNN, Department of Biology, University of New Mexico, Albuquerque, NM, 87131, and ROSS CONOVER, Department of Science, Glenville State College, Glenville, WV, 26351. **Northern pocket gopher activity across elevation gradients.**

A specific behavioral adaptation (i.e., burrowing) can indicate species distributional range but the influence of behavioral factors are often poorly understood. Minimal research has been conducted on the range factors of northern pocket gopher (*Thomomys talpoides*) and its relatives above 2700m. We investigated whether burrowing was affected by elevation and determined that activity is best represented by a quadratic relationship; activity was highest from 3000-3400m ( $P < 0.001$ ). Pocket gopher activity is correlated with elevational abiotic factors (temperature, precipitation). As the climate changes, the range will shift and should be measured again to understand intra and interspecific interactions.

HOLLY CHILES and NATALIA OMELCHENKO, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Improving the clinical evaluation: two-point discrimination threshold is strongly influenced by stress.**

In order to test for proper nerve function in the extremities, many physicians use the two-point determination test (also known as a compass test), a measure of tactile spatial resolution. The test requires placing two separate points on a person's finger, and subsequently increasing the lengths between the points until the subject can differentiate between each individual point. In this study, we attempted to identify the factors that may influence the threshold in 15 healthy volunteers (5 males, 10 females, all between the ages of 19-25). After, the baseline measures of the threshold were obtained (threshold is 1.666 mm  $\pm$  1.047,  $p = 0.490$ ). In contrast, the stress lead to a significant decrease in the number of errors made (average threshold is 0.933 mm  $\pm$  0.594 SD,  $p = 0.014$ ). Our data indicates that the vividness of somatosensory perception is influenced by stress, but not by mild cold exposure. The findings may be potentially important for accurate interpretation of outcomes of two-point determination tests in clinical settings (average threshold is 1.4 mm  $\pm$  0.986 SD). The experiment was repeated twice again after 1) the volunteers placed their hand into ice cold water for 2 minutes ; and 2) performed the Stroop Color-Word Interference Task for 2 minutes (it is an accepted method to generate mild stress in adults). Our data indicates that the exposure to cold did not affect the two-point determination threshold.

JENNIFER CLYMER, Department of Forensic Science, Fairmont State University, Fairmont, WV, 26554. **Comparison of round nose and hollow point blood spatter analysis.**

The difference between bloodstain patterns of round nose and hollow point bullets of three different types of guns. The three guns used were an Anschutz .22 competitive rifle, a 9 mm Ruger pistol, and a .38 special Smith and Wesson revolver. The Anschutz was shot at 50 yards, the Ruger at 7 yards, and the Smith and Wesson at 7 yards. Each gun was shot with a round nose and a hollow point bullet. The target was a balloon filled with fake blood. The results concluded that a hollow point bullet will make a bigger blood stain pattern. The balloon 'exploded' and made a very large pattern. Also, there was blood found feet away from the point of impact. A round nose bullet does the opposite. When the balloon was hit with a round nose, the blood just leaked out. There was a pool of blood directly below the point of impact. The type of bullet, a round nose or hollow point, will affect the blood stain pattern.

EVAN COLLINS, Department of Biology, Wheeling Jesuit University, Wheeling, WV, 26003. **Standardization of *E. coli* coliform counting for the determination of stream health from combined sewer outflows along Wheeling Creek.**

Five sites stretching the length of Big Wheeling Creek in Wheeling, WV were chosen and spanned from Elm Grove down to the mouth of the creek at Tunnel Green Recreational Park. These sites were chosen based on their proximity to a Combine Sewer Overflow (CSO) which discharge when approximately 2.5 mm of rain have fallen in a given area. A total of 230 samples were taken from the creek, 115 *E. coli* Fecal Coliforms (EFC) and 115 Non-*E.coli* Fecal Coliforms (NEFC), from a sampling period of 23 days. Once the EFC and NEFC were enumerated, a percentage was taken to give a ratio of EFC vs. Total Coliform Counts (TCCs) revealing a very low correlation of 0.0422; this was not enough to state whether the EFCs are a good enough predictor for stream health. It also showed that the EasyGel medium used was not an accurate medium for effective stream sampling despite its simplicity. Also, the EFC levels in the creek were not dependent on the CSOs opening after greater than 2.5mm of rainfall. As for acceptable levels of coliforms, the months of July and August had the most samples, and consequently both months exceeded the EPA's limit of 10% of EFCs greater than 400 CFUs/100 mL

AMANDA CORBEL, Department of Biology, Shepherd University, Shepherdstown, WV, 25443, SEAN O'BRIEN, ELENA CHERTOVA, MAC TRUBEY, JULIAN BESS, JR., and BRANDON KEELE, AIDS and Cancer Virus Program, Leidos Biomedical Research, Inc., Frederick National Laboratory for Cancer Research, Frederick, MD, 21702. **Imaging Human/Simian Immunodeficiency Virus infectivity using fluorescently functional fusion partners.**

Nonhuman primate models for HIV have enabled investigations into the early stages of infection that would not be possible in human models. However, longitudinal studies tracking the course of virus infection suffer from the need to sacrifice the subject for autopsy to probe viral dissemination and pathogenesis. The stochastic nature of early infection, animal-to-animal variability, and large sample sizes being cost prohibitive make proper interpretation of the data and insightful conclusions difficult. The ability to visualize the early phase of infection would circumvent the need for autopsy and allow for the true longitudinal studies within the same animal. To address this need, we tested a battery of fusion partners of fluorescent functionality for their impact on viral viability. Virus with the SNAP-tag fusion partner remained infectious. Future studies will focus on characterizing the SNAP-tag for *in vivo* imaging.

MACKENZIE L. DAVIS and JOSPEH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Resorufin acetate has potential for use as a novel antibiotic against tularemia**

*Francisella tularensis* is a pathogenic bacterium and is the causative agent of the disease tularemia. Tularemia can be passed to humans through contact with infected animal tissues, biting insects, contaminated food and water, and by inhaling the bacteria. Due to the virulence and ease of aerosolization, the Centers for Disease Control and prevention classified *F. tularensis* as a category A bioterror agent. Therefore, it is essential to develop multiple effective treatments to combat *F. tularensis*. Resazurin is a compound commonly used to test cell viability. In previous experiments, resazurin and the reduced form, resorufin, were effective in

killing *F. tularensis* in vitro. However, both compounds were ineffective as treatments during in vivo *F. tularensis* infections of mice. We hypothesize that resazurin is being metabolized to an inactive form when introduced to the host. To prevent this, resazurin/ resorufin was modified in an effort to identify a compound that maintained its antibacterial properties, but was more stable in the mammalian host. Therefore we investigated the antimicrobial nature of resorufin acetate. Resorufin acetate (44  $\mu$ M) completely inhibited the growth of *F. tularensis* on chocolate II agar plates and in broth culture. Therefore, the addition of an acetate group to the hydroxyl of the resorufin phenol did not diminish the antimicrobial properties of this compound. Future investigations will determine whether resorufin acetate is effective in treating tularemia in mice.

MICHAEL FAGIOLA, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443, TAICHENG ZHOU, YIZENG YANG, and JONATHAN P. KATZ, NIH Center for Molecular Studies in Digestive and Liver Diseases & the Division of Gastroenterology; Department of Medicine, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, 19104. **Regulation of mesothelin and kallikrein-related peptidase 5 in human esophageal keratinocytes by the zinc-finger transcription factor Krüppel-like factor 4.**

Krüppel-like factor 4 (KLF4) is a key transcriptional regulator that functions in a number of cellular processes including proliferation, differentiation, and carcinogenesis. In the esophagus, KLF4 is typically induced in differentiating keratinocytes and plays a role in esophageal keratinocyte proliferation, migration and differentiation functions. KLF4 deletion in murine esophageal epithelia alters keratinocyte morphology and delays keratinocyte differentiation at 5 weeks and 3 months of age; these mice eventually developed a premalignant condition known as squamous cell dysplasia. To determine the targets of KLF4 in esophageal epithelial cells, we performed gene expression analyses on esophageal epithelia of 3 month-old mice. Among the most differentially regulated genes were MSLN & KLK5, two genes implicated in squamous cell differentiation and carcinogenesis. We hypothesized that KLF4 binds to the promoters of MSLN and KLK5 and acts as a direct transcriptional regulator of these genes during proliferation and/or differentiation in human esophageal keratinocytes. In studies using human primary esophageal keratinocytes in culture, we found that KLF4 was induced during keratinocyte differentiation and that KLF4 loss altered differentiation. Taken together, these findings are consistent with an important role for KLF4 in human esophageal keratinocyte differentiation. By quantitative real-time PCR and Western Blot, respectively, KLF4 loss in human esophageal keratinocytes also resulted in decreased mRNA and protein levels for MSLN and KLK5. Further, by chromatin immunoprecipitation, we found that the MSLN and KLK5 gene promoters were directly bound by KLF4. Thus, KLF4 is important for human esophageal keratinocyte differentiation and directly regulates MSLN and KLK5. The authors acknowledge support from NIH NIDDK R01-DK069984 (to J.P.K.), and by the Undergraduate Student Scholars Program at the University of Pennsylvania Center for Molecular Studies in Digestive and Liver Diseases (NIH R25-DK066028).

ALEKSANDR FLORJANCZYK and JOSPEH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **A *Penicillium* sp. isolate inhibits the growth of the American chestnut blight fungus, *Cryphonectria parasitica*.**

The American chestnut (*Castanea dentata*) used to be the dominant canopy tree along the eastern seaboard of the United States. *Cryphonectria parasitica*, the causative agent of chestnut

blight, was introduced from Asia in the very early 1900's, and obliterated the chestnut population within 50 years. We sought to identify microbes that were capable of producing factors that were fungicidal or inhibited growth of *C. parasitica* in the hopes developing a biological control of chestnut blight. We isolated a filamentous fungus that significantly inhibited the growth of *C. parasitica* upon co-cultivation. Extracellular fractions were capable of inhibiting *C. parasitica* growth, indicating that a potential fungicide was produced by the novel isolate. Sequence analysis of 16S rRNA identified this inhibitory fungus as *Penicillium* sp. with the nearest identity to *P. expansum*. Future work will explore whether amending soil with *P. expansum*, or treating chestnuts with *P. expansum* extracts could prevent chestnut blight. A more unconventional future approach may be to engineer *C. dentate* to express the inhibitory factor produced by the *Penicillium* isolate.

JAMES GAINER and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alcohol induced alterations in protein-protein interactions of transcription factors associated with proliferation changes in FASD and Alcoholism.**

Excessive alcohol consumption, during pregnancy (Fetal Alcohol Spectrum Disorders, FASD) or in adult alcoholism, induces significant developmental and neurological alterations that effect neuronal development or brain plasticity respectively. It has been shown that alcohol exposure leads to alterations in neuronal stem cell proliferation, apoptosis and cell migration. Our interest was to begin delineation of the mechanism(s) associated with altered growth patterns of neuronal stem cells associated with FASD and alcoholism. Recent studies on protein expression demonstrate alcohol induced increases in expression of cell cycle proteins that effect the G1/S phase transition and likely DNA replication. These include the E2F1 family of transcription factors that regulate transcription of S-phase specific genes at the start of DNA replication. In addition, alcohol is shown to induce overexpression of the E2F1 dimerization partner(s) DP1 family and the retinoblastoma protein (RB), both of which demonstrate importance in regulation of transcription from E2F1 consensus sites. However, the mechanism of altered E2F1 activity is poorly understood. We examined E2F1 interactions with both DP1 and RB by co-immunoprecipitation of E2F1 and western blotting. We used cortical neuronal stem cells from a rat in cell culture with a moderate (400mg/dl for 8 hr.) alcohol exposure. We examined protein interaction changes for both DP family isoforms as well as the RB protein. Our antibody capture of E2F facilitated all 8 isoforms. We suggest that alterations in RB binding to E2F1 alter transcription of S-phase specific genes and increases transcription of S-phase specific genes in a premature fashion.

ASHLEY GEORGE and CAROL Z. PLAUTZ, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Cloning of key steroidogenic pathway elements in the mollusk *Lymnaea palustris*.**

The increasing use of herbicides in agriculture poses a threat to aquatic organisms. Studies using the gastropod mollusk *Lymnaea palustris* and chronic Roundup have demonstrated decreases in reproductive output, alterations in steroidogenic acute regulatory protein (StAR; the rate-limiting step in steroid biosynthesis) levels, and a decrease in testosterone levels. This study aims to clone genes encoding key enzymes in the steroidogenic pathway of *L. palustris*. One of the most relevant genes to pursue—since testosterone levels are clearly affected—is the gene coding for the protein aromatase (CYP 19), which serves as the switch between testosterone and

estradiol. After designing degenerate primers for aromatase (using *Alligator mississippiensis*, *Mus musculus*, *Homo sapiens*, *Xenopus laevis*, *Danio rerio*), two methods of nucleic acid extraction and amplification were compared: adult tissue-specific snail RNA/RT-PCR, and snail embryo genomic DNA/PCR. Extraction of genomic DNA and PCR amplification yielded a product of ~600 bp. Following ligation into a vector, transformation, and sequencing, sequence analysis results will be shared. Cloning of the *L. palustris* aromatase gene will provide tremendous insights into invertebrate steroidogenesis and ultimately facilitates determination of transcriptional changes or altered regulatory mechanisms caused by herbicide disruption.

TRICIA L. GILSON, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **The role of IglC in erythrocyte invasion by *Francisella tularensis*.**

*Francisella tularensis* is a gram negative bacterium whose virulence has been associated with its ability to replicate within phagocytic cells of the immune system, such as macrophages. More recently, investigation revealed that *F. tularensis* invades erythrocytes. Preliminary studies from our laboratory suggested that the type VI secretion system (T6SS) is required for red blood cell invasion. In homologous systems, the T6SS is synthesized by the polymerization of Hcp. *F. tularensis* lacks a clear homolog to Hcp. However, modeling predictions reveal that IglC of *F. tularensis* may have a similar three dimensional structure to Hcp of other bacteria. To further confirm the role of the T6SS and to examine the contribution of IglC in this process, we generated an IglC-null deletion mutant. *F. tularensis* IglC-null mutant bacteria exhibited a substantial defect in their ability to invade erythrocytes. Complementation of this mutation is the focus of ongoing investigations. These results provide further support that the T6SS is required for erythrocyte invasion by *F. tularensis*. (Supported by NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence and NIH Grant 5K22AI087703).

MITCHELL HAINES and ANDREAS BAUR, Department of Chemistry, Biology, and Geoscience, Fairmont State University, Fairmont, WV, 26554. **High performance liquid chromatography method development for the analysis of selected phenolic acids in plant extracts.**

Several plants with anti-inflammatory or anti-cancer activity, including some traditional West Virginia herbs, were analyzed for the phenolic acids gallic, caffeic, and vanillic acid since the literature reports a connection between these medicinal properties and phenolic acids. Plant samples (wild grape, calendula officinalis, elderberry, butterfly weed, lemon balm, applemint, ox-eye daisy, bee balm, flowering dogwood, poke weed, jewel weed, and purple coneflower) were extracted using methanol and water (1:1, v/v) and analyzed by HPLC with fluorescence detection (column: ZORBAX Agilent SB-C18 column (4.6x150 mm, 5  $\mu$ m particle size), gradient: 25%-80% methanol in 0.02 % aqueous TFA, flow rate: 0.5 mL/min, excitation wavelength: 268 nm, emission wavelength: 360 nm). There was a large region spanning retention times from 3-6 minutes on all chromatograms that made determining a gallic acid peak (retention time 3.6 min) impossible. There were a lot of unexpected peaks on the chromatograms from other substances in the plant samples which fluoresced at the chosen wavelengths. The results for vanillic and caffeic acid were inconclusive. This project was funded by the College of Science and Technology's SURE program at Fairmont State University.

JESSE HALL, SAMANTHA KNOWLTON, KATHLEEN LOUGHMAN, DEVIN SINDELDECKER, COURTNEY WOOD, TRICIA GILSON, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **The molecular mechanism of the temperature-dependent antibiotic resistance of *Francisella tularensis*.**

Aminoglycosides such as gentamicin (Gm) are commonly used to treat bacterial infections such as tularemia – the disease caused by *Francisella tularensis*. In addition to being pathogenic, *F. tularensis* is found in environmental niches such as soil where this bacterium likely encounters Gm producers (*Micromonospora* sp.). *F. tularensis* LVS and Schu S4 show increased resistance to Gm at ambient temperature (26°C) compared to mammalian body temperature (37°C). Temperature regulates a number of *F. tularensis* LVS genes – notably, those presumed to be involved in resistance to beta-lactams, drug efflux, and LPS modification are induced at 26°C. To gain further insight into the mechanism of this temperature-dependent resistance, we examined the effect of CCCP, an inhibitor of the proton motive force that powers efflux pumps and the uptake machinery of small molecules. CCCP increased Gm resistance at both ambient and mammalian temperatures. This indicated that the increased resistance at 26°C was likely due to diminished uptake of Gm, and not enhanced efflux. To evaluate uptake of Gm by *F. tularensis*, fluorescent marker Texas Red (Tr) was conjugated with Gm, yielding Tr-Gm. Bacteria incubated at 26°C showed reduced fluorescence compared to those at 37°C when exposed to Tr-Gm further suggesting that uptake of Gm was reduced at 26°C. Moreover, unconjugated Gm competitively inhibited uptake of Tr-Gm, demonstrating the specificity of the Tr-Gm uptake. *F. tularensis* also exhibited enhanced beta-lactamase activity at 26°C. Collectively, our data suggest that *F. tularensis* augments antibiotic resistance at lower temperature by increasing beta-lactamase expression and reducing permeability to aminoglycosides.

ASHLEY HAUGHT, TAYLOR ROGERSON, TRICIA GILSON, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Inhabiting the intracellular space of an erythrocyte protects *Francisella tularensis* from the low pH environment associated with the gut of a tick.**

*Francisella tularensis* is a highly infectious bacterium that causes the disease, tularemia. Humans acquire tularemia through inhalation, oropharyngeal exposure, or tick bites. A unique feature of *F. tularensis* during infection is its ability to invade erythrocytes. Recent evidence indicated that residing within an erythrocyte enhances the ability of *F. tularensis* to colonize ticks. We hypothesized that the intracellular environment of the erythrocyte protects *F. tularensis* from the low pH or the different proteases associated with the digestive tract of the feeding tick. To test whether residing within an erythrocyte protects this bacterium from the acidic environment of the tick's gut, intra-erythrocytic *F. tularensis* or bacteria that had been liberated from erythrocytes were subjected to media that ranged in pH. Results from these investigations indicated that inhabiting an erythrocyte protected *F. tularensis* from an acidic solution (pH of 3.6, which is similar to that of the intracellular space of tick gut cells). Similarly, intra-erythrocytic *F. tularensis*, or bacteria that had been liberated from erythrocytes were incubated with proteases found in the gut of ticks that commonly transmit this bacterium. These proteases included Cathepsin D, Legumain, and Papain. These investigations indicated equivalent survival between extracellular bacteria and those inhabiting erythrocytes, suggesting erythrocyte invasion

does not provide additional protection from proteases associated with the tick gut. Results presented here indicate that erythrocyte invasion may protect *F. tularensis* bacteria from an acidic pH, promoting tick colonization.

