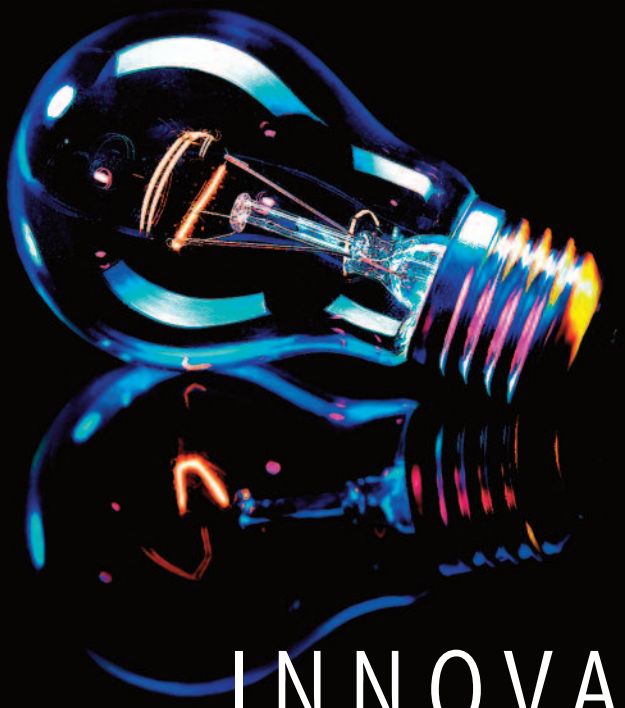
STaR SYMPOSIUM 2012

and the 87th Annual Meeting of the West Virginia Academy of Science



INNOVATION

concept to commercialization

April 20-21, 2012 | West Virginia State University, Institute, W.Va.

www.wvresearch.org/starsymposium

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OVERVIEW

For the first time, the West Virginia Academy of Science annual meeting, the 87th such event, is being combined with the Science, Technology and Research (STaR) Symposium, the fourth biennial symposium.

Both events have similar purposes: to expand science knowledge, allow students and faculty to share their research, and to assemble and learn from one another.

This event serves as a forum for the state's increasingly competitive science and technology enterprise. University and college faculty members, researchers, graduate and undergraduate students, policymakers and members of the business community come together to share research developments, ideas and collaborations.

This year's theme, *Innovation: From Concept to Commercialization*, focuses on how research in West Virginia is generating revenue for researchers and institutions and creating economic development.

Symposium proceedings will be available online at www.wvresearch.org/starsymposium.

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Please recycle your name tag holders in the STaR recycling boxes

Greetings from the Symposium Planning Committee

West Virginia has made great strides in research, technology and innovation. In the year 2000, who would have thought that over the next 12 years the state would receive nearly triple the funding for academic research, open several new centers for research and technology, attract dozens of renowned faculty and significantly increase the number of students entering science, technology, engineering and mathematics fields?

Thanks to strong leadership and vision by our state's leaders, and hard work and effort by our higher education institutions' administration, faculty and students, West Virginia is making great progress toward its vision of research and innovation becoming the primary driver of a new diverse and prosperous economy.

A look at the speakers in our event is a good example of the benefits of the investment of research dollars in West Virginia. Many represent companies that did not exist in 2000, yet today are manufacturing and selling products to markets worldwide, generating revenue, employing scores of West Virginians and showing tremendous potential for future growth, all because they had access to research funding, research infrastructure and research intellect within the state.

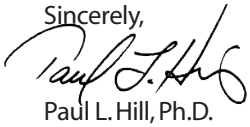
We hope that some of the students presenting their research at this event will someday also be leading companies and generating economic development with their scientific research.

Our achievements have been great, but to sustain this level and keep attracting more research investment, we must continue to graduate high quality students in STEM fields.

That's why it's important for the science community to get together at events like STaR Symposium and West Virginia Academy of Science meetings.

Let's keep the momentum by continuing to invest in research and inspiring our youth with high-quality STEM education, and continuing to get our message about science and research out to West Virginia.

Sincerely,



Paul L. Hill, Ph.D.
Chairman, STaR Symposium Planning Committee
Chancellor ,West Virginia Higher Education Policy Commission

2012 STAR SYMPOSIUM COMMITTEE MEMBERS

Jack Carpenter, Kicking Stones Consulting
Candy Cordwell, NASA WV Space Grant Consortium
Dr. Kevin DiGregorio, Chemical Alliance Zone
Annette Echols, WV Higher Education Policy Commission
Dr. Mark Flood, Fairmont State University
President, West Virginia Academy of Sciences
Dr. Rich Ford, West Virginia State University, Biology
West Virginia Academy of Sciences
Dr. Micheal Fultz, West Virginia State University
West Virginia Academy of Science
Dr. Mridul Gautam, West Virginia University Research Corporation
Dr. Donald D. Gray, Department of Civil and
Environmental Engineering, West Virginia University
Dr. Gerald Hankins, West Virginia State University
West Virginia Academy of Science
Dr. Katherine Harper, West Virginia State University,
College of Natural Sciences and Mathematics
Dr. Paul Hill, WV Higher Education Policy Commission
Dr. Majid Jaridi, NASA WV Space Grant Consortium
Dr. John Maher, Marshall University Research Corporation
Kelly Merritt, WV Higher Education Policy Commission
Dr. Richard M. Niles, Marshall University
Ginny Painter, Marshall University Research Corporation
Dr. Robert Paysen, Bethany College
Dr. Gary Rankin, Marshall University
Dr. Roger Seeber Jr., West Liberty University
West Virginia Academy of Sciences
Dr. James Sheil, West Virginia University
Dr. Genia Sklute, West Virginia State University
West Virginia Academy of Sciences
Dr. Jan Taylor, WV Higher Education Policy Commission
Dr. Vickie Wolfe, West Virginia State University
West Virginia Academy of Science

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WVAS West Virginia ACADEMY of SCIENCE Founded 1924

Greetings from the Academy

Welcome to the 87th annual meeting of the West Virginia Academy of Science, and the 4th biennial West Virginia Science, Technology and Research (STaR) Symposium. We at West Virginia State University are delighted to host the first joint meeting of these two organizations, each dedicated to the advancement of science and scientists in West Virginia.

The 2012 joint meetings feature panel discussions led by a dozen recognized leaders in STEM innovation, oral and poster research presentations, and four extraordinary speakers:

B. Gentry Lee
Chief Engineer, Planetary Flight Systems Directorate at the NASA Jet Propulsion Laboratory

Dr. Paul Hill
Chancellor of the West Virginia Higher Education Policy Commission

The Honorable Jay Rockefeller
Senior United States Senator from West Virginia
Chairman of the Senate Committee on Commerce, Science and Transportation

Dr. Subra Suresh
Director of the National Science Foundation

So whether you are a student, a teacher, a researcher, or an administrator; in government, industry or academia; or if you're simply an interested visitor, we encourage you to experience everything these meetings have to offer.

Notice the people in yellow STaR / WVAS T-shirts. They are student volunteers, and they're here to help you. They can help you find what you're looking for, help with technical issues, give you a tour of our science facilities, or whatever. Just ask one!

"Thank you" to the many hard-working individuals who made these meetings possible.

Enjoy your visit!

Richard Ford

Rich Ford, West Virginia Academy of Science meeting coordinator
Associate Professor, Biology
West Virginia State University

schedule of events

Friday, April 20, 2012

8:30 a.m. to 4:15 p.m. **Registration** *Wallace Hall first floor hallway*

10 a.m. **Welcome** *Wallace Hall Auditorium*

Welcome and overview

Dr. Jan Taylor, Director of Research Programs, W.Va. Higher Education Policy Commission Division of Science and Research

Dr. Jason Best, Incoming President, West Virginia Academy of Science

Welcome to West Virginia State University

Dr. Hazo Carter, **Jr.**, President

Dr. Orlando McMeans, Dean and Director, Gus R. Douglass Land Grant Institute

Opening remarks

Dr. Paul Hill, Chancellor
West Virginia Higher Education Policy Commission

10:15 a.m. to 11:30 a.m. **STaR Panel 1:** *Wallace Hall Auditorium*

West Virginia biotech start up success stories.

Recent start-ups turned successful companies who have developed and commercialized new products in West Virginia.

Moderator: **Lindsay Emery**, West Virginia University Office of Research & Economic Development

- **Matthew Powell**, Protea Biosciences
- **Justin Swick**, Engineering Director, Vandalia Research
- **Richard Niles**, Ph.D., President, Progenesis Technologies
- **Jamie Miller**, Ph.D., Chief Scientific Officer, TRAX Bio Discovery

11:30 a.m. to 1 p.m. *Lunch* – on your own (WVSU Cafeteria or attendee's choice)

12:15 p.m. – 12:50 p.m. Optional guided tour of Gus R. Douglass Institute facilities.
Gather in front of Hamblin Hall.

12:15 p.m. to 12:45 p.m. Judges for Poster Presentations and Oral Sessions meet. *Hamblin Hall, Room 002*

1 p.m. to 2:30 p.m. **STaR Panel 2:** *Wallace Hall Auditorium*

Transforming your discovery into a successful product.

How to transform an idea from the research laboratory into a successful business.

Moderator: **Anne Barth**, TechConnect WV

- **Chris Kolanko**, Ph.D., Associate Professor, WVU College of Engineering, co-founder of Eyemarker
- **Gary Morris**, Ph.D., Professor, WVU Mechanical and Aerospace Engineering; Office of Technology Transfer Patent Agent
- **Rich Overmoyer**, CEO, Fourth Economy Consulting
- **Ryan Wall**, Director, Innovation & Entrepreneurship Center, Wheeling Jesuit University

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Friday, April 20, 2012 continued

2 p.m. to 4:15 p.m.	**Concurrent Poster Session 1** See Poster List, page 22, for presenter locations.	*Hamblin Hall, Floors 1, 2 and 3*
2:30 p.m. to 2:45 p.m.	**Break**	
2:45 p.m. to 4 p.m.	**STaR Panel 3:** **Government and civic groups available to help.** How the state of West Virginia and public/private partnerships work to support and promote start-ups and grow in-state businesses.	*Wallace Hall Auditorium*
Moderator	**Charlotte Weber**, Robert C. Byrd Institute for Advanced Flexible Manufacturing • **Natalie Tennan**t, West Virginia Secretary of State • **Emma Wilson**, Manager, Charleston branch, U.S. Small Business Administration • **Anne Cavalier**, Ed.D. U.S., West Virginia Representative, U.S. Economic Development Authority • **Ron Basini**, President, West Virginia Angel Investment Network	
4 p.m. to 4:15 p.m.	**Break**	
4:15 p.m. to 5:15 p.m.	**Keynote Presentation** Introduction by **Dr. Jason Best**, Professor of Astronomy and Astrophysics; Director, Shepherd University Observatory **B. Gentry Lee**, Chief Engineer, Solar System Exploration, NASA Jet Propulsion Laboratory, "A Vision of the 21st Century."	*Wallace Hall Auditorium*
5:15: p.m. to 6:30 p.m.	**Reception**	*Erickson Alumni Center*
6:30 p.m.	**Dinner on your own** Optional dinner at Quarrier Diner (advanced sign up required) *West Virginia's Kanawha Valley: Birthplace of the Modern Chemical Industry* with local historian Stan Bumgardner	
7 p.m.	**WVAS Executive Committee meeting**	*Hamblin Hall, Room 002*

Saturday, April 21, 2012

8 a.m. to 1 p.m.	**Registration**	*Wallace Hall Lobby until 10:30 a.m.* *Hamblin Hall Lobby from 10:30 a.m. until 1 p.m.*
8:30 a.m.	**Judges meet**	*Hamblin Hall, Room 005*
9 a.m.	**Welcome and day's overview** **Dr. Jan Taylor**, Director of Research Programs, HEPC Division of Science and Research **Dr. Rich Ford**, West Virginia Academy of Science **Dr. R. Charles Byers**, Provost and Vice President for Academic Affairs West Virginia State University **Dr. Orlando McMeans**, Dean and Director, Gus R. Douglass Institute West Virginia State University	*Wallace Hall Auditorium*

9:15 a.m. to 10:15 a.m. **STaR Panel 4:** *Wallace Hall Auditorium*

Research Funding Opportunities within West Virginia.

Panel presentation to inform students and rising scientists of the competitive research programs available.

- **Jan Taylor**, Ph.D., Director of Research Programs, WV Higher Education Policy Commission, Division of Science and Research, on the National Science Foundation's EPSCOR program and state-funded programs.
- **Donald Primerano**, Ph.D., Robert C. Byrd Biotechnology Center, Joan C. Edwards School of Medicine, Marshall University, to discuss National Institutes of Health funded IDeA Network of Biomedical Research Excellence (INBRE).
- **Majid Jaridi**, Ph.D., Director of NASA West Virginia Space Grant Consortium to discuss NASA EPSCoR and Space Grant opportunitites.

10:15 a.m. to 10:30 a.m. **Break**

10:30 a.m. to Noon **Keynote Speakers** *Wallace Hall Auditorium*

- **Paul L. Hill**, Ph.D., Chancellor, W.Va. Higher Education Policy Commission
- **Jay Rockefeller**, U.S. Senator
- **Subra Suresh**, Ph.D., Director, National Science Foundation

Noon to 1 p.m. **Lunch on your own**

1 p.m. to 3 p.m. **Oral Sessions 1-12** *Hamblin Hall*

Sessions begin at 15 minute intervals.
See Oral Sessions List, page 17, for presenter times and locations.

1:30 p.m. to 4 p.m. **Concurrent Poster Session 2** *Hamblin Hall, Floors 1, 2 and 3*

See Poster List, page 25 for locations.

3 p.m. to 4:00 p.m. Optional guided tour of Gus R. Douglass Institute facilities.
Gather in front of Hamblin Hall.

3 p.m. to 3:30 p.m. **WVAS business meeting** *Hamblin Hall, Room 005*

3 p.m. to 3:45 p.m. **Judges meet** *Hamblin Hall, Room 002*

4 p.m. **Awards ceremony and closing** *Hamblin Hall Auditorium*

Dr. Jan Taylor
Dr. Rich Ford, Dr. Katherine Harper, West Virginia State University
Jack Carpenter, Kicking Stones Consulting

- Teacher of the Year Award
- High-Performance Computational Resources Student Competition Awards
- Oral presentations and posters

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Dr. Bonnie Dean
1939 - 2012

Memorium

On March 23, 2012, West Virginia State University lost our colleague and friend, Dr. Bonnie Dean. Dr. Dean came to the WVSU Department of Biology in 1976. As department chair from 1989 through 2005, she grew the department from 98 Biology majors to nearly 300. She grew the department from a small Bachelor's degree-granting liberal arts program to the modern research-oriented Master's degree-granting program it is today. Her significant contributions, accomplishments and accolades are too numerous to detail here.

Dr. Dean will be sorely missed. She was more than an advisor to hundreds of pre-nursing students. She was a mentor, life-coach, confidant, role model and friend. She challenged students with "tough love" while supporting them with personal compassion. Among WVSU staff, faculty and administrators, Dr. Dean could be relied upon to be thoughtful, wise, and far-sighted. She was a mentor to junior faculty as well as novice graduate teaching assistants.

You may have never known Dr. Dean. But when you receive competent, professional, compassionate health care in West Virginia, you may very well be reaping the rewards of this remarkable person's life of service.

Thank you Bonnie, from your friends, students and colleagues at West Virginia State University.

Instructions to Presenters and Session Moderators

1. Speakers in all Oral Sessions should load their PowerPoint presentations on the computer in their assigned room prior to 1 pm.
2. In order to facilitate judging, each speaker should state his or her name and whether they are an undergraduate or a graduate student.
3. Oral presentations are scheduled for 15 minutes including questions.
4. Session Moderators are responsible for maintaining the published schedule so that persons can move between sessions if they wish to do so. Oral presentations must begin and end at the assigned times. In the event that a talk runs short or is not presented, the next talk must not begin until its assigned time.
5. All posters presented on Friday should be in their assigned spaces by 2 pm and should not be removed until 4:15 pm. All posters presented on Saturday should be in their assigned spaces by 1:30 pm and should not be removed until 3:30 pm.
6. Presenters for Poster session 1 (Friday) should be at their posters from 2 pm until 4:15 pm.
7. Presenters for Poster session 2 (Saturday) should be at their posters from 1:30 pm until 4 pm.

John Warner Outstanding Teacher Award

The West Virginia Academy of Science Outstanding Teacher Award for 2012 goes to Barbara LaVon "Tootie" Black, 3rd grade teacher at West Teays Elementary School in Putnam County.

Barbara LaVon "Tootie" Black

My philosophy of education is based on the concept that all children deserve an education that will prepare them for a successful and rewarding life. Children rise to meet the expectations placed upon them. I try to motivate and encourage my students to do their best. I invite my students to continually ask questions, not settle for one correct answer or simple solution, but rather to develop ways of thinking and communicating their discoveries based on higher-level thinking.

I challenge all my students to push themselves. I believe students should be actively involved in their own learning. So I captivate their interests by providing a world of science, such as raising trout, hissing cockroaches, a guinea pig, tarantula, crayfish and greenhouse projects to get them engaged.

My goal is to create real-world opportunities for students to experience working as writers, scientists, historians, and other professionals. By incorporating related topics and issues, I stretch their minds and horizons, extend their knowledge and understanding of the world, and ultimately enrich their education.

By 3rd grade, many students have had so much traditional "schooling" that they are already bored and go through the motion of being a "good student" without the benefit of becoming a life-long learner. I try ignite the spark in students that school is the action place, and I use the self-motivating subject of hands-on science to accomplish this. One of my students said it this way: "Mrs. Black teaches science in a way that we learn to love science! She makes it so fun that sometimes my twin sister gets jealous when I tell her what we did for science. The best part is we get to DO science, not just read about it in a textbook."

> "The best part is we get to DO science, not just read about it in a textbook."
>
> Student of "Tootie" Black

Additionally, my mission is to educate students on how to distinguish well-founded views from prejudices, good arguments from bad. The facts they learn at school will be forgotten; the opinions they hold will change; but, that students can do something they couldn't do before is the proof and reward that they are being educated. As Ella Wheeler Wilcox said, "With every deed you are sowing a seed, though the harvest you may not see."

I became a National Board Certified Teacher (NBCT) in 2001 and renewed that in 2011. To attain this voluntary advanced teaching credential, I had to demonstrate possession of the highest standards for what accomplished educators should know and be able to achieve in their classrooms. The process made me reach deep inside to evaluate and reflect on how I motivate and educate all my students. It was rewarding and eye-opening to weigh my professional goals and ideas against such rigid standards. Another accomplishment was being awarded the 2008 Milken Educator Award. This has opened numerous opportunities for me to be an educational ambassador.

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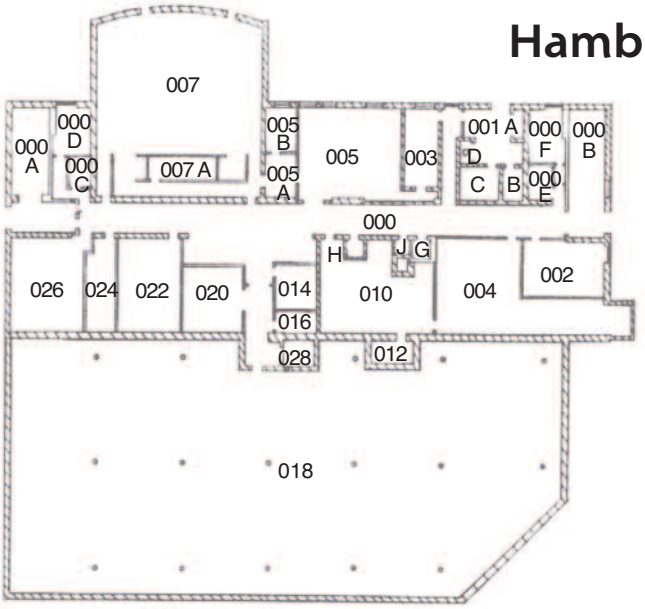
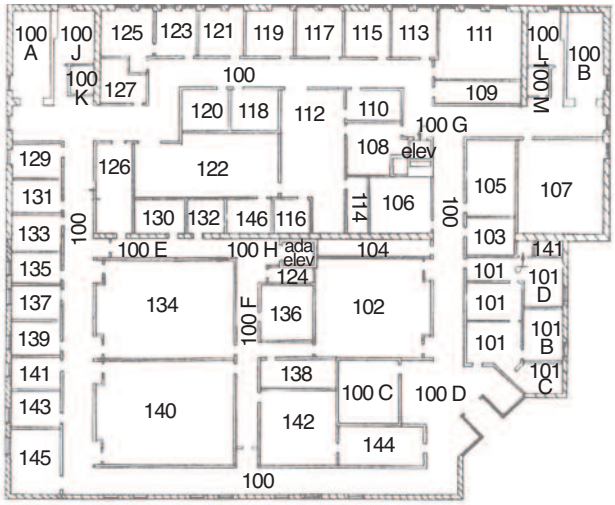
Building Maps

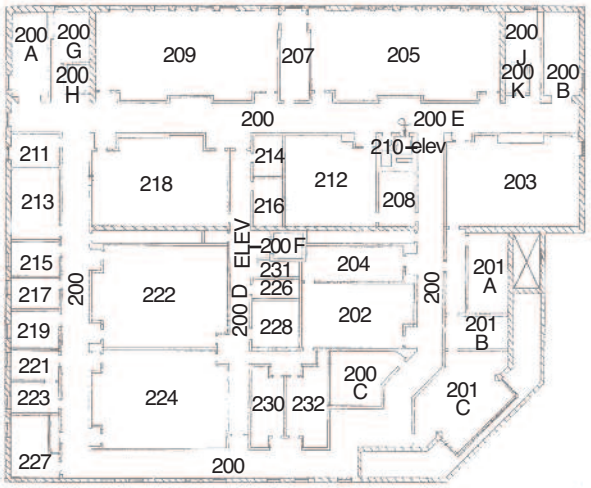
Hamblin Hall



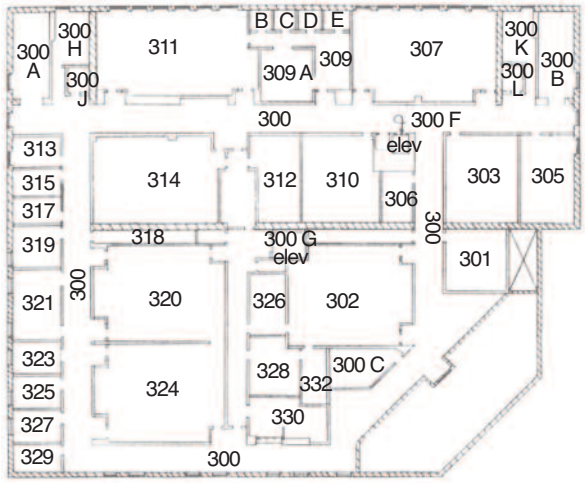
Ground Floor



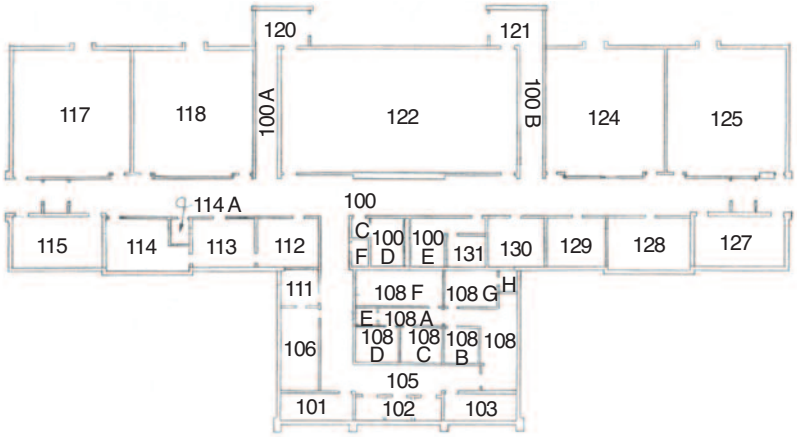
First Floor



Second Floor



Third Floor



Wallace Hall

Speakers

Anne Barth

Anne Barth is the Executive Director of TechConnect West Virginia, a non-profit coalition of professionals from higher education, private industry and the public sector. The goal of TechConnect WV is to diversify and grow the state's economy through innovation-based economic development.