JOHN H. HULL, Department of Psychology, Bethany College, Bethany, WV, 26032, DEBRA B. HULL, Department of Psychology, Wheeling Jesuit University Wheeling, WV, 26003, and ALANNA C. BEBECH, Department of Psychology, Bethany College, Bethany, WV, 26032.

**Interpreting a date rape situation with a male victim and a female perpetrator.**

We explored women's and men's interpretations of a date rape situation involving a female perpetrator and a male victim. Seventy mostly white undergraduate participants (39 women and 31 men) read a passage describing a typical college party involving alcohol and sexual innuendo, but with an ambiguous ending. The scenario indicated that the female character (named Brooke) was more interested in having sex than the male character (named Kenny). Participants completed the story in writing, then read an addition to the scenario which indicated that sexual activity had occurred. Finally, participants responded to the following items using a five point scale rating from 1 - Strongly Disagree to 5 - Strongly Agree: Kenny wanted to have sex; Kenny was raped; Kenny is to blame; Brooke is to blame; if Kenny dressed more conservatively this wouldn't have happened; if Kenny were sober this wouldn't have happened; if Kenny said fine after many attempts at saying no, it would have been consensual sex. Independent-samples *t*-tests showed male participants were significantly more likely to blame the female perpetrator, although significantly less likely to view what happened as rape. Both male and female participants evaluated the male victim as being as aggressive, powerful, and in control as the female perpetrator. Men were not significantly more likely than women to indicate that the scenario involved sexual assault, abuse, or harassment. Overall, gender stereotypes appeared to influence participants' interpretations more than the characteristics of the situation did.

ASHLEY HUREY and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alcohol increases double stranded DNA breaks and reduces nucleosome formation in a dose dependent manor in rat cortical stem cells.**

In Fetal Alcohol Spectrum Disorders (FASD), alcohol induces both physical and neurological changes attributed to alterations in proliferation, differentiation, migration and cell death in neural crest stem cell populations. It has been demonstrated that oxidative stress in these cells contribute to both single (SS) and double stranded (DS) DNA breaks that ultimately increase apoptosis on a large number of cells. Recent data on histone H1 expression suggests effects on nucleosome formation and changes in condensation of chromatin. To date, the extent and type of DNA damage incurred by alcohol is poorly understood. It is thought that dose and duration of alcohol exposure play a role in the extent of damage and the number of cells lost. Our hypothesis is that alcohol induced DNA damage is dose dependent and affects predominantly DS DNA breaks. This in turn would affect chromatin structure and nucleosome formation. To examine these changes, we used ELISA to detect histone H1 formation in nucleosome formation that will lead us to interpretations on the extent of DS DNA damage. We used rat cortical stem cells (derivative of neural crest stem cells) that were treated with two alcohol doses (300 and 400 mg/dl) for 8 hrs. Extracts of DNA were tested on H1 antibody coated plates and developed using horseradish peroxidase (HRP). Increased expression will determine the extent of DNA DS breaks and the binding of DNA to nucleosomes in both alcohol and control samples. We suggest



a dose dependent increase of DS DNA damage associated with a decrease in DNA associated with nucleosome formation.

NANCY ISNER and JON SERRA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Calculation of the heat of combustion of different grades of gasoline.**

The price of gasoline can vary dramatically with the octane rating or grade. It is suggested that higher grades of gasoline produce more engine power by producing more heat during the combustion process. The relationship between the grades of commercially available gasoline to the heat of combustion was studied using bomb calorimetry. To determine the efficiency of different grades of gasoline, the heats of combustion,  $\Delta H_{\text{combustion}}$ , were determined for several different commercially available grades of gasoline. Calibration of the bomb calorimeter was achieved using standardized benzoic acid to calculate the calorimeter constant. The  $\Delta H_{\text{combustion}}$  for each gasoline sample was obtained by generating a heating curve and analysis using industry standard procedures. Preliminary results show little difference in the heat of combustion versus the different grades of gasoline. For commercially available mid-grade gasoline, the  $\Delta H_{\text{combustion}}$  was determined to be 6129.40 ( $\pm 1$ ) cal/g, while the  $\Delta H_{\text{combustion}}$  for the highest grade of the same commercially available gasoline was determined as 6636.57 ( $\pm 1$ ) cal/g with a difference of only 507.17 ( $\pm 1$ ) cal/g. This suggests that although the price of different grades of gasoline can vary drastically, the heat produced does not vary as drastically. Further studies are currently being developed to compare other grades of gasoline to these preliminary results.

LEXIE KEDING, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **A high throughput screen of a natural product library for the discovery of novel antibiotics.**

Antibiotic resistance is considered one of the greatest public health and clinical threats encountered during the 21<sup>st</sup> century. Discovery of novel antibiotic agents is imperative to combat the trend of decreasing antibiotic efficacy. The National Center for Natural Products Research (NCNPR) has assembled a library of organic compounds derived from plants, fungi, marine, and algae species with potential antibacterial properties. In partnership with NCNPR, we have developed a rapid and effective method for screening large quantities of organic compounds for antibacterial sensitivity against *Neisseria sicca*. *N. sicca* is a nonpathogenic bacterium related to the pathogenic *N. gonorrhoea* and *N. meningitidis* and serves the purpose as a laboratory surrogate. Bacteria were inoculated into microtiter plates in which each well contained liquid growth medium. A small volume of each compound was added to a corresponding well in the microtiter dish. After incubation at 37°C, bacterial growth was measured using a plate reader. Wells lacking treatment or containing antibiotics known to be effective at inhibiting *N. sicca* were used to identify normal or inhibited growth levels respectively. Preliminary results have identified two compounds exhibiting significant growth inhibition. Future investigations will involve the characterization and a detailed analysis of the antimicrobial efficacy of these compounds.

JACOB KEENEY and RACHEL WADELL, Department of Biology, Wheeling Jesuit University, Wheeling, WV, 26003. **Chronic toxicity of crude 4-methylcyclohexanemethanol to the crustacean *Ceriodaphnia dubia*.**

On January 9<sup>th</sup>, 2014 more than 10,000 gallons of an organic solution contaminated the Elk River in West Virginia, which serves as a water source for over 300,000 residents in the Charleston area. The main constituent of the solution was 4-methylcyclohexanemethanol (MCHM). Prior understanding of crude MCHM'S toxicological effects on aquatic organisms has been limited. In this experiment, chronic toxicity tests were performed using *Ceriodaphnia dubia* to test the chemical's aquatic toxicity at various concentrations according to the Environmental Protection Agencies standard operating procedures. Chronic reference toxicant tests were run for quality assurance. Two tests were conducted with MCHM; a range finder test and a narrow range test. No Observed Effect Concentration (NOEC) values were found to be 6.25 mg/L while the Effect Concentration 50% (EC50) was 25 mg/L. This experiment and other recent studies have shown that the toxicity of MCHM to aquatic organisms is greater than previously thought. Tests performed prior to 2014 do not support the endpoints gathered from this study regarding MCHM toxicity to any daphnid species. Funding for this experiment was provided by the class action council of Goode vs American Water.

EVAN LAU, E. JOSEPH NOLAN, HANNAH E. CREWDSON, ZACHARY W. DILLARD, MARCUS A. KINKER, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074, and HONGWEI YU, Department of Biochemistry and Microbiology, Marshall University, Huntington, WV, 25755. **Microbial diversity and abundance of the sputum of younger Cystic Fibrosis patients using Illumina MiSeq multiplex 16S rRNA sequencing.**

Cystic fibrosis (CF) is the most common genetic disease among individuals of European ancestry. The microbiota of sputum of CF patients, especially in younger patients before later stage infections where mucus- and alginate-producing bacteria tend to dominate is relatively understudied. It is not known whether the presence and abundance of pathogenic microbial taxa is linked to disease progression in CF patients. In this study, we used multiplex sequencing of 16S rRNA genes to reveal microbial diversity and abundance in younger CF human sputum (age 10-16), focusing on pathogenic taxa. Our data indicate the vast majority of the microbiota in these CF patients consist of potentially pathogenic *Staphylococcus aureus* (other *Staphylococcus* sp. were absent) followed by members of the Proteobacteria and Firmicutes, based on multiplex sequencing of the 16S rRNA gene. This is in sharp contrast to the presence of the less abundant but more diverse Pseudomonads, which may explain the lack of serious respiratory infections seen in later stage CF patients. Our results correspond with previous work based on microbial cultivation and laboratory observations. Further work is underway to sequence the *mucA* and *algU* genes in more CF patients to test our hypothesis that *mucA* gene mutations only occur a relatively small number of Pseudomonads in CF patients in early stages of infection.

ANDREW LEICHLITER, MARQUEZ GIBSON, ALICE MAGRO and ALBERT MAGRO, Department of Biology, Fairmont State University, Fairmont, WV 26554. **Temozolomide's effectiveness upon the invasiveness of glioblastoma cells.**

Temozolomide (TMZ) is the current adjuvant drug of choice in the clinical, chemotherapeutic treatment of glioblastoma multiforme. Glioblastoma multiforme is a type of brain cancer that is very invasive and highly malignant. We have previously determined that

TMZ does not effectively induce apoptosis in a variety of glioblastoma cell lines. In light of TMZ's clinical effectiveness devoid of apoptotic effects, the purpose of this study was to determine the efficacy of TMZ as an inhibitor of invasiveness. The efficacy of TMZ to inhibit invasiveness was compared to the naturopathic products thymoquinone (TMQ) and epigallocatechin gallate (EPIGAL) and also to the antibiotic staurosporine (STAURO). TMQ, EPIGAL and STAURO are all known to have *in vitro* antineoplastic properties. The effect of TMZ upon growth and invasiveness was tested using the established glioblastoma cell lines U87MG, U118MG, LN18, M059J and T98G. A three dimensional *in vitro* matrigel spheroid assay, which measures the changes in the radius and volume surrounding the invading cellular spheroid, was used. It was determined that TMZ was not effective as an inhibitor of invasiveness as measured by the spheroid assay. The data raise the question as to why TMZ is effective as an adjuvant drug in the treatment of glioblastoma multiforme. Overall, the data indicate that there may be *in vivo* effects other than those manifested by *in vitro* apoptotic and spheroidal testing that are more relevant with regard to some chemotherapeutic agent's ability to inhibit the growth and invasiveness of glioblastoma cells.

TIA LEMASTER and KEVIN L. EVANS, Department of Science and Mathematics, Glenville State College, Glenville, WV, 26351. **Effect of UV radiation on anti-Markovnikov hydrobromination of alkenes.**

Alkyl bromides are key intermediates in numerous multi-step organic syntheses and are commonly synthesized from the hydrobromination of alkenes. The regiochemistry of the hydrobromination of alkenes is controlled with the absence or presence of radicals. The addition of a peroxide results in a radical mechanism which yields predominately the anti-Markovnikov alkyl bromide. The objective of this research is to develop an efficient synthesis of the anti-Markovnikov alkyl bromide by generating hydrobromic acid *in situ* by the hydrolysis of phosphorous tribromide. The reaction of 1-octene with phosphorous tribromide, silica gel, and benzoyl peroxide in hexanes has been studied with varying reaction conditions. The benzoyl peroxide promotes the desired radical mechanism, whereas, the silica gel promotes the electrophilic addition mechanism. By having conditions that result in the mechanisms competing, the effects of varying reaction conditions become more prominent. Results of the ratio of 1-bromooctane (anti-Markovnikov product) to 2-bromooctane (Markovnikov product) with varying quantities of peroxide and varying exposure times to shortwave UV radiation will be presented.

CHRISTINE LEPINE, PETER VILA, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown, WV, 25443, LAURA CHRISTIANSON, KATA SHARRER, and STEVE SUMMERFELT, The Conservation Fund's Freshwater Institute, Shepherdstown, WV 25443. **Impact of hydraulic retention time on nitrogen removal in a woodchip bioreactor receiving aquaculture effluent.**

Four 1:10 pilot-scale models (L x W x D: 3.8 x 0.75 x 0.61m) were constructed at The Conservation Fund's Freshwater Institute, Shepherdstown, WV, USA to assess the practicality of denitrification (*i.e.*, - nitrate-removing) woodchip bioreactors for field-scale implementation in an aquaculture setting. Hydraulic retention time (HRT), a main design parameter of bioreactors, controls the degree of denitrification by regulating the flow rate through the system; the four models were operated at differing HRTs (12, 22, 39, and 58 hours). Denitrification was measured by weekly water quality sampling of total nitrogen (TN) and nitrate-nitrogen (NO<sub>3</sub>-N); sulfate

(SO<sub>4</sub><sup>2-</sup>) and dissolved oxygen (DO) were measured concurrently. After 125 days of operation, all four bioreactors demonstrated high nitrogen reductions of 59-100% of NO<sub>3</sub>-N removal. The 12 hour HRT treatment had the lowest removal efficiency (59%), but the highest removal rate (64 g N/ (m<sup>3</sup>-dy)) since it received the highest nitrate loading rate. The 22 hour HRT bioreactor had slightly higher removal efficiency (76%) but a lower removal rate (44 g N/ (m<sup>3</sup>-dy)). The 39 hour and 58 hour HRT treatments resulted in nearly 100% nitrate removal; in these two systems, sulfate reduction was observed as nitrate became a limiting factor. To avoid toxic hydrogen sulfide (H<sub>2</sub>S) production from sulfate reduction, this work recommends HRTs of 12-24 hours. Early evidence of excessive bacterial growth was observed and may eventually cause clogging and disruption of flow through the system. Further analysis over a longer time period is needed to ascertain whether this growth impacts bioreactors' longevity.

BALEY LOY, Department of Biological Sciences, Shepherd University, Shepherdstown, WV, 25443, and JORDAN MADER, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443. **Preparation of p-mercaptostyrene/divinylbenzene copolymer foam and its removal of arsenic from groundwater.**

Arsenic pollution and contamination is a large concern in many countries and affects many people worldwide. Exposure to toxic arsenic species can lead to serious short term and long term medical conditions and abnormalities. Development of a low cost arsenic filter system was studied by creating thiol-functionalized polymer foams. Thiol (-SH) groups have an affinity for heavy metals like arsenic. Functionalization of the different density polystyrene/divinylbenzene copolymer foams was conducted by a series of reactions including electrophilic aromatic substitutions (EAS) (halogenation and nitration), thioacetate substitution to form the protected polymer, and deprotection to achieve functionalized polymer. Foams with densities of 30, 60, 90, 100, 120, and 500 mg/cc were made using either a mechanical stirrer or gas-tight syringes. Stability and functionalization was studied using thermogravimetric analysis (TGA) and attenuated total reflectance-fourier transform infrared (ATR-FTIR) spectroscopy. An arsenic testing kit was used with the functionalized polymer to test the efficacy of the thiol groups. Arsenic levels were reduced between 25 and 250 ppb when tested with 30, 60, 90, and 120 mg/cc functionalized polymer after one hour of contact time. Stable functionalized polymers were developed and preliminary testing of arsenic reduction occurred, but further tests need to be conducted. This work was supported by the West Virginia Higher Education Policy Commission Division of Science and Research SURE Grant Program, the Shepherd University Chemistry Department, and the Shepherd University School of Natural Sciences and Mathematics.

DANIEL LUKICH and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. ***Cambarus bartonii bartonii* (Common Crayfish) in Virginia's James River basin: one species or two?**

The distribution of *Cambarus bartonii bartonii* (Common crayfish) is broader than that of any other North American crayfish. It encompasses stream ecosystems from Canada to Georgia (Cordeiro et al., 2010). In this study, a Virginian population of *C. bartonii* with a characteristic red and reticulated phenotype (dubbed "Virginia A") was analyzed to determine if sufficient morphological difference existed between it and type populations to elevate it to full species status. Twelve morphometric measurements from males (Form I) were compared between both populations to determine if phylogeographic distinctiveness existed between these two groups. Univariate and multivariate analyses of these variables did not show significant

morphological difference between Virginia A and the type population. Thus, a phylogenetic approach is recommended for determining if taxonomic definition is appropriate for the Virginia A population.

KELLY MACHUCA and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alcohol induced changes to replication fork helicase complex (MCM) may induce DNA damage in rat neuronal stem cells.**

Fetal Alcohol Spectrum Disorders (FASD) and adult alcoholism exhibits phenotypes associated with alterations in proliferation and cell losses in stem cell populations derived from the neural crest. Although the mechanism associated with cell losses is not well understood, our recent data suggests that cells enter S-phase prematurely, experience both double and single stranded DNA breaks early in replication, and are followed by apoptosis from poor repair of multiple DNA breaks. We also show that alcohol induces overexpression of histone H1, normally aligned with nucleosome packaging early in replication. To determine if apoptosis induction is associated with early DNA replication, we have chosen to examine expression of MCM3 protein, which is part of the helicase complex associated with DNA replication forks. It is feasible that the cells experience a lack of function or stalling of the replication forks hindering the replicative properties of the cells followed by cell death. To test this we used rat cortical stem cells with an alcohol dose of 400 mg/dl for 8 hrs. Both control and alcohol induced cells were double stained using either DAPI or propidium iodide for DNA stain along with antibody against MCM3 and FITC secondary antibody. Microscopic analysis suggests alterations in MCM3 expression and the formation of stalled replication forks. This will help in understanding the mechanism in which alcohol induces DNA damage and apoptosis for future design of treatment paradigms.

JAMES HORNER, MCKENSIE MASON, JON SERRA and THEUNIS VAN AARDT, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Synthesis of *trans*-Pterocarpan from 2-hydroxy benzaldehyde.**

The objective of the research project is to synthetically produce *trans*-pterocarpan, a non-naturally occurring flavonoid. In order to achieve this, a synthetic method must be developed to produce the desired stereo outcome of the pterocarpan product. First, a Williamson ether synthesis is performed using MOMCl to protect the hydroxyl functional group of a benzaldehyde molecule, to be later combined via an aldol condensation with a similarly protected phenylacetic acid. The aldol products can then be converted to *trans*-pterocarpan by sequential cyclization of the 5-membered ring and the 6-membered ring using protection and deprotection procedures. At this point, the protection of 2-hydroxy-4-methoxy benzaldehyde has been completed via Williamson ether synthesis with MOMCl with a maximum yield of 92%. The product has been verified via NMR, including H1, C13, DEPT, HETCOR, and COSY spectrums, as well as GC-MS. Preparative TLC plates were used in separation of the reaction mixture of the ether synthesis. Protection of salicylaldehyde is also being performed using the same methods. Once a sufficient amount of protected benzaldehydes have been prepared, the next step will be to perform the aldol condensation and confirm the ester product.

LEANNE MAZZELLA, DEANNA SCHMITT, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Erythrocyte invasion by *Francisella tularensis* increases colonization of *Ixodes* ticks**

*Francisella tularensis* is a highly infectious bacterium that causes the severe disease tularemia. Humans acquire tularemia through inhalation, oropharyngeal exposure, or tick bites. A unique feature of *F. tularensis* is its ability to invade erythrocytes. In this study, we investigated if red blood cell invasion enhances colonization of ticks, which could lead to increased transmission of disease. To test this, we used a predominant vector for this bacterium, *Dermacentor variabilis*. Ticks become infected with *F. tularensis* as nymphs and bacteria are maintained until adulthood. Subsequently, *F. tularensis* is transferred to humans during a blood meal. First, we sought to inoculate *D. variabilis* nymphs and adults in vitro through capillary feeding. Our experience was consistent with reports that indicate these ticks do not actively feed from capillary tubes, and require a live animal host to initiate feeding. Therefore, an alternative tick species, *Ixodes scapularis* was used as a model for this experiment since these ticks can also transmit *F. tularensis* and actively feed from capillary tubes. Here we show that red blood cell invasion increases bacterial colonization of *I. scapularis*.

PATRICK MILKOWSKI and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Effects of alcohol exposure on the binding of transcriptional factor E2F1 to DNA consensus sequence.**

Fetal Alcohol Spectrum Disorders (FASD) are associated with alterations in proliferation, and increased apoptosis in neuronal stem cells exposed to alcohol. Chronic alcohol abuse also shows alterations in self renewal and apoptosis in neuronal stem cells. Alcohol exposure is shown to cause an expressional change in cell cycle proteins that monitor and initiate cell cycle checkpoint progression at the G1-S phase. Improper regulation is thought to alter DNA replication processes, contributing to decreased proliferation and increased apoptosis seen in these cells. Our preliminary studies show that alterations in protein expression of E2F and DP1 transcription factor families may induce altered gene expression and allow for premature G1-S phase transition and altered DNA replication. To date, there is little understanding of the mechanistic changes that occur in altered proliferation and apoptosis associated with alcohol exposure. Our interest is to understand how changes in E2F1 expression might relate to functional changes in transcriptional activation. The goal of this experiment is to determine how the binding of E2F transcriptional factors to DNA consensus is affected by exposure to alcohol. Both control and alcohol exposed nuclear proteins were used in an Electrophoretic Mobility Shift Assay (EMSA). DNA probes included; 1) nonconsensus site 2) single consensus sequence and 3) 2 consensus sequences in tandem. We suggest that E2F1 binding to a normal consensus sequence is altered in alcohol exposed stem cells. This suggests a mechanism in which changes in functional E2F1 transcription alters DNA synthesis and increased apoptosis associated with moderate alcohol exposure.

SERDAR BILGILI, HALEY MORELLA, and V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506. **Effect of internal flame structure on the flame dynamics.**

Internal flame effects are incorporated into the theory of flame acceleration, where, the flame structure is described by means of the Markstein number,  $M_k$ , which characterizes the flame response to curvature and stretch. This quantity is a function of the primary thermal-chemical combustion parameters such as the Lewis,  $Le$ , and Zeldovich,  $Ze$ , numbers as well as the thermal expansion coefficient  $\alpha$ .  $M_k$  can be positive or negative, thereby moderating or promoting the flame acceleration. Herein the Bychkov theory is combined with the Matalon-Matkovsky

formulation [*Journal of Fluid Mechanics* 124 (1982) 239]. While the difference between these two approaches is recognized (the former deals a strongly elongated flamefront, while the latter is devoted to the planar one), we reduce such a discrepancy by splitting the analysis into two parts: first, we identify the diffusional-thermal (in)stability limits within the Ze-Le-a space; second the Markstein number is incorporated into the formulae for the flame acceleration rate. Two formulae are compared – one is based on a simplified theory, while the other is the outcome of a model equation. Both the simplified theory and the model equation are proposed, first, in the present work. It is shown that the internal flame structure may provide a substantial correction to the flame acceleration rate only when the flame propagation Reynolds number is small enough. However, such a correction moderates fast with the increase in the Reynolds number. Overall, the effect of the internal flame structure is quantitative, but it does not change the qualitative scenario of the flame acceleration.

ZULFIYA MURADOVA, DARRYL JOHNSON, QING WANG, ZHIJUN WANG, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443, and DAVID J. KLINKE, Department of Chemical Engineering and Department of Microbiology, Immunology and Cell Biology, West Virginia University, Morgantown, WV, 26506. **Analysis of Ebola SIR variant model.**

The recent outbreak of Ebola in West Africa is a tragic example of how quickly an unchecked virus can run through a population. It shows the need for strong and rapid measures for containment of possible infected. While the first case in Guinea appeared in December 2013, no great measures were taken to contain the disease until March 2014; the Ebola virus is still spreading in Guinea today. The first case in Mali was reported in October 2014 with measures taken to combat the spread enacted that month. Consequently, Mali has been declared Ebola free since January 18<sup>th</sup>, 2015. This research proposes a set of ODEs based on the well-known SIR model to model the spread and transmission of the disease. The model will be calibrated to observations of the outbreak using Markov chain Monte Carlo algorithms. In this model we include a parameter that represents the country's ability to seek contacts with infected individuals and to put them into quarantine. This model also accounts for delays that may occur in organizations' reactions to epidemics and the speed at which they can set up quarantine protocols. We vary both of these and show how the speed and efficacy of quarantine could affect the number of infected. This project was supported by the NIGMS of the NIH grant as part of the West Virginia INBRE (P20GM103434).

TYLER MURPHY, PHILLIP YEAGER, and MARK FLOOD, Department of Biology, Fairmont State University, Fairmont, WV, 26554. **Determination of the effects of acid mine drainage remediation in the Three Fork Creek drainage.**

Acid mine drainage has become a more serious issue as years go by and the maintenance of closed and abandoned coal mines has decreased. The high sulfur content of the seams of coal that run through West Virginia create the perfect conditions for acid mine drainage (AMD). This research focuses on the success of attempts to remediate the acidification of the three Fork Creek Watershed, through the use of limestone dosers. The dosers automatically dispenses a regulated amount of a limestone slurry solution to counteract the AMD. Extensive stream data has been collected at sites above and below the treatment sites to serve as an assessment of the effectiveness of the stream remediation including pH, total dissolved solids, turbidity, and dissolved oxygen (mg/L). Local macro-invertebrates were collected and used to determine the

health of the river thru the FBI Index. Water samples were also collected and *Daphnia magna* were used to test the ability of a semi-sensitive organism to survive and reproduce. Through all of the collections and analysis the Three Fork River System is found to be positively effect by the remediation efforts, which will aid in the overall maintenance of the natural ecosystems of the state of West Virginia. This project was supported by a Fairmont State University SURE grant.

WILLIAM NACE and NATALIA OMELCHENKO, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Do food and physical exercise alter the cognitive performance in the morning?**

A growing body of evidence supports the influence of exercise and diet on cognitive functions. The aim of the present study was to evaluate if morning exercise and breakfast alters cognitive performance in the morning. The attention (the Stroop Task), working memory (the Digit Span Test), and the reaction time (the Ruler Drop Test) evaluations were performed over period of three days in six healthy volunteers during morning hours (8-10 a.m.). After a volunteer described his/her morning routing on the first day of testing, the individual was asked to alter exercise regimen for the second day of testing, and return to original exercise regimen, but alter the food intake for the third day of testing. Our data indicated that change in routine by itself did not alter cognitive performance ( $p=0.433$ ). However, the volunteers seem to perform notably better on attention tests on the days when they had breakfast (14.1% improvement,  $p=0.0687$ ) or exercised (5.5% improvement,  $p=0.0824$ ). The working memory and reaction time seems to be less influenced by food intake or exercise regimen, with only working memory capacity showing a trend toward improvement following food intake (15.7% improvement,  $p=0.0913$ ). Although the sample size is too small for definite conclusion, our results indicate that food and physical exercise likely influence attention and possibly working memory in the morning. Since appropriate mourning routine seems to affect cognitive performance, the data of the study might be used to optimized the morning activities of the students and improve the learning outcomes in early morning classes.

TINA NGUYEN, Department of Biology, Shepherd University, Shepherdstown, WV, 25443, MARY DAVIS, MACKENZIE NEWMAN, and HAN GANG YU, Department of Physiology and Pharmacology, West Virginia University School of Medicine, Morgantown, WV, 26506.

**Mechanism of leptin resistance-induced cardiac arrhythmias.**

Cardiovascular disease, such as heart disease, is the leading cause of death in the United States. Approximately 70% of overweight/obese individuals die from heart disease. Premature ventricular contraction (PVC), a type of cardiac arrhythmia, and prolonged QT syndrome occur at an exponentially higher rate in overweight/obese patients. Yu's lab has recently discovered the expression of functional leptin receptors (ObRb) in cardiomyocytes, suggesting that leptin may exert a direct local effect on cardiac electrical properties as opposed to the canonical adrenergic pathway. Using next-generation sequencing RNA-Seq, our lab has generated a database of mRNA expression from obese Zucker rats (OZR) and lean Zucker rats (LZR). Through Ingenuity Pathway Analysis, we have identified significantly decreased gene expression of Akt3 and changes in ion channel transcript levels in OZR compared to LZR. In addition, confocal microscope imaging showed internalization of leptin receptors in cardiomyocytes when exposed to a high concentration of leptin. These data suggest a novel mechanism for leptin resistance toward modulating cardiac ion channels known to affect natural pacemaking, such as  $Ca_v1.2$ .



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CAYSON PARKER, Department of Chemistry, Fairmont State University, Fairmont, WV, 26554; MARTIN CHRIST, West Virginia Department of Environmental Protection, and MATTHEW SCANLON, Department of Chemistry, Fairmont State University, Fairmont, WV, 26554. **Diffusion of CO<sub>2</sub>, a novel method to analyze CO<sub>2</sub> in acid mine drainage.**

Measuring the partial pressure of CO<sub>2</sub> in acidic solutions is of interest to those working to eliminate acid mine drainage (AMD). Infrared gas analyzers can be used with equilibration chambers, but would be prohibitively expensive for the nonprofit organizations leading AMD treatment. We are developing a method to measure amounts of CO<sub>2</sub> in alkalinity-free solutions by enclosing them in a sealed chamber with an alkaline trap. CO<sub>2</sub> will diffuse from the acidic solution to the trap, and then be detected by quantifying the hydroxide that it neutralizes.

JESSICA PAYNE, AUSTIN CUSICK, ADAM KENNEY, ROGER SEEBER, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Survival of *Francisella tularensis* in a nectar surrogate and the colonization of mosquitoes.**

*Francisella tularensis* is a highly infectious bacterium that causes tularemia. In parts of Europe, mosquitoes are capable vectors for transmission of *F. tularensis*. Presumably, mosquitoes become colonized with *Francisella* following extraction of a blood meal from an infected mammal. Mosquitoes feed intermittently on nectar between blood meals. Our long term goal is to determine whether mosquitoes deposit *F. tularensis* into plant nectar during these intermittent feedings. And if so, can the bacteria present in the nectar colonize a feeding mosquito, producing a disease vector. Therefore, we first sought to determine the viability of *F. tularensis* in nectar by inoculating sucrose solutions, a nectar alternative, in comparison to water and a bacterial growth medium (TSBc). Bacteria were capable of surviving in sucrose and TSBc over a long period of time relative to water. Mosquitoes (*Aedes aegypti*) feeding from this sucrose became colonized with *F. tularensis* as was determined by plating insect homogenates at various time points. The presence of *F. tularensis* was confirmed by PCR using *Francisella*-specific primers on the viable bacteria recovered from the mosquitoes that fed from the colonized sucrose.

JENNI PERKINS, JULIA OLIVETO, SEAN HARWELL, and ERICA HARVEY, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. Solar Army, West Virginia Brigade: **Beta-testing the Solar Hydrogen Activity Research Kit (SHArK) and new techniques for metal oxide distribution.**

In collaboration with researchers at the University of Wyoming and California Institute of Technology, we are searching for cheap, abundant metal oxide combinations to act as photoelectrocatalysts for solar energy conversion. Two student-friendly instruments used to test samples of metal oxides for a photocurrent are SHArK (Solar Hydrogen Activity research Kit) and SEAL (Solar Energy Activity Lab). Fairmont State University is working with both systems to improve the procedures necessary to collect data and to help distribute the project to K-16 students throughout West Virginia. SEAL, the more developed system, provides insightful sample results during SHArK's beta-testing phase. Beta testing has involved assembling and running the SHArK in varied configurations using LEGO pieces and other commonly available

materials, and troubleshooting the data acquisition boards and software provided by collaborators at the University of Wyoming. Test materials include a small commercial solar panel as well as mixed metal oxides prepared by pipetting metal salt solutions onto conductive glass plates and baking them in a kiln. Current progress on alternative methods (silkscreening and inkjet printing) to distribute metal salts onto the conductive plates will also be presented. Students who become involved in the Solar Army have the opportunity to work on a highly relevant problem, think critically about the technical aspects of the project, learn basic stoichiometric solution preparation and dilution techniques, and improve their technical writing and presentation skills. Work this academic year has been supported by the NASA Space Grant Consortium.

LORI M. PETRAUSKI, GREGORY A. GOOD, THOMAS RODD, GEORGE CONSTANTZ, and JAMES T. ANDERSON, Department of Wildlife and Fisheries Resources, West Virginia University, Morgantown, WV, 26505. **Using archival data to analyze patterns of bird breeding and flowering dates of wildflowers to create a baseline phenological database for the West Virginia University Natural History Museum.**

The objective of this study is to use archival phenological information to analyze temporal patterns of bird breeding, to evaluate the factors that affect full flowering in wildflowers, and to create a general database of phenological data across species in cooperation with the West Virginia University Natural History Museum. There has been little research on phenology in West Virginia and no central phenological database for the state exists. In order to create a long-term historical database, we are utilizing archival sources to uncover historical phenologic data. We are collecting information from diaries of nature-minded citizens, natural history observations found in local history centers, herbarium specimens, field station records, and field notes taken by nature clubs. Using this phenological information, we are analyzing patterns and the environmental variables that affect species specific to West Virginia. We are using a variety of techniques to recover, collect, and organize this historical phenologic data. Outreach materials including flyers, brochures, newspaper and magazine articles, an online blog, and social media are being used to reach citizens who are in possession of relevant data. This type of public outreach for data collection is unique in the field of phenology and an important resource in establishing a reliable baseline dataset for future climate change research and citizen science programs.

ANDREW PHILPOTT, ASHLEY HOFFMASTER, DANIELLE GRODI, and ERICA HARVEY, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Molecular dynamics simulations of detergent micelles.**

Molecular dynamics simulations are being performed to model the micelle properties of three detergents; 3-[(3-cholamidopropyl)dimethylammonio]-1-propanesulfonate (CHAPS), dodecyl maltoside (DDM), and dodecylphosphocholine (DPC). The goal is to see which type of detergent micelle best mimics the natural lipid environment for Proteorhodopsin, a light-activated membrane protein that acts as a proton pump. The detergents are built as individual molecules in a program called Avogadro, and multiple molecules are assembled into a spherical micelle configuration using a program called Packmol. VMD software is used to visualize the molecules and to add water molecules and ions to the micelles. The molecular dynamics simulations are run in NAMD software to see how the micelle behaves in water over time. Our longest simulation to date is 2 ns with the DPC system. Difficulties encountered include different atom naming and numbering conventions in molecule and micelle structure files versus

force field topology and parameter files. All software being used in this project is freely available and runs in a Unix-based operating system or on the Windows operating system, although Linux is recommended for easier use of some of the programs. This work has been supported by the NSF Research Infrastructure Improvement/NanoSAFE-HPC project at West Virginia University (WVU), Fairmont State University, and the NASA Space Grant Consortium, and has been carried out in collaboration with Blake Mertz, Assistant Professor of Chemistry at WVU.

KELSEY ROBERTSON and NATALIA OMELCHENKO, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Improving the clinical evaluation: palpatory sensibility is strongly influenced by wearing gloves.**

Palpation allows examination of variations in tissue and organs by feeling them from the surfaces of the body and is commonly used in diagnosis. To identify the factors that affect the palpation threshold, we studied the palpation capacity in 15 healthy volunteers. Each volunteer was presented with 12 boxes filled with sheets of paper (from 18 to 60 sheets). Some of these boxes contained a short nylon monofilament on the bottom. The boxes were given in a random order and the volunteer was asked to identify the presence of a monofilament by touching. The test was repeated 3 more times after the volunteer 1) had the hand into the ice cold water for 2 minutes; 2) performed the Stroop Color-Word Interference Task for 2 minutes (an accepted method to generate a mild stress in adults); and 3) put on the latex gloves (Sigma brand gloves that were appropriate for the volunteer size). The majority of volunteers were effectively recognizing the object under the paper (average threshold is 3.867 pages, +/- 2.295 SD). The palpation sensibility was not affected by exposure to cold (average threshold is 4.400 pages, +/- 2.923 SD,  $p=0.49$ ) or stress (average threshold is 3.2 pages, +/- 2.111 SD,  $p=0.19$ ). However, wearing the gloves decreased abilities of volunteers to correctly determine the content of the boxes (average threshold is 5 pages, +/- 2.323 SD,  $p=0.020$ ). Our data indicate that the palpatory ability is strongly influenced by wearing gloves. Nonetheless, regardless of the impact on palpatory threshold, the health care workers must continue to wear gloves if there is a risk to be exposed to body fluids or other potentially infectious materials.