Anne manages a variety of programs aimed at fostering entrepreneurs and start-up companies, leads development and fundraising efforts to implement programs and activities, and is involved in a number of educational, cluster development and workforce initiatives.

In 2011 she was appointed by Governor Earl Ray Tomblin as a member of the Southern Technology Council of the Southern Growth Policies Board. She serves on the Board of Directors of Teaming to Win, the Charleston Area Alliance Vision 2030 Innovation/R&D committee, and was Co-chair of the Environmental Issue Team in the 2011 Power of 32 Project.

Before joining TechConnect WV, she worked for more than two decades for the late U.S. Senator Robert C. Byrd. Based in Charleston as State Director, Anne oversaw the Senator's in-state constituent services operation, represented him at meetings and events, and worked with him to bring numerous federal agencies, facilities, and infrastructure projects to the state. In addition, she worked on five of his record-setting nine consecutive campaigns for the Senate. She serves as a member of the Congressional Education Foundation Board of Directors, which administers the Robert C. Byrd Center for Legislative Studies on the campus of Shepherd University.

Anne holds a Bachelor's Degree in Journalism and a Master's Degree in Corporate and Organizational Communications from West Virginia University.

Ron Basini

Ron Basini is the President of the West Virginia Angel Investor Network (WVAIN). Basini has spent 40 years building a balanced approach to founding, funding, and growing new companies as well as teaching New Venture Strategies and Business Plan Writing at universities in the US and in both Western and Eastern Europe (Switzerland and Romania). In the last ten years, Ron has lectured on Business Plan Writing and starting technology-based companies in China, India, and Russia.

Ron has raised equity capital from every source of capital, to start and grow four companies during the 1970s, 1980's and 1990's. The companies operated in import/export, manufacturing, medical network development, and medical/insurance software.

Basini is an advisor in the formation of new angel networks in Montana and Wyoming and in Romania where he spent five years coaching and advising new ventures.

Anne Cavalier

D. Anne Cavalier, Ed.D. joined the U.S. Economic Development Administration in early 2008. Based in Charleston, she is responsible for statewide outreach and technical assistance representing the agency's mission and goals, programs, and guidelines to clients and potential clients. She provides expert guidance and technical assistance in project development, grant application, planning and post-approval. She is well positioned geographically and experientially to serve as an effective liaison between the EDA and clients at federal, state and local levels. Dr. Cavalier develops and maintains important relationships to facilitate collaboration and partnerships in support of objectives designed to foster regional innovation, industry clusters and new economic growth zones.

Before joining the EDA, Dr. Cavalier was a tenured business professor with West Virginia University on its engineering and technology focused campus in south-central West Virginia. From that platform she served as the statewide economic outreach professional for 20 years. As a part of her regional and statewide focus, she led successful efforts to build a technology incubator and to attract innovative entrepreneurs and high tech business and workforce training.

speaker bios continued

She served on boards and committees leading to the development of projects such as the Chemical Alliance Zone to establish a commercialization center to engage many of the chemists, physicists, mathematicians and engineers who lost their jobs in major chemical industries during the 1990s due to overseas competition. During the last 15 years of her academic career she served as the Principal Investigator for the EDA University Center which allowed her to provide technical assistance to entities across the state. She received the 2004 National Outstanding Project from the University Economic Development Association after nomination by an industry client and credited by its President for providing the technical assistance that saved and grew his manufacturing business.

Lindsay Emery

Lindsay Emery is the Business Development Manager for a grant through the WVU Office of Research and Economic Development. The program, entitled LIINC (Linking Innovation, Industry and Commercialization) aims to develop the innovative culture on WVU's campus by identifying and implementing best practices, managing business development events, and strengthening ties between faculty and graduate students with the private sector. Several key research areas addressed include Department of Defense-related research, bioscience and biomedical research, and energy and the environment.

Lindsay is a native of Cleveland, Ohio and graduated from Duke University in 2010, receiving graduating honors with highest distinction in the linguistics department. Lindsay pursued several diverse projects during her collegiate career. Her cultural experiences included a semester abroad in Salamanca, Spain and a summer volunteering in Salta, Argentina. A trip to Israel with faculty and classmates from Duke inspired the production of a documentary addressing interfaith dialogue and religious identity, which was showcased in a couple of film festivals and conferences. On-campus activities included graphic design and editing for an international student-run magazine and performing harp with several Duke orchestras.

Her involvement with the WVU Research Office began in January 2011 as an intern, but transitioned to a full-time role upon receipt of the grant from the Claude Worthington Benedum Foundation. In addition to managing the LIINC program, Lindsay is pursuing a master's degree in integrated marketing communications.

Paul L. Hill

Dr. Paul Hill is serving as interim Chancellor of the West Virginia Higher Education Policy Commission. Prior to accepting that role in January 2012, Dr. Hill was vice chancellor for science and research. As such, he also served as executive director of the West Virginia Experimental Program to Stimulate Competitive Research (WVEPSCoR), a state infrastructure program of the National Science Foundation (NSF), and managed a number of competitive research programs with academic institutions throughout the state, including the Research Trust Fund – "Bucks for Brains," the Research Challenge Fund and Eminent Scholars initiative.

Dr. Hill has more than 25 years of experience in academic research, grant administration, public policy and management, and has held CEO positions in state, federal and private organizations. Before joining WVEPSCoR in 2001, he was chairman and CEO of the United States Chemical Safety Board, appointed by President Bill Clinton and confirmed by the U.S. Senate.

He became vice chancellor of the West Virginia higher education system's Division of Science and Research in 2007 and is the recipient of more than $50 million in federal research funding. He held a position at West Virginia University in Research and Economic Development and served as adjunct faculty in biology at the University of Charleston.

Dr. Hill is active in numerous state and federal committees, boards and commissions, including the West Virginia Science and Research Council; WV Commission on International Education; EPSCoR Program Directors Council (past chairman); national EPSCoR/IDeA Foundation Board (chairman); Mid-Atlantic Technology, Research, and Innovation Center (MATRIC) board of directors; Hawaii EPSCoR State Committee; Iowa EPSCoR State Committee; Hawaii EPSCoR Monitoring and Assessment Panel (past chairman); A Vision Shared-West Virginia Technology-Based Economic Development (TBED) Council; Marshall University Research Corporation; West Virginia Commission on Science, Technology, Engineering and Mathematics Graduate Education; and West Virginia University College of Engineering Visiting Committee (2004-2007).

He has been a U.S. delegate to the Organization for Economic and Community Development in Europe and served on both the New York City Environmental Protection Council and the U.S. EPA's Council on the Clean Air Act. Dr. Hill was an invited participant in the development of the NSF EPSCoR 2020 Report and has provided congressional testimony on science and technology policy on numerous occasions. He is a member of the American Association for the Advancement of Science (AAAS), the Association of University Technology Managers (AUTM) and the Coalition on the Public Understanding of Science (COPUS).

A native West Virginian, Dr. Hill holds degrees from Marshall University (B.S. and M.S.) and the University of Louisville (Ph.D.) in biology and chemistry. He studied at the University of Louisville's Systems Science Institute, where his research emphasis was environmental chemistry and ecological systems.

Majid Jaridi

Majid Jaridi is a Professor of Industrial Engineering at West Virginia University. He earned a Ph.D. in Industrial and Operations Engineering from the University of Michigan, Ann Arbor, in 1983 and an M.S. in Industrial Engineering from the Asian Institute of Technology, Bangkok, Thailand in 1975. He teaches courses in the areas of Statistical Design of Experiments, Quality Engineering, Forecasting, and Decision Analysis. Also, he has authored numerous peer-reviewed journal publications and conference proceedings in the areas of quality control, decision analysis, and transportation planning.

Dr. Jaridi serves as the Director of WV NASA EPSCoR and NASA West Virginia Space Grant Consortium, a consortium of 12 colleges and universities in West Virginia, NASA IV & V Facility, National Radio Astronomy Observatory Green Bank Telescope, TMC Technologies, Polyhedron Learning Media, Inc., the Clay Center for the Arts and Sciences, and WV High Tech Consortium Foundation.

He has served as the Principal Investigator or co-investigator on funded projects totaling over $20 million since joining West Virginia University in 1984. He has been a reviewer for several research programs and panels for NASA, National Institute of Occupational Safety & Health, and NSF, and several professional journals and session chair and organizer for several professional conferences. Dr. Jaridi is an active Senior Member of the American Society for Quality.

Chris Kolanko

Dr. Kolanko is Vice President and Chief Scientist of EyeMarker Systems, Inc. and is responsible for the corporation's research and development operations. Dr. Kolanko has over 20 years of industrial and military professional experience and has been responsible for the development of biological/chemical threat agent and advanced medical diagnostic technologies. Dr. Kolanko graduated with a Ph.D. in Genetics and Developmental Biology from West Virginia University and currently has the position of Research Associate Professor within the Lane Department of Computer Science and Electrical Engineering.

Dr. Kolanko is a Commissioned Officer in the United States Marine Corp Reserve and is currently assigned to Command Naval Forces Korea. Other military tours included Officer-in-Charge Pittsburgh Detachment 4th Marine Logistics Group, 4th Marine Combat Engineering Battalion and the Office of Naval Research CBRD106. Prior to joining Eye Marker Systems, he was an active duty Navy Officer (Biochemist) assigned to the Naval Research Laboratory and the Armed Forces Radiobiology Research Institute directing a number of military initiatives designed to provide and develop field deployable diagnostics and biodosimetry capabilities for the military. Dr. Kolanko was also a Research Scientist at Bristol-Myers Squibb and Company within the Analytical Research Division working on anti-cancer therapeutic compounds.

Dr. Kolanko hails from Weirton, West Virginia.

B. Gentry Lee

Gentry Lee is Chief Engineer for the Solar System Exploration Directorate at the NASA Jet Propulsion Laboratory (JPL) in Pasadena, California. In this position, he is responsible for the engineering integrity of all the robotic planetary missions managed by JPL. His major recent work included the engineering oversight of the Phoenix mission that landed successfully in the Martian arctic in May 2008. Previously, Lee provided oversight for all engineering aspects

speaker bios continued

of the twin rover missions to Mars that landed in January 2004, as well as NASA's successful Deep Impact and Stardust missions.

Lee was Chief Engineer for the Galileo project from 1977-1988 and, after working in a variety of positions on the Viking project from 1968-76, was Director of Science Analysis and Mission Planning during the Viking operations. The historic Viking mission was mankind's first successful landing on another planet. The Galileo mission explored Jupiter with both an atmospheric probe and an orbiter that mapped the major Jovian satellites during a decade of operations.

In addition to his engineering work, Lee has been an active novelist, television producer, computer game designer, media columnist, and lecturer. Between 1989 and 1994, Lee co-authored four novels, Cradle, Rama II, The Garden Of Rama, and Rama Revealed, with revered science fiction grandmaster Arthur C. Clarke. All four books were New York Times Bestsellers and were translated into over 20 languages. Since his collaboration with Clarke, Lee has written three more successful solo novels, Bright Messengers, Double Full Moon Night, and The Tranquility Wars.

From 1976 until 1981 Mr. Lee was the late Carl Sagan's partner in the creation, design, development, and implementation of COSMOS, the highly successful science documentary series for television that won several Emmys and the prestigious Peabody Award. In July 2009, Gentry Lee was the featured performer/narrator in 'Are We Alone?,' a two-hour Discovery Channel documentary about life in the solar system.

Lee received the NASA Medal for Exceptional Scientific Achievement in 1976 and the Distinguished Service Medal (NASA's highest award) in 2005. He is also the recipient of the prestigious Harold Masursky Award from the American Astronomical Society's Division of Planetary Sciences for his career contributions to planetary exploration.

Judy McCauley

Judy K. McCauley is West Virginia District Director of the U.S. Small Business Administration (SBA). She is responsible for the delivery of SBA programs and services statewide, including guaranteed lending, government contracting, counseling, training, disaster assistance, international business opportunities, compliance, as well as oversight of the Small Business Development Centers, Women's Business Center and SCORE Chapters.

Prior to her appointment in 2004, McCauley served as procurement center representative, commercial marketing representative and contracting officer for SBA in western Pennsylvania and West Virginia, overseeing the release of procurement opportunities and contract awards.

She was recently appointed to the 2011-2012 Affiliate Leadership Council for the West Virginia High Technology Consortium Foundation and serves on the Board of Advisors for the Small Business Development Centers, West Virginia Export Council, Glenville State College Department of Business and Vision Shared Entrepreneurship Committee. She is the SBA point-of-contact for the West Virginia FEMA Voluntary Agency Liaisons and the West Virginia Voluntary Organizations Active in Disasters. McCauley is actively involved in the statewide collegiate business plan competition, hosted by West Virginia University and is a recipient of the West Virginia Women in Business Champion Award.

McCauley recently served on the SBA Administrator's National Advisory Council and the West Virginia Chamber of Commerce Small Business Committee, and the Regional Contracting Assistance Center Board of Advisors. McCauley was instrumental in the creation of West Virginia's premier federal procurement conference, "Teaming to Win," serving as conference director.

A native of West Virginia, McCauley earned associate and bachelor's degrees from Fairmont State University. She resides in Fairmont with husband Matt and daughter Lauren.

Jamie Miller

Jamie Miller is the Director of the Health and Life Sciences Division at the Mid-Atlantic Technology, Research & Innovation Center. She is an adjunct member of the faculty of the Department of Medicine at West Virginia University's Health Sciences Center in Morgantown, WV and is currently working with MATRIC's first life science spin off company, TRAX BioDiscovery, where she is serving as the Chief Scientific Officer. Her doctoral degree

was awarded from West Virginia University in 2005 in the areas of Microbiology and Immunology where she conducted her graduate work in the Cancer Center working in the area of stem cell transplantation. She resides in Fairmont, WV with her husband and three year old son.

Gary Morris

Gary J. Morris, a native of Morgantown, attended West Virginia University earning a Bachelor of Science in Aerospace Engineering, a Master of Science in Mechanical Engineering, and a Ph.D. in Mechanical Engineering. Prior to joining the faculty in the WVU Department of Mechanical and Aerospace Engineering (MAE) as an Assistant Professor in 1986, he worked as an engineer in the private sector at Gulf Research and Development Company and at Hercules, Inc. Allegany Ballistics Laboratory. During his tenure at WVU, Morris reached the rank of Professor with teaching and research areas focusing on aerodynamics, rocket propulsion, and the thermal sciences. He has also been active in academic administration at WVU, serving as MAE Associate Chairman and Graduate Program Director for several years and as MAE Interim Chairman in 2002. In 2005, Morris passed the patent bar exam and became registered to practice before the United States Patent and Trademark Office as a Patent Agent. In the same year, he became the Associate Director of Technology Transfer for WVU, a position he holds concurrently with his position of Professor in MAE.

Over the last two decades as an independent inventor outside of WVU, Morris developed, patented, and licensed to industry several of his own technologies related to life safety and security. This activity, in addition to his position in the WVU Office of Technology Transfer, has provided him with broad technology transfer experiences including product ideation, assessment of technology feasibility and value, intellectual property protection, patent filing and prosecution, prototype development, new technology marketing, and negotiating license agreements. Morris currently holds 18 US patents and five international patents.

Richard M. Niles

Richard M. Niles, Ph.D. is President and a founding member of Progenesis. He is also Professor and Chair of the Department of Biochemistry and Microbiology at the Joan C. Edwards School of Medicine, Marshall University, where he also serves as the Senior Associate Dean for Research and Graduate Education. Dr. Niles has served on and chaired many grant review panels for the National Institutes of Health, Department of Defence Breast Cancer Research Program, DoD Prostate Cancer Research Program and the American Institute for Cancer Research.

He is currently the Principal Investigator of a $9.2 million Center of Biomedical Research Excellence grant from the NIH. Prior to coming to Marshall University in 1992, he was Professor of Biochemistry at Boston University School of Medicine. His broad training and experience in Plant Pathology, Microbiology, and Biochemistry, together with his administrative experience, has helped shaped the strategic development plans for Progenesis.

Rich Overmoyer

Rich Overmoyer, President and CEO, Fourth Economy, is a nationally known thought leader in the innovation-based economic development field and has served in diverse roles in Pennsylvania's economic development community. His most recent endeavor is a startup consulting firm called Fourth Economy Consulting which is headquartered in Pittsburgh. The Fourth Economy team is working with clients throughout the country to develop new economic and community development strategies to support sustainable futures. This work has included supporting projects in West Virginia including work with TechConnect West Virginia, Marshall University's successful pursuit of an EDA University Center, the Greenbrier Resort, City of Morgantown and Innova. I addition, Rich also serves as Executive Director of the University Economic Development Association (www.universityeda.org).

Rich has managed both private and public sector projects having previously served the as Pennsylvania's Deputy Secretary of Technology Investment. In this position, Rich directly managed technology investment programs totaling over $82 million annually. As Executive Director of the Ben Franklin Technology Development Authority, Rich and his team were credited with the creation and attraction of hundreds of new Pennsylvania companies and thousands of jobs within the Commonwealth. Rich also supervised numerous other state-funded entrepreneurial and technology commercialization organizations. He designed and launched the Keystone Innovation Zone program to spur economic development around Pennsylvania's university research institutions and create entrepreneurial networks across the state. He holds a B.A. in Political Science and a M.A. in Public Policy from the University of Pittsburgh.

INNOVATION concept to commercialization

speaker bios continued

Donald A. Primerano

Dr. Donald A. Primerano is Professor and head of the Division of the Microbiology at the Marshall University (MU) Joan C. Edwards School of Medicine. Dr. Primerano serves as the Director of the MU Genomics Core, Director of the Appalachian Cardiovascular Research Network (ACoRN), a member of the WV-INBRE Administrative Core and a member of the WV Cancer Genomics Steering Committee. His primary research interests are in the discovery of cardiovascular and cancer susceptibility genes using next generation sequencing, linkage analysis, expression profiling and bioinformatic methods.

With support from WV-INBRE and ACoRN, Dr. Primerano identifies research projects which determine genetic and environmental causes of cardiovascular disease. As director of the Genomics Core, Dr. Primerano is responsible for developing service relationships between the core and research programs networks like WV-INBRE, in providing overall direction to a core with evolving technologies and institutional responsibilities, and in assisting individual investigators in designing genomic experiments. During the period from 1999 to the present, the Genomics Core has successfully supported the goals of the several funded programs: WVBRIN, WV-INBRE Phase I, WV-INBRE phase II, COBRE Transcription Factors and Cancer, and the WV Cancer Genomics Network.

Dr. Primerano has been a faculty member at Marshall University since 1988. He received his PhD in Microbiology from Duke University in 1982 and completed a postdoctoral fellowship in yeast genetic regulation at Michigan State University in 1998.

Jay Rockefeller

U.S. Senator Jay Rockefeller has proudly served the people of West Virginia for more than 40 years. A central part of his education and economic priorities, he believes investments in science, technology, engineering and mathematics (STEM) education are investments in stronger communities and a more diversified economy.

As U.S. Senator and Chairman of the Senate Committee on Commerce, Science and Transportation, Rockefeller has pushed for smart opportunities to increase competitive research in West Virginia. He is a national leader on the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR), which has spurred more than $900 million in federal academic research and development investments in the state since 2000. In 2007, Rockefeller led efforts to pass the America COMPETES Act, which ensured significant growth in science and technology funding for all states, and that increases in EPSCoR funding would accompany overall growth in the NSF research budget. Most recently, in 2010, Rockefeller spearheaded the successful reauthorization of America COMPETES, continuing funding commitments to research and education at key science agencies.