ELIZABETH ROBINSON, RUTH CONLEY, and HEATHER BROWN, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Courtship behavior of *Aeluropoda insignis*, the flat-horned hissing cockroach.**

To characterize the courtship behavior of *Aeluropoda insignis*, the flat-horned hissing cockroach, we examined behaviors preceding copulation to generate an ethogram. These courtship behaviors and affiliated hissing sounds may form the basis of species recognition, since several species of the Oxyhaloinae (namely, tribe Gromphadorhini) have been noted to produce hissing sounds and a vocal apparatus has been described for *Gromphadorhina portentosa* (Nelson & Fraser 1979). In our experiments, two specimens of opposite sexed *Aeluropoda insignis* were placed in a sound-insulated room with audio & video monitoring for a thirty minute time frame. Videotapes were analyzed to create operational definitions for associated behaviors with behaviors and behavioral sequences compiled across successfully mating pairs of animals. The most common behaviors observed included hissing, antenna tapping, mutual antennation, and body posturing (telescoping of the abdomen) between one or both members of the pair. Abdominal telescoping or extension has been observed during agonistic behaviors among males of *G. portentosa* as well as within the courtship display (Clark & Moore 1994;

Nelson & Fraser 1980). A G-test (goodness-of-fit) shows that these behaviors and specific pairs of behaviors are associated during courtship. The resulting courtship behavior is similar to that reported for *Gromphadorhina portentosa* (Nelson & Fraser 1980), with the exception of characteristics of the hissing vocalizations, indicating that vocalizations may be the basis for species recognition and reproductive isolation within the species.

JOSEPH ROXBY and NATALIA OMELCHENKO, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **In pursuit of cyberconsciousness.**

The rising processing power of computers offers a possibility that our real-life personalities can exist outside of a biological entity. Here we attempted to outline a scaffold for such digital copies using a synthesis of knowledge of philosophy/ psychology and neuroscience. This analytical work relies on several assumptions: the neurons and their connections are fully responsible for our personalities and behaviors; the decisions we make result from information processing that can be simulated; the modern fields of neuroscience and psychology/philosophy deliver complementary ideas and data. We propose that there are at least five essential personality parameters that give weight to behavioral outcomes, some of which may be unique to humans: 1) Fear tolerance, the ability to overcome fears and the resistance to developing them in the first place; 2) Impulse tolerance, the ability to resist immediate impulses to gratify desires or correct homeostatic imbalances; 3) Emotional tolerance, the ability to resist the effects of emotion in favor of rationality; 4) Traditional tendency, the measure of likelihood that either a traditional or novel option will hold more sway; 5) Self-conception, the rewarding value we assign to projected outcomes. The parameters can be evaluated using both surveys and brain imaging (the topics that will be discussed in the presentation in details) and can provide a rough scaffold of our personalities. We believe that someday it may be possible to fine tune an artificial personality in such a way that its decision making process would be nearly indistinguishable from its biological counterpart.

STEVEN SAGUN, ELLIOT COLLINS, CALEB MARTIN, JOSEPH NOLAN, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Antimicrobial properties of trans-2-octenal and trans-2-decenal, the major aldehydes responsible for the scent of *Halyomorpha halys*, the brown marmorated stink bug.**

Some insects release scented compounds as a defense against predators. Such compounds in Earwigs have also been shown to have antimicrobial activity. Trans-2-octenal and trans-2-decenal are the major aldehydes responsible for the scent of *Halyomorpha halys*, the brown marmorated stink bug. Previous research has shown these aldehydes are antifungal and produce an antipredatory effect, but have never been tested for antibacterial activity. We hypothesized that these compounds functioned similarly to the analogous multifunctional action of earwig compounds, so we tested whether these aldehydes could inhibit the growth of bacteria. Disk diffusion assays indicated that these aldehydes significantly inhibited the growth of methicillin-resistant *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*, *in vitro*. An *in vivo* model using wax worms and meal worms coated in stinkbug aldehydes was utilized to determine if the aldehydes induced an antibacterial effect on live insects. Application of these aldehydes significantly reduced the colonization of bacteria on insects. These results suggest that stinkbug aldehydes are indeed antibacterial. These compounds could potentially be used as

novel antimicrobial treatments. Furthermore, aldehydes have been shown to destroy bacteria more efficiently when coupled with antibiotics, thereby decreasing minimum inhibitory concentrations necessary to kill microbes. This work was funded by a West Liberty University faculty development grant and an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health (P20GM103434).

DEREK SCHOPPERT and CAROL Z. PLAUTZ, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Exploration of memory formation and disruption in the pond snail, *Lymnaea palustris*.**

Given the biological and chemical complexity of humans, the use of a model organism is often ideal in experimentation; one such organism that has demonstrated suitability for the study of memory formation is the pond snail *Lymnaea palustris*. For this study, operant conditioning was used to test alterations in long-term memory (LTM) formation following exposure to a common widely used herbicide, Roundup. Snails were subjected to three 45-minute training sessions with a one hour break between the first two sessions and a 24-hour break before the third; in all sessions a tactile stimulus is applied upon attempted pneumostome opening. LTM formation can be assessed by a significant decrease in mean pneumostome openings from the first to the third session. Animals presoaked and trained in the presence of Roundup exhibited significant learning (from session one to two) as in control groups, but an inability to form LTM. LTM formation is related to up-regulation or activation of protein kinase C (PKC). Previous studies in our lab have demonstrated diminished PKC expression following conditioning with exposure to Roundup. The PKC inhibitor GF109203X was applied prior to and during conditioning to further establish a link between PKC and LTM in *L. palustris*.

CHRISTIAN SHIMER, DARRYL JOHNSON, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443; FRANK LIAO, Boonsboro High School, Boonsboro, MD; QING WANG, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443; and DAVID J. KLINKE, Department of Chemical Engineering, and Department of Microbiology, Immunology and Cell Biology, West Virginia University, Morgantown, WV, 26506. **Modeling of Japan's population by a Markov Chain Monte Carlo method.**

According to reports, Japan has experienced net population loss due to falling birth rates and almost no net immigration in recent years and this trend will continue in the coming decades. This project is aimed at developing the Japanese population growth model through a system of differential equations and then calibrating parameters against published census data using a Markov Chain Monte Carlo (MCMC) method. MCMC creates a probability distribution as its desired equilibrium distribution (basically the trajectory of the population) and it is desired because it provides a rapid convergence to probable areas of parameter space. The model has been formulated trying to accommodate all major factors that affect each subpopulation. It might be used to predict the future population and develop population management strategies that could avoid the declining trend in the long run. Funding supporting this project was received from West Virginia Higher Education Policy Commission Division of Science and Research SURE Grant Program and the NIGMS of the NIH grant as part of the West Virginia INBRE (P20GM103434).

ERIC TENNANT, SPENCER BELL, ZACHARY DILLARD, LUKE SADECKY, NICOLE SADECKY, ERIC TIDMORE, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Phylogenetic analysis of *Cambarus robustus* in the north, middle, and south forks of the Kentucky River.**

*Cambarus robustus* is a wide spread species complex whose global range extends from Tennessee to southern Ontario. This species has been assessed as Least Concern (LC) by the IUCN due to this large geographic range and current populations remaining stable. Southern populations may ultimately constitute undescribed species and require heightened conservation efforts. A protocol using modern phylogenetic analysis was developed to determine if *C.* (cf) *robustus* in the Kentucky River watershed were undescribed taxa or nominate *C. robustus*. *C. robustus* were collected from the north, middle, and south forks of the Kentucky River watershed. DNA was collected from leg tissue of the crayfish and prepared using a DNEasy Kit. Genetic sequences were run through a bootstrap analysis with 2000 iterations using program MEGA v6. *Cambarus* (cf.) *robustus* display extreme phenotypic plasticity in this watershed, with distinct phenotypes allied with specific basins. Morphological analysis has already proved consistent differences exist between basins. This project's goal was to corroborate morphological investigation with genetic information. Ultimately, Middle Fork *C.* (cf.) *robustus* claded separately from all other basins genetically, and are morphologically and genetically divergent from the rest of the Kentucky River system. Additional sequences are needed from the Middle Fork to officially declare it unique taxonomically.

JACKIE TURNER, Forensic Science Program, Fairmont State University, Fairmont, WV, 26554. **Analysis of GSR particles post firing and post laundering.**

Clothing was tested for GSR residues succeeding discharged weapons and laundering of worn garments with different types of detergents with warm water in a conventional washing machine. Each garment of the same type of fabric was tested post firing and post washing to determine if GSR particles were present if washed in different types of detergents in concentrations of 60 mL, 120 mL, 180 mL, and 240 mL of detergents: Purex dirt lift action, Oxi Clean max force and Ultra Tide plus bleach. Results demonstrated that nitrite particles were present post firing on all garments. Results concluded that the type of detergent did affect the particles of GSR. The increased concentrations affected the amount of GSR particles observed post laundering by the color intensity of the Gunpowder Particle Detection Kit that provided a sensitive method to visualize particles containing chemical nitrates. The detergent containing bleach products did not show any residual evidence of GSR particles post laundering. Testing of GSR particles on clothing does signify that a person was near a discharged weapon but cannot conclude whether or not they were discharging the weapon.

KATHERINE VECCHIO, MEGANN BOONE, and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alcohol induced alterations in DNA and RNA synthesis in rat cortical stem cells relate a possible mechanism for slowed stem cell growth and increased apoptosis.**

Fetal alcohol spectrum disorders (FASD) are associated with a mother who consumed alcohol while pregnant. FASD symptoms include physical effects, along with behavior and learning problems all associated to reduced proliferation and increased cell death of neural crest stem cells during embryo development. Under normal growth conditions Cyclin D1 expression is transiently increased during late G1 phase and signals cells to proceed to S-phase. D1 initiates a

cascade of events necessary for transcription of genes required for proper DNA synthesis. It has been shown in mouse embryos that alcohol increased cyclin D1 protein expression 2-fold, which in turn parallels increased picnosis in 40 % of alcohol exposed neuronal stem cells. We suggest that alcohol has induced premature G1/S phase transition by D1 overexpression, which, in turn, altered DNA synthesis and increased apoptosis. Through the use of flow cytometry we examined both RNA and DNA profiles with gating focuses on G1 and S phases respective. We then examined by antibody/fluorescent staining the overlapping expression of Cyclin D1 levels on these gated populations. Under normal growth conditions, Cyclin D1 expression is limited to the G1/S phase transition. Alcohol alters this expression pattern and suggests a continued expression in S phase cells. Profiles allowed an examination of apoptosis percentage as well. Understanding this mechanistic misregulation may eventually lead to a full understanding and treatment options for fetuses exposed to alcohol.

EVAN VENSKE, DANIEL MEYER, NICOLE SADECKY, and HEATHER KALB, Department of Biology, West Liberty University, West Liberty, WV, 26074. **Preliminary survey of turtles in the West Liberty Reservoir, West Liberty, WV.**

The reservoir at West Liberty University is home to a wide variety of animals including common snapping turtles, *Chelydra serpentina*, and midland painted turtles, *Chrysemys picta marginata*. Little is known about the population size or life history of these turtles. The survey will help us determine the number, sex, age, and species present in the reservoir. A second objective is to determine when the turtles go into hibernation and when they become active the following spring. The academic school year is from September through early May. For inclusion of the turtles into research focused courses, it would be useful for them to be active. This poster presents very preliminary results based on September, 2014 through the middle of March, 2015. Hoop traps (4) were placed at various locations around the perimeter of the reservoir. All turtles captured were weighed, measured, photographed and an ultrasound exam conducted on the females. A total of three adult male common snapping turtles, one hatchling common snapping turtle, and five (two females, three males) midland painted turtles were captured. The presence of the hatchling indicates that there are female snapping turtles present though they were not captured. No animals were recaptured. Both female midland painted turtles had ovarian follicles, but no oviducal eggs.

EVAN VENSKE, CLARISSA DAMIS, and ZACHARY LOUGHMAN, Department of Biology, West Liberty University, West Liberty, WV, 26074. **Isopod diversity survey in the Northern Panhandle of West Virginia.**

A survey of terrestrial isopods was conducted in the northern panhandle of West Virginia. The survey included many sites in Hancock, Brooke, Ohio, and Marshall Counties. Isopods were collected by hand at each of these sites. A total of 1158 isopods were collected belonging to seven genera and ten species. Of the seven genera, *Armadillidium* was the most numerous and *Porcellio* was found in the most sites.

DI WANG, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV, 26506, BOYI HU, Department of Industrial Engineering, West Virginia University, Morgantown, WV, 26506, FEI DAI, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV, 26506, and XIAOPENG NING, Department of Industrial Engineering, West Virginia University, Morgantown, WV, 26506. **A**

### **sensor-based factorial experiment on low back disorder (LBD) risk factors among roofers.**

Roofers have long suffered from low back disorders (LBDs), which is a primary non-fatal injury in construction. Until present, most of the research on roofing safety is mainly focused on fatal injury risks such as falls from height, leaving much to be desired in the risk assessment of non-fatal, cumulative musculoskeletal disorders among roofers. Ergonomics studies have identified several physical risk factors associated with LBDs in workplaces and developed predictive models for general LBD risk assessments. However, these models cannot be used for roofing assessments in that they are designed for general tasks without considering different roofer working postures and the effect of working on uneven rooftops. To understand the relationship between the risk factors (i.e., slope angle, posture, facing direction, and working pace) and LBD incidence in roofing shingle installation, a factorial in-lab experiment is conducted with the aid of the Vicon camera system and Electromyography (EMG) sensors. The bending angles and muscle strengths in the low back, which are measured by the two sensor systems, are analyzed as facts that indicate the LBD risk. The proposed experiment finds out the risk factors with significant effect on the LBD injury and interaction between the studied factors. The findings may be used to study the detailed ergonomic safety guidelines for roofing contractors and to reveal the working conditions which expose the roofers to a large LBD risk (e.g., stooping on a low-pitch roof at fast working pace), which will be useful for eliminating LBD risk factors on the roofing sites.

QING WANG and ZHIJUN WANG, Department of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443. **Shepherd CME S-STEM program: enhancing academic performance and career preparation of CME students.**

The Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) Program at Shepherd CME department (grant number: DUE - 1259713) has been funded by NSF since June 2013. The overall goal of the program is to increase the number of STEM graduates by providing financial, academic, and social supports, thereby enabling qualified students to overcome some of the barriers that prevent them from meeting their educational goals. The program has supported 19 students since Fall 2013. In this poster, major activities will be presented and survey and report results will be discussed along with initiatives that increase, retain, and support students in the computer science, mathematics and engineering fields.

## Oral Abstracts- Alphabetical

KATELYN AMSPACHER, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Ecology of the invasive cereal aphid, *Metopolophium festucae cerealium*, in the Pacific Northwest.**

*Metopolophium festucae cerealium* (MFC) is an invasive cereal aphid in the Pacific Northwest USA. The species has only become widely distributed in the region in the past four years, so this study aims to learn more about its general ecology. In its native habitat in the UK the species lives on wild grasses, however no MFC was found on wild grasses of the Palouse prairie in the Pacific Northwest. The genera *Metopolophium* overwinters on roses but no MFC was found on roses in the Palouse. A positive correlation was found in average abundance of MFC and *Sitibion avenae*, suggesting a "hot spot" theory of species abundance. MFC is a host to parasitoids of genera *Praon* and *Aphidius* which are natural enemies controlling population growth and invasion. The phytotoxic saliva of the species is enough to kill wheat in the



greenhouse, so an economic threshold will be produced to aid farmers in the decision to treat for aphids.

ELIZABETH ARNOLD, DEVIN HEITZ, TYLER MURPHY, PHILLIP YEAGER, and MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Assessing the impact of Marcellus shale drilling on stream health using *Daphnia magna* and benthic macroinvertebrates.**

To compare the quality of stream water above and below hydraulic fracturing drill sites in Doddridge, Wetzel, and Harrison Counties in West Virginia: 1) benthic macroinvertebrates were collected from 11 sites in order to calculate the Hilsenhoff Index values and 2) the freshwater crustacean *Daphnia magna* was used in a bioassay. Invertebrates were identified, counted, and categorized based upon their pollution tolerance level. This information was used to obtain the Hilsenhoff Index value for each location. *Daphnia magna* were placed in water samples from the locations above and below drilling sites and survival was monitored over the course of 2 weeks. Physical and chemical measurements were also obtained using an SYI Multi-Parameter Data Collection System (650 MDS) and a DREL 2400 portable quality laboratory. Hilsenhoff Biotic Index values decreased downstream of well sites at Frank Run 1, Frank Run 2, and Cherry Camp by 0.36, 0.23, and 0.14, respectively. No significant correlation was observed between sample location and *Daphnia magna* survivability. Total dissolved solids (TDS) measurements were higher at below sampling points for Cherry Camp, Smithton, Pike Fork, and Franks Run 1. Pike Fork below exhibited the highest TDS value at  $0.336 \pm 0.002$  g/L. Though TDS isn't considered a primary pollutant, it is often used as an indicator of the presence of chemical contaminants. While most chemical parameters showed no substantial discrepancies, further research is needed to determine the cause of increased TDS values. This research was funded by a Fairmont State University SURE grant.

SPENCER BELL, ZACHARY DILLARD, LUKE SADECKY, NICOLE SADECKY, ERIC TENNANT, ERIC TIDMORE, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **A pilot study into the habitation requirements of burrowing crayfish.**

Crayfish have historically been classified as primary, secondary, or tertiary burrowers based on burrowing behavior. Secondary and tertiary burrowers are primarily stream dwelling species which enlarge natural depressions into simple burrows. Primary burrowing species typically create more complex burrows with tunnel systems connecting multiple chambers. Although primary burrowing species inhabit a wide range of habitat types, they are typically thought to have similar morphology and ecological requirements for habitation. To test this theory, multiple primary burrowing crayfish species were collected in the area surrounding Lewisburg, WV. During collection efforts, morphological measures were taken, soil cores were collected, and site data was noted. Morphological ratios were calculated using chelae, carapace, and palm measures. Soil type was determined by calculating the percent sand, silt, and clay from each soil core. Preliminary cluster analyses of both morphology and ecological site data show variance existing between primary burrowing species. In the future, this theory will be further tested by including primary burrowing species from the Ohio River floodplains in analyses. This project was carried out using funding from the West Virginia University Summer Undergraduate Research Experience.

DEBORAH K. BEUTLER, Department of Biology, West Virginia University Institute of Technology, Montgomery, WV, 25136. **Effects on benthic macroinvertebrates of limestone sand addition to Morris Creek to mitigate the damage caused by acid mine drainage.**

Limestone sand (also known as limestone fines) have been used to treat streams that are vulnerable to acidic precipitation. In the Morris Creek Watershed, we are using limestone sand to pre-treat a stream that is under a continuous inflow of acid mine drainage (AMD) from several sources. Beginning in 2011, several tons of limestone sand have been dumped twice a year on the bank of the creek upstream of the outflows of two acid mine treatment facilities. pH and conductivity data of the stream were collected before and after the dumping of the sand. Benthic macroinvertebrates were sampled using kick nets at two sites near the limestone fines. There was a “dead zone” with no macroinvertebrates found immediately downstream from the pile of sand. However, in the stream between the AMD treatment facilities, macroinvertebrates, particularly mayflies, increased. We also conducted pebble counts that demonstrated that after the sand was dumped into the stream, there was an increase in embeddedness, with the sand filling in the spaces between the rocks, immediately downstream of the pile. The effect decreased with distance downstream of the pile. Embeddedness also decreased after high water from large rainstorms washed the sand out of the creek.

SERDAR BILGILI, ORLANDO UGARTE, and V'YACHESLAV AKKERMANN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506. **Acoustical coupling of Kelvin-Helmholtz instability in reacting viscous potential flows.**

Hydrodynamic instabilities play a profound role in the evolution, stabilization and control of fluid flows and flames. In this respect, the Kelvin-Helmholtz (KH) instability is an important trigger to induce turbulence within a single fluid by means of a velocity shear, or along the interface of multiple fluids. This mechanism was widely studied by Funada and Joseph for the surface separating two fluids within the approximation of inviscid and viscous potential flows [Journal of Fluid Mechanics 445 (2001) 263]. In the present work, the Funada-Joseph formulation is extended to incorporate the effect of imposed sound waves. The KH-sound interaction is investigated by modifying the Bychkov formulation on the acoustic coupling to the Darrieus-Landau combustion instability [Physics of Fluids 11 (1999) 3168]. Analytic formulae for the dispersion relations, growth rates and neutral curves describing the perturbed interface are derived. Namely, the limits for stable/unstable regimes as a function of hydrodynamic and acoustic parameters are determined considering a linear dispersion relation for the perturbed interface. Two interacting modes are of particular interest: resonant and parametric, characterized by their frequency in relation to the disturbance oscillation. Overall, a comprehensive parametric study of the results demonstrate that while the acoustics of relatively low amplitude shows a promising contribution to stabilize the KH instability, those of high amplitude can as well excite the parametric instability.

SERDAR BILGILI, BERK DEMIRGOK, and V'YACHESLAV AKKERMANN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506, and DAMIR VALIEV, Department of Physics, Umea University, Umea, Sweden. **Effect of Lewis number on flame acceleration scenario through channels.**

The role of  $Le$  in the flame acceleration scenario is investigated by means of direct numerical simulations of the complete set of combustion equations including fully-compressible hydrodynamics, transport properties (viscosity, diffusion, thermal conduction) and chemical

kinetics modelled by one-step Arrhenius reactions. We have identified a threshold Lewis number,  $Le_t$ , such that the thermal-diffusive effects do not appear for  $Le > Le_t$  and  $Le_t$  varies with the channel width. For  $Le < Le_t$  flames, the flamefront segment at the centreline is “retarded” as compared to the flame segments at the walls, thereby forming a cusp, followed by the cavities and pockets. Amazingly, a globally-convex flamefront splits into two or more “fingers”, accompanied by a drastic increase in the flame surface area and associated enhancement of flame acceleration. This picture is limited to the initial stage of acceleration. Later, the flame fingers meet, promptly consuming the cavities and pockets. This is accompanied by a substantial decrease in the flame surface area and associated moderation of flame acceleration. Eventually, this results in a single, globally-convex flamefront that keep accelerating. Overall, the  $Le$ -effects substantially facilitate the flame acceleration scenario, thereby advancing a potential deflagration-to-detonation transition. The effects promotes with the decrease in  $Le$  and with the increase in the channel width.

MEGANN BOONE, KATHERINE VECCHIO, and BRUCE ANTHONY, Department of Chemistry/Biochemistry, West Virginia Wesleyan College, Buckhannon, WV, 26201. **Alterations in DNA and RNA profiles from alcohol exposed cortical stem cells relate a possible mechanism for slowed proliferation and increased apoptosis.**

Fetal Alcohol Spectrum Disorders (FASD) has become an ever increasing health concern associated with consumption of alcohol during pregnancy. The mechanistic pathways under which alcohol slows cell growth and induces apoptosis are poorly understood, yet necessary to create possible treatments. Previous studies suggest that alterations in proliferation are associated with the loss of cell cycle checkpoint regulation at both  $G_1/S$  and  $G_2/M$ . Our previous studies suggest major contributions from overexpression of proteins associated with late  $G_1$  and the transcriptional induction of S-phase genes required for DNA synthesis. Cell growth was examined using BrdU incorporation over 36 hrs. and showed that  $G_1$  and S phases are slowed due to alcohol exposure. Our interest with this set of experiments is to define the periods of slow growth in both phases.

We used flow cytometry to examine RNA synthesis (Pyrinin Y staining representative of  $G_1$  progression) and DNA synthesis using 7-AAD. Each staining was done independently with one set in tandem. We used rat cortical neuronal stem cells which are progenitors of neural crest cells. Analysis included DNA, RNA and apoptosis profiles from both control and alcohol exposed cells. We suggest that a population of cells show alterations in  $G_1$  phase progression, induced early entry to S phase, and increased apoptosis. This research is important in understanding the mechanism in alcohol induced proliferation and apoptotic changes associated with alcohol exposure and allows insight into plasticity changes in FASD.

CAITLYN BURT and TIFANI FLETCHER, Department of Social and Behavioral Sciences, West Liberty University, West Liberty, WV, 26074. **Framing Effects and the Influence of Social Cues on Decision Making.**

When given choices, a person must use reasoning and judgment to make a decision. How the choices are stated, known as framing, can influence a person’s cognitive process when a forced decision is presented. However, it is currently unclear if framing or social cues presented are more influential on decision making. A convenience sample of 106 undergraduate students were given one of four hypothetical scenarios in which they had to make a forced choice between a

risky or safe program. Two of the scenarios were framed in a positive way in which the amount of “lives saved” were presented, while the other two scenarios were framed in a negative way in which the amount of “lives lost” were presented. The scenarios were further divided using a social cue, with an inclusion of either relatives lives at risk, or strangers lives at risk (4 scenarios: positive/relative, positive/stranger, negative/relative, negative/stranger). Using chi-squared analyses, results indicated that regardless of which social cue was presented, participants that read the negative framing scenario were more likely to choose the riskier program, while the participants that read the positive framing condition were slightly more likely to choose the safer program. Participants that read a scenario with a stranger were much more likely to choose the riskier program in both the positive and negative frames, while the relative scenario risky choice was more likely only in the negative frame. These results indicate that negative framing is much more influential in decision making compared to social cues.

SRI HARI RAMAKRISHNA CHALAGALLA, SINAN DEMIR, V’YACHESLAV AKKERMAN Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506, ALI S. RANGWALA Department of Fire Protection Engineering, Worcester Polytechnic Institute, Worcester, Massachusetts 01609, and VITALY BYCHKOV Department of Physics, Umea University, Umea, Sweden. **Predictive scenario for premixed methane-air flame spreading and explosion triggering in a mining passage.**

To reveal the inner mechanism of gas explosion, the entire scenario of premixed flame front evolution within an accidental fire is prescribed, quantitatively, with the situation of a methane-air explosion in a mining passage as the primary application. Specifically, the key stages of flame evolution are scrutinized. First, a globally-spherical expansion of a centrally-ignited, embryonic flame, with a possibility of self-similar acceleration caused by the hydrodynamic (Darrieus-Landau) instability occurs. This stage provides an order of magnitude increase in the flame speed in realistically large mining passages. Second, a transition from a globally-spherical front to a finger-shaped one happens when a flame starts approaching the passage walls. While this acceleration is extremely strong, it stops as soon as the flame touches the passage wall. This mechanism is Reynolds-independent; being equally relevant to micro-channels and giant tunnels. The flame speed increases by one more order of magnitude during this stage. Eventually, a flame may accelerate due to wall friction as well as in-built obstacles and wall roughness. While this scenario could be dominant at micro- and mesa-scales, it appears negligible in a mining passage because the influence of wall friction decreases, drastically, with the Reynolds number, and wall-attached obstacles are small in mines. Overall, we have identified the key characteristics of all stages such as the timing for each stage as well as the flame shapes, propagation speeds, acceleration rates, and flame-generated velocity profiles. The flame speed rises by orders of magnitude. Starting with laminar homogenously-gaseous combustion, the analysis is subsequently extended to dusty-gaseous environments.

CORY S. CRAMPTON and OSMAN GUZIDE, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **802.11ax HEW.**

For my project, I will be researching the new wireless protocol of 802.11ax. From what I have researched up to this point, this new protocol is capable of achieving new vast speeds. These speeds have the capacity to reach up to 7 gigabytes per second. AX is simply taking the current 802.11ac which operates solely on 5 GHz and allowing the system to operate on both 2.4GHz and 5 GHz. Other new features of AX are the Full Duplex capability, the Uplink MU MIMO

which is the counterpart to ac's Download MU MIMO, along with many other new advancements.

SINAN DEMIR, HAYRI SEZER, West Virginia University, Morgantown, WV, USA, ALI S. RANGWALA, Worcester Polytechnic Institute, Worcester, MA, USA, VITALY BYCHKOV, Umea University, Umea, Sweden, and V'YACHESLAV AKKERMAN, West Virginia University, Morgantown, WV, USA **Theory and modeling of flame acceleration mechanisms for spatial variations of planar flame speed.**

While a planar premixed flamefront propagates with a speed,  $S_L$ , that depends on the thermal-chemical properties of the fuel mixture only, irrespective of the configuration and hydrodynamics, such a flame occurs extremely seldom in the practical reality. Indeed, the majority of industrial and laboratory flames are corrugated, in particular, due to turbulence, acoustics, shocks, combustion instabilities, wall friction, in-built obstacles etc. Majority of theories, associated with the variety of flame acceleration scenarios, are based on the "geometrical formulation": namely, the wrinkled to planar flame speeds ratio,  $S_w / S_L$ , is evaluated as the scaled increase in the flame surface area, while the entire combustion chemistry is immersed in  $S_L$ , which is assumed to be constant. However, in the practical reality,  $S_L$  may experience spatial and temporal variations; at least, due to the associated pressure and temperature distribution within a combustor, and their evolution during burning. In the present work, we initiate the systematic study of a much more intriguing situation – when  $S_L$  - variations are *externally imposed* in a manner being a free functional of the formulation. This is relevant, in particular, to multi-phase combustion in dusty environment, with a non-uniform distribution of combustible and/or inert dust; as well as to the event of spatial variations of the equivalence ratio. First, the variety of spatial  $S_L$  - distributions are incorporated into the *Bychkov* theories of flame acceleration due to wall friction [*Physical Review E* 72 (2005) 046307] and “finger” flame shape [*Combustion and Flame* 150 (2007) 263]. Second, we develop the *Dust and Gas Explosion Model* (D-GEM) – a computational platform capable of quantifying the mining fire hazards, namely, the probability of spontaneous ignition, the evolution of a flame front, and the likelihood of a deflagration-to-detonation transition. A backbone for the platform is a fully-compressible, finite-volume Navier-Stokes code solving for the hydrodynamics and combustion equations in a homogeneously-gaseous, laminar environment. Specifically, the dust (combustible or inert) is implemented into the theory and solver by means of thermal-chemical parameters of particle-air flames, tabulated as functions of particle type, size and concentration. In particular, the classical *Seshadri* formulation [*Combustion and Flame* 89 (1992) 333] for the laminar premixed particle-cloud flame speed is employed. It is investigated, the variety of gradient forms for the dust distribution.

ZACHARY DILLARD, KATIE SCOTT, MATTHEW MCKINNEY, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Geospatial analysis of *Cambarus monongalensis* across a habitat gradient.**

*Cambarus monongalensis* (Blue Crayfish) are burrowing crayfish that are found throughout the mountains and hills of West Virginia and Pennsylvania. This study was conducted in order to determine *C. monongalensis* habitat preferences. Transects were set up around a crayfish colony

and data concerning burrow entrances and burrow numbers was collected. Collected data was interpreted using geostatistical analysis techniques which created maps that reveal *C. monongalensis* preferred habitat. In addition to discerning habitat preference, the geostatistical analysis also reveals that *C. monongalensis* behave differently depending on their microhabitat. This can be inferred by differences which were identified in burrow entrances across multiple microhabitats. It was determined that *C. monongalensis* prefer to inhabit “seep” microhabitats. These areas are typically found adjacent to waterways and have high water tables and moisture levels, yet experience no water flow. Specimens inhabiting burrows outside of seep microhabitats employ specific burrow architecture in responses to deeper water tables. Identified behavioral differences across microhabitats included creating open burrow entrances where water levels were highest and utilizing burrow plugs and chimneys where water tables are lowest. This is believed to be a behavior adapted in order to inhibit and decrease evaporation rates where water is relatively scarce. These revelations are important aspects of *C. monongalensis* ecology that were previously unknown.

MAURO DOZA, HANS VOMEND, ZHIJUN WANG, QING WANG, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443, and DAVID J. KLINKE, Department of Chemical Engineering and Department of Microbiology, Immunology & Cell Biology, West Virginia University, Morgantown, WV, 26506.

#### **Immunotherapy treatment strategies of cancer via impulsive control.**

Cancer has been one of the leading causes of death. Although traditional treatments have been developed to deal with cancer, new methods have been investigated to prevent and successfully treat cancer. Immunotherapy is one of such treatments against tumor cells. Unlike the aggressive approach of chemotherapy and radiotherapy, immunotherapy enhances the body's own immune system to eliminate the tumor cells. We revised the Kirschner-Panetta model (J. Math. Biol. 1998) that used the LAK therapy in conjunction with the TIL therapy to control tumor growth. The therapies were implemented by the injection of cultured immune cells that have anti-tumor reactivity into tumor bearing host where cytokine IL-2 was used as an enhancer to the effector cells. The modified version used an impulsive ODE system to allow for a more realistic model of injections of IL-2 and effector cells at discrete times. Based on the revised model, we tested the effect of dose and timing of the combined immunotherapy treatments by impulsive control depending on the scale of the tumor cells to develop an optimal solution scenario. This project was supported by the NIGMS of the NIH grant as part of the West Virginia INBRE (P20GM103434).

MAURO DOZA, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Harnessing electrical energy from the body using thermoelectric energy and other methods.**

Technological advancements have made it possible to miniaturize our technology, whether it is our powerful smartphones, health monitors, or implantable medical devices. Pacemakers relieve arrhythmia victims of the abnormal heart rhythms and allow them to lead a better lifestyle. Cardioverter defibrillators are also an implantable technology. It helps victims with tachycardia, which is a fast heart rhythm, to be able to prevent heart attacks. About every 5 years these victims have to proceed with yet another invasive surgery, which will further weaken their bodies, in order to be able to replace the batteries. Bringing attention to the battery power, this research will look at viable ways to harness energy produced from the body in order to power the

wearable and implantable technologies currently available. Taking the models and information given by Seebeck (1821), Thermoelectric energy will be a focus on this research. It has been around for a while but never really caught on because of its inefficiency issues. With new technologies in the nanotech field, we will explore the materials used, such as etched nanowires. Attempting to maximize the power output to be able to power our devices is the main objective.

SHENA EYE and MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Effects of prolonged exposure and short term exposure of different concentrations of bromoform on *Daphnia magna*.**

Bromine, a concern for drinking water, is a chemical found in flowback water resulting from hydraulic fracturing. As illegal dumping and spills of this water occur, bromine ions enter the groundwater. At water treatment facilities, bromine ions replace chlorine ions forming bromoform and other potentially dangerous disinfection byproducts. The EPA issued a maximum contaminant level for total contaminants in drinking water of 0.1 mg/L. The effects of this level of bromoform on *Daphnia magna* were observed. Concentrations of 0.01 mg/L and 1.0 mg/L were also evaluated. The hypothesis was that higher concentrations of bromoform would decrease *Daphnia magna* population growth faster than lower concentrations. By exposing *D. magna* in spring water to these concentrations of bromoform, prolonged exposure observations were obtained. A group with no added bromoform served as the control. Data was collected based on population size for two weeks. Organisms were also viewed under a dissecting microscope to observe morphological features such as longer limbs. Short term exposure involved exposing organisms to different concentrations for one hour. The heart rate was examined through a dissecting microscope. Preliminary long-term exposure results show an unexpected large decrease in population for the control group. Current experiments are investigating the effects of different water sources on population growth before repeating the bromoform exposure experiment again.

ZACHARY FERGUSON, SARAH METZ, STEVEN ROOF, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Determining the retention factor of ink to develop a laboratory to be used in an introductory non-science major's class.**

Paper Chromatography is used to separate mixtures into their rightful components. In this research, the purpose is to additionally involve students with non science majors in forensic biology. Chromatography samples have a stationary phase in which a solid or liquid is supported on a solid. As the solvent moves up the paper, the different components of the mixtures will separate into multiple colored spots. Ethyl alcohol (70%), ethyl alcohol (80%), and tap water were used as the solvent to determine the varying components of the ink(s) used. Previously prepared inks were applied as well as food coloring mixtures to help stimulate the ink compounds. Some of the compounds in the mixtures traveled nearly as far as the solvent did; while others remained near the base line.  $R_f$  values were calculated to help determine the distance traveled compared to the solvent. The structure of the paper used chromatography is made of cellulose fibers, which is a polymer of glucose. Difficulties arise due to the cellulose fibers attracting water vapor in the process of the paper being manufactured. This interaction with water is one of the most important effects during chromatography. From the results obtained, it is apparent that ethyl alcohol is the best solvent; 80% ethyl alcohol being the most efficient;

however, the majority were water soluble; the results were not ideal. When using tap water, the individual colors did not separate as efficiently.