In addition, Rockefeller is committed to educating students in STEM fields. He introduced the Math and Science Partnership Act, which directed the NSF to engage in innovative partnerships that promote teaching math and science; and championed creation of the Noyce Scholarship Program, which provides scholarships for promising math and science students willing to make a commitment to teaching.

Subra Suresh

Dr. Subra Suresh, distinguished engineer and professor, was nominated by President Barack Obama and unanimously confirmed by the U.S. Senate as the Director of the National Science Foundation (NSF) in September 2010. As director of this $7-billion independent federal agency, he leads the only government science agency charged with advancing all fields of fundamental science and engineering research and related education.

Prior to his current role, Dr. Suresh served as the Dean of the School of Engineering and the Vannevar Bush Professor of Engineering at the Massachusetts Institute of Technology (MIT). His experimental and modeling work on the mechanical properties of structural and functional materials, innovations in materials design and characterization, and discoveries of possible connections between cellular nanomechanical processes and human disease states have shaped new fields in the fertile intersections of traditional disciplines. He has co-authored more than 240 journal articles, registered 21 patents, and written three widely used materials science books.

Dr. Suresh received his Bachelor of Technology degree from the Indian Institute of Technology, Madras, in First Class with Distinction; a Master's degree from Iowa State University; and a Doctor of Science degree from MIT. Following postdoctoral research at the University of California, Berkeley, and the Lawrence Berkeley National Laboratory, he joined the faculty of engineering at Brown University in 1983 and was promoted to full professor in 1989. He joined MIT in 1993 as the R.P. Simmons Professor of Materials Science and Engineering and served as Head of MIT's Department of Materials Science and Engineering from 2000-2006.

In his leadership roles at MIT, Dr. Suresh helped create new state-of-the-art laboratories, the MIT Transportation Initiative, and the Center for Computational Engineering; led MIT's efforts in establishing the Singapore-MIT Alliance for Research and Technology (SMART) Center; and oversaw the recruitment of a record number of women faculty in engineering. Since joining NSF, he has established several new initiatives including INSPIRE (Integrative NSF Support Promoting Interdisciplinary Research and Education), PEER (Partnerships for Enhanced Engagement in Research, in collaboration with USAID), the NSF Career-Life Balance Initiative, and the NSF Innovation Corps.

In 2006, Technology Review magazine selected Dr. Suresh as a top-ten researcher whose research "will have a significant impact on business, medicine or culture." His many honors include the 2006 Acta Materialia Gold Medal, the 2007 European Materials Medal, the 2008 Eringen Medal of the Society of Engineering Science, the 2011 General President's Gold Medal from the Indian National Science Congress, the 2011 Padma Shri Award from the President of India (one of the highest civilian honors from the Republic of India), the 2011 Nadai Medal from the American Society of Mechanical Engineers, and the 2012 R.F. Mehl Award from the Minerals, Metals & Materials Society.

Suresh and his wife Mary have two daughters, Nina and Meera.

- **Justin Swick**

  Justin Swick has been involved in biomanufacturing industry for eight years and is currently head of the engineering department at Vandalia Research. Prior to this he developed process automation instrumentation for research projects at Marshall University. His experience is chiefly in control systems design, mechanical design, and fabrication. Justin holds a BS in Integrated Science & Technology from Marshall University. He, along with Derek Gregg, Vandalia's COO, were recognized as undergraduate researchers of the year 2005 in West Virginia. His current efforts at Vandalia Research are directed toward machine development for DNA manufacturing process optimization.

- **Jan Taylor**

  Dr. Jan R. Taylor is Interim Director of the Division of Science and Research at the WV Higher Education Policy Commission.

  Dr. Taylor joined the West Virginia Experimental Program to Stimulate Competitive Research (WVEPSCoR) in 2003 as deputy director and senior research fellow and became Director of Research Programs at the Division of Science and Research in 2010. Before that, she served as vice president and project director of the National Institute for Chemical Studies. She has also worked in the environmental quality field for the state of West Virginia and served on the faculty of Marshall University.

  She holds bachelor's and master's degrees in biological sciences from Marshall University and a doctorate in biology and systems science from the University of Louisville.

- **Natalie Tennant**

  Natalie E. Tennant is West Virginia's 29th Secretary of State. Secretary Tennant has promoted an open and engaging government and has developed business friendly initiatives. Tennant has also implemented the use of electronic poll books, employed a vote by mail pilot project, had legislation passed to allow satellite voting, and is implementing the first public financing program. Tennant oversaw the unprecedented administration of a special election to replace United States Senator Robert C. Byrd. She was chosen for the Aspen Institute's Rodel Fellowship program and hosted the first National Association of Secretaries of State conference to be held in West Virginia.

INNOVATION concept to commercialization

speaker bios continued

Steve Turner

Stephen Turner is the Founder / CEO of Protea Biosciences. He has 40 years of experience in the biotechnology industry, during which time he founded and served as CEO of the BRL division of Life Technologies, Oncor, OncorMed, and Quorum Sciences. He has in-licensed and commercialized technology from over 60 universities worldwide, and has completed numerous public and private financings. Prior to undertaking his career as a builder of biotechnology companies, he served as the Director of Marketing for the Clinical Microbiology Division of Becton-Dickinson & Co., a major Healthcare company. Steve is a graduate of Stanford University. In 1994 he received the Ernst & Young Entrepreneur of the Year Award for the Washington D.C. Region.

Ryan Wall

One of the original founders of the Innovation and Entrepreneurship Center (IEC) at Wheeling Jesuit University, Ryan Wall is responsible for marketing and managing the center, which includes organizing professional workshops, and developing and implementing strategic planning and growth strategies for entrepreneurs. A business owner in both the U.S. and overseas, Wall brings a diverse background and global perspective to the innovation and commercialization process. Formally the Director of a regional export assistance program, Wall has also held the position of Commercial Business Manager for a robotic systems manufacturer where he was responsible for export sales of several hundreds of thousands of dollars of defense equipment.

In addition to his role with the IEC, Wall is President and owner of Wall2Wall Innovations, a digital marketing and technology firm based in Wheeling. Wall2Wall creates mobile device apps for businesses and organizations, and leveraging this capability in the development of sensors systems for environmental, bio-medical and other applications. Wall2Wall also delivers a range of business consulting and training, which includes organizational leadership, project management, and international business.

Wall holds a bachelor's degree in political science, a master's degree in international relations and a Master's in Business Administration degree from Wheeling Jesuit University. Originally from Glasgow, Scotland, he now resides in Wheeling with his wife and three young children, and lists personal interests as, spending time with family, and playing and coaching soccer and boxing.

Charlotte Weber

Under the leadership of Charlotte Weber, the Robert C. Byrd Institute for Advanced Flexible Manufacturing (RCBI) is recognized as a national model that provides access to innovative manufacturing and entrepreneurial technology and training.

As Director & CEO of RCBI, Ms. Weber oversees a broad range of operations aimed at providing manufacturers and entrepreneurs with access to the latest computer-controlled manufacturing equipment, as well as technical training and workforce development initiatives. This assistance enables manufacturers to remain or become quality suppliers to the Department of Defense (DoD), NASA and the commercial sector.

When Ms. Weber took the helm at RCBI in 1996, it operated one Advanced Manufacturing Technology Center in Huntington. At her direction, RCBI undertook an aggressive expansion effort, opening additional facilities in Charleston, Bridgeport and Rocket Center (near Keyser in the state's Eastern Panhandle).

RCBI's activities have provided modernization, technology and workforce development assistance to more than 5,300 manufacturers that employ more than 81,000 individuals at an annualized payroll approaching $2 (B) billion. As a direct result of the exposure and trial use of specialized production equipment and cutting-edge technologies it provides, RCBI has helped facilitate nearly $32 (M) million in private industry investment.

In addition to her responsibilities at RCBI, Ms. Weber serves as Vice President for Federal Programs at Marshall, coordinating the university's technology and research activities with federal grant opportunities.

A native of Weston, Ms. Weber attended West Virginia University and George Washington University, where she earned a bachelor's degree in business administration. She served nearly a decade as Executive Assistant to the late U. S. Senator Robert C. Byrd in Washington, D.C., prior to joining Marshall University in 1993.

Oral Presentation List

ORAL PRESENTATION LIST

Session 1 Nongame Wildlife — *Hamblin Hall Auditorium*

Convener and Moderator: *Dr. Heather Kalb, Dept. of Biology, West Liberty University*

1:00 **ZACHARY LOUGHMAN,** KINSEY SKALICAN, and NATE TAYLOR. Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Determination of daily of movements and macrohabitat preference of the invasive crayfish Orconectes virilis through use of telemetry.**

1:15 **ZACHARY LOUGHMAN**, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and **STUART WELSH**, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown WV 26506-6125. **Occupancy rates of primary burrowing crayfishes at natural and disturbed sites along West Virginia's Ohio and Kanawha River floodplains**.

1:30 **TIM RUHNKE**, Dept. of Biology, West Virginia State University, Institute, WV 25112. **Progress and obstacles in species level investigations of two cestode genera from sharks and stingrays.**

1:45 **KAREN KETTLER** and **ZACHARY LOUGHMAN**, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. Project B.E.E.: **A biodiversity experience for science educators.**

Session 2 Molecular/Cellular Biology — *Hamblin Hall, Room 307*

Convener and Moderator: *Dr. Robert Harris, Dept. of Biology, West Virginia State University*

1:00 ***ANAND NARAYANAN** and DR. PETER GANNETT, Dept. of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26505, and SRI LAKSHMI YEDLAPPALI and DR. LLOYD CARROLL, Dept. of Chemistry, West Virginia University, Morgantown, WV 26505. **Multi-functional Magnetic Nanoparticles as Cancer Therapeutic Agents.**

1:15 ***ARIELLE STAFFORD** and ADAM PARKS, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Bunker-Busting Bacteriophage: Isolation of Bacteriophage for Elimination of Pseudomonas aeruginosa Biofilms.**

1:30 **UMESH K. REDDY,** PADMA NIMMAKAYALA, YAN TOMASON, JONICA THOMPSON, H. LEE DALTON, GOPI VAJJA and SUMANTH MANOHAR, Department of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25112. **Use of Nextgen Sequencing for genome analysis of cucurbit crops.**

1:45 **#RYAN M. WILLIAMS**, Dept. of Basic Pharmaceutical Sciences, PO Box 9530, West Virginia University, Morgantown, WV 26506, and LETHA J. SOOTER, WVNano Initiative, Dept. of Basic Pharmaceutical Sciences, PO Box 9530, West Virginia University, Morgantown, WV 26506. **In vitro selection of DNA molecular recognition elements for the pesticide atrazine.**

Session 3 Botany — *Hamblin Hall, Room 107*

Convener and Moderator: *Dr. Donald Trisel, Dept. of Biology, Fairmont State University*

1:00 ***BRITTANY M. LEE** and DONALD. E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of growing media on the growth and photosynthesis rates of morning glory.**

1:15 ***CAITLAND M. ADKINS** and DONALD. E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of mychorrizal fungi on strawberry plants.**

1:30 ***DAWNELLE R. POWELL** and DONALD. E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of acidity and salinity on growth and photosyn thetic rates of squash plants.**

Oral Presentation List continued

1:45 ***KRISTINA M. LEWIS** and DONALD. E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of norgestimate/ethinyl estradiol on the growth and the photosynthetic rates of maize (Zea mays).**

Session 4 Chemistry

Room Hamblin Hall 212

Convener and Moderator: *Dr. Micheal Fultz, Dept. of Chemistry, West Virginia State University*

1:00 **#BRIAN C. TRAIN**, Dept. of Pharmaceutical and Pharmacological Sciences, West Virginia University, Morgantown, WV 26505, and VORASIT VONGSUTILERS, Dept. of Pharmaceutical Sciences, Chulalongkorn University, Bangkok 10330, Thailand, and NISSA M. THOMSEN, Dept. of Pharmaceutical and Pharmacological Sciences, West Virginia University, Morgantown, WV 26505, and PETER M. GANNETT, Dept. of Pharmaceutical and Pharmacological Sciences, West Virginia University, Morgantown, WV 26505. **Investigation of the Z-DNA Binding Protein Mediated B-/Z-DNA Transition Through the Use of C8-Arylguanine Modified Oligonucleotides.**

1:15 **#ALAN CAMPBELL,** CHENBO DONG, AND CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND CHENGCHENG XIANG AND NIANQUIANG WU, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown WV, 26506, AND JONATHAN DORDICK, Department of Chemical Engineering, Rensselaer Polytechnic Institute, Morgantown WV, 26506. **Activity and stability studies of bionano engineered hybrids for decontamination.**

1:30 **#CHENBO DONG** and CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND DAVID LOWRY, MICHAEL KASHON, AND LINDA M SARGENT, National Institute for Occupational Safety and Health, Morgantown WV, 26505. **Nanoindentation analysis of epithelial cells incubated with carbon nanotubes.**

1:45 **XIAOPING SUN,** DAVID HAAS, KAYANNA SAYRE, KATRINA LEAPTROT, and BENJAMIN SMITH. Dept. of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304. **Our progress in studies of aryl organosulfur compounds: synthesis, substituent effects, and reaction mechanisms.**

Session 5 Engineering

Hamblin Hall, Room 005

Convener and Moderator: *FARSHID ZABIHIAN, Dept. of Engineering, WVU Tech*

1:00 **#MURAT DINC** and DONALD D. GRAY, Dept. of Civil and Environmental Engineering, NICHOLAS HILLEN, J. STEPHEN TAYLOR, and **JOHN KUHLMAN**, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Computational Fluid Dynamics Study of the Effect of Gravity on the Impact of a Drop onto Dry and Wet Surfaces.**

1:15 **#NICHOLAS HILLEN,** J. STEPHEN TAYLOR, and JOHN KUHLMAN, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506, MURAT DINC and DONALD D. GRAY, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Spray Cooling Experiments for Monte Carlo Simulation Model.**

1:30 **#REEM ELDAWUD,** CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND HOSAM A. ELBAZ, YON ROJANASAKUL, Department of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506. **Electronic platform used as a proxy to quantify cellular toxicity of anticancer drugs.**

1:45 **#JINLONG YAN,** MINGJIA ZHI, and NIANQIANG WU, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **PH_3 Poisoning Effect on Ni/YSZ Cermet Solid Oxide Fuel Cell Anode.**

2:00 **FARSHID ZABIHIAN** and KAMRAN ROSTAMI, Dept. of Mechanical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136, ASAD DAVARI, Dept. of Electrical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136, and GIFTY OSEI-PREMPEH, Dept. of Chemical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136. **Development of proof-of-concept single cell polymer electrolyte fuel cell fueled with carbon monoxide.**

Session 6 Applied Mathematics and Physics — *Hamblin Hall, Room209*

Convener and Moderator: *Dr. Qing Wang, Dept. of Mathematics, Shepherd University*

1:00 ***DUSTIN REVELL** and ADAM PARKS, Dept. of Biology, Shepherd University, Shepherdstown, WV 25433, and QING WANG, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25433. **Mathematically modeling the growth of Escherichia coli K12 throughout GASP phase.**

1:15 ***BRITTANY WHITED**, Mathematics Dept., Marshall University, Huntington, WV 25755 and MARCIA HARRISON-PITANIELLO, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. **Modeling Gravitropic Curvature in Plant Stems.**

1:30 **#ANVEEKSH KONERU,** MINGJIA ZHI, and NIANQIANG WU, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Electrospun La0.8Sr0.2MnO3 Nanofibers for High Temperature Electrochemical Carbon Monoxide Sensor.**

Session 7 Nongame Wildlife — *Hamblin Hall Auditorium*

Convener and Moderator: *Dr. Sean Collins, Dept. of Biology, West Virginia State University*

2:00 **CLIFFORD STARLIPER,** USGS Leetown Science Center, Fish Health Laboratory, Kearneysville, WV 25430, and BARNABY WATTEN, USGS Leetown Science Center, S.O. Conte Anadromous Fish Research Center, Turners Falls, MA, 01376. **Method development for IMO D2 Standards on-board ship disinfection of ballast water.**

2:15 **#CHASE TURNER** and TIM RUHNKE. Dept. of Biology, West Virginia State University, Institute, WV 25112 and KIRSTEN JENSEN, Dept. of Ecology and Evolutionary Biology, The University of Kansas. **Examination of host species usage patterns in species of the shark cestode genus Paraorygmatobothrium.**

2:30 ***JESSICA CAIN,** COLLEEN J. NOLAN, and CAROL ZYGAR PLAUTZ, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Effects of chronic treatment with Round-Up and its constituents on the snail Lymnaea palustris with respect to mortality, fecundity, growth, and developmental abnormalities.**

2:45 **#DAVID A. FOLTZ II,** Dept. of Biology, Marshall University, 1 John Marshall Drive, Huntington WV 25755, DR. STUART A. WELSH, Division of Forestry and natural Resources, West Virginia University, Morgantown WV 26506-6125, and DR. ZACHARY J. LOUGHMAN, West Liberty University, West Liberty, WV 26074**. Baited lines, a novel approach to collecting burrowing crayfishes.**

Session 8 Botany — *Hamblin Hall, Room 107*

Convener and Moderator: *Dr. Kevin Barry, Dept. of Biology, West Virginia State University*

2:00 ***KADY ROGERS,** DR. KATHARINE GREGG and JEN COLLINS, Dept. of Biology, West Virginia Wesleyan College, WV 26201. **Composition of Four Forest Communities at Straight Fork, Southern Upshur County, West Virginia.**

2:15 ***AARON DEESE** and DONALD E. TRISEL, Dept. of Biology, Fairmont State University, Fairmont WV 26554. **Nosema Disease in West Virginia Honey Bees**.

2:30 ***NICHOLAS D. HIGINBOTHAM** and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of growing media on the growth and photosynthesis rates of beans.**

INNOVATION concept to commercialization

Oral Presentation List continued

Session 9 Stream Ecology — *Hamblin Hall, Room 205*

Convener and Moderator: *Dr. Vickie Wolfe, Dept. of Biology, West Virginia State University*

2:00 ***NATALIE FOX,** MARK FLOOD, and PHILLIP YEAGER, Dept. of Biology, Fairmont State University, Fairmont, WV 26554, and PAUL BAKER, Save the Tygart Watershed Association, Grafton, WV 26354. **Determination of the effects of acid mine drainage remediation using microbial community assessment.**

2:15 ***CHRISTINA SNODGRASS,** MARK FLOOD, and PHILLIP YEAGER, Dept. of Biology, Fairmont State University, Fairmont, WV 26554, and PAUL BAKER, Save the Tygart Watershed Association, Grafton, WV 26354. **Determination of the effects of acid mine drainage remediation in the Three Fork Creek drainage.**

2:30 **#CHARLES Z. WALBURN** and LESLIE C. HOPKINSON, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV. **Quantifying near-streambank turbulence through a storm event.**

2:45 ***SETH O'NEAL** and MARK FLOOD, Dept. of Biology, Fairmont State University, Fairmont, WV, 26554. **Determination of the effects of Marcellus shale drilling and fracking on local stream composition.**

Session 10 Chemistry — *Hamblin Hall, Room 212*

Convener and Moderator: *Dr. David Haas, Dept. of Chemistry, University of Charleston*

2:00 **#ENGIN CIFTYUREK,** KATARZYNA SABOLSKY, and EDWARD M. SABOLSKY, Dept. of Mechanical & Aerospace Engineering, West Virginia University Morgantown, WV 26506. **Degradation of Platinum Thin Films Electrodes for High-Temperature MEMs Applications.**

2:15 **#PHIL GANSOR,** CHUNCHUAN XU, JOHN ZONDLO, KATARZYNA SABOLSKY, and EDWARD M. SABOLSKY, Dept. of Mechanical & Aerospace Engineering, West Virginia University Morgantown, WV 26506. **An H2S-Tolerant Ni/GDC Anode with a GDC Barrier Layer.**

2:30 **#IRFAN A. KHAN** and ELMER M. PRICE, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755, COLTON J. KOONTZ, MASUDUR RAHMAN, BIN WANG, and MICHAEL L. NORTON, Dept. of Chemistry, Marshall University, Huntington, WV 25755, and DAVID NEFF, Molecular and Biological Imaging Center, Marshall University, Huntington, WV 25755. **Designing a microfluidic cell culture system for growing endothelial cells.**

2:45 **XUEYAN SONG,** YUN CHEN, XUEZHANG XIAO, SONG CHEN, and EVER BARBERO, Dept. of Mechanical and Aerospace Engineering, West Virginia University, WV 26506. **Thermoelectric and nanostructure evolution of $CA_3CO_4O_9$ bulk ceramics upon high temperature annealing.**

Session 11 Computer Science — *Hamblin Hall, Room 209*

Convener and Moderator: *Dr. Asad Davari, Dept. of Electrical and Computer Engineering West Virginia University Institute of Technology*

2:00 ***MATTHEW GRIFFITH,** SEUNG-YUN KIM, and OSMAN GUZIDE, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, WV 25443. **An Educational CPU Instruction Set Architecture.**

2:15 ***JOHN LAUB** and OSMAN GUZIDE, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, WV 25443. **Optimizing and Analyzing Fat-Tree Butterfly Network-on-Chip Muliticore Topology designs under Nano Scale Technology Constraints.**

2:30 ***MICHEAL V SMITH,** SEUNG-YUN KIM, and OSMAN GUZIDE, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, WV 25443. **An Efficient Management Algorithm for Smart Home Environments using Petri Net Modeling and Simulation Tools.**

2:45 ***CHRISTOPHER C. WALLACE** and OSMAN GUZIDE, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, WV 25443. **Quantum Cryptography: Ultraviolet Hash Function of Quantum Cryptography**.