ADAM P. FISCHER and SARAH L. MILES, Department of Biochemistry and Microbiology, Joan C. Edwards School of Medicine, Marshall University, Huntington, WV, 25755. **Vitamin C...not just for sailors: Examining ascorbate-mediated down regulation of hypoxia-inducible factor-1 in metastatic melanoma.**

Ascorbic acid (AA) is a simple, yet essential compound for multiple biological functions. The potential use of ascorbic acid as an effective non-toxic adjuvant treatment to enhance chemotherapy is supported by the discovery that many patients with advanced cancer, including melanoma, are vitamin C (ascorbic acid) deficient. Ascorbic acid acts as an important cofactor for HIF hydroxylase enzymes that regulate the oxygen sensitive degradation of hypoxia-inducible factor (HIF-1 $\alpha$ ). Overexpression of the HIF-1 $\alpha$  transcription factor has been linked to the progression of several cancer types including melanoma. Previous studies in our lab show a correlation in melanoma progression and stabilized HIF-1 $\alpha$  protein expression under normoxic conditions, with the highest expression found in metastatic cells. In these studies our aim was to determine the ability of WM9 metastatic melanoma cells to accumulate ascorbic acid following exposure to various ascorbic acid derivatives as well as determine the ability of ascorbic acid to effectively inhibit normoxic HIF-1 $\alpha$  protein stabilization, accumulation and transcriptional activity by supporting the function of HIF hydroxylases. Our results demonstrate that not only is ascorbate preferentially transported/accumulated by WM9 cells over dehydroascorbate (DHA; oxidized ascorbate), it is more effective in attenuating HIF-1 function by significantly reducing both HIF-1 $\alpha$  protein accumulation and transcriptional activity. Furthermore, treatment of WM9 cells with ascorbate 2-phosphate (A2P; non-oxidizable AA) decreased their invasive potential. These studies suggest the addition of ascorbic acid could be a beneficial adjuvant therapy in melanoma treatment, in addition to other malignancies, particularly in types expressing high HIF-1 $\alpha$  expression/stabilization and warrants further investigation.

JESSICA GEIERMANN, Department of Biological Sciences, Shepherd University, Shepherdstown, WV, 25443, and JORDAN MADER, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443. **The synthesis of polystyrene foams via HIPE for arsenic remediation.**

Arsenic is relatively abundant in the earth's crust, yet removing it from water sources is still an issue in many places. Even in the United States, some wells contain far above the World Health Organization's 10 $\mu$ g/L standard (World Health Organization, 2012). Using polystyrene foams synthesized via HIPE, a thiol functional group was added to the polymer in order to bind arsenic as contaminated water passes through the polymer. During the course of this research, it was found that by adjusting the methods in Dujardin, Cazé, & Vroman (2000), the thiol group can be added to the polymer. Arsenic concentrations were lowered from 400 ppb to 175 ppb with a 120 mg/cc density foam. Further testing will be completed to refine the process of functionalizing these polymers, as well as testing for the presence of a thiol group and quantifying arsenic removal. This work was supported by the West Virginia Higher Education Policy Commission Division of Science and Research SURE Grant Program, the Shepherd University Chemistry Department, and the Shepherd University School of Natural Sciences and Mathematics.



MARQUEZ GIBSON, ANDREW LEICHLITER, ALICE MAGRO and ALBERT MAGRO, Department of Biology, Fairmont State University, Fairmont, WV, 26554. **Evolutionary basis for exaggerated anatomical proportions in artistic renditions of human form.**

An aim is to provide an evolutionary perspective with regard to the aesthetic appreciation of human form. Representations in art and pop art and also in fashion and cosmetics illustrate a correlation between hominin evolution and our sense of beauty of human form. A comparison of the fossil record of hominins with our sense of beauty of anatomical proportions indicates that ancestral (plesiomorphic) traits are considered unattractive while more recently evolved (apomorphic) anatomical traits are considered attractive. In artistic renditions of humans and in fashion and cosmetics we tend to exaggerate differences between us and closely related species. We refer to this phenomenon as Cross Species Avoidance, which is a form of sexual selection leading to the adaptation of our current anatomical proportions. As an exaptation we find artistic renditions that exaggerate facial and post cranial anatomical proportions aesthetically appealing. Visual cues allow us to distinguish between us and closely related species, thus avoiding sterile offspring or no offspring at all. As a result, modern *Homo sapiens* exist with a host of derived anatomical traits including: long neck and legs, straight fingers, full lips, V-shaped torso and large eyes as just a few examples of apomorphic traits resulting from Cross Species Avoidance. Despite our propensity to emphasize derived traits there are art works which exaggerate both plesiomorphic and apomorphic traits. This disproportionism is aesthetically appreciated and can be quite dramatic. Fundamentally, Cross Species Avoidance provides an evolutionary rationale for our appreciation for exaggerated traits in artistic representations of human form.

EMILY GRANT and STEVEN ROOF, Department of Biology, Chemistry, and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Osmosis investigations for elementary education majors.**

The objective of the project was to develop a simple laboratory exercise for elementary education majors that would allow them to investigate the concept of osmosis. The major goals were to create the exercise using basic scientific equipment, collection of data from multiple replications, and analyze data collected using Excel software. The reagents needed to be inexpensive, easy to obtain, and safe while the laboratory portion of the exercise needed to be completed within a two hour time block. Small pieces were cut from different fruits and vegetables that weighed 1-2g, soaked in six well culture plates with various concentrations of sodium chloride, and then reweighed. Reasonable data was obtained when the fruits and vegetables were soaked for an hour in the salt concentrations that ranged from 1 to 6%. The analysis of the data required basic Excel software skills to determine the percent change in weight, preparation of graphical representations, and addition of a linear trend line. Basic algebra is also required to determine concentrations of salt that would be isotonic to the vegetable or fruit used. The laboratory exercise can be extended to facilitate more open ended student experimentation by using different salts and/or the additional fruits or vegetables.

DONALD D. GRAY, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV, 26506. **Three dimensional visualization of the specific head function of open channel hydraulics.**

In 1912 the Russian hydraulic engineer Boris Bakhmeteff (1880-1951) introduced the specific head, a new quantity for use in the analysis of open channel flow. Specific head is the total head with respect to the invert of an open channel. It is the sum of the integrated velocity head and

the depth of flow at a given cross section. Specific head (a.k.a. specific energy) has proved to be a key to understanding the energetics of open channel flow. It is discussed at length in every open channel book. Usually the discussion is illustrated by two dimensional plots of depth vs. specific head with flowrate as a parameter and/or depth vs. flowrate with specific head as a parameter. Obviously these graphs depict slices through a surface in a three dimensional space whose coordinates are depth, flowrate, and specific head. The plots are almost invariably displayed only for rectangular cross sections, and the three dimensional specific head surface is rarely shown. Using modern graphical software, this presentation will display the specific head function as a surface in three dimensions for rectangular cross sections. For the first time, the specific head function will also be visualized for triangular, trapezoidal, parabolic, and circular cross sections, revealing some unexpected features.

HALLIE GUNNOE, LINDSAY MILLER, and DONALD TRISEL, Department of Biology, Chemistry, and Geoscience, Fairmont State University, Fairmont, WV, 26554. **The science and folklore of using medicinal plants to treat Diabetes Mellitus.**

Type II Diabetes Mellitus is a chronic condition in humans resulting from insulin resistance in fat and muscle cells and impaired secretion of pancreatic  $\beta$  cells, which create insulin in the body. This resistance causes a chronic state of hyperglycemia and can be fatal without treatment. Glycemic homeostasis maintenance is the common objective for those who have Type II Diabetes. The goal of this research was to collect, cultivate, and study medicinal plants used historically or currently to treat Diabetes Mellitus. Extracts of barberry (*Berberis vulgaris*), ginseng (*Panax quinquefolius*), aloe vera (*Aloe barbadensis*), and ginger (*Asarum canadense*) are all classified as sulfonyleurea derivatives and act on  $\beta$  cells to increase insulin release. Licorice (*Glycyrrhiza foetida*) has also been found to regulate insulin resistance by reducing blood pressure and blood glucose levels. Plants were grown in the green house, and five collecting trips to the northern West Virginia counties of Marion, Harrison, Randolph, Monongalia, and Lewis were taken to collect various specimens. A total of 96 plants were collected, mounted, and digitized to contribute to the Fairmont State University Herbarium (FVWA). New updates for the Checklist and Atlas of the Vascular Flora of West Virginia will be provided from the results of this study. This research was supported by a Fairmont State University S.U.R.E. grant.

SHELBY HAYES, Department of Biology, Shepherd University, Shepherdstown, WV, 25404, and JEFFREY R. GROFF, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown, WV, 25404. **Assessment of a model population's sensitivity to collapse and extinction due to generational variance in adult survivorship.**

Populations of organism subjected to unsustainable human harvest may collapse or become extinct. The purpose of this investigation is to study how generation-to-generation variability in harvest size, or more specifically adult survivorship, affects the susceptibility of a model population to collapse and extinction. The study utilized a modified logistic map-model of population change and the MATLAB programming environment to simulate a population subjected to proportional harvest over many generations. While the adult survivorship is a beta-distributed random variable that changes from generation-to-generation, the populations intrinsic growth rate was assumed to be constant during any individual simulation for simplicity. Our results indicated that for an adult survivorship of fixed mean, the sensitivity of our model

population to collapse often increased, and the expected number of generations until collapse decreased, as the variance in adult survivorship from generation-to-generation increased. These results indicate that managers of populations subjected to human harvest should strive to reduce generation-to-generation variability in adult survivorship. Thus, harvest sizes should be dynamically set to smooth out fluctuations in adult survivorship instigated by other natural or manmade causes. At the same time, our results suggest that maximizing generation-to-generation variability through artificial means may be a successful strategy for mitigating nuisance and invasive species. Funding supporting this project was received from West Virginia Higher Education Policy Commission Division of Science and Research SURE Grant Program.

DEVIN HEITZ, DANNIE ARNOLD, TYLER MURPHY, PHILLIP YEAGER, and MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Microbial testing of water quality near Marcellus shale drilling.**

In recent years the integrity of water quality near Marcellus drill sites has been questioned. Microorganisms are typically the first organisms to react to chemical and physical changes in any given environment and it is for this reason that chemical and physical properties as well as microbial activity within the water were tested. Water samples were taken from above and below well sites at seven different locations. While there was not an overall consistent pattern for other chemical properties measures, total dissolved solid levels were noticeably higher below well sites in comparison to above. The microbial testing that was conducted included the use of EcoPlates and coliform plates (using Coliscan Easygel) so that both environmental change and bacterial diversity could be measured. The data collected from the EcoPlates concluded that most of the sites differed between their above and below locations in terms of microorganismal diversity. Immense differences were observed at the Franks Run and Lewis Wetzel sites. The Coliscan Easygel plates showed that there were significant differences in the amount of bacterial colonies above and below some of the sites; two of the more noticeable differences occurring between the above and below sites of Cherry Camp Road and Franks Run ponds. Further monitoring needs to be expanded to determine the exact cause of each difference in bacterial diversity. This research was funded by a Fairmont State University SURE grant.

SEUNGHO HONG, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV, 26506. **Scour downstream of a spillway.**

The consequences of climate change cause historically unprecedented flood stages in the major rivers and their tributaries. To bring water security and flood protection, weir control structures are typically used in the river. However, structural stability of the weirs because of scour downstream of the spillway has become the object of heated debate at several locations. For example, drought conditions in South Florida during 2007 and 2008 induced extremely low tailwater stages downstream of Structure 65E on the Kissimmee River and the low tailwater stages of downstream of the spillway resulted in swept-out hydraulic jumps that enhance scour downstream of the structure. A hydraulic model study and field study were conducted simultaneously in Georgia Tech and in the South Florida Water District Managements (SFWDM) to further investigate the hydrodynamics of the flow downstream of the structure during conditions of low tailwater. As a part of projects, two methods that can be used for securing the safety of structure were tested in the field and in the laboratory. In the field, new tailwater weirs were constructed with earthfill materials and sheet piles about 1.5 km downstream

of an existing spillway to investigate any additional scouring action or not during the drought season. In the laboratory, 1:30 scale hydraulic model of the gated spillway was constructed and the effect of riprap apron length on the stability of the bed immediately downstream of a weir structure were tested. Both methods successfully reduce the scour depth and move maximum scour depth further downstream.

DEANNA M. SCHMITT, TRICIA GILSON, LEANNE MAZZELLA, MATTHEW FORD, REBECCA BARNES, TAYLOR ROGERSON, ASHLEY HAUGHT, JAMES BIRCH, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. ***Francisella tularensis*, a bacterium that's no-bloody-good.**

*Francisella tularensis* is among the most virulent organisms on the entire planet. Fewer than 10 of these bacteria are capable of initiating a disease that causes death in 60% of untreated patients. *F. tularensis* bacteria are notorious for replicating in host macrophages and neutrophils – cells that normally phagocytose and kill squatting bacteria. Unlike phagocytic cells, erythrocytes (red blood cells) are normally incapable of engulfing extracellular material, including bacteria. At a low frequency, *F. tularensis* can invade erythrocytes, suggesting that these bacteria induce a change in non-endocytosing cells to allow for translocation into the red blood cell cytosol. This manipulation of the erythrocyte is mediated by effector molecules of two distinct protein secretion systems. These effectors likely modulate spectrin, a major component of the erythrocyte cytoskeleton, to facilitate bacterial entry. *F. tularensis* bacteria residing within erythrocytes are more resistant to antibiotics. Moreover, intraerythrocytic bacteria are better at colonizing *Amblyomma americanum* and *Ixodes* sp. ticks – blood sucking arthropods capable of transmitting *F. tularensis* to humans. Erythrocyte invasion seemingly protects or allows for *F. tularensis* bacteria to better adapt to the low pH associated with the tick gut. Interestingly, other bacteria recently discovered to invade erythrocytes also use ticks as arthropod vectors for transmission. We speculate that, like *Francisella*, these other bacteria gain access to the intracellular space of erythrocytes to enhance tick colonization. (Supported by NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence, funding from the WV Research Challenge Fund [HEPC.dsr.14.13], and a grant from the National Institute of Allergy and Infectious Diseases [5K22AI087703]).

RYAN HOUSER, MARK FLOOD, and TONY MORRIS, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Determining the mutagenic effects of bromoform and its impact on the environment as a carcinogenic substance.**

The Ames Test is a simple test for mutagenic properties of different chemicals upon a special strain of *Salmonella*. They require the amino acid histidine for growth as they are auxotrophic. The test relies upon mutations that would revert the bacteria forms that are able to self-produce histidine (prototrophic). The levels of bromoform have been rising in the environment due to the increased level disposal of fracking fluids into the West Virginia watersheds. The objective of the experiment was to determine if concentrations of bromoform that have been documented in the environment and in drinking water are mutagenic. The mutagenic effect was tested using bromoform in concentrations of 1.0 mg/L, 0.1 mg/L, and 0.001 mg/L. Preliminary results are pending, but the expectation is that the highest concentration of bromoform will generate the most mutations in the Ames Test. Further rounds of testing are expected after the results of the initial experiment are collected.

RACHELLE HUFF and OSMAN GUZIDE , Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Robotic operating system (ROS) used for swarm technology.**

. My project is to research applications of ROS for autonomous swarm robots with a focus on navigation capabilities as well as looking into new methods, or simply better methods, of developing an operating system for swarms to allow a more robust network that permits the swarm to have a variety of capabilities. The idea is basically to look into ways of making a system that supports a multitude of more “intelligent” robots having them be more versatile and be able to act as a group or as completely separate individuals while still connected.

DARRYL JOHNSON, QING WANG, ZHIJUN WANG, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443, and DAVID J. KLINKE, Department of Chemical Engineering and Department of Microbiology, Immunology and Cell Biology, West Virginia University, Morgantown, WV, 26506. **Modeling the mechanism of Oxaliplatin and IL-12 cooperation.**

Oxaliplatin, a chemotherapeutic agent, has been shown previously to cooperate well with interleukin 12 treatments of colorectal cancer liver metastases in mice. Experiments show that not only does this treatment eliminate the tumor present, mice treated with this form of immunotherapy have shown a resilience to tumor rechallenge. This research proposes a mathematical model that attempts to explain the mechanism by which this cooperation and increased resilience are brought about. A Markov Chain Monte Carlo algorithm is used to find the probable regions of parameter space that fit the proposed model and a bifurcation analysis is performed to demonstrate how treatment brings subjects to a stable tumor-free equilibrium. This project was supported by the NIGMS of the NIH grant as part of the West Virginia INBRE (P20GM103434).

DARRYL JOHNSON and RALPH WOJTOWICZ, Department of Computer Sciences, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443.

**Analysis of logical structure of topos quantum mechanics.**

The Kochen-Specker (KS) theorem, proved in 1967 asserts the impossibility of a deterministic quantum mechanics that simultaneously assigns a value to every classical variable. This proved that hidden variable theories were fundamentally inadequate for explanation of quantum phenomena and spelled the final blow towards realist approaches. In 1998, Isham and Butterfield proved that KS is equivalent to a statement about the structure of a certain presheaf topos. In 2008, Doring and Isham developed a schema by which physical theorems may be treated as representations of an appropriately typed formal language into a topos. This work seeks to survey the logical structure induced by the presheaf over the category of contexts proposed by Doring and Isham. We list and prove various tautologies in the semantics of such topos representations and offer physical interpretations on such tautologies.

THOMAS JONES, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown, WV, 25443, and JEFFREY R. GROFF, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown, WV, 25404. **Comparing the accuracy of polygon versus point classification training in Google Earth Engine.**

This study was undertaken to optimize the process of mapping mountaintop mining, which will allow for the production of an updated map of the mining sites in West Virginia. To undertake this study, a classifier, which assigns types of land cover to a designated category, was trained on 2009 Landsat-5 imagery. The classifier was trained twice, once using points and a second time using polygons, in order to see which training method performs best at identifying mountaintop-mining sites in West Virginia. This study was performed at SkyTruth in Shepherdstown, WV. After the training of the two classifiers was completed in Google Earth Engine (GEE), they were then imported into Quantum Geographical Information Systems (QGIS). In QGIS, twelve chosen mine boundaries had been drawn using 2009 National Agriculture Imagery Program (NAIP) imagery as a reference in order to compare the accuracy of the two classifiers against the digitized mines. The results of a Paired Sample T-Test yielded a significance of .006 and a t value of 3.417, which meant that the first variable, point areas, had a significantly higher mean than the second variable, polygon areas. Despite the greater concentration on perfecting the polygon trainer, the point trainer classifier turned out to be more accurate in identifying mountaintop removal area. For future research, giving equal attention to perfecting both training methods would be the next step in discovering if the point method of training actually is more accurate than the polygon method.

ADAM KENNEY, AUSTIN CUSICK, JESSICA PAYNE, ROGER SEEBER, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Colonization of mosquitoes by *Francisella tularensis* via a nectar reservoir.**

Although mosquitoes have been responsible for some of the largest arthropod-borne tularemia outbreaks reported, little is known about mosquitoes' interaction with *Francisella tularensis* in nature. Mosquitoes likely acquire *F. tularensis* by taking a blood meal from an infected animal. Between blood meals, these insects feed from flower nectar. We hypothesize that colonized mosquitoes are able to inoculate flower nectar with *F. tularensis* during these intermittent meals. The aim of this research project is to reassess the role that mosquitoes play in the spread of *F. tularensis*, as well as to evaluate the possibility of flower nectar to act as a reservoir for *F. tularensis*. To test this, mosquitoes are reared and fed a nectar substitute inoculated with *F. tularensis*. Preliminary results show that *F. tularensis* can be isolated from the remains of mosquitoes subjected to inoculated nectar substitute. Moreover, results confirming that *F. tularensis* can survive in a nectar substitute over time have been collected, asserting the plausibility that nectar may act as a natural reservoir for *F. tularensis*. Future endeavors of this study include observing where in the mosquitoes' body *F. tularensis* resides, with the ultimate goal of gaining a firmer grasp of how mosquito-borne tularemia infections arise.

GEORGE H. LAMBERT, SUSAN MARTINEZ, and SHER HENDRICKSON, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Species occurrence and genomic sampling of salamanders in the Eastern Panhandle of West Virginia**

The objective of this research was to determine species occurrence and genomic sampling of salamanders in Jefferson and Berkeley counties in the West Virginia panhandle. Salamanders in Jefferson County were sampled in Morgan's Grove Park in Shepherdstown, West Virginia. Berkeley County samples were taken at Sleepy Creek Wildlife Management Area. Most sampling in Morgan's Grove Park consisted of sampling for aquatic larvae within the stream in 10 meter transects. Sleepy Creek samples consisted of terrestrial sampling. Specimens were

taken from the field sites to a laboratory setting in order to gather morphometric data and collect tissues for a genomic repository. Morphometric data collected consisted of weight, total length, and snout-vent length to determine age class of specimens sampled. Genomic sampling consisted of clipping tails and toes for DNA extraction and for future identification of recaptured specimens. Liver and heart samples were collected from freshly euthanized voucher specimens. DNA extraction quality and quantities from the toe, tail, liver, and heart samples were compared to establish minimum amounts of each type of tissue necessary for less invasive sampling. The predominate species that occurred in the Jefferson County survey were *Eurycea bislineata bislineata*. The second most numerous species was *Pseudotriton ruber ruber*. The most numerous caught in Berkeley County was *Plethodon cylindraceus*.

EVAN LAU, E. JOSEPH NOLAN, HANNAH E. CREWDSON, ZACHARY W. DILLARD, MARCUS A. KINKER, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074, and HONGWEI YU, Department of Biochemistry and Microbiology, Marshall University, Huntington, WV, 25755. **Microbial *algU* and *mucA* genes in contrast to Pseudomonad 16S rRNA gene diversity and abundances in patients with Cystic Fibrosis using Illumina MiSeq multiplex sequencing.**

*Pseudomonas aeruginosa* is the major cause of both morbidity and mortality in patients with Cystic fibrosis (CF), which is the most common genetic disease among individuals of European ancestry. It is believed the conversion from nonmucoid to mucoid Pseudomonad strains (regulated by Pseudomonad *mucA* gene mutations) in the lungs of CF patients leads to the overproduction of microbial alginate and mucus, which lead to chronic cardio-respiratory associated deaths. In this study, we used multiplex sequencing of Pseudomonad *algU* and *mucA* genes and concurrent 16S rRNA genes to contrast genes associated with alginate and mucus with Pseudomonad diversity and abundance in younger CF human sputum (age 10-16). Although the Pseudomonads were not as abundant as the pathogenic *Staphylococcus aureus*, we detected more diverse populations of Pseudomonads in relatively significant numbers, based on multiplex sequencing of the 16S rRNA gene. It appears that only a small number of these Pseudomonads have undergone mutations to the *mucA* gene in younger CF patients, which may explain the lack of severe respiratory infections in these patients. Our results correspond with previous work based on microbial cultivation and laboratory observations. Further work is underway to sequence the *mucA* and *algU* genes in more CF patients to test our hypothesis that *mucA* gene mutations only occur a relatively small number of Pseudomonads in CF patients in early stages of infection.

DANIEL LUKICH, NICOLE TURNER, THEUNIS VAN AARDT, and ROGER SEEBER, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Chemical analysis of American ginseng's ginsenoside content from two sources.**

The genus *Panax* is a group of herbs that are widely used for alleged medicinal purposes. Plants from *Panax* have been used medicinally for over a thousand years. Ginsenosides are compounds that are found in plants of the genus *Panax*, and much research has already been done investigating their potential medicinal value. The purpose of this study is to determine if ginsenoside content varies between different sources of American ginseng (*Panax quinquefolius*) by comparing the results of several extractions of ginseng from capsules and from dried, cultivated root. This investigation utilizes gas chromatography-mass spectroscopy (GC-

MS) to chemically analyze the results of the extractions. In addition, it's also hoped that the actual effectiveness of hot water extraction of ginsenosides will be evaluated by this study. Preliminary GC-MS results indicate the possible presence of free phenolics. Phenolic protection employing methylation and acetylation will be completed to allow for greater differences in Rf-values, thus allowing for clearer analyses of the constituent products.

CORYNN MCATEE, MARIA WEBBER, Department of Biological Sciences, Marshall University, Huntington, WV, 25755, ANISHA VALLURI, Cabell Midland High School, Ona, WV, 25545 and LOGAN LAWRENCE, Department of Biological Sciences, Marshall University, Huntington, WV, 25755. **3D tumor model for testing anticancer drugs.**

The purpose of this research was to study a simple three-dimensional (3D) spheroid model to test cytotoxic effects of anticancer drugs for Glioblastoma Multiforme (GBM), a primary brain tumor. The 3D spheroid cell culture is recognized as a suitable model to study tumor biology, because of the biological similarities shared with solid tumors in vivo. Methods: GBM cancer cell lines T98G, BNC6, and C2 were seeded in a 96-well Perfecta 3D Hanging Drop Plate in 8 replicates (n=8) in RPMI medium and cultured in the dark at 37°C in a 5% CO<sub>2</sub> water-jacketed incubator. On day 7, the spheroids were exposed to a panel of standard-of-care anticancer drugs for treatment of GBMs. Each anticancer drug was tested at the clinically relevant dose. Cell viability and cytotoxicity assessment of spheroids was performed using Trypan blue exclusion and MTT assay. Cells were immunophenotyped for CD133 cancer stem cell marker by flow cytometry. Results: Cells in the Perfecta 3D Hanging Drop Plate formed single spheroids within 4 days, and spheroid growth was observed for 7 days. Cytotoxic death resulting from drug treatment was observed in the peripheral cells, while internal cells remained alive. This was measured by MTT cell viability assay and (RSIM) regional spheroid integrity measurements. Conclusion: With the ability to directly observe the cytotoxicity of an anti-cancer drug on a spheroid, the Perfecta 3D system may be applicable for rapid screening of anti-cancer drugs on the entire population of a tumor with relation to its internal structure and composition.

KARA MCCULLOUGH and DONALD TRISEL, Department of Biology, Fairmont State University, Fairmont, WV, 26554. **The science of medicinal plants used in treating fungal infections (*Candida albicans*) in humans.**

Due to the rise in the development of drug resistance in human pathogens, there is a need for more research and finds of new antifungal agents by using natural products. The frequency of life-threatening infections caused by pathogenic microorganisms has increased worldwide, becoming an important cause of morbidity and mortality in immunocompromised patients in developing countries. *Candida albicans* is known for causing the disease candidiasis. In order to improve the problem of reduced availability of drugs needed to treat candidiasis, traditional medicines derived from plants are still being used throughout the world. The objective of this experiment was to screen a variety of natural products for anti-fungal properties. The plants in this study included, basil (*Ocimum basilicum*), mint (*Mentha*), oregano (*Origanum vulgare*), thyme (*Thymus vulgaris*), parsley (*Petroselinum crispum*), rosemary (*Rosmarinus officinalis*), onion (*Allium cepa*), and hardneck garlic (*Allium sativum*). Extracts of the plants were made by blending 10 grams of plant material in 100 mL of methanol. Extracts were administered using a series of assays, including a paper disk diffusion assay and an agar well assay. Initial results for both disk assay and the agar well assay showed inconclusive results for *C. albicans*. Additional



trials will be performed on these and other extracts in an attempt to find natural plant products that can treat *C. albicans*.

SARAH METZ, ZACHARY FERGUSON, STEVEN ROOF, Dept of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV 26554. **Determining the retention factor of ink to develop a laboratory to be used in an introductory non-science major's class.**

Paper chromatography is used to separate mixtures of substances into their rightful components. The purpose of this research is to further involve non science major students in applications of Forensic Biology and help them to gain interest in the biology field while learning. Chromatography takes place by the substance being placed on paper and introduced to a solvent; as the solvent moves up the paper, the different components will separate into various colored spots. In this experiment three solvents were utilized, 70% ethyl alcohol, 90% ethyl alcohol, and tap water were used determine the components of the ink(s)used. Previously prepared inks were utilized as well as food coloring mixtures to simulate ink compounds. Some of the compounds in the mixtures traveled almost as far as the solvent did; where as some remained closer to the base line.  $R_f$  values were calculated to help determine the distance traveled relative to the solvent. The structure of the paper used in chromatography is made of cellulose fibers; cellulose is a polymer of glucose. Complications may arise due to the fact that cellulose fibers attract water vapor from the atmosphere when the paper is made. This interaction with water is one of the most important effects during chromatography. From the results found, it is apparent that ethyl alcohol is the best solvent to be used when separating the ink compounds, however the majority were water soluble; the results were not as ideal. When using tap water the individual colors did not separate as efficiently.

DESIRÉ MILLER and OSMAN GUZIDE, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Heartbeat sensors.**

In the virtual video game, Call of Duty: Modern Warfare 2, there exist an accessory that can read heartbeats and display on the output screen whether the heartbeat is that of a friend or enemy. Although this exact device does not currently exist in the real-world, there have been other innovations, such as the use of infrared imaging and microwaves that lead to the potential creation of the heartbeat sensor accessory as shown in the video game, or close to it. There are already signs that changes will have to be made to the accessory, such as being able to tell the difference between heartbeats of friends and enemies. For this, additional technology will be needed, such as the use of a microchip, GPS, etc. However, with enough research, one could clear the path for this new innovation.

LINDSAY MILLER, HALLIE GUNNOE and DONALD TRISEL, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Historical and current diabetes mellitus treatment using medicinal plants.**

Diabetes mellitus is a metabolic disorder that affects up to 20% of the population. Many medicinal plants have been studied and shown to treat symptoms of diabetes mellitus, such as *Panax quinquefolius* (ginseng), *Allium cepa* (onion), *Berberis vulgaris* (barberry) and *Trillium erectum* (red trillium). The objectives for this research were to cultivate and collect plants to treat symptoms of diabetes mellitus, document locations of the medicinal plants, and create/digitize specimens to add to the FWVA herbarium database. When this research began, FWVA held

seven *B. vulgaris*, nineteen *T. erectum*, three *A. cepa*, and eleven *P. quinquefolius* specimens. Five trips were taken to collect plant specimens from five counties throughout West Virginia. Studies on certain alkaloids and flavonoids have shown hypoglycemic effects on diabetic patients. Specifically, berberine is an alkaloid found in *B. vulgaris* that has a potential glucose-lowering effect. Quercetin is a flavonoid found in *A. cepa* that has alpha-glucosidase inhibitory activity, which is important in controlling blood glucose levels. Results from this study will provide updates for the Checklist and Atlas of the Vascular Flora of West Virginia. In total, 96 medicinal plant specimens were collected and digitized in the FWVA herbarium for future studies and experiments. This research was supported by the S.U.R.E. grant from Fairmont State University.

EMILIE PIATEK, Department of Computer Science, Mathematics and Engineering, Shepherdstown, WV, 25443. **Applications of Big Data Technologies to Bio-Informatics.**

Big Data Concepts: The digital universe has experienced a rapid expansion over the past decades due to growth of the Internet; evolution of social media; availability of electronic images, video and audio; the ubiquity of sensor data such as GPS; and scientific data efforts including the human genome project, the Large Hadron Collider and the Sloan Digital Sky Survey. Increases in the capacity of electronic storage devices has helped support the growth of digital data in science, business and in our personal lives. Data access rates of these devices, however, have not kept pace. In 1990, for example, the entire contents of a typical 1.4 MB hard drive could be read in about five minutes at 4.4 MB/s. Currently, it takes more than 2.5 hours to read the contents of a typical 1 TB drive at 100 MB/s. In response to this data access rate shortfall, researchers have developed techniques for analyzing data that is distributed across multiple storage devices located on a network of computers. The challenge is to operate on the data locally in order to (1) minimize the amount of data that must be transferred among machines, (2) overcome latencies of individual hard drives and (3) efficiently utilize data that is naturally collected in a distributed manner. The objective will be achieved through implementation of various algorithms such as Rabin-Karp, Knuth-Morris-Pratt, Finite automation and the Naïve string-matching algorithm.

STEVEN PIFER and KEVIN EVANS, Department of Science and Mathematics, Glenville State College, Glenville, WV, 26351. **Anti-Markovnikov hydrobromination of alkenes.**

Alkyl bromides are key intermediates in numerous multi-step organic syntheses and are commonly synthesized from the hydrobromination of alkenes. In the late 1920s, Kharasch published a mechanistic explanation for the regiochemistry of the hydrobromination of alkenes that was first observed by Markovnikov in 1870. In the absence of radicals, an electrophilic addition mechanism yields predominately the Markovnikov product. The addition of peroxide into the reaction mixture generates radicals and results predominately in the anti-Markovnikov alkyl bromide. The objective of this research is to develop an efficient synthesis of the anti-Markovnikov alkyl bromide by generating hydrobromic acid *in situ* by the hydrolysis of phosphorous tribromide. The reaction of 1-octene with phosphorous tribromide, silica gel, and benzoyl peroxide in hexanes has been studied with varying reaction conditions in an effort to optimize the yield of 1-bromooctane (anti-Markovnikov product). The roles of the silica gel have been investigated and the percent conversion of 1-octene to either alkyl bromide with varying quantities of silica gel and peroxide and the addition of water will be presented. Current optimized conditions result in 90% conversion of 1-octene to 1-bromooctane.

CAROL Z. PLAUTZ, Department of Biology, Shepherd University, Shepherdstown, WV, 25443, ALLISON BROOKS, Department of Chemistry, Shepherd University, Shepherdstown, WV, 25443, and COLLEEN J. NOLAN, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Effects of Roundup on reproduction, steroid hormone levels, and the steroidogenic pathway in *Lymnaea palustris*.**

The aquatic pond snail *Lymnaea palustris* is a good system in which to study exposure to environmental contaminants, in particular the developmental and reproductive effects of the herbicide Roundup. Following exposure to Roundup, alteration in reproductive levels as well as decreased production of steroidogenic acute regulatory protein (StAR) are demonstrated. We used enzyme immunoassay to monitor steroid sex hormone levels and monitored fecundity by reproductive output in the hermaphroditic *L. palustris* following chronic (6 week) Roundup treatment. Snails exhibited a significant decrease in fecundity and altered levels of progesterone and testosterone. Protein analysis by Western blot of StAR and aromatase reveal altered levels of these steroidogenic pathway enzymes. These results suggest that Roundup can cause significant changes in fecundity and steroid hormone production levels resulting in reduced reproductive capability in non-target aquatic organisms. Funding supporting this project was received from the West Virginia Higher Education Policy Commission Division of Science and Research SURE Grant Program.

TIMOTHY PRACTH and MARK FLOOD, Department of Biology, Chemistry, & Geosciences, Fairmont State University, Fairmont, WV, 26554. **Determining the impact of Marcellus well drilling on stream ecology in Randolph County, West Virginia.**

Water is vital to all living organisms and plays a principal role in the maintenance of ecosystems, especially within West Virginia. Hydraulic fracturing methods to extract natural gas have become highly prevalent throughout the entire state. The methods of disposal of the hydraulic fracturing fluids have come under scrutiny, with chemicals potentially leaching into nearby waterways. The objective of this experiment is to analyze the effects of Marcellus well drilling on stream water quality. Water quality was assessed with a YSI Multiprobe that measured the temperature (°C), pH, conductivity (mS/cm), dissolved oxygen (mg/l), total dissolved solids (g/l), salinity (ppt), oxidation reduction potential (mv), and turbidity (NTU) of the stream water. Benthic macroinvertebrates were also sampled from the stream. Data collected upstream from the drilling site was compared to data that was collected downstream of the site. Overall, the results indicated that Marcellus well drilling had some negative effects on the water quality measurements that were collected. Further study is needed to determine the precise cause of the differences that we discovered.

LUKE SADECKY, NICOLE SADECKY, and ZACHARY LOUGHMAN, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV, 26074. **Ecology of *Cambarus carinirostris* in Northern West Virginia: A baseline study.**

The primary goal of this study is to better understand the ecology of a common Appalachian secondary burrowing crayfish, *Cambarus carinirostris*, the Rock Crayfish, by achieving the first complete life history study of this species. Understanding *C. carinirostris* ecology will help aid in conservation and protection of closely related imperiled taxa by discovering unknown biological behaviors of secondary burrowing crayfish. By collecting physiochemical and climatic data at a single site and recording one population's

responses to changes in the environment, we can determine multiple behavioral strategies that correlate with those environmental changes. In addition, we can determine important life history variables, such as growth rates, fecundity, and required age and size to reach sexual maturity. So far, this study has consisted of catching, measuring, sexing, and determining how old each crayfish are, and noting their preferred habitat within a reach (a 20 meter stretch of stream). This process was repeated in various locations along the stream. During the summer months, 384 crayfish were captured and Total Carapace Lengths (TCL) were measured. We now know that the dominant carapace length during the summer months is roughly 11 millimeters. There were 149 crayfish with this carapace length, 87 of which were female. During the month of June, the habitat preference was equally distributed between the run and riffle. However during July, 69% of the crayfish were found in the runs.