Session 12 Molecular Biology/Microbiology

Hamblin Hall, Room 307

Convener and Moderator: *Dr. Barbara Liedl, Associate Research Scientist, Gus R. Douglas Institute*

2:00 **MASUDUR RAHMAN,** ANSHUMAN MANGALUM, and MICHAEL NORTON, Dept. of Chemistry, Marshall University, Huntington, WV 25755 and DAVID NEFF, Molecular and Biological Imaging Center, Marshall University, Huntington, WV 25755. **Using DNA Origami to organize bio-Materials.**

2:15 **#SHELLY H. BRIGHT** and GERALD R. HANKINS, Dept. of Biology, West Virginia State University, Institute, WV 25112. **Are fibroblast growth factors steroid-responsive autocrine signals in meningiomas?**

2:30 **#NIRANJAN ARYAL**, Dept. of Biology, West Virginia State University, Institute, WV 25526, DAVID H. HUBER, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25526. **The metagenome of the microbial gut community of the wood-feeding larvae of the beetle *Osmoderma eremicola*.**

2:45 **DAVID H. HUBER**, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25526, and DEEPAK SHARMA, Dept. of Biology, West Virginia State University, Institute, WV 25526. **Comparative Metagenomics of Microbial Bioenergy Communities.**

Session 13 Psychology

Hamblin Hall, Room 218

Convener and Moderator: *Dr. James Spencer, Dept. of Psychology, West Virginia State University*

2:00 **ALAN M. DANIEL**, Dept. of Social Science, Glenville State College, 200 High Street, Glenville, WV 26351. **A Comparative Approach to Models of Depression.**

2:15 ***H. JANE LONG**, DANYALE LANE, STEPHEN MCGILL, JAMES SPENCER, RYAN SIRCY, ANNA REED, PATTI HARRISON, VIRGINIA KENNEDY, DAWN RACER, VALERIE BLAKE, and ELIZABETH HICKOK, Dept. of Psychology, West Virginia State University, Institute, WV 25112. **Salient objects influence elevator conversation latency and content.**

2:30 ***STEVEN PIFER,** BRANDON ABBOT, ADAM FISCHER, WESTLEY MULLINS, JOE EVANS, and GARY MORRIS, Department of Science and Mathematics, Glenville State College Glenville, WV 26351. **Using the Process of Fermentation to Stimulate Interest in Undergraduate Science Laboratories.**

2:45 AMBER A. SMITH, Dept. of Kinesiology, Texas Woman's University, Denton, TX 76204-5647 and **ALAN D. SMITH,** Dept. of Management and Marketing, Robert Morris University, Pittsburgh, PA 15219-3099. **Sports gambling, promoting the professional intellect, and productivity issues during March Madness.**

Poster List

INNOVATION concept to commercialization

POSTER LIST FRIDAY APRIL 20, 2012

1st Floor Hamblin Hall

1. ***DOUGLAS W. BRIGHT** and J. MARK CHATFIELD, Dept. of Biology, West Virginia State University, Institute, WV 25112. **Developing a modern herbarium at WVSU.**
2. MARILYNN BURKOWSKI, ***ETHAN EPLING, *JOSEPH BROWN,** and DR. RICO GAZAL, Dept. of Land Resources, Glenville State College, Glenville, WV 26351. **Spatial distribution of plant invasives in West Virginia.**
3. **#MIRANDA B. CARPER[1],[3],** GORAN BOSKOVIC[1],[3], JAMES DENVIR[1],[3], DONALD PRIMERANO[1],[3], and PIER PAOLO CLAUDIO[1], [3], [1]Dept. of Biochemistry and Microbiology, Marshall University, Huntington, WV 25755, [2] Dept. of Surgery, Joan C. Edwards School of Medicine, Marshall University, Huntington, WV 25701, [3] McKown Translational Genomic Research Institute, Marshall University Huntington, WV 25701. **Finding a bridge that connects the p53 and pRb tumor suppressor pathways.**
4. **#ARGELIA CERVANTES**, Escuela de Ciencias Biológicas, Universidad Autónoma de Coahuila, México, Department of Biology, West Virginia State University, Institute, WV 25112, and NAGAMANI BALAGU RUSAMY, Escuela de Ciencias Biológicas, Universidad Autónoma de Coahuila, México, and DAVID H. HUBER, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25526. **Bacterial Diversity of a unique freshwater ecosystem, Cuatro Ciénegas, Coahuila, México.**
5. **#H. LEE DALTON II**, SUMANTH MANOHA, PADMA NIMMAKAYA, YAN TOMASON, and UMESH K. REDDY, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25112-1000, and GURU JAGADEESWARAN and SUNKAR RAMANJULU, Dept. of Biochemistry and Molecular Biology, Oklahoma State University, Stillwater, OK 74078. **Differential expression of miRNA across the grafted tissues collected from scion and root stock belonging two different genera.**
6. ***RAQUEL FAGUNDO**, MICHAEL LUCERO, and ZACHARY LOUGHMAN, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Epigean crayfishes of the Lower Kanawha River system: conservation and natural history.**
7. **MIN KOOK KIM**, Dept. of Integrated Science and Technology, Marshall University, Huntington, WV 25575, and JOHN J. DAIGLE, School of Forest Resources, University of Maine, Orono, ME 04469. **Analysis of vegetation diversity using remote sensing technology on Cadillac mountain summit, Acadia National Park.**
8. **#JASON R. HEALY** and RAE R. MATSUMOTO, Dept. of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506, and PADMAVANI BEZAWADA, MATTHEW METCALF, CHRIS CUNNINGHAM, SUCHETA KUDRIMOTI, and ANDREW COOP, Dept. of Pharmaceutical Sciences, University of Maryland School of Pharmacy, Baltimore, MD 21201. **Pharmacological Characterization of Novel Opioid Agents Intended to Reduce Chronic Tolerance.**
9. ***KAILEY IMLAY**, Dept. of Biology, West Virginia University, Morgantown, WV 26506, and RYAN M. WILLIAMS and LETHA J. SOOTER, Dept. of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506. **Isolation of molecular recognition elements against Exotoxin A for application in toxin detection.**
10. ***AMANDA R. KULICK**, Pre-forensics, West Virginia University, Morgantown, WV 26506, and RYAN M. WILLIAMS, Dept. of Basic Pharmaceutical Sciences, PO Box 9530, West Virginia University, Morgantown, WV 26506, and LETHA J. SOOTER, WVNano Initiative, Dept. of Basic Pharmaceutical Sciences, PO Box 9530, West Virginia University, Morgantown, WV 26506. ***In Vitro* Selection of PETN Molecular Recognition Elements Using Capillary Electrophoresis.**
11. MEAGAN LESSER, ALICIA ROSE, and **SARA SAWYER**, Dept. of Science and Mathematics, Glenville State College, Glenville, WV 26351. **The effects of temperature on integrin distribution in the aposymbiotic tropical sea anemone, *Aiptasia pallida*.**

Bold font indicates presenter | *Indicates undergraduate presenter | # Indicates graduate student presenter

12. **#AMRUTA MANKE** and YON ROJANASAKUL, Dept. of Basic Pharmaceutical Sciences, West Virginia University, Morgantown WV 26505, and TODD A. STUECKLE and LIYING WANG, National Institute for Occupational Safety & Health, Morgantown WV 26505, and CERASELA ZOICA DINU, Dept. of Chemical Engineering, West Virginia University, Morgantown WV 26505. **Novel synthetic cardiac glycosides for Anti-cancer Therapy.**

13. **#SARAH MATHIS**, CANDACE M. HOWARD, and PIER PAOLO CLAUDIO, Dept. of Biochemistry and Microbiology, Translational Genomic Research Institute, Marshall University, Huntington, WV 25755, and JAGAN VALLURI, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755, and GERRIT A. KIMMEY, Dept. of Medical Oncology, St. Mary's Hospital, Huntington, WV 25702, and THOMAS DOUGHERTY, Dept. of Pathology & Marshall University, St. Mary's Hospital, Huntington, WV 25702. **Personalized Chemotherapy Identified for a Case of Progressing Spinal Ependymoma.**

14. **#ROUNAK NANDE**[1], MICHAEL S. GOSSMAN[2], JEFFREY P. LOPEZ2, CANDACE M. HOWARD[1], JAMES DENVIR[1], and PIER PAOLO CLAUDIO[1],[3], [1]Dept. of Biochemistry and Microbiology, Translational Genomic Research Institute, Marshall University, Huntington, WV [2]Tri-State Regional Cancer Center, Radiation Oncology, Ashland, KY. [3]Dept. of Surgery, Marshall University, Huntington, WV. **Comparison of micro-bubble assisted p53, pRB, and p130 gene therapy in combination with radiation therapy in prostate cancer in vitro and in vivo.**

15. **#THOMAS RICHARD** and JENNIFER WEIDHAAS, Civil and Environmental Engineering, West Virginia University, WV 26506. **Adsorption and bioremediation of explosive compound: IMX-101 and constituents.**

16. **#DEEPAK SHARMA**, Dept. of Biology, West Virginia State University, Institute, WV 25526, DAVID H. HUBER, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25526, TEODORO ESPINOSA-SOLARES, Agroindustrial Engineering Department, Universidad Autonoma Chapingo, Mexico. **Bacterial community dynamics during codigestion in a thermophilic anaerobic digester.**

17. ***KINSEY SKALICAN**, SHANNON BERARDI, and ZACHARY LOUGHMAN, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Life History of the Crayfish *Cambarus chasmodactylus* from the central portion of the species range.**

18. ***NICHOLAS ZIMMERMAN** and KEVIN DALY, Dept. of Biology, West Virginia University, WV 26506, and AMANDA KULICK, Dept. of Forensics and Investigative Sciences, West Virginia University, WV 26506, and RYAN WILLIAMS, Dept. of Basic Pharmaceutical Sciences, West Virginia University, WV 26506, and LETHA SOOTER, WVNano Initiative, Dept. of Basic Pharmaceutical Sciences, West Virginia University, WV 26506. **Selections of odor-binding Molecular Recognition Elements using CE-SELEX.**

2nd Floor Hamblin Hall

19. **JON-TAIT BEASON**, ALEX ZWIERKO, and REBECCA S. LINGER, University of Charleston School of Pharmacy, Charleston, West Virginia V. JO DAVISSON, Purdue University College of Pharmacy, West Lafayette, Indiana. **Investigating the Allosteric Activation in Guanosine Monophosphate Synthetase.**

20. **#CHRIS D. BOSTICK**, JOHN E. JETT, and PETER M. GANNETT, Dept. of Pharmaceutical and Pharmacological Sciences, West Virginia University, WV 26506, DAVID LEDERMAN, Dept. of Physics, West Virginia University, WV 26506. **Single Molecule Direct Measurement of Electron Transfer in Cytochrome P450's and the Effect of Bound Substrates or Protein.**

21. ***HANNAH CAVENDER**, SHAWN SIMMS, and GENIA SKLUTE, Dept. of Chemistry, West Virginia State University, Institute, WV 25112. **Reactivity and Diastereoselectivity of Acyl Zirconocene towards Chiral Sulfinimines.**

22. ***ROBERT MORRIS**, MICHEAL FULTZ, and THOMAS GUETZLOFF, Dept. of Chemistry, West Virginia State University, Institute, WV 25112. **Microwave Syntheis of N-Phenyl succinimides.**

23. **#JOSHUA MULLENAX**, PATRICK BROWNING, WADE HUEBSCH, and EDWARD M. SABOLSKY, Dept. of Mechanical & Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Electrochemical and Mechanical Evaluation of Multifunctional Lithium Ion Batteries.**

Friday Poster List continued

24. ***WILLIAM ROLLYSON** and MICHEAL FULTZ, Dept. of Chemistry, West Virginia State University, Institute, WV 25112. **Progress toward the synthesis of (±)-spathoside.**

3rd Floor Hamblin Hall

25. ***JEFFREY HECK**, KOUROSH SEDGHISIGARCHI, and ASAD DAVARI, Dept. of Electrical & Computer Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136. **Real-time maximum power point tracking of photovoltaic arrays.**

26. ***NAIRITA DEB** and WEIDONG LIAO, Dept. of Computer Science, Math and Engineering, School of Natural Sciences and Mathematics, Shepherd University, Shepherdstown, WV 25443. **Hybrid CPU vs GPU Computing: A Comparative Study.**

27. ***CHAD VANORSDALE, JORDAN CANNIN, JESSICA NOVAK,** and **WEIDONG LIAO**, Dept. of Computer Science, Math and Engineering, School of Natural Sciences and Mathematics, Shepherd University, Shepherdstown, WV 25443. **Mobile Computing: Hardware, Software, and Security.**

28. **#FERNANDO A COSSO**, Dept. of Mechanical and Aerospace Engineering, West Virginia University WV 26505. **Computer Aided Design Environment for Composites.**

29. **#JOSE ESCOBAR** and ISMAIL CELIK, DOE National Energy Technology Laboratory, Morgantown, WV 26505, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26505. **Faster Simulations for Pollutant Predictions using Detailed Chemistry.**

30. **#SERGIO ESCOBAR**, S. RAJU PAKALAPATI, and ISMAIL CELIK, DOE National Energy Technical Laboratory, Morgantown, WV 26505, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26505. **Numerical study of Rotating Detonation Combustion for stationary power generation.**

31. **VIJAYMARAN MANICKAM**, ISMAIL CELIK, JERRY MASON, S. RAJU PAKKALAPATI, CFD&AMP center at the Mechanical and Aerospace Engineering (MAE) Dept., College of Engineering and Mineral Resources (CEMR) WVU, Morgantown, WV 26505. **Quantification of mixing in two fluid micro-channels for biomedical applications.**

32. ***KAMRAN ROSTAMI** and FARSHID ZABIHIAN, Dept. of Mechanical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136, and ASAD DAVARI, Dept. of Electrical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136, and GIFTY OSEI-PREMPEH, Dept. of Chemical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136. **Polymer electrolyte fuel cells fueled with carbon monoxide.**

Poster List

POSTER LIST SATURDAY APRIL 21, 2012

1st Floor Hamblin Hall

33. ***CAMILLE AGUIRRE**, ADRIENNE WALKER, and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Behavioral effects of serotonin and photoperiod in the Madagascar Hissing Cockroach, *Gromphadorhina portentosa*.**

34. ***SIOBHAN BELLEW** and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Characterization of courtship and agonistic calls in three species of hissing cockroaches: *Gromphadorhina portentosa, Aleuropoda insignis, Princisia vanwaerbecki*.**

35. ***MORGAN JOHNSON** and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Behavioral effects of Octopamine levels in the Madagascar Hissing Cockroach, *Gromphadorhina portentosa*.**

36. ***LORI DINGESS,** LAVANYA ABBURI, GOPI VAJJA and UMESH K. REDDY, Dept. of Biology, West Virginia State University, Institute, WV 25112. **Competition ability of *Arabidopsis* ecotypes.**

37. ***JORDAN A. HUNTER**, COLLEEN J. NOLAN, and CAROL ZYGAR PLAUTZ, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Long term memory formation and inhibition in *Lymnaea palustris*.**

38. ***AISHA KHAN** and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Disturbance hisses in six species of hissing roaches.**

39. ***ADRIENNE WALKER**, CAMILLE AGUIRRE, MORGAN JOHNSON and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Modulation of Behavioral Syndromes by Serotonin and Octopamine in the Madagascar Hissing Cockraoch, *Gromphadorhina portentosa*.**

40. ***JULIA R. SALING**, LEAH D. STARKEY, and MATTHEW J. ZDILLA, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and DEVAN M. BASIL, Dept. of Community Medicine, West Virginia University, Morgantown, WV 26506. **Correlations between zinc intake and taste perception of zinc sulfate solution.**

41. ***LEAH D. STARKEY,** JULIA R. SALING, and MATTHEW J. ZDILLA, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and DEVAN M. BASIL, Dept. of Community Medicine, West Virginia University, Morgantown, WV 26506. **Correlations between a zinc specific food frequency questionnaire, zinc taste test, and a novel visual analog scale.**

42. ***AARON DEESE, *JOSHUA VANOSDOL**, and DONALD E. TRISEL, Dept. of Biology, Fairmont State University, Fairmont, WV 26554. **Effects of Nitrogen Deficiency and Toxicity on Photosynthetic Rates in *Lycopersicon esculentum*.**

43. ***CAITLIN HUDKINS, *LAUREN SIBURT**, and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of trace nutrient deficiencies on photosynthetic rates of *Solanum lycopersicum*.**

44. **JOHN LANDOLT**, Dept. of Biology, Shepherd University, Shepherdstown, West Virginia 25443, and JAMES CAVENDER, Dept. of Environmental and Plant Biology, Ohio University, Athens, Ohio 45701, and HANNAH SUTHERS, 4 View Point Drive, Hopewell, New Jersey , and STEVE STEPHENSON, Dept. of Biological Sciences, University of Arkansas, Fayetteville, Arkansas 72701. **Ecological distribution of dictyostelid cellular slime molds in Mexico.**

Bold font indicates presenter | *Indicates undergraduate presenter | # Indicates graduate student presenter

INNOVATION concept to commercialization

Saturday Poster List continued

45. **#HANNAH MICK** and MARCIA HARRISON-PITANIELLO, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. **Development of a screening method for identification of new proteins that regulate gravitropism kinetics in *Arabidopsis thaliana*.**

46. ***EVA A. MULLINS** and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of mycorrhizal fungi on strawberry plants.**

47. ***BERNIE SUPERAK, *JADE BENNETT**, and DONALD E. TRISEL. Dept. of Biology, Fairmont State University, Fairmont, WV 26554. **Effects of global warming on photosynthetic rates and CO2 compensation points of C3 and C4 plants.**

48. **#SEAN ABEL**, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506, and DR. LESLIE HOPKINSON, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Characterizing near-boundary turbulence following stream restoration of varying intensity.**

49. ***FOREST LEFEVRE**, Dept. of Biology, Marshall University, Huntington, WV 25755, and JEFF KOVATCH, Dept. of Biology, Marshall University, Huntington, WV 25755. **Effect of time out of water on non-lethal prediction of soft tissue mass and metabolic rate for the freshwater mussel, *Pyganodon grandis*.**

50. ***ZACHARY DOUGLAS**, SHANNON STEWART, ZHAOLIANG LI, HAITAO LUO, YI CHARLIE CHEN. Natural Science Division, Alderson-Broaddus College, Philippi, WV 26416. **Kaempferol Inhibits VEGF Expression in Prostate Cancer Cells.**

51. **#JONICA THOMPSON**, SUMANTH MANOHAR, PADMA NIMMAKAYA, YAN TOMASON, UMESH K. REDDY, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25112-1000, and GURU JAGADEESWARAN and SUNKAR RAMANJULU, Dept. of Biochemistry and Molecular Biology, Oklahoma State University, Stillwater, OK 74078. **miRNA-guided gene regulations control the phenotypes of isogenic diploid and tetraploid watermelon lines.**

52. ***CAITLYN ASBURY** and HEATHER KALB. Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Daily behavior patterns in various age groups of captive bred Malayan box turtles (Cuora amboinensis).**

53. **LORI HENRY** and HEATHER KALB. Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Preliminary study on nest site selection in a captive population of Malayan box turtle *(Cuora amboinensis)* housed indoors.**

54. ***HOPE LIMA** and JEANNE SULLIVAN, Dept. of Biology, West Virginia Wesleyan College, Buckhannon, WV 26201. **Male-male dominance interactions, male body size and courtship behaviors affect female mate choice in *Melopsittacus undulatus* (budgerigars).**

55. ***CHRISTOPHER D. SEAL**, Dept. of Chemistry, Shepherd University, Shepherdstown, WV 25443, COLLEEN J. NOLAN, and CAROL ZYGAR PLAUTZ, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Analysis of StAR protein abundance in snails *(Lymnaea palustris)* chronically treated with the herbicide Round-Up.**

56. ***LESLEY SWISHER** and CAROL ZYGAR PLAUTZ, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Using cold-shock gynogenesis to identify novel phenotypes in random mutagenesis screens of *Xenopus tropicalis*.**

57. ***KEVIN CARTE**, ANOJININE KARUNATHILAKE, and ROBERT HARRIS, West Virginia State University, Institute, West Virginia 25112, and ERIC BLOUGH, Department of Biological Sciences, Marshall University, Huntington, West Virginia 25701. **Expression of Titin, CCN and Extracellular Matrix Proteins in Smooth Muscle are Altered by Mechanical Stretch.**

3rd Floor Hamblin Hall

58. ***HANNAH BILLIAN**, Dept. of Environmental Studies, Shepherd University, Shepherdstown, WV 25443. ***STEVEN MARTIN, *STEAVE SANDERSON, *KAYLA WALKER,** and **QING WANG**, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443. **Wolf Population Dynamics.**

59. ***DARRYL JOHNSON, *MATTHEW ALT,*EMAD KHAN,** and **QING WANG**, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, WV 25443, BRITTANI LOVE, Dept. of Chemistry, Shepherd University, 25443. **Fundamental modes of elliptic drumheads in relation to eccentricity.**

60. ***MATTHEW MOCNIAK, QING WANG,** and **ZHIJUN WANG**, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443. **Genetic algorithm based analysis and numerical study of an SIR model for contagious disease patterns.**

61. ***COSTANDEINO DOURAKOS, ZHIJUN WANG,** and **QING WANG**, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443. **Performance study of a TSP optimization problem solver using genetic algorithm.**

62. ***DAVID A.C. CHELF**, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown WV 25443, and DR. JEFFERY GROFF, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown WV 25443. **The effects of synaptic noise on the spike-timing precision of an integrate-and-fire cortical neuron model driven by an integrate-and-fire-or-burst thalamocortical relay cell model.**

63. ***KATHERINE HOECK**, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown WV 25443, and DR. JEFFERY GROFF, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown WV 25443. **Constructing an ultrasonic anemometer based on the ATmega328 microcontroller.**

64. **#PUJYA WAGLE GAUTAM**, Civil and Environmental Engineering, West Virginia University, WV 26505 and JENNIFER WEIDHAAS, Assistant Professor, Civil and Environmental Engineering, West Virginia University, WV 26505. **Spatial relationship between the trichloroethylene degrading bacteria Dehalcooccoides sp., sulphate reducers and methanogens during reductive dechlorination.**

65. **#BAHAR NOORBAKHSH**, RAE MATSUMOTO, Dept. of Basic Pharmaceutical Sciences, School of Pharmacy, West Virginia University, Morgantown, WV 26505, and CHRISTOPHE MESANGEAU and CHRISTOPHER MCCURDY, Dept. of Medicinal Chemistry, School of Pharmacy, University of Mississippi, University, MS, 38677. **Pharmacological characterization of sigma-2 receptor compounds: putative aids in the treatment of cocaine abuse and addiction.**

66. **JOSEPH L. ALLEN** and STEPHEN C. KUEHN, Environmental Geosciences Program, Dept. of Physical Sciences, Concord University, Athens, WV 24712. Concord University microanalysis facility: **Electron microprobe and micro-X-ray fluorescence for teaching and research in West Virginia.**

67. AARON COSTA, AARON DENEAU, CARLA FERAGOTTI, STEWART HARVIN, ENMANUEL MADERA, JEREMY PEPPER, DARIUS REYNOLDS, ***CALEB RICE**, ***ALEX SQUIRES**, MIRANDA STRAUB, NATHAN WEESE, and JOHN KUHLMAN, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Electrostatically Enhanced Fluidized Beds in Microgravity.**

68. **MARCIA HARRISON-PITANIELLO**, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. **Publishing your Teaching Resources through the National Science Digital Library.**

Saturday Poster List continued

69. **#CHENBO DONG** AND CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND DAVID LOWRY, MICHAEL KASHON, AND LINDA M SARGENT, National Institute for Occupational Safety and Health, Morgantown WV, 26505. **Nanoindentation analysis of epithelial cells incubated with carbon nanotubes.**

70. **#REEM ELDAWUD**, CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND HOSAM A. ELBAZ, YON ROJANASAKUL, Department of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506. **Electronic platform used as a proxy to quantify cellular toxicity of anticancer drugs.**

71. **#ALAN CAMPBELL**, CHENBO DONG, AND CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND CHENGCHENG XIANG AND NIANQUIANG WU, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown WV, 26506, AND JONATHAN DORDICK, Department of Chemical Engineering, Rensselaer Polytechnic Institute, Morgantown WV, 26506. **Activity and stability studies of bionano engineered hybrids for decontamination.**

72. **#ALDO ALMEIDA,** PADMA NIMMAKAYALA, NISCHIT ARYAL, SUMANTH MANOHAR, GOPINATH VAIJA, MARK CHATFIELD, AMD UMESH REDDY, Gus R. Douglass Institute and Department of Biology, West Virginia State University, Institute, WV, 25112, GAGAN KAUSHAL, School of Pharmacy, University of Charleston, Charleston, WV. **Genomic Strategies to Mine Alleles That Control Capsaicin, Dihydrocapsaicin and Related Com pounds.**

73. ***H. JANE LONG**, Dept. of Psychology, West Virginia State University, Institute, WV 25112. **On choosing a pet: Characteristics of patrons adopting an animal from a local shelter**

74. ***BRANDON ABBOT**, STEVEN PIFER, ADAM FISCHER, WESTLEY MULLINS, JOE EVANS, and GARY MORRIS, Department of Science and Mathematics, Glenville State College Glenville, WV 26351. **Using the Process of Fermentation to Stimulate Interest in Undergraduate Science Laboratories.**

ABSTRACTS FOR ORAL PRESENTATIONS

The abstracts for the oral presentations are arranged in alphabetical order by the first author's last name. Please see the oral presentation list for the specific time and place of each presentation.

CAITLAND M. ADKINS and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of mychorrizal fungi on strawberry plants.**

This study was designed to determine the effects of different amounts of mycorrhizal fungi on strawberry (Tristar) plants. Three groups of four plants each were treated with increasing amounts of inoculum (0 tsp., 2 tsp., and 4 tsp.) and grown in the greenhouse at FSU under standard conditions. To determine which treatment resulted in the best growth and development of the plants, weekly observations of the stem height, number of leaves, and overall appearance were recorded. In addition, a light curve dataset was obtained using three leaves from every plant at 250, 500, 1000, and 1500 µmols $m^{-2}s^{-1}$ using the LICOR 6400 Portable Photosynthesis System.

Preliminary results showed the control group (containing no added microbes) at the quantum flux rate of 1000 µmols $m^{-2}s^{-1}$ had the highest average photosynthesis rate at 7.73µmols CO_2 $m^{-2}s^{-1}$. Using this value as the reference, the plants treated with 2 tsp. had a 17.36% decrease and the 4 tsp. treatment, which had the largest decrease in photosynthesis of 85.00%.

NIRANJAN ARYAL, Dept. of Biology, West Virginia State University, Institute, WV 25526, DAVID H. HUBER, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25526. **The metagenome of the microbial gut community of the wood-feeding larvae of the beetle *Osmoderma eremicola*.**

The microbial ecology of plant biomass-feeding insect guts has been a research interest for bioenergy biotechnology. Several studies have been done on the gut of termites which are the best characterized wood-feeding insect. However the microbial ecology of other wood-feeding insect guts is still poorly known. Here we studied the gut microbial ecology of *Osmoderma eremicola* larvae, a wood-boring beetle (family Scarabaeidae). Approximately 60 million base pairs of DNA was acquired from the hindgut microbiome of mature larvae using 454 pyrosequencing. A large diversity of microorganisms was found: 97% of the microbiome was dominated by bacteria, 1.5 % by archaea, and 1.5 % by eukaryotic organisms, including fungi and protists. Interestingly, the microbiome of the *Osmoderma* larvae hindgut was substantially different from termite guts. 16S rRNA gene diversity analysis using the RDP (Ribosomal Database project), showed that the Firmicutes occupied 74 % of the total bacterial diversity in the larvae hindgut but only 3% in the termite. The Spirochaetes occupied less than 1% of the bacterial diversity in the larvae but 18% in the termite. Other significant groups present in the *Osmoderma* hindgut are Bacteroidetes (11%) and Proteobacteria (9%). We anticipate that the Firmicutes may be the key group for contributing plant biomass degrading enzymes in the gut of these larvae. Surprisingly, the *Osmoderma* hindgut also contained methanogens (Methanomicrobia, Methanococci, Methanobacteria) which is similar to some termites. Metagenome analysis also showed some differences in the suite of plant biomass-degrading genes in the *Osmoderma* larvae compared to termites.

SHELLY H. BRIGHT and GERALD R. HANKINS, Dept. of Biology, West Virginia State University, Institute, WV 25112. **Are fibroblast growth factors steroid-responsive autocrine signals in meningiomas?**

Meningiomas are the most common primary brain tumors in adults. Incidence rates indicate that they are up to 10 times more common in women compared to men. Since this gender bias does not exist in children, it is believed that female sex hormones are involved in the development and progression of these tumors. Fibroblast growth factors (FGFs) are mitogenic growth factors that contribute in many important biological processes including cell proliferation, morphogenesis, angiogenesis and cell migration. Research conducted by Wing *et al*. (2003) indicates that expression of FGF9 and its cognate receptors function in an autocrine fashion that is mediated by estrogen during the early stages of endometriosis. We have previously shown by microarray analysis that that the gene encoding FGF9 is up-regulated two-fold in meningioma samples versus healthy meninges. Other research indicates that both FGF9 and FGF2 participate in tumorigenesis through abnormal autocrine signaling. We hypothesize that FGF9 and/or FGF2 contribute to meningioma progression through autocrine signaling. To test this we performed cell proliferation assays using tyrosine kinase inhibitors PD166866 (FGF receptor-1 specific) and PD166285. We have also performed chemiluminescent immunoassays to evaluate the effects of these inhibitors on ERK1/2 phosphorylation. Our preliminary data indicates that both PD166866 and PD166285 reduce cell proliferation in 4 meningioma cell lines. Treatment with PD166285 also significantly reduces phosphorylation of ERK1/2. Currently we are in the process of evaluating FGF2 and FGFR1 gene expression in meningioma cells in response to female steroids and epigenetic agents.

JESSICA CAIN, COLLEEN J. NOLAN, and CAROL ZYGAR PLAUTZ, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Effects of chronic treatment with Round-Up and its constituents on the snail *Lymnaea palustris* with respect to mortality, fecundity, growth, and developmental abnormalities.**

The freshwater gastropod mollusk *Lymnaea palustris* is a valuable laboratory organism since it is easily obtained, bred, and maintained year-round. We designed experiments to establish the toxicological effects of Round-Up and its constituents on this aquatic organism. *L.palustris* is a practical model organism for toxicological studies; the effects of environmental contaminants on the adults and embryos are easily observed.

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We established mesocosms containing the herbicide Round-Up or each of its main components, glyphosate and polyethoxylated tallow amine (POEA). We also constituted a synergistic treatment of both glyphosate and POEA. Starting concentrations were based on 5x concentration of the EPA MCL for glyphosate; comparable POEA concentration was estimated. Four mesocosms of four snails each were subjected to chronic treatment lasting for six weeks. Adults were measured for growth, mortality and fecundity each week. Embryos were subjected to the same concentrations as the adults and developmental abnormalities recorded each week.

Our data show that overall average weight was decreased slightly in all chemical treatments except for the synergistic treatment. In length, only the Round-Up group show a decrease compared to the control; Round-Up treatment caused the greatest shell degradation. Total fecundity in all treatments was significantly different than the control ($p<0.001$) which carried over to the total abnormalities, which were all also significantly elevated ($p<0.001$). The overall average length of the egg-bearing jelly masses was recorded and glyphosate, Round-Up, and POEA groups were all significantly decreased ($p<0.001$) compared to controls. The highest mortality was experienced by the POEA group with five deaths overall out of 16 snails (31% mortality).

In conclusion, Round-Up and its constituents have all been observed to exert effects on the freshwater organism, *L. palustris*. The shell degradation of the snails treated in Round-Up may be caused by an issue in the uptake of calcium caused by the chemicals. All of the chemicals tested showed that they significantly affected ($p<0.001$) fecundity and all caused abnormality in the embryos; this suggests that exposure at certain concentrations in the environment may affect fecundity in aquatic organisms and cause their embryos to exhibit abnormal development. Further testing will be conducted on Round-Up, since it has more of an effect on the snails overall than any of the other chemicals tested, alone or in combination, implying that there is another chemical in Round-Up which is causing the suppression of fecundity and rise in developmental abnormalities.

#ALAN CAMPBELL, CHENBO DONG, AND CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND CHENGCHENG XIANG AND NIANQUIANG WU, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown WV, 26506, AND JONATHAN DORDICK, Department of Chemical Engineering, Rensselaer Polytechnic Institute, Morgantown WV, 26506. **Activity and stability studies of bionano engineered hybrids for decontamination.**

Most of the current decontamination methods are corrosive and/or toxic and can cause collateral damage to goods and people. There is a critical need for a technology that allows decontamination to be non-toxic, non-corrosive and easily deployable. We are developing passive, self-cleaning decontamination surfaces using enzyme-based technologies. Specifically, our first approach involves direct attachment of enzyme (i.e., chloroperoxidase that generates hypochlorous acid) to nanosupports (i.e., carbon nanotubes or TiO2 nanobelts) through covalent binding with user-defined functionalities. In the second strategy, we use PEG-based spacers to separate the enzyme from the nanosupports and thus to reduce any unspecific binding or protein-protein interactions. The nanomaterial-enzyme conjugates are characterized in terms of loading, activity, and stability and the data is related to the structural changes in enzyme at the interface with the nanosupport (i.e., hydrophobicity/hydrophilicity, surface area, surface curvature, etc.). The nanomaterials offer high surface-volume aspect ratios that allow relatively high enzyme loadings and ease of recovery of the conjugates by filtration; the nanomaterial surface curvature enhances enzyme stability. The resulting nanomaterial-enzyme conjugates can be incorporated into paints, fabrics or polymer materials to generate composites with enhanced stability and decontamination capabilities to be tested against model bacteria or spores.

ENGIN CIFTYUREK, KATARZYNA SABOLSKY, and EDWARD M. SABOLSKY, Dept. of Mechanical & Aerospace Engineering, West Virginia University Morgantown, WV 26506. **Degradation of Platinum Thin Films Electrodes for High-Temperature MEMs Applications.**

Platinum thin films are used in many areas as heaters, sensors (temperature, chemical), catalyst, micro-electrical interconnects and electrodes. In a subset of these applications, the microstructural, chemical, and electrical stability under high-temperature conditions are of major concern for extended use in these specialized microelectronic technologies. Typical applications of these high-temperature electrodes/interconnects are aligned with micro-heaters and -hotplates within microelectromechanical (MEM) systems.

Platinum, with its relatively high melting point (1773 °C) and excellent chemical inertness, has long been utilized for MEMS devices capable of operating under high temperature conditions. Pt and other noble metals have a great chemical inertness; however show weak adhesion toward oxide surfaces. High temperature processing and service conditions lead to the development of many structural defects and grain coarsening, which all eventually result in non-uniform film morphology and variable electrical response. In order to improve noble metal adhesion and stability of thin film different approaches have been offered so far are; using intermediate layer , post deposition annealing, using ceramic top layer, utilizing thick Pt film, using second phase precipitations and manipulating thin film deposition parameters (deposition pressure and temperature). In our study we examined and extensively characterized common adhesion layers (Ti, Ta and Zr), as well as, focused on improved film characteristic with different coating architectures by simple manipulation of the deposition parameters. The coating deposition was completed by DC magnetron sputtering on alumina substrates under cleanroom conditions. In order to evaluate the film microstructure and migration behavior of the materials after intermediate (800 °C) and high temperature annealing (1200°C) processes, Scanning Electron Microscopy (SEM), Energy-dispersive X-ray spectroscopy (EDS) and X-Ray Photoelectron Spectroscopy (XPS) were utilized.

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AARON COSTA, AARON DENEAU, CARLA FERAGOTTI, STEWART HARVIN, ENMANUEL MADERA, JEREMY PEPPER, DARIUS REYNOLDS, CALEB RICE, ALEX SQUIRES, MIRANDA STRAUB, NATHAN WEESE, JOHN KUHLMAN, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Electrostatically Enhanced Fluidized Beds in Microgravity.**

The research of the West Virginia University Microgravity Research Team aims to explore an electrostatic force as a means of creating a fluidized bed which can be used in microgravity conditions. Successfully operating a fluidized bed in microgravity would provide a means of filtration for improved crew life support for long-term manned missions. An opposing body force is necessary for a fluidized bed to function properly; on Earth this is supplied by the gravitational force. Because of the absence of significant gravitational forces while in microgravity environments, a substitute body force is required. The primary focus of the proposed experiment is to test the effects of electrophoresis on fluidized beds in microgravity, thereby providing a means of enabling fluidized beds to function in a weightless environment. To test this hypothesis, an electric field will be created using two charged parallel plates located above and below a cylindrical test bed. Glass particles within the bed will be charged and placed in this electric field to produce a net Coulomb force on the particles. Inter-particle forces will also be considered since previous research that has shown the possibility that these forces may have an effect on the fluidization of the bed. The magnitude of the electric body force must be strong enough to prevent the particles from accumulating at the top of the bed, but not so strong that the particles become packed at the bottom of the bed. In the absence of gravity, the appropriate magnitude of an electrostatic body force will simulate Earth's gravitational force while a flow field is directed in the opposing direction inside the test section. This will result in proper fluidization of the particles in the test bed. A high-speed camera and digital data acquisition system will be used to evaluate the fluidization conditions within the bed. The experiment payload will be flown and tested aboard NASA's Microgravity Research Aircraft at the Johnson Space Center in June of 2012. Currently, progress is being made as the team constructs and tests each subsystem of the test apparatus payload in preparation for flight.

ALAN M. DANIEL, Dept. of Social Science, Glenville State College, 200 High Street, Glenville, WV 26351. **A Comparative Approach to Models of Depression.**

Animal models of surprising reward loss have been compared to human depression and post-traumatic stress disorder. The reaction to reward loss, termed "frustration," is an unconditioned emotional reaction that parallels physical pain and fear conditioning in terms of brain structures, neurotransmitter systems, and its effects on behavior. So far, evidence of frustration has only been discovered in one vertebrate class: mammals. Frustration-like effects have been observed in only one nonmammalian species, *apis mellifera*, the honey bee. It is yet to be determined if frustration-like effects found in bees are a case of convergent evolution.

Recent research from our lab has expanded knowledge of the role of the opioid system (notorious for its modulation of physical pain) in reward loss situations. The opioid system in mammals is engaged during reward loss situations, and appears to modulate the comparison between expected and received rewards during the downshift, but not the memory of the downshift event. In bees, the opioid system is much less explored, but they are sensitive to opioid compounds in aversive learning situations. The most recent mammalian opioid data from our lab will be reviewed, and a new experiment will be proposed to approach the question of whether frustration effects in bees evolved convergent mechanisms underlying the behavior.

AARON DEESE and DONALD E. TRISEL, Dept. of Biology, Fairmont State University, Fairmont WV 26554. **Nosema Disease in West Virginia Honey Bees.**

Nosema is a highly contagious fungal disease found in the digestive tract of adult honey bees. It affects adult bees only and is highly contagious. *Nosema* disease is of rising concern in honeybees nationwide and may be one of the key components of Colony Collapse Disorder (CCD). *Nosema* disease is caused by the spore forming parasites known as *Nosema apis* and *Nosema ceranae*. The disease invades the bee's digestive tract, focusing primarily on the lining of the middle intestine. *Nosema* increases mortality rates in adult bees and may decimate entire colonies. This project included free testing for *Nosema* as well as presentations raising *Nosema* awareness among beekeepers in WV. Beekeepers submitted 281 samples in 2010 that were tested for the presence of *Nosema*.

Nosema spores were detected in 35.94% of all samples. Due to the large range of standard deviation in spore counts, finding significant correlations in the data was difficult. The trends indicated that bees which were medicated, fed, taken from average-strength hives, or originated from the either a 2010 package or overwintered hives had the lowest average spores per bee. The range of positive infestation was 50,000 to 33,000,000 *Nosema* spores per bee. Of the 25 counties in WV represented in the study, 19 had at least one positive sample. Of the 89 beekeepers who participated, 55% had at least one positive sample.

MURAT DINC and DONALD D. GRAY, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506, and NICHOLAS HILLEN, J. STEPHEN TAYLOR, and JOHN KUHLMAN, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Computational Fluid Dynamics Study of the Effect of Gravity on the Impact of a Drop onto Dry and Wet Surfaces.**

The impact of liquid drops onto both dry surfaces and wet surfaces has fascinated researchers for more than a century due to its evident beauty and important technological applications. The wealth of phenomena in this seemingly simple flow is such that fresh discoveries continue to be reported. Our interest has been sparked by the need to obtain correlations that can be incorporated into a computationally efficient Monte Carlo model for the cooling of heated surfaces by sprays. While this project utilizes

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experimental, analytical, and computational techniques, this presentation reports results obtained using the FLUENT computational fluid dynamics (CFD) computer code running on a desktop workstation to study the effect of gravity on single drop impacts. These simulations assume axial symmetry.

Drop impact in the absence of heat transfer is influenced by inertia, viscous, surface tension, and gravity forces. Dimensional analysis reveals that the relevant dimensionless numbers may be taken to be the Reynolds number Re (proportional to the ratio of inertia to viscous forces), the Weber number We (proportional to the ratio of inertia to surface tension forces), and the Froude number Fr (proportional to the ratio of inertia to gravity forces). The surface layer thickness H (zero for a dry surface) divided by the drop diameter D is a key geometric parameter. In cases in which a liquid-solid-gas interface forms, the contact angle q must also be considered. In these simulations, q is assumed to be constant.

Simulations of water drop impact onto an upward facing dry surface (Re = 2000, We = 28, H/D = 0, q = 90°) have been performed with Earth gravity (Fr = 51), Lunar gravity (Fr = 308), and zero gravity (Fr =∞). Although differing in detail, the flows look surprisingly similar. The most significant (but hardly surprising) difference when an upward moving drop hits a downward facing surface in Earth gravity (Fr = -51) is that nearly all of the fluid falls off of the surface.

Simulations were also performed for the impact of a water drop onto an upward facing liquid film with Re = 6690, We = 137, H/D = 0.837, q = 0°) in Earth gravity (Fr = 51.5) and zero gravity (Fr = ∞). In both cases, a crater with a very thin bottom film formed and was replaced by an incipient Worthington jet, but no fluid was splashed. In the case of an upward moving drop hitting a downward facing liquid film in Earth gravity (Fr = -51.5), there was still no splashing, but the impact excited a Rayleigh-Taylor instability in which the crown of the impact crater grew large as it fell away from the surface.

This work is supported by a NASA EPSCoR grant.

CHENBO DONG AND CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND DAVID LOWRY, MICHAEL KASHON, AND LINDA M SARGENT, National Institute for Occupational Safety and Health, Morgantown WV, 26505. **Nanoindentation analysis of epithelial cells incubated with carbon nanotubes.**
Carbon nanotubes (CNTs) "bottom-up" functionalization with biological molecules such as proteins or nucleic acids opened up exciting applications in bioengineering and biomedical fields. However, with current topics aimed at translating modified CNTs into potential therapeutic platforms, studies of their cytotoxicity are of urgent need. In here we unravel the biological complexity of CNT interactions with epithelial cells by building on latest technological advances. Specifically, by using Atomic Force Microscopy (AFM) we are probing topography and evaluating mechanical properties of cells incubated with CNTs, all with high spatial resolution and increased sensitivity. Our results demonstrate that spherical mapping of cells can be correlated to cell dynamics and thus provide the platform to develop further topologically based approaches to probe the structure-function relationship in live cells and cells treated with other nanomaterials.

REEM ELDAWUD, CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND HOSAM A. ELBAZ, YON ROJANASAKUL, Department of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506. **Electronic platform used as a proxy to quantify cellular toxicity of anticancer drugs.**
Digitoxin is a cardiac glycoside known for its efficacy in treatment of heart failure. Recently, it was shown that this drug also exhibits strong cytotoxic effects against several types of cancers, from breast to prostate and lung cancer. However, the mechanisms associated with cellular exposure to digitoxin and it's selectivity towards cancer cells when compared to normal cells are still unknown. In this research we used a new technique called Electric Cell Impedance Sensing (ECIS) to assess digitoxin's kinetics and toxicity in real time. The approach is based on correlating the behavior induced by exposure to the drug of non-small lung cancer cells (NCI-H460) at interface with the electronic platform used as a proxy, into complex internal cellular signaling. In this approach, the cells immobilized on gold electrodes serve as an active platform; changes in impedance upon exposure to different drug concentrations are measured and subsequent cellular structure-function relationships are derived. Our results provide novel means to investigate drug kinetics and metabolization in real time using a high throughput electronic platform and promise to extend such a cellular-based assay to studies of other analytes such as toxins in real time.

DAVID A. FOLTZ II, Dept. of Biology, Marshall University, 1 John Marshall Drive, Huntington WV 25755, DR. STUART A. WELSH, Division of Forestry and natural Resources, West Virginia University, Morgantown WV 26506-6125, and DR. ZACHARY J. LOUGHMAN, West Liberty University, West Liberty, WV 26074. **Baited lines, a novel approach to collecting burrowing crayfishes.**
Collection methods for organisms are constantly being improved upon or experimented with in order to reach the highest capture rate with the least amount of effort possible. Excavation is the primary method used for collecting primary burrowing crayfish. This method is moderately successful and often physically demanding, time consuming, and difficult in certain habitats. Recently, burrowing crayfish nets have been used to collect crayfishes without excavating burrows. Unfortunately, success rates with n BCN is directly correlated to weather events, making use of this method temperamental. Baited lines are fishing hooks baited with earthworms, tied to 20-30cm long monofilament leaders, and require investigators to see crayfishes resting at the entrances of burrows. Crayfish when observed, are tempted with the worms from their portals, were they are later grasped. The focus of this study is to compare the baited line method against burrowing crayfish nets and excavation in a variety of habitats with different crayfish species in order to

determine the success of the Baited line. Four study areas were selected throughout West Virginia to ensure broad coverage of primary burrowing crayfishes. Prior to the creation of baited line rigs, burrow colonies were found during daylight hours and scouted. Active burrows were flagged so they could be returned to after dark. Baited lines were used when crayfish were within arm's reach of the investigator. Crayfishes were lead 5-10 cm from the burrow portal over a 5- 20s period, and grasped or pinned to the entrance of the burrow and extracted. The additive model (taxa + sampling method) was the best approximating model to the data (AIC weight = 0.71), and provided evidence for differences in capture rates among taxa and sampling methods (Table 1). In all instances, baited lines were the most successful method used to collect burrowing crayfishes. Baited lines represent a novel way to collect burrowing crayfishes without drastically disturbing the landscape. This method can only be used during nightfall, which makes incorporating it into a busy field day rather problematic. That said, a suite of field situations exists that are extremely conducive to the use of this collection method. Baited lines always proved more favorable in forested situations, where the method is now our primary means of collecting upland burrowing species.

NATALIE FOX, MARK FLOOD, and PHILLIP YEAGER, Dept. of Biology, Fairmont State University, Fairmont, WV 26554, and PAUL BAKER, Save the Tygart Watershed Association, Grafton, WV 26354. **Determination of the effects of acid mine drainage remediation using microbial community assessment.**

Microbial communities are very important to the environment by first reacting to any chemical or physical changes that may have occurred in the environment. They react to changes in pH levels, dissolved oxygen levels, conductivity levels, salinity levels, total dissolved solids, sediment changes, and temperature changes in streams. The objective of this project was to determine how microbial communities react in streams that are impacted by Acid Mine Drainage using Ecoplates. Samples of water were collected in bottles at 10 different sites in the Three Fork Creek watershed in Taylor and Preston counties in West Virginia. The samples were collected above and below the lime dosers. To collect the water chemistry, a YSI multi probe was used and it measured the pH, temperature (°C), 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. Upon arriving back at the lab, each sample from the 10 different sites was pipetted into an Ecoplate. A Fluostar Optima microplate reader was used to asses digestion of the substrates by release of a tetrazolium dye attached to them. A measurement at 590um was used to detect changes in optical density at 2, 4, 8, 12, 24, 48, and 72 hours. Ward's cluster analysis revealed similarities between streams which are separated into three groups. Group 1 consisted of North Fork of Birds Creek (Below Doser) and Raccoon Creek (Above Doser), which revealed very little metabolic rate and diversity among the microbial communities. Group 2 consisted of North Fork of Birds Creek (Above Doser), South Fork of Birds Creek (Below Doser), Raccoon Creek (2 miles below Doser), and Raccoon Creek (not impacted) having very similar microbial activity to each other with Raccoon Creek (not impacted) showing the most microbial activity. Group 3 consisted of South Fork of Birds Creek (Above Doser), Mouth of Raccoon Creek (6 miles below doser), and Squires Creek (Above Doser). Overall, the results indicated that recently installed limestone dosers did impact the microbial community results in this experiment. This project was supported by a Fairmont State University SURE grant.

PHIL GANSOR, CHUNCHUAN XU, JOHN ZONDLO, KATARZYNA SABOLSKY, and EDWARD M. SABOLSKY, Dept. of Mechanical & Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **An H_2S-Tolerant Ni/GDC Anode with a GDC Barrier Layer.**

Solid Oxide Fuel Cells (SOFC's) offer a high efficiency, low emission method of generating useable electrical power. In addition to running on pure hydrogen fuel, these devices are also capable of utilizing cheaper, more abundant hydrocarbon fuels. Among the most intriguing options is coal due to its abundance within the United States.

However, a major obstacle with operating SOFC's with gasified coal is degradation of the anode upon exposure to trace amounts of impurities that exist within coal-derived synthesized gas (syngas). In general, H_2S is found in many types of fuel in levels ranging from <1 ppm to >1000 ppm. With the standard nickel/yttrium stabilized zirconium (Ni/YSZ) cermet anode, an initial loss in performance is seen due to surface adsorption of sulfur on the Ni particles. However, this loss is instantaneous and reversible upon removal of H_2S from the fuel stream. The secondary losses seen at higher concentrations of H_2S are irreversible and harmful to the life of the cell. Recent works suggest that a nickel/gadolinium-doped ceria (GDC) anode improves the tolerance, though stability for extended periods of time (>100 hours) has yet to be shown. The two primary theories for irreversible losses are a) loss of Ni catalysis due to Ni-S formation and b) oxidation of Ni particles to hinder catalysis. The purpose of this work is to investigate a Ni/GDC (gadolinium-doped ceria) anode with a dense GDC barrier layer and assess its tolerance to high concentrations of H_2S in both humidified H_2 and coal syngas environments. This study utilizes in-situ voltage vs. time and impedance curves to monitor changes in cell activity during the extended testing times. Additionally, ex-situ Scanning Electron Microscopy (SEM), Energy-dispersive X-ray spectroscopy (EDX), and X-Ray Photoelectron Spectroscopy (XPS) are used to show the minimal effects the high-concentrations of H_2S have on this particular anode.

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MATTHEW GRIFFITH, SEUNG-YUN KIM, and OSMAN GUZIDE, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, WV 25443. **An Educational CPU Instruction Set Architecture.**

In general CPU designs suited for teaching computer architecture design are either simple toys incapable of producing any real

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computation, or far too complex to be taught in a single semester. Through this research we developed an easy to understand educational computer architecture that is capable of high computational complexity whilst striving for ease of use. It is developed as a FPGA design with a hardware description module, support software, and manual to be taught with an FPGA development board. It has an easy to learn and teach pipe-lined data-path and a minimalist instruction set that can compete with the processing power of contemporary CPU designs. This CPU architecture results in the ability of teaching a single-semester course on computer architecture design where it is possible for each student to build this CPU with an FPGA.

NICHOLAS D. HIGINBOTHAM and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of growing media on the growth and photosynthesis rates of beans.**

This study was designed to determine the effects of different growing media on the bean plant (*Phaseolus vulgaris*). The plants were grown from seed and housed in the greenhouse at Fairmont State University where environmental factors (temperature, CO_2, and light) were the same for each plant in the study. The seeds were given a two week germination and growth period in peat moss, and then transplanted into the selected media. The three media tested were sand (control), Miracle-Gro® potting soil, and a precise mixture of peat moss and Vegetables Alive® fertilizer. Both the height and number of leaves for each plant were recorded on a weekly basis. Plants were acclimated to different levels of PAR (250, 500, 1000, and 1500 umol photons $m^{-2}s^{-1}$) using the LICOR 6400 Potable Photosynthesis System in order to determine photosynthesis rates.

Preliminary results for plant height showed the greatest average height (57.0 cm) in the Miracle-Gro® treatment and the lowest average (17.0 cm) in the peat moss/Vegetable Alive® treatment. The treatment with the greatest average photosynthetic rate (5.83 µmol CO_2 $m^{-2}s^{-1}$) was the peat moss/Vegetable Alive® medium; the lowest average photosynthetic rate (2.43 µmol CO_2 $m^{-2}s^{-1}$) was in the sand treatment.

NICHOLAS HILLEN, J. STEPHEN TAYLOR, and JOHN KUHLMAN, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506, and MURAT DINC and DONALD D. GRAY, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Spray Cooling Experiments for Monte Carlo Simulation Model.**

Future space-based power systems, as well as lidar instruments and laser diode arrays for future earth science satellites or defense-related space systems, all will require higher rejected heat fluxes, due to both increased device power levels and smaller device sizes. Spray cooling is one promising candidate heat rejection method that has demonstrated heat fluxes as high as 10^3 W/cm^2 using water as the coolant. Full Computational Fluid Dynamics (CFD) simulations of the complicated spray cooling process is beyond the scope of current computational modeling: droplet number fluxes are on the order of 10^6 drops/(s.cm^2), and simulation of a single drop impact can take several hours on a current-generation PC using a quad core processor. There is a great need for a simple but efficient spray cooling model that can capture enough of the complex physics to enable useful design predictions in practical computational times.

A preliminary Monte Carlo model has recently been described that incorporates heuristic correlations developed from experiments and CFD simulations to enable accurate prediction of heat flux as a function of spray flowrate and temperature and the surface temperature, as well as the dryout of the heater surface at the onset of the critical heat flux, in a reasonable computational time. In the present work experiments using high-speed video and a time-resolved optical thickness instrument are being performed to obtain data for incorporation into the Monte Carlo spray cooling model in order to improve its accuracy to a quantitative level. Typical video frame rates of 1-2x10^4 fps are required to resolve impact crater formation and crater lifetimes for individual spray droplets. The thin films that remain in the impact craters have thicknesses on the order of a couple microns or less, as measured by the optical sensor.

This thin liquid film thickness has a significant impact on the level of heat flux that can be achieved. The portions of the heater surface covered by: a.) vapor bubbles (due to boiling), and b.) droplet impact craters, increase the overall average heat flux by facilitating local, transient heat fluxes that are significantly higher than can be achieved in pure conduction or single-phase convection. Quantitative values of the droplet impact crater diameter, the volume of splashed liquid, the time between droplet impact and the filling in of a droplet impact crater, and the minimum film thickness in the impact crater, are being correlated with the initial droplet diameter and impact velocity. Companion studies are also being conducted using numerical CFD methods. From these results improved correlations will be developed and implemented into the Monte Carlo simulation model in order to improve its accuracy. This work is supported by a NASA EPSCoR grant.

DAVID H. HUBER, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25526, and DEEPAK SHARMA, Dept. of Biology, West Virginia State University, Institute, WV 25526. **Comparative Metagenomics of Microbial Bioenergy Communities.**

Bioenergy is anticipated to be an important component of the future energy portfolio of the United States. Anaerobic microbial communities are a significant source of bioenergy through the decomposition of organic matter and synthesis of methane and hydrogen. The most successful industrial scale anaerobic microbial process for producing bioenergy is anaerobic digestion. West Virginia State University operates a pilot-scale (40m^3) thermophilic anaerobic digester and research facility for the purpose of studying and improving the anaerobic digestion process and anaerobic bioenergy production. Although the general biochemical pathways in anaerobic digestion are known, the metabolic potential and flexibility of these pathways as well as the underlying microbial ecology of the systems are still poorly known. We have applied pyrosequencing to this digester to obtain a >500 Mb metagenome

and have compared it to a 600 Mb metagenome derived from a German mesophilic digester using MG-RAST. The SEED subsystem metabolic profiles for the two digesters shows greater similarity than the taxonomic profiles. The thermophilic digester is enriched in the bacterial families Ruminococcaceae, Peptococcaceae, Paenibacillaceae and Thermoanaerobacteraceae, while the mesophilic digester is enriched in Clostridiaceae and unclassified Bacteria. The two digester metagenomes are more similar to each other than to other anaerobic microbiomes indicating that the digester environment does not simply duplicate other anaerobic environments were decomposition occurs, such as animal guts. Both digesters have a diverse array of carbohydrate utilization genes, but the thermophilic digester which has been fed primarily poultry litter is enriched in xylose utilization genes.

KAREN KETTLER and ZACHARY LOUGHMAN, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Project B.E.E.: A biodiversity experience for science educators.**
This past June marked the second year of a professional development opportunity for science educators in West Virginia, called Project B.E.E: Biodiversity Experience for Educators (previously known as Nature Leaders Training School (NLTS)). This one week intensive learning experience, based in Oglebay Institute's Mountain Nature Camp in Terra Alta, West Virginia, focused on exposing teachers to various aspects of arthropod biodiversity. The basis of this program was two-fold: 1. to increase the content knowledge of science educators regarding a largely understudied group of organisms, and 2. to develop a synergistic relationship between science educators, citizen scientists, and arthropod experts from both the Carnegie Museum of Natural History and West Liberty University in order to obtain valuable data regarding West Virginia arthropods. Participants of Project B.E.E. included both primary and secondary educators from West Virginia and individuals involved in the West Virginia Dept. of Natural Resources Master Naturalist program, which focuses on generating citizen scientists throughout the state. By creating a professional development model that incorporated educators, citizen scientists, and content experts working together to conduct authentic scientific research, we created an effective community of practice. We believe that this unique learning experience could serve as a model for other content-based professional development programs.

IRFAN A. KHAN and ELMER M. PRICE, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755, and COLTON J. KOONTZ, MASUDUR RAHMAN, BIN WANG, and MICHAEL L. NORTON, Dept. of Chemistry, Marshall University, Huntington, WV 25755, and DAVID NEFF, Molecular and Biological Imaging Center, Marshall University, Huntington, WV 25755. **Designing a microfluidic cell culture system for growing endothelial cells.**

We are developing microfluidic chips with microchannels capable of sustaining monolayers of endothelial cells outside of the laboratory environment, with the objective of integrating the chip into a biosensing platform for monitoring environmental toxicity. The cells we are using are human umbilical vein endothelial cells (HUVEC) and the chips are fabricated using polydimethylsiloxane (PDMS). We have designed the chips using AutoCAD. We have designed several microfluidic chips with different geometric constructions. The initial design was based on our previous experience without the help of a simulation tool. After fabrication, we found out that the fluid distribution and shear stress applied on the endothelial cells were not uniform throughout the microchannel resulting in turbulent flow and low-flow zones. To ensure that uniform shear stress is experienced by cells growing in the microchannels, we have been simulating our designs using COMSOL simulation software since then. COMSOL Multiphysics provides us with easy-to-use tools for the study of fluid dynamics. It also lets us choose different physics and to define the interdependencies ourselves. We are currently working with the third generation of microfluidic chips. These chips are designed to provide a quasi-physiological environment for the endothelial cells. These chips have simple designs with capability of running two parallel experiments in the same chip allowing control and test to be run at the same time. It is anticipated that cellular function will be modulated by exposure to any of a wide range of different environmental toxins and this modulation can be quantifiable using fluorescence microscopy or electrochemical probes. The objective is to determine the time dependent nitric oxide concentrations of the cells inside these microchannels using DAF-FM DA (4-amino-5-methylamino-2 ,7 -difluorofluorescein diacetate) as a fluorescent reporter probe. Successful development of this microfluidic cell culture system will pave the way to development of a very sensitive, broad spectrum, portable water toxicity testing system.

ANVEEKSH KONERU, MINGJIA ZHI, and NIANQIANG WU, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Electrospun $La_{0.8}Sr_{0.2}MnO_3$ Nanofibers for High Temperature Electrochemical Carbon Monoxide Sensor.**
$La_{0.8}Sr_{0.2}MnO_3$ (LSM) nanofibers were prepared by electrospinning method and investigated as sensor electrode for sensing carbon monoxide (CO) gas at high temperatures. The nanofibers show good thermal stability even when annealed at 1050°C. This nanofibrous structure possesses several advantages such as high porosity, high surface to volume ratio and high activity towards CO electrochemical oxidation. The sensitivity and low detection limit (20 and 5 ppm at 600°C and 550°C) were significantly improved as compared with bulk LSM powders. Electrochemical impedance (EIS) analysis indicated that the nanofibers electrode showed better charge transfer capability, leading to an improved catalytic activity for CO oxidation and sensor performance. The developed sensor can be used for monitoring emissions from coal-fired power plants and vehicle exhaust.

JOHN LAUB and OSMAN GUZIDE, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, WV 25443.

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Optimizing and Analyzing Fat-Tree Butterfly Network-on-Chip Muliticore Topology designs under Nano Scale Technology Constraints.

Many fat-tree interconnectivity designs for network-on-chip (NoC) are unrealistic and impractical to implement due to physical chip design limitations. Optimal NoC architectures focus on low latency communication and scalability with little impact to performance. However, as processer density increases with technology advancements and the NoC interconnections become smaller, the importance of realistic multi-layered interconnections at the submicron level becomes more critical to optimize latency speeds.

This research presents some possible realistic NoC designs using a three dimensional design architecture for Fat-Tree Butterfly (FTB), Extended FTB, and Enhanced FTB. Each of the optimized topology designs will be tested by creating a routing algorithm which be used to compare the efficiency of each design. The simulator will be developed in Java and will support the above topologies. It will also explore the architectural design space, assess design quality regarding performance, cost, power and reliability and also evaluate the traffic patterns and application-oriented traffic.

BRITTANY M. LEE and DONALD. E TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554.

The effects of growing media on the growth and photosynthesis rates of morning glory.

The study was designed to determine how different growing media affect morning glory plants (*Convolvulaceae)*. The plant seedlings were grown in peat moss in the FSU greenhouse for 2 weeks and then transplanted to pots containing the treatment media: sand (control), Miracle-Gro® Potting Soil, and a precise mixture of Vegetables Alive® fertilizer and peat moss. The photosynthetic responses of the plant were measured with the LICOR 6400 Portable Photosynthesis System. The plants were exposed to the same controlled environmental factors (temperature, CO_2 levels, light). The plants were tested with four different light treatments (250, 500, 1000, 1500 PAR µmol photons $m^{-2}s^{-1}$) during the readings. Each plant's height and number of leaves were recorded weekly.

Preliminary results of the plants showed the greatest average height in the Miracle-Gro® medium (6.16 cm) and the lowest average height in the sand (4.83 cm). The plants showing the greatest average photosynthetic rate were grown in Miracle-Gro® (14.1µmol CO_2 $m^{-2}s^{-1}$). The lowest average photosynthetic rate occurred in the Vegetables Alive® mixture (7.77 µmol CO_2 $m^{-2}s^{-1}$).

KRISTINA M. LEWIS and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554.

The effects of norgestimate/ethinyl estradiol on the growth and the photosynthetic rates of maize *(Zea mays)*.

This study was designed to determine the effects of norgestimate/ethinyl estradiol, found in oral contraceptives, on maize *(Zea mays)* growth and photosynthetic rates. The maize was grown in the greenhouse at FSU. The maize in the control group received only tap water. The three treatments with oral contraceptives were each subjected to the same dosage of ethinyl estradiol at 0.035 mg but with increasing levels of norgestimate at 0.180 mg, 0.215 mg, and 0.250 mg.

At week 4, the control plants had an average height of 44.1 cm which was a 39.5 % increase from week 3, the 0.180 mg treatment plants were 39.3 cm tall which was a 40.8% increase from the previous week, plants in the 0.215 mg treatment were 42.1 cm tall which was a 40.4% increase, and the 0.250 mg treatment plants were 42.5 cm tall which was a 43.1% increase.

The photosynthetic rates for each of the parameters were conducted and measured with the LICOR 6400 Portable Photosynthesis System. The block temperature, the CO_2 reference, and the flow rate were set and remained the constant for each parameter. The photosynthesis rate was measured at light levels of 200, 500, 1000, and 2000 (umol of photons $m^{-2}s^{-1}$) PAR. The preliminary results for the photosynthetic rates for all of the treatments including the control exhibited no differences between treatments.

H. JANE LONG, DANYALE LANE, STEVEN MCGILL, JAMES SPENCER, RYAN SEARCY, ANNA REED, PATTI HARRISON, VIRGINIA KENNEDY, DAWN RACER, VALERIE BLAKE, and ELIZABETH HICKOK, Dept. of Psychology, West Virginia State University, Institute, WV 25112.

Salient objects influence elevator conversation latency and content.

In this country, elevator etiquette reflects social norms. When entering an occupied elevator, strangers are expected to behave according to specific, unwritten rules: do not speak, do not make eye contact, and do not encroach on others' space. This study attempted to determine the threshold of these standards of conduct. Would people engage strangers in conversation more often if those strangers were carrying one of several salient objects, as opposed to when they were not? Elevators at West Virginia State's Wallace Hall served as the study's setting. Objects chosen for researchers to carry were a large stuffed animal (a bunny rabbit, approximately 24 inches tall), a taxidermied squirrel mounted in a standing position on a 7 inch by 10 inch base, and two helium balloons tethered by colorful ribbons. Researchers began each trial by entering the 9th floor elevator alone, with one of the objects. For each trial, they descended until the elevator was stopped by a patron. When the patron(s) entered the elevator, the researcher maintained their position at the back center of the car, made eye contact, but did not initiate conversation. The researcher noted the gender and approximate age of the patron(s), and whether they were known to the researcher. Any conversation initiated by the patron towards the researcher was noted after the trial was complete, particularly whether the conversation was directed towards the object carried. The latency of the conversation after entry into the car was also recorded.

A total of 101 trials were conducted: 27 with the squirrel, 24 with the stuffed animal, 23 with the balloons, and 27 control trials, in which the researcher carried no object. Twenty-two of the 27 trials with the taxidermied squirrel resulted in initiated conversations; the object was the focus of the conversation in each, and typically immediately. Only 3 of the 27 control trials resulted

in initiated conversations distinct from expected elevator etiquette (asking which floor, etc). The stuffed animal and balloons were intermediate in results, each responsible for 12 initiated conversations.
Overall results are consistent with prior research indicating that an individual carrying a baby, or walking a dog is the target of significantly more initiated conversation by strangers than towards individuals who do not. Salient objects provide a focus for elevator conversation not otherwise available, and ease the tension normally associated with stranger interactions in Western culture.

ZACHARY LOUGHMAN, KINSEY SKALICAN, and NATE TAYLOR. Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Determination of daily of movements and macrohabitat preference of the invasive crayfish *Orconectes virilis* through use of telemetry.**
In an effort to better understand the daily activity and microhabitat preference of invasive *Orconectes virilis* populations, a study was performed in Anthony Creek, West Virginia utilizing telemetry. Eight *O. virilis* (3IM/4IIM/1 F) were fitted with 0.8 g transmitters and released at their initial point of capture. Animals were tracked for six consecutive days, after which a 20 day non-interaction period was initiated, followed by six days of tracking. Following the location of each individual, water Dept.h and velocity, substrate type, and distance travelled were noted. *Orconectes virilis* utilized two distinct movement patterns. "Residents" made up 62% of crayfish and either did not move from their point of capture or made initial long distance movements, followed by little to no movement. "Adventives" (38 % of crayfish) moved on average 41 m/day, and rarely used the same retreat more than one day. The longest recorded daily movement was 210 m; one individual moved 1.62 kilometers over 28 days. *Orconectes virilis* preferred depositional habitats with an abundance of detritus and macrophytes, and avoided habitats dominated by boulders.

ZACHARY LOUGHMAN, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and STUART WELSH, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown WV 26506-6125. **Occupancy rates of primary burrowing crayfishes at natural and disturbed sites along West Virginia's Ohio and Kanawha River floodplains.**
Many primary burrowing crayfish inhabit floodplains where forested landscapes have been fragmented by agricultural, industrial, or residential uses. The impact these practices have on burrowing crayfishes occupying floodplains is poorly understood. In order to elucidate burrowing crayfish conservation concerns associated with these land use types, site occupancy rates ( ) were modeled for *Fallicambarus fodiens* and *Cambarus thomai*, from Ohio and Kanawha river floodplains in West Virginia. Occupancy rate modeling incorporated four environmental covariates (forest age, soil type, tree frequency, and land use). Based on presence/absence data, forests with tree ages > 100 years (∅QAICc = 0) and sites with loam soils (∅QAICc= 1.80) were most likely to harbor *F. fodiens* populations. For *C. thomai*, several models were supported owing to model selection uncertainty, however land use had more total model weight (total wi = 0.55) than all other covariate models. *Cambarus thomai* rarely occupied industrial/agricultural sites, but were often present in forested and residential sites. Although the influence of covariates on site occupancy differed between species, forested habitats were important for *F. fodiens* and *C. thomai*.

ANAND NARAYANAN AND DR. PETER GANNETT, Dept. of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26505, and SRI LAKSHMI YEDLAPPALI and DR. LLOYD CARROLL, Dept. of Chemistry, West Virginia University, Morgantown, WV 26505.
Multi-functional Magnetic Nanoparticles as Cancer Therapeutic Agents.
Superparamagnetic iron-oxide nanoparticles (SPIONs) are a class of magnetic nanoparticles that offer benefits for the early detection and treatment of diseases, such as cancer. SPIONs are unique in that they can be rendered biocompatible with living systems, capable of being loaded with therapeutic drugs, have the potential for RF-induced heating as a therapeutic mechanism, and can be conferred with the capability of specifically targeting cells through the use of antibodies and receptor specific tags. These versatile particles are prime candidates for improving the current therapeutic methods available for the treatment of cancer and potentially other diseases.

This multi-disciplinary project includes various milestones and multiple aims: identifying the design parameters for SPIONs that optimize aqueous stability and maximize amphiphilic character, evaluating SPION-related drug storage and release characteristics, and finally, demonstrate binding and entry of SPIONs to specific cells using molecular targeting. Here, the focus is on the fluorescence analysis of labeled SPIONs, the cellular absorption of SPIONS, and target binding studies using confocal microscopy. A previous study examined coupling of cell-specific agents to the SPIONs, focusing on an antisense oligonucleotide against Survivin mRNA, a protein over-expressed in cancerous cells. Coupling was accomplished using an amino end-labeledoligonucleotide ($^{5'}$CCCAGCCTTCCAGCTCCTTG-$(CH_2)_6$-3'NH_2) to form amide linkages upon activation of the exposed carboxylic acid groups (-COOH) of the SPION by treatment with N-((3-dimethylamino)-propyl)-N-ethyl carbodiimide (EDC). Circular dichroism (CD) and gel electrophoresis (GE) studies were performed i) with SPIONs in solution, ii) SPIONs and anti-sense Survivin in solution, iii) SPIONs coupled to the antisense Survivin oligonucleotide, and finally, iv) SPIONs coupled with anti-sense Survivin, hybridized to the complementary strand. These data allow us to demonstrate coupling of the oligonucleotide to the SPION and also served as a method to quantify and optimize coupling. Further, these studies demonstrated that antisense Survivin duplex formation was not destabilized by the presence of the SPION. The CD results were correlated with gel electrophoresis data and the same set of samples.

The aforementioned sequence has now been modified with 5'-Fluoroscein, a fluorophore with excitation and emission maxima

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with corresponding values at 494 and 522 nm. The same coupling procedures were performed to develop a SPION:DNA complex that could now be measured and quantified through fluorescent techniques. The intention behind the fluorescent approach is to quantify, with greater accuracy, covalent binding between SPIONs coupled to DNA with the complementary sequence, which is otherwise difficult to quantify with CD and GE assays. Furthermore, application of the SPION:DNA complexes to a cell culture assay, such as an WST assay, will allow for demonstration of cellular uptake and localization within the cell, as confocal microscopy requires the use of a fluorophore agent for detection. This will allow for testing of numerous conditions, such as cellular absorption, environmental effects of the endosome, localization within the cytosol, etc. Funding support is provided in part through the NIH GM081348 grant and the WVU Research Corporation; additional funds, and the Space Grant Consortium.

SETH O'NEAL and MARK FLOOD, Dept. of Biology, Fairmont State University, Fairmont, WV, 26554. **Determination of the effects of Marcellus shale drilling and fracking on local stream composition.**

Marcellus shale drilling has become a highly anticipated economic activity in West Virginia recently. Not only does it yield large amounts of natural gas for nationwide use, it also provides local jobs on well sites. However, it has been seen in previous drilling expeditions that several issues arise from the hydraulic fracturing process. This study was conducted to examine whether or not the drilling and hydraulic fracturing processes used in West Virginia had negative effects on streams located near the well sites. To examine the stream's composition nitrate and phosphate levels were measured using reagent packets and a spectrophotometer in addition to a YSI probe being used to measure temperature, total dissolved solids (TDS), conductivity, pH and turbidity above and below five different Marcellus well site. Aquatic macroinvertebrates were also sampled in all areas. The five sites were along Cherry Camp Road, Indian Creek road, little Bingamon Creek, and 2 sites along Big Bingamon Creek. The results were that 3 of the 5 sites experienced an increase in conductivity and nitrates below the Marcellus well sites and 2 sites had higher dissolved oxygen and TDS below the well sites. Only one of the sample sites on Big Bingamon Creek did not have any changes to the stream composition below the well site. Furthermore, an effect was also observed in some local well waters nearby to the newly drilled wells. In conclusion, several factors in the streams appear to be affected by the presence of Marcellus shale wells. This project was supported by a Fairmont State University Sure Grant.

DAWNELLE R. POWELL and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of acidity and salinity on growth and photosynthetic rates of squash plants.**

Four groups of squash plants were grown in the FSU greenhouse at uniform lighting, temperature and CO_2 levels. The control group received tap water, while the salt treatment plants were watered with 1800 ppm NaCl, the salt/acid treatment plants received 1800 ppm NaCl and pH 4 buffer, and the acid treatment plants received only the pH 4 buffer. Photosynthetic and transpiration rates of other plants were tested on the LICOR 6400. Rates were tested at 500, 1000, and 1500 PAR (umol photons $m^{-2}s^{-1}$), other conditions remained constant.

Preliminary results indicated that the average photosynthetic rate of the control group was 9.75 µmol CO_2 $m^{-2}s^{-1}$ at 500 PAR, and this was 39.8% higher than plants in the salt treatment and 77.4% higher than the salt/acid treatment. After one buffer treatment all plants in the acid treatment were dead. The control group had a transpiration rate higher than the salt group by 50.3% at 500 PAR. The control group demonstrated close to 80% higher transpiration rates than the salt/acid group at all three light levels.

MASUDUR RAHMAN, ANSHUMAN MANGALUM, MICHAEL NORTON, Dept. of Chemistry, Marshall University, Huntington, WV 25755 and DAVID NEFF, Molecular and Biological Imaging Center, Marshall University, Huntington, WV 25755. **Using DNA Origami to organize bio-Materials.**

To organize nano-materials (NMs) with the highest possible accuracy and control is one of the biggest challenges in Nanotechnology. Such control will lead usher in nanoelectronics, nanorobotics and nano-bio sensor systems to efficiently monitor our environment. Structural DNA nanotechnology [1, 2] is one of the most powerful routes to this control and DNA origami (DO) is currently one of the most powerful enabling tools for this objective. DO is the folding of long DNA to create one, two and three dimensional nanoscale shapes [3]. Typically this method entails the combination of a long ssDNA (single strand DNA, bacteriophage M13, 7249 nucleotides) with about 250 small ssDNA (called staples) to define the shape and pattern the structure. With such a high pixelation density, it is in principle possible to build patterns with about 100 addressable points within a definable shape in an area of about 10,000 nm^2 [4]. We have developed rectangular shaped DO (100 X 72 nm^2 L x H) to address bio-NMs such as streptavidin proteins accurately with a 60nm pitch. Our result suggests that combinations of single DO are arguably the most effective way of producing large addressable platforms; therefore we have developed 1D DO to increase the addressable area. This study brings us to the point where bottom-up organization of NMs can meet the limit of top-down organization of NMs.

DUSTIN REVELL and ADAM PARKS, Dept. of Biology, Shepherd University, Shepherdstown, WV 25433, and QING WANG, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25433. **Mathematically modeling the growth of *Escherichia* coli K12 throughout GASP phase.**

During growth, bacteria undergo several different stages where different events and growth patterns occur. They experience the lag, exponential, stationary, death, and GASP phase. During the lag phase, they take in nutrients and prepare to undergo cell division. During the exponential phase, the bacteria are dividing at an exponential rate because nutrients are plentiful. During the stationary phase, the nutrients have become primarily depleted and the growth rate is equal to the death rate, causing a stationary colony population.

During the death phase, no more nutrients are available for the bacteria, so they lyse. The first 4 phases have been well studied and it is known what events occur during each phase. Many mathematical models readily predict the sigmoidal shape of the first three phases. Much less is known about the GASP phase, however. During the GASP, many physiological events occur, such as mutations to cell death and regulatory pathways and the activation of error-prone DNA Polymerases, which allow the bacteria to survive even in some of the most nutrient deprived conditions. This growth has not been able to be previously modeled, due to seemingly sporadic growth patterns. We wished to study this growth pattern by looking at a model bacterium, *E.* coli K12, as it underwent the different growth phases over time. We allowed the bacteria to grow in minimal media and observed their optical density as they proliferated. By observing the changes in optical density over time, we were able to pinpoint around which day each phase started and ended. We plotted the Optical Density of several colonies over time and compared the graphs in order to generate a model to represent bacterial growth throughout the GASP phase. This research has been supported by the SOARS program.

KADY ROGERS, DR. KATHARINE GREGG, JEN COLLINS, Dept. of Biology, West Virginia Wesleyan College, WV 26201. **Composition of Four Forest Communities at Straight Fork, Southern Upshur County, West Virginia.**

This study was designed to determine the community composition of four forest areas on a 48-acre property at Straight Fork in southern Upshur County, West Virginia. The property was surveyed using a Trimble GPS unit to find the elevation, slope, and aspect of the four different forest areas surveyed by students in 2006 and 2007. In those two years forest areas were sampled in non-overlapping swathes and data were collected at points every twenty five meters. Ecological point-centered-quarter (PCQ) method sampling was implemented and importance values for each species were calculated using density, dominance, and frequency. Based on canopy species, the community types were determined to be Mixed Deciduous Forest, *Acer saccharum-Quercus rubra* Forest, *Liriodendron tulipifera-Acer saccharum* Forest, and *Acer saccharum* Forest. The species richness and equability were calculated using Shannon-Wiener and Equability indices, respectively. Similarity between communities was determined using the Sorensen Index. The Shannon-Wiener Index quantifies species richness and abundance; values below 1 are indicative of low species diversity and those above 3 indicate a higher species diversity. The four forest areas in this study had a range of values from 2.04 to 3.12. The *Acer-Quercus rubra* Forest had the largest Shannon-Weiner value which indicates the richness and species abundance are higher for that forest area than the others. The *Liriodendron tulipifera-Acer saccharum* Forest had the second highest value. Mixed Deciduous and *Acer saccharum* Forests had lower values. Equitability, used to determine evenness of distribution of individuals among the species in a community, ranges from 0 to 1, with one indicating the most even distribution. The equitability values for the four forest areas ranged from 0.40 to 0.82. *Acer saccharum-Quercus rubra* Forest had the highest equitability and therefore the most even distribution among species of the four forest areas. The *Liriodendron tulipifera-Acer saccharum* Forest had the lowest equability and therefore the least evenness. The Sorensen Index is used to determine the similarity of species in different communities and ranges from 0 to 1, with 0 indicating no species in common and 1, all species in common. The Mixed Deciduous Forest and the *Acer saccharum* Forest area had the largest Sorensen value (0.67) and therefore have the highest community similarity. The two forests with the lowest Sorensen value (0.52) and the least number of species in common were the Mixed Deciduous and *Liriodendron tulipifera-Acer saccharum* Forest. Predictions about future forest composition will be presented and discussed.

TIM RUHNKE, Dept. of Biology, West Virginia State University, Institute, WV 25112. **Progress and obstacles in species level investigations of two cestode genera from sharks and stingrays.**

Substantial un-described species diversity exists within the cestode fauna of elasmobranch fishes, especially within the genera *Anthocephalum* and *Paraorygmatobothrium*. The study of morphology and molecules for species of these genera has yielded both success and frustration. In different ways, both serve as case studies of species level taxonomy and systematics. In this talk, species concepts are considered as they apply to tapeworms. Issues with the problematic nature of the boundaries of new and existing species are also considered. Examples of how DNA sequence data is employed in the study of cestode species level questions will also be presented. Elasmobranch cestode species have been assumed to be quite host specific. That assumption will be examined. Research supported by NSF PEET No. DEB 0529684, NSF PBI Award Nos. DEB 0818696 & DEB 0818823, NSF EPSCoR, and WV-NASA.

MICHEAL V. SMITH, SEUNG-YUN KIM, and OSMAN GUZIDE, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, WV 25443. **An Efficient Management Algorithm for Smart Home Environments using Petri Net Modeling and Simulation Tools.**

With the cost of energy on the rise, there is a drive to reduce energy consumption of every device. There is a lot of technology that is used to reduce the energy consumption of the average home. Sometimes the occupant of the home can be a limiting factor of the potential energy efficiency of the home. An approach is needed to produce the maximum efficiency of the home when given irregular activity patterns of the occupant without sacrificing the comfort of the occupant. In this paper an algorithm is proposed to control the utilities of the home by monitoring the occupant's distance away from the home and the use of sensors to determine sleeping. Also the activities of the home are taken in consideration. By using the distance of the occupant from the home the algorithm is able to adjust the home to the comfort level for the occupant no matter what the behavioral pattern of the occupant. Petri Net is a useful mathematical tool that can be used to model environments because the elements of the Petri Net can act of given conditions in real time. The algorithm and the smart home environment were modeled using Tina and HPSim Petri net modeling and simulation tools. From the Petri Net simulation, the results of the efficiency of the home were dependent on the location of the occupant outside the home

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when the occupant was away but there was a reduction of energy consumption by the home when using the algorithm as compared to not using the algorithm.

CHRISTINA SNODGRASS, MARK FLOOD, and PHILLIP YEAGER, Dept. of Biology, Fairmont State University, Fairmont, WV 26554, and PAUL BAKER, Save the Tygart Watershed Association, Grafton, WV 26354. **Determination of the effects of acid mine drainage remediation in the Three Fork Creek drainage.**

Water is an integral part of life and plays a central role in the balance of the ecosystem, especially in West Virginia. The state has flourished in the coal industry, but improper upkeep of abandoned mines have negatively impacted local streams and rivers due to the toxic effects of acid mine drainage (AMD) on aquatic flora and fauna. In order to rectify AMD, the WV-DEP recently installed dosers at four locations in the Three Fork Creek drainage that automatically dump limestone into the stream to neutralize the acidity of the water. The objective of this project was to assess if the dosers were positively impacting stream health. Water quality was assessed using a YSI multiprobe that measured the pH, temperature (°C), 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. In addition, aquatic macroinvertebrates were sampled. Data collected during the summer of 2011 (after dosers were installed) was compared to previously collected samples from before the dosers were installed. Overall, the results indicated that recently installed limestone dosers did have a positive impact on several of the water quality measurements that were collected. Knowledge gained from this remediation effort will help in determining how to reclaim AMD waters in the future within the state of West Virginia. This project was supported by a Fairmont State University SURE grant.

XUEYAN SONG, YUN CHEN, XUEZHANG XIAO, SONG CHEN, and EVER BARBERO, Dept. of Mechanical and Aerospace Engineering, West Virginia University, WV 26506. **Thermoelectric and nanostructure evolution of $CA_3CO_4O_9$ bulk ceramics upon high temperature annealing.**

Thermoelectric (TE) technology is recognized as a clean and promising energy conversion technology, which can convert heat from many energy production and consumption systems directly into electricity. To achieve a high efficiency in a TE power generator, particularly for high temperature applications, identifying high performance TE materials is key. TE oxide materials, such as $Ca_3Co_4O_9$, are particularly promising for on-board heavy-duty vehicle applications and high temperature waste heat harvesting from power plants, because they are lightweight, inexpensive, highly efficient, and stable at high temperatures in air, and non-toxic. However, it was reported that $Ca_3Co_4O_9$ phase decomposes at 1199 K.

In the present work, we report the TE performance and nanostructure of polycrystalline $Ca_3Co_4O_9$ samples synthesized using the chemical sol-gel route. Specifically, TE properties and nanostructure evolution were studied for a $Ca_3Co_4O_9$ sample annealed at 1273 K, which is over the $Ca_3Co_4O_9$ decomposition temperature of 1199 K as indicated in the CaO-CoO phase diagram. Electrical and thermal properties of both baseline and annealed sample were measured over the temperature range of 323-1073 K. The baseline polycrystalline $Ca_3Co_4O_9$ sample exhibits the highest *ZT* of 0.15 at 1023 K. The sample annealed at 1273 K has the highest *ZT* of 0.13 at 1073 K. X-ray diffraction from both samples only reveals peaks from $Ca_3Co_4O_9$ phase. SEM shows the baseline sample has micron-sized $Ca_3Co_4O_9$ grains. TEM results show that each of the micron-sized "grains" in the baseline sample shown in SEM, consist of nano-lamella $Ca_3Co_4O_9$ grains with fiber texture. As a result of annealing, some CaO nano-phases exist between neighboring $Ca_3Co_4O_9$ nano-lamella grains. In addition to the CaO phases, a very small amount of $Ca_2Co_2O_5$ phase was also observed in the annealed sample. The $Ca_2Co_2O_5$ phase does not exhibit the same lamella nanostructure as $Ca_3Co_4O_9$ and displayed few crystal defects. Except for the $Ca_3Co_4O_9$ and $Ca_2Co_2O_5$, no other Ca-Co-O cobaltite phase such as $Ca_3Co_2O_6$ phase was found in the annealed sample.

In summary, the polycrystal $Ca_3Co_4O_9$ pellet shows excellent thermal stability. After annealing at 1273 K, $Ca_3Co_4O_9$ is still the dominant phase with small amount of minor phases of Co-containing CaO phase existing between the $Ca_3Co_4O_9$ lamellas, and irregular shaped $Ca_2Co_2O_5$ grains with few crystal defects. Both the CaO phase and $Ca_2Co_2O_5$ grains exhibit a well-defined crystallography relationship with $Ca_3Co_4O_9$.

Research sponsors: West Virginia-Energy Materials Program (Grant EPS08-01), and West Virginia University Advanced Energy Initiative.

ARIELLE STAFFORD and ADAM PARKS, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Bunker-Busting Bacteriophage: Isolation of Bacteriophage for Elimination of *Pseudomonas aeruginosa* Biofilms.**

Pseudomonas aeruginosa is a biofilm forming pathogen that has become increasingly resistant to antibiotics, forcing researchers to look into alternative treatment methods. Bacterial biofilms consist of an exopolysacchride matrix that surrounds cells and protects them from host defenses and antibiotic treatment. Bacteriophage therapy, which uses specific viruses that infect bacteria, is currently being considered as an alternative treatment for these bacterial infections. Using a sewage sample from the Shepherdstown Sewage Treatment Plant, we isolated a bacteriophage that can degrade *Pseudomonas aeruginosa* biofilms, allowing it to infect and kill the bacteria. We tested the interaction of *Pseudomonas aeruginosa* and its bacteriophage, as well as the host range of the bacteriophage. Spot assays showed that the bacteriophage was able to prevent biofilm formation, and microtiter plate analysis showed that overnight exposure to the bacteriophage was able to degrade an existing biofilm by up to 36%. Individual plaques exhibited halos, indicative of polysaccharide depolymerase activity. The bacteriophage was unable to infect other bacteria and/or

their biofilms, showing that the virus has a very limited host range. This is necessary for future therapeutic use because it protects the essential bacteria in the body from infection. Spot assays showed the presence of bacteriophage resistant colonies. This resistance indicates a need for a phage cocktail with multiple bacteriophage or using phage therapy and antibiotics simultaneously in future treatments. While this bacteriophage is able to degrade *Pseudomonas aeruginosa* biofilms and lyse cells, additional research needs to be completed to characterize the bacteriophage's genome before it can be employed in future research. This research was supported by funding EPSCoR to AS through the SOARS program at Shepherd University.

CLIFFORD STARLIPER, USGS Leetown Science Center, Fish Health Laboratory, Kearneysville, WV 25430, and BARNABY WATTEN, USGS Leetown Science Center, S.O. Conte Anadromous Fish Research Center, Turners Falls, MA, 01376. **Method development for IMO D2 Standards on-board ship disinfection of ballast water.**

Ship ballast water is a well-recognized medium for the transfer and introductions of aquatic nonindigenous species to North America. There are numerous examples of the deleterious effects to aquatic ecosystems resulting from inadvertent introductions of invasive species, many of which have been associated with ballast water releases. Most notable in recent years were introductions of Dreissenid mussels, zebra mussels (*Dreissena polymorpha*) and quagga mussels (*D. bugensis*). These invasive mussels have not only resulted in extirpations of native mussel species, they continue to pose eminent threats to native fauna and are responsible for an estimated $1 billion annually in the United States in damages to infrastructure and control measures.

To control dissemination of invasive species via ballast water, The International Maritime Organization (IMO), an agency of the United Nations, developed legislation that requires ships utilizing ballast water which were/are constructed during and after 2009 to have treatment capability on-board ship to disinfect ballast water prior to release. Effective treatment must be to the extent to meet D2 Standards for maximum allowable numbers of indicator microorganisms, including *Vibrio cholera*, *Escherichia coli* and intestinal Enterococci.

We are developing the use of high pH (NaOH) as a method for disinfection of ballast water. This paper summarizes our bacteriological studies to date, which evaluated the efficacy of various pH concentrations through pH 12.0 to kill D2 Standards indicators and a suite of fish pathogenic and environmental bacteria common in freshwater aquatic environments. In controlled laboratory studies, we have determined minimum values of pH and treatment duration necessary to achieve bactericidal effect for 155 pure bacterial cultures. These included 124 cultures developed from primary isolation plates from ballast water that originated from the Laurentian Great Lakes (i.e., Lakes Michigan, Huron, Superior) and was sampled from ballast tanks from the 'Indiana Harbor', a bulk-freight carrying ship (app. 1,000 feet in length). Although the bactericidal endpoints varied for the bacteria tested, and with the Gram-positives requiring the highest pH and longest treatment, all bacteria were killed within 72 h and pH 12.0.

XIAOPING SUN, DAVID HAAS, KAYANNA SAYRE, KATRINA LEAPTROT, and BENJAMIN SMITH. Dept. of Natural Science and Mathematics, University of Charleston, Charleston, WV 25304. **Our progress in studies of aryl organosulfur compounds: synthesis, substituent effects, and reaction mechanisms.**

Diaryl sulfoxides (Ar_2SO), parented by Ph_2SO, are valuable organic reagents and possess substantial utility in biomedical and synthetic applications. For example, Ar_2SO [Ar = Ph, O_2NPh, H_2NPh, and $(ClCH_2CH_2)_2NPh$] have been used as precursors to hypoxia-directed bioreductive cytotoxins (anti-cancer drugs). Ph_2SO has been used effectively in catalytic oxidation of various alkyl sulfides to sulfoxides. Usually, Ar_2SO, including Ph_2SO, are made by catalytic oxidation of the corresponding Ar_2S. The preparation involves complicated transition-metal-complex based catalysts. In addition, the available methods for synthesis of the starting Ar_2S are tedious and often require sophisticated catalysts.

Olah *et.al.* have studied mechanism for the $AlCl_3$–catalyzed EAS reactions of arenes with arenesulfonyl chlorides (ArSOCl) giving various aryl sulfoxides at 25 °C. Analogues to ArSOCl, thionyl chloride ($SOCl_2$) was initially expected to undergo double consecutive EAS reactions with PhH in the presence of $AlCl_3$ to give Ph_2SO when the starting materials were mixed in the molar ratio of PhH : $SOCl_2$: $AlCl_3$ = 2:1:1.

However, only under carefully selected and controlled conditions was this reaction found to give a sole product Ph_2SO (Reaction 1) in high yields. In many other cases, depending on the temperature and the manner in which the starting materials were actually mixed, this reaction usually gave several products, including Ph_2SO, Ph_2S, $PhSO_2SPh$, and Ph_2SO_2, in various yields. The yield of Ph_2SO was getting greater as temperature increased, while the yields of Ph_2S and $PhSO_2SPh$ increased as temperature was lowered.

$AlCl_3$–catalyzed reactions of $SOCl_2$ with several substituted benzenes (ArH), including toluene (PhMe), phenol (PhOH), chlorobenzene (PhCl), and pentamethylbenzene ($PhMe_5$), were conducted at room temperature in the molar ratio of ArH : $SOCl_2$: $AlCl_3$ = 2:1:1. The PhMe reaction afforded *p*-$(MePh)_2SO$ (70%), *o*-$(MePh)_2SO$ (19%), *p*-$MePhSO_2S$(*p*-PhMe) (5%), and *p*-$(MePh)_2SO_2$ (5%). However, the PhOH reaction only gave *p*-$(HOPh)_2S$ (62%) together with minor *p*-HOPhCl (5%), and *p*-$(HOPh)_2SO$ was surprisingly not formed. The PhCl reaction gave *p*-$(ClPh)_2SO$ (69%), *o*-$(ClPh)_2SO$ (11%), *p*-$(ClPh)_2S$ (5%), and *p*-$ClPhSO_3H$ (14%). The $PhMe_5$ reaction gave a sole diaryl sulfide $(Me_5Ph)_2S$ product (10%) with no other products observed, and the low reactivity of $PhMe_5$ is presumably attributable to steric effect. All the results show that different groups on the aromatic rings result in distinct substituent effects.

Mechanisms for formations of Ar_2SO, Ar_2S, $ArSO_2SAr$, Ar_2SO_2, and $ArSO_3H$ have been proposed. While formation of Ar_2SO originates from the $AlCl_3$–catalyzed double consecutive EAS reactions with $SOCl_2$, novel auto-redox and oxygen-exchange processes were proposed to account for formations of Ar_2S, $ArSO_2SAr$, Ar_2SO_2, and $ArSO_3H$.

Abstracts for Oral Presentation continued

BRIAN C. TRAIN, Dept. of Pharmaceutical and Pharmacological Sciences, West Virginia University, Morgantown, WV 26505, and VORASIT VONGSUTILERS, Dept. of Pharmaceutical Sciences, Chulalongkorn University, Bangkok 10330, Thailand, and NISSA M. THOMSEN, Dept. of Pharmaceutical and Pharmacological Sciences, West Virginia University, Morgantown, WV 26505, and PETER M. GANNETT, Dept. of Pharmaceutical and Pharmacological Sciences, West Virginia University, Morgantown, WV 26505. **Investigation of the Z-DNA Binding Protein Mediated B-/Z-DNA Transition Through the Use of C8-Arylguanine Modified Oligonucleotides.**
The left-handed zigzag conformation of DNA, Z-DNA, has been implicated in carcinogenesis. Because the negatively charged phosphate residues are closer together, Z-DNA formation is unfavorable which generates large scale gene deletions, translocations, and rearrangements when formed in vivo. As a result of the inherent instability of Z-DNA, investigation of B- to Z-DNA interconversion has proven difficult since Z-DNA requires external stimuli to stabilize its formation like high salt, chemical modifications, negative supercoiling, or specific proteins known to stabilize Z-DNA, Z-DNA binding proteins (ZBP). We have demonstrated that C8-arylguanine DNA adducts, derived from carcinogenic arylhydrazines, drive Z-DNA formation and the presence of $MgCl_2$ stabilizes the Z form under physiological conditions. The conformational effects of the DNA adducts were determined by nuclear magnetic resonance spectroscopy (NMR) and circular dichroism (CD). In addition, preliminary results using in silico molecular dynamics calculations and CD have demonstrated that ZBPs prefer to bind to C8-arylguanine modified DNA. Therefore, C8-arylguanine modified DNA can be used as a tool to further elucidate the mechanism of ZBP mediated B- to Z-DNA transition. The current view of the B-/Z-DNA transition suggests a stepwise mechanism where one ZBP binds B-DNA converts it to Z-DNA that is stabilized when another ZBP binds. However this view fails to explain the ZBP selectivity and leads to a contradictory conclusion that ZBP cannot bind Z-DNA even though the [ZBP-Z-DNA-ZBP] complex is stable. Therefore, our C8-arylguanine modified DNA can be used to investigate the binding of ZBPs to DNA, as either the B or Z forms can be generated under physiological conditions, to fully clarify the mechanism of ZBP binding to their target DNA permitting studies not heretofore possible. Future work will examine the kinetics of ZBP binding of B- and Z-DNA by surface plasmon resonance (SPR). This may reveal the underlying factors that control ZBP-DNA interactions which could become a potential therapeutic target (Supported by a fellowship to BCT HEPC.dsr.09013 and NSF EPS-1003907).

CHASE TURNER and TIM RUHNKE. Dept. of Biology, West Virginia State University, Institute, WV 25112, and KIRSTEN JENSEN, Dept. of Ecology and Evolutionary Biology, The University of Kansas. **Examination of host species usage patterns in species of the shark cestode genus *Paraorygmatobothrium*.**
The shark cestode genus Paraoygmatobothrium was erected by Ruhnke (1994) for three species. Since then, the genus has grown to include seventeen species. Host specificity has also been a key assumption in the taxonomy of this genus. Collections from a variety of localities world-wide has revealed substantial un-described species diversity within the genus. Thus far, analysis of the cytochrome c oxidase I (COX1) region has been conducted for 76 individual samples of *Paraorygmatobothrium*. These samples have been collected from 17 shark species of the order Carcarhiniformes. Sharks were taken from the Northwestern Atlantic Ocean, the Gulf of Mexico, the Gulf of California, and the waters off Northern Australia, Malaysian Borneo, and Senegal. An alignment of 471 nucleotide positions was completed for the samples of Paraorygmatobothrium, in addition to the outgroup taxa *Thysanocephalum thysanocephalum* and *Phyllobothrium lactuca*. At least 17 species have been putatively identified using COX1, and only two are known to science. Seven of the new species were collected from two or more host species. This pattern of host use by species of *Paraorygmatobothrium* is contrary to previous assumptions of host specificity for the group. Research supported by NSF PEET No. DEB 0529684, NSF PBI Award Nos. DEB 0818696 & DEB 0818823, NSF EPSCoR, and WV-NASA.

CHARLES Z. WALBURN and LESLIE C. HOPKINSON, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Quantifying near-streambank turbulence through a storm event.**
Fluvial entrainment, initiated by near-boundary turbulence, is the main driver of streambank retreat as it leads to unstable streambank geometries. This research characterized the turbulence structure of flow near the streambank toe throughout a storm event. Three-dimensional velocity was measured at baseflow and through a storm hydrograph at an experimental cross-section (West Run in Morgantown, WV) using a Sontek 16-MHz ADV. One velocity measurement (2 min sample time at 25 Hz) was taken every seven minutes for a 23 hour storm event; water depth was also monitored. Channel geometry, grain roughness, and vegetation parameters (i.e. location, size, and density) were measured before and after the storm event. Reynolds stresses, turbulent kinetic energy, and turbulence intensities were calculated for each velocity time series, resulting in a time distribution of shear stress and turbulence characteristics. Turbulent kinetic energy increased with an increase in water Dept.h. The average turbulent kinetic energy as the flow approached the peak was 38% greater than the average turbulent kinetic energy at baseflow. Reynolds stresses did not increase as water Dept.h increased. Additionally, applied shear stresses estimated by turbulent kinetic energy were an order of magnitude greater than the calculated Reynolds stresses, indicating that the turbulence characteristics may not be used interchangeably to estimate streambank erosion rates.

CHRISTOPHER C. WALLACE and OSMAN GUZIDE, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, WV 25443. **Quantum Cryptography: Ultraviolet Hash Function of Quantum Cryptography.**
Quantum Cryptography is becoming by far the go to standard of encryption. The cryptography field is getting more and more familiar with this process every year. While systems have been researched for many years the wide ranging capabilities are becoming more and more important. This is to introduce the reader to the field of quantum cryptograph and the direction it is headed. It will

discuss the need for an improved security function for the Quantum Key Distribution process. To accomplish this it will mean taking a quick look at quantum physics, basic components, single photonic systems with the use of a pulsed UV laser, and the future research of Quantum Cryptography.

BRITTANY WHITED, Dept. of Mathematics, Marshall University, Huntington, WV 25755, MARCIA HARRISON-PITANIELLO, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. **Modeling Gravitropic Curvature in Plant Stems.**
Gravitropism is a physical response in plants that results in a curvature of the stem. Primitive measuring methods consisted of basic angle measurement between the tip and base of the plant. Now, time lapse imaging can be used to capture this curving over several hours. Using image analysis in MATLAB, we are able to standardize this angle measurement. In the 2006 paper, "Quantification of curvature production in cylindrical organs, such as roots and hypocotyls," Andrés Chavarría-Krauser produces various graphs relating the distribution of curvature over the stem, the rate of curvature, distribution of rate of change of curvature, and time. Utilizing numerical methods, including radial basis functions, we seek to recreate these graphs. Ultimately, the graphs can be used to simulate changes in the pattern of gravitropic curvature that has been characterized experimentally.

RYAN M. WILLIAMS, Dept. of Basic Pharmaceutical Sciences, PO Box 9530, West Virginia University, Morgantown, WV 26506, LETHA J. SOOTER, WVNano Initiative, Dept. of Basic Pharmaceutical Sciences, PO Box 9530, West Virginia University, Morgantown, WV 26506. ***In vitro* selection of DNA molecular recognition elements for the pesticide atrazine.**
Atrazine is the most widely used herbicide in the world and has been causally linked to hormonal cancers in humans. It has been found in ground and drinking waters in agricultural areas at levels well above the EPA Maximum Contaminant Limit. The current method for atrazine detection is gas chromatography, which is time and labor intensive. A more rapid and efficient method of detection that can be deployed at the point-of-care and in the field is necessary to determine human and environmental exposure to this chemical. Towards this end, twelve rounds of *in vitro* selection have been completed, enriching a pool of 10^{15} single-stranded DNA molecules (ssDNA) for those that bind to atrazine. Binding studies will be performed on ssDNA sequences present in the enriched pool. The MRE with the greatest selectivity and affinity for atrazine will be used in a microfluidic chip sensing device for rapid, field-deployable sensing of this environmental contaminant. We acknowledge support from the National Science Foundation (Cooperative Agreement 1003907).

JINLONG YAN, MINGJIA ZHI, and NIANQIANG WU, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **PH_3 Poisoning Effect on Ni/YSZ Cermet Solid Oxide Fuel Cell Anode.**
It is attractive to use coal-derived gas as the fuel of solid oxide fuel cells (SOFCs). Ni-Yttria stabilized Zirconia (YSZ) cermet is widely employed as the anode materials of SOFCs for its characters of low-cost, high electronic conductivity and excellent catalytic activity for diverse fuels. However, the long-term stability of Ni/YSZ anode is of great concern when a SOFC is operated with coal syngas as the fuel. One major concern is poisoning by impurity species in the coal syngas, such as sulfur, phosphorous, arsenic, selenium, etc. Among all the impurities, phosphorous is most detrimental to cell performance. Therefore, it is of significance to unveil the underlying mechanism of phosphorus contamination.

The present paper deals with the influence of electric current and moisture concentration on the degradation of Ni/YSZ anode upon exposure to PH_3. In-situ electrochemical test is combined with ex-situ material characterization methods to analyze the degradation of the SOFC anode. Specifically, Ni migration behavior at the Ni/YSZ anode is quantitatively investigated. The nickel migration is induced by the electrostatic force due to electric current and by the chemical potential difference of phosphorous. In addition, the preence of moisture aggravates the cell degradation in the PH_3-containig fuel.
Source of support: US Dept. of Energy (DOE) EPSCoR Program under grant number DE-FG02-06ER46299; Energy Materials Program EMSE/RCG.

FARSHID ZABIHIAN and KAMRAN ROSTAMI, Dept. of Mechanical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136, ASAD DAVARI, Dept. of Electrical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136, and GIFTY OSEI-PREMPEH, Dept. of Chemical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136. **Development of proof-of-concept single cell polymer electrolyte fuel cell fueled with carbon monoxide.**
The Dept. of Energy (DOE) promotes "Clean Coal Technologies" as alternative path for future power generation. Direct carbon fuel cells (DMFC) are one of the key elements of this program. Polymer electrolyte fuel cells (PEFC) can be ideal candidates for small-scale residential and mobile coal-based power generation because of their high power density, low operating temperature, and their well-developed technologies. Due to the internal operation of fuel cells, it is not possible to directly feed coal to fuel cells. With the currently available state-of-the-art fuel cells, it is not possible to achieve a reasonable three-phase boundary where solid fuel, electrolyte, and electro-catalyst meet. To avoid this problem, coal should be first pre-processed. The most common technique for pre-processing of coal is coal gasification, but it requires a high quantity of water. An alternative technique for coal pre-processing is partial oxidation (POX) of coal. Unlike the gasification technique, the POX does not require any steam. In this process, the fuel is partially combusted with a sub-stoichiometric amount of air or oxygen. The equipment in this process is simpler, lighter, and smaller. Its response to load change is fast, and its start-up time is short. The product of this process is a fuel gas with very high concentration of CO. In the carbon monoxide-fueled PEFC, the following reactions take place at the anode and cathode:
Cathode Anode.

Abstracts for Oral Presentation continued

At the anode, carbon monoxide reacts with water in water gas-shift reaction, generating carbon dioxide, electrons, and protons. Protons transport through the membrane and react with oxygen at the cathode to generate water. The generated electrons get transported through an external circuit from anode to cathode thus producing the desired product of the system, electricity.

Unfortunately, the aforementioned fuel gas cannot be used as fuel in the conventional PEFC. Traditionally, the electrocatalysts of PEFC are made of platinum-based material, which is strongly poisoned in the presence of carbon monoxide. To solve this problem, it has been proposed to use platinum alloys, such as platinum- ruthenium, as the electrocatalyst.

Currently, a team of researchers from the Mechanical, Electrical, and Chemical Engineering Departments at the West Virginia University Institute of Technology are intensively working to develop a PEFC that can directly convert the chemical energy of carbon monoxide to electrical energy through electrochemical reactions and to develop a process to convert coal to CO-rich fuel.

The research laboratory of the WVU Tech and its industrial partner, American Science and Technology (AST), is well equipped to develop and test CO-fueled PEFC. In this facility, many alloys of platinum- ruthenium have been tested. The researchers have been able to develop a single cell proof-of-concept PEFC that could successfully operate with CO as the inlet fuel. The current objective of the research is to optimize the cell to increase its power density, efficiency, longevity, and reduce cost. The next step will be to develop a stack of fuel cells that can produce a significant amount of electricity.

The abstracts for the poster presentations are arranged in alphabetical order by the first author's last name. Please see the poster presentation list for the specific time and place of each presentation.

SEAN ABEL, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506, and DR. LESLIE HOPKINSON, Dept. of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506. **Characterizing near-boundary turbulence following stream restoration of varying intensity.**

The goal of this project is to examine the influence of stream restoration on stream stability. The specific objective is to characterize near-boundary flow within the three restored reaches of the Stroubles Creek Stream Restoration, Education, and Management (StREAM) Laboratory. Three restoration techniques have been employed on contiguous sections of Stroubles Creek: 1) cattle restriction (1.3 mi); 2) reshaping and revegetating of the stream bank (0.34 mi); and, 3) reestablishment of natural channel flow (0.54 mi). An experimental reach, consisting of a riffle and a pool, will be identified within each section of restoration treatment. A detailed topographic survey and modified Wolman pebble counts will be conducted