NICOLE SADECKY, SPENCER BELL, ZACHARY DILLARD, ERIC TENNANT, ERIC TIDMORE, LUKE SADECKY, Department of Natural Science and Mathematics, West Liberty University, West Liberty, WV, STEWART WELSH, West Virginia University, Morgantown, WV, and ZACHARY LOUGHMAN, Department of Natural Science and Mathematics, West Liberty University, West Liberty, WV. **Determination of Crayfish Occupancy Rates Across the North, Middle, and South Forks of the Kentucky River.**

In the coal fields of eastern Kentucky coal extraction occurs via surface mining, where coal seams are exposed to the Earth's surface through the elimination of mountain tops. The current status of the epigeal crayfishes in the greater Kentucky River headwaters, composed of the North, Middle, and South Forks of the Kentucky River, where this form of mining is prevalent is currently unknown. To remedy this lack of knowledge the goals of this project were to determine the crayfish fauna of the region, identify habitat use for each crayfish species, and finally ascertain conservation concerns for the crayfish fauna as a whole. During the summer of 2014 crayfish were sampled across all three watersheds at 60 sites. Both physiochemical and habitat quality data acquisition was completed at each 150 m stream reaches. Physiochemical data was collected with a YSI datasonde; habitat data was collected through completion of the OEPA QHEI habitat form. Mining presence was identified for each stream through collection of a water sample, which was later tested in the laboratory for sulfates, with sulfate concentrations  $>50\text{mg L}^{-1}$  indicating mining activities. All of the aforementioned data were used to create occupancy models through use of logistic regression for each species. Sampling results determined that 6 species (*Cambarus* cf. *robustus* A, *Cambarus* (cf.) *robustus* B, *Cambarus distans*, *Cambarus sphenoides*, *Cambarus jezerinaci*, and *Orconectes cristavarius*) occurred in the three basins, with *C. distans*, *C. jezerinaci*, *C. sphenoides* and *C. cf. robustus* B, limited to single watersheds. Of the 33 covariates modeled for each species, sulfate levels proved to be the most predictive covariate driving site occupancy for 50% of the crayfish species; elevated sulfate levels always were associated with either crayfish absence or low crayfish CPUE. In addition to sulfate, sediment scores proved to be predictive for the other three species. Overall, elevated sedimentation scores were always indicative of low crayfish CPUE, both on an individual and pooled basis. This study indicates that mining influences this region's rich crayfish diversity. Understanding stream and habitat quality will allow for proper conservation of the epigeal crayfishes of the Kentucky River watershed.

JAD SADEK, Department of Mechanical and Aerospace Engineering, West Virginia University

Morgantown, WV, 26506, VITALY BYCHKOV, Department of Physics, Umea University, Umea, Sweden, and V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506. **Theory of flame acceleration in open/vented obstructed pipes**

Obstructed pipes are presumably the most relevant configuration for extremely fast premixed flame acceleration and deflagration-to-detonation transition. While the flame propagation through obstacles is often associated with turbulence and/or shocks, Bychkov et al [*Physical Review Letters* 101 (2008) 164501] have revealed a shockless, conceptually-laminar mechanism of ultra-fast flame acceleration in semi-open pipes (one end of a pipe is closed; a flame is ignited at the closed end, propagating towards the open one). Namely, the acceleration is devoted to a powerful jet-flow produced by delayed combustion in the spaces between obstacles. This mechanism is Reynolds-independent (say, scale-invariant, in some respect), with turbulence and flame turbulizaion playing only supplementary roles. In the present work, this formulation is extended to open or vented pipes, keeping in mind to fulfill the industrial needs, and to describe the ongoing experiments in Karlsruhe Institute of Technology. For simplicity, we started the analysis with the geometry of a two-dimensional channel, but then extended the formulation to an axisymmetric cylindrical tube, which is closer to the experimental configuration. It is demonstrated that flames accelerate strongly in open channels and tubes with obstacles, and the tubes provide stronger acceleration than the channels. The acceleration mechanism is the same as that for the semi-open pipes with the ignition at the closed end: namely, it is shockless, conceptually-laminar and Reynolds-independent, being associated with the delayed burning in pockets between the obstacles. Although the acceleration rate is large enough in the open obstructed pipes, it is nevertheless less than that in the semi-open ones. Starting with inviscid approximation, we subsequently incorporated the viscous forces (the hydraulic resistance) into the formulation in order to compare their role with that of the jet-flow driving the acceleration. It is shown that the hydraulic resistance is not required to drive the flame acceleration. In contrast, this is a supplementary effect, which actually moderates the acceleration. Besides, the hydraulic resistance can be responsible for the initial delay, before the flame acceleration onset, observed in the experiments.

DEANNA M. SCHMITT, TRICIA GILSON, and JOSEPH HORZEMPA, Department of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Characterization of resazurin derivatives as novel antimicrobial agents against *Francisella tularensis* and *Neisseria gonorrhoeae*.**

Inhalation of the Category A bioterrorism agent, *Francisella tularensis*, results in an acute pneumonia with a 30-60% mortality rate without treatment. *Neisseria gonorrhoeae* is the second most common sexually transmitted infectious bacterium, with over 100 million cases of gonorrhea reported annually. Due to the prevalence of antibiotic resistance, and the potential use of *F. tularensis* for bioterrorism, there is a strong need for new antibacterial drugs targeting both of these organisms. Resazurin is a compound commonly used to measure cell viability through its reduction to the fluorescent product resorufin. Previously, we demonstrated that resazurin and resorufin exhibit a potent bactericidal effect against *F. tularensis* and *N. gonorrhoeae*. The antimicrobial activity of resazurin and resorufin is comparable to gentamicin and ampicillin, antibiotics used to treat tularemia and gonorrhea, respectively. Based on these results, we tested the therapeutic efficacy of resazurin in a mouse model of tularemia. While resazurin exhibited potent *in vitro* antimicrobial activity, *in vivo*, resazurin did not reduce bacterial burden or prolong

survival in mice infected with *F. tularensis*. A possible explanation for the ineffectiveness of resazurin *in vivo* is its metabolism by the host into a pharmacologically inactive form. Therefore, we sought to evaluate the antimicrobial activity of modified resazurin compounds that could be less likely to undergo biotransformation. Various resazurin derivatives have been tested and three exhibit a bactericidal effect against *F. tularensis* and *N. gonorrhoeae in vitro*. In the future, these compounds will be tested for *in vivo* efficacy using a mouse model of gonorrhea. (Supported by NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence, West Liberty University Faculty Development Grant, and funding from WV-NASA).

ANDY SHTANKO and OSMAN GUZIDE, Department of Computer Science, Mathematics and Engineering, Shepherd University, Shepherdstown, WV, 25443. **Indoor GPS systems.**

Most people are familiar with the Global Positioning System (GPS) as used in personal technology, which determines the exact location in order to provide directions from users' current locations to a new destination. More often, the term GPS describes a device capable of determining the absolute position of a person or object on the surface of Earth, the initial step of determining the exact location featured in the personal GPS. This step does not work correctly in certain scenarios. For example, when GPS is used in an indoor environment, exact location may be extremely inaccurate or entirely impossible to determine. This is because GPS uses satellites to send and receive a signal to determine location. In indoor environments, the signal becomes scattered and distorted, often losing contact with the satellite entirely. The goal of this project is to develop an alternative to GPS for use in indoor environments, using RF and Infrared tags within a certain range to map specific locations and be able to find them within the environment. Following the initial mapping process, the mapped tags will be used to create a grid system with absolute coordinates, referenced in the future to determine exact location. Uses of this system could include, but are not limited to, the automation of robots, indoor robotic sensor networks used for temperature or humidity control, navigation to specific offices within buildings, and navigation to products within warehouses.

BEN M. STOUT III, Department of Biology, Wheeling Jesuit University, Wheeling, WV 26003. **Wheeling, West Virginia experience with frackwater: what “brinewater” and “residual waste” trucks are really carrying.**

Brinewater trucks were sampled by West Virginia Department of Environmental Protection. Of 13 trucks sampled, 5 (38%) would be considered Hazardous Waste if not for exemptions from federal laws. One truck carried approximately 5,000 gallons of pH 1.5 liquids. Three trucks exceeded hazardous waste standards for radiation, and another had benzene at 1320ug/L. The WVDEP investigation led to a Consent Decree with \$400,000 fine levied against the City of Wheeling, WV. Since then another application for a frackwater treatment plant was received by the City. This plant, 2 km upstream of Wheeling's Ohio River water intake, is purported to “recycle” frackwater thus requiring no air or water quality permits. Frackwater samples compared with primary drinking water standards revealed 1 of 13 samples (8%) met standards. Standards were exceeded 30 times in 12 samples including arsenic (2 samples), barium (7), selenium (1), benzene (4), gross alpha (7), and radium (9). Trucks carrying frackwater labeled “brinewater” and “residual waste” often contain hazardous waste and toxic substances. Local ordinances may be the only means of preventing communities from becoming hazardous waste destinations.

MATTHEW S. THOMPSON, SUSHANT AGARWAL, Department of Chemical Engineering, West Virginia University, Morgantown, WV, 26506, XUEYAN SONG, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506, and RAKESH K. GUPTA, Department of Chemical Engineering, West Virginia University, Morgantown, WV, 26506. **Effects of extensional flow cells and surface-modified nanoparticles on the morphology of immiscible polymers.**

To fulfill the property requirements for a specific application, a polymer engineer will often blend multiple polymers together with hopes to exploit the attractive attributes of each and compensate for the unfavorable properties of each. When blended, most polymers form a two-phase microstructure, or morphology, which greatly affects the mechanical and flow properties and subsequent application areas of the blend. The development of this morphology follows the balance of drop deformation and breakup, which tend to decrease the dispersed-phase size, and drop coalescence, which tends to increase size. Extensional flow fields are known to promote drop deformation and are more efficient for drop breakup than shear flow fields, which most polymer processing equipment utilize; in addition, extensional flow fields are especially important for dispersion in blends of high viscosity ratio, the ratio of dispersed-phase viscosity to matrix-phase viscosity. Coalescence is usually minimized using compatibilizers which modify the interface between the polymer phases; nanoparticles with tuned surface chemistry may also be used for this purpose to stabilize the morphology from coalescence. In this work, blends of high-density polyethylene (HDPE) dispersed in polystyrene (PS) with viscosity ratio  $> 4$  were subjected to extensional flow by forcing them through converging flow dies, which resulted in decrease in the volume-average diameter of the drops. Addition of fumed nanosilica to the blends was also found to decrease the volume-average diameter despite the nanoparticles localizing exclusively in the PS matrix phase rather than at the HDPE/PS interface, which is predicted to be the optimal localization.

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**Epigeal crayfishes of the North, Middle, and South Forks of the Kentucky River: life history and ecology.**

The Headwaters of the Kentucky River Basin's (HKRB) epigeal crayfish fauna were surveyed during the summer of 2014. Goals of this project included determining the native fauna of the basin, as well as identification of basic life history parameters. Sixty random sites were chosen for sampling through use of GIS. Site coverage accounted for all stream orders conducive to crayfishes. Physiochemical and biotic data were collected at each site, as well as crayfish vouchers for identification in the laboratory. The native epigeal crayfish fauna of the HKRB consists of six species: *Cambarus (c.f.) robustus A*, *Cambarus (c.f.) robustus B*, *Cambarus distans*, *Cambarus jezerinaci*, *Cambarus sphenoides*, and *Orconectes cristavarius*. *Cambarus (c.f.) robustus B* was only found in the Middle Fork of the Kentucky River while its ecological equivalent, *Cambarus (c.f.) robustus A*, possessed a broader distribution, and was found in the north and south fork of the Kentucky River. Sites with high density of *O. cristavarius* on average had lower density of *C. robustus A* and *C. robustus B*. *Cambarus distans* was limited to the headwaters of the Middle Fork of the Kentucky River, where it occurred primarily in smaller streams. Both *C. jezerinaci* and *C. sphenoides* were limited to the headwaters of the south fork basin. *Orconectes cristavarius* was the only species that occurred in all three watersheds, and

was the most common species encountered in the study. Crayfish populations reached their highest densities in the South Fork, where environmental degradation was limited. Results of this study indicate that the forks of the Kentucky River harbor a rich crayfish assemblage, with several species relegated to small subbasins within the greater watershed.

ORLANDO UGARTE, BERK DEMIRGOK, V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506 and DAMIR VALIEV, Department of Applied Physics and Electronics, Umea University, Umea, Sweden. **Flame propagation in micro tubes considering various constant wall temperatures.**

Flame propagation in pipes has been studied since the middle of the 1900<sup>th</sup>, with a particular progress circa 2000<sup>th</sup>. The reasons making attractive this configuration can be summarized in two: *first*, large aspect ratio allows a deflagration (flame) front to accelerate so rapidly that it can convert into a detonation wave; *second*, turbulence plays a secondary role in the flame dynamics in pipes, which simplifies the analysis. However, most studies in tubes have considered the pipe walls to behave adiabatically, restricting the attention to the effect produced by the momentum transferred at the boundaries only. In this investigation, numerical simulations of premixed flames have been performed considering micro tubes with walls preheated to a constant temperature. The obtained flame front propagation characteristics are contrasted to those observed in adiabatic conditions, aiming to identify the effect produced by the heat exchanged at the walls. Results show two qualitatively different effects in the preheated configuration: an initial stage of burning where the hot walls facilitate the combustion process by preheating the fuel mixture, and a later stage where heat exchanged by the warm walls, after reducing the thermal expansion ratio, decelerates the flame propagation and postpones (or even suppresses) any detonation triggering. For this purpose, a parametric study provided by extensive fully-compressible numerical simulations of the combustion and hydrodynamic equations have been performed. The cases investigated change with the tube and channel widths, boundary conditions and fuel mixture, described by the thermal expansion coefficient and laminar flame speed.

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**Flame propagation dynamics observed in obstructed micro tubes.**

A spontaneous deflagration-to-detonation transition (DDT) can be attained as a result of sustained flame acceleration, as it has been widely discussed in fire safety and combustion technology venues, which makes the ability of enhancing or diminishing the acceleration rate of great importance. The effect can be particularly strong in combustion chambers with obstructed walls. In this work, we focus on a “tooth-brush”-like array of long and narrow obstacles – a geometry associated with enormous flame acceleration. In this configuration, the acceleration is produced by an intense jet-flow generated by the delayed combustion occurring in the spaces between obstacles. The acceleration is unlimited in time, provided long enough channels; it is Reynolds-independent and conceptually laminar, with turbulence playing only a supplementary role. The acceleration rate is very strong, and the detonation can be attained in a very short time interval. In the present work, this mechanism is compared to other conventional scenarios of flame acceleration, including those driven by wall friction and the so-called “finger” flame



shape. For this purpose, an extensive parametric study is undertaken by means of numerical simulations of the fully-compressible hydrodynamic and combustion equations. Two-dimensional channels and cylindrical tubes, of various radii are considered. The fuel variety is represented by the variation of the thermal expansion coefficient and the laminar flame speed. A threshold blockage ratio, at which the obstacle-based mechanism dominates, is investigated and it is shown how such a cutoff depends on the variety of combustion and flow parameters.

TIFFANIE WILSON and TIFANI FLETCHER, Department of Behavioral and Social Sciences, West Liberty University, West Liberty, WV, 26074. **Priming and altruism behaviors: A replication based study.**

The current study attempted to replicate the findings from the survey based altruism investigation of Howard, Nelson, and Sleight (2011). One hundred and twenty five undergraduate students from a Northern West Virginia University were given one of three priming conditions in which they had to write a brief story about helping behaviors, and one control group that wrote about what they did that day. Following the writing activity, participants answered an altruism behavior (AB) questionnaire and a question on if they would help the research investigator on another short project at a later time without any incentives (helping behavior). Corroborating previous results, there was no significant differences found between the four scenario conditions and AB scores, and no differences on priming and helping behaviors. This supports that this type of priming does not have an influence on altruism scores or helping behaviors. Also, similar to Howard et al., higher empathy scores were significantly related to higher AB scores, and no significant gender differences were found on AB scores. Only 33% of participants exhibited a helping behavior, and unlike Howard et al., there was no significant relationship between AB scores and helping behavior, although, empathy scores were significantly related to helping behaviors. Interestingly, while females were significantly more likely to report helping behaviors compared to males, there were no gender differences found on empathy scores. Overall the majority of findings were replicated, and it is suggested that other forms of priming should be investigated to influence AB scores and helping behaviors.

AMBER WOOTEN and MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV, 26554. **Determining the short and long term effects of 4-Methylcyclohexanol exposure on aquatic species.**

West Virginia is one of the biggest providers of coal in the United States, and although it has great economic value it has some environmental problems. Used in the mining industry, 4-methylcyclohexanol (MCHM) is involved in the washing of coal before it is burned. In January 2014, 7,500 gallons of MCHM contaminated the Elk River. The effects of MCHM on aquatic life are not well known. The objective of this study is to look at the short-term and long-term effects of MCHM on the aquatic species *Daphnia magna*. Several concentrations of MCHM solutions were made, 0 ppm, 0.5 ppm, 1.0 ppm, 1.5 ppm, and 2.0 ppm. Short terms effects were observed by introducing *Daphnia* to each concentration of MCHM for 1 hour, and then heart rates were observed to determine stress level. The long-term effects of MCHM on *Daphnia* were observed by exposing the species to the varying concentrations of MCHM for two weeks, to determine if the chemical was having an effect on their reproductive rate. It was hypothesized that the higher concentrations of MCHM would yield faster heart rates as well as smaller population sizes when compared to the smaller concentrations. The observations for long-term exposure were unexpected and are being investigated farther and the observations for the short-

term exposure were expected but are being farther investigated as well. This research was funded by the NASA WV Space Grant Consortium.

VICTORIA YOUNG, RICHARD GOODMAN, and CAROL Z. PLAUTZ, Department of Biology, Shepherd University, Shepherdstown, WV, 25443. **Effects of caffeine on learning and memory in *Lymnaea palustris*.**

The snail *Lymnaea palustris* has been used as a simple model system to test the effects of caffeine on learning and memory. The ability of caffeine to enhance memory formation in snails was tested using aversive operant conditioning over three 45-minute training sessions, the first two one hour apart, the third 24 hours later. In one group, caffeine was administered but then withdrawn in a test of state-dependent learning. All groups exhibited learning and memory trends; when caffeine was administered but withdrawn, a significant difference was demonstrated between groups, suggesting that caffeine enhances consolidation of learning into long-term memory in exposed individuals. Based on these findings, two systems of conditioning were used to train snails and further test the role of caffeine in learning. Using the three 45-minute sessions, snails subjected to caffeine during all trials again demonstrated significantly enhanced memory formation versus controls. To address state-dependence, caffeine was administered in sessions one and two but withheld from two parallel groups of snails in the third session; caffeine was readministered during a fourth session to one parallel group to determine if the effects of state-dependence could be reintroduced. Snails provided with caffeine in the fourth session exhibited significantly greater recall. Additional snails were subjected to “one trial” testing, challenging memory after one session. Similar learning trends were observed. Overall, we have observed greater effects of caffeine on learning and memory when snails are administered caffeine over multiple training sessions and days rather than a single day of training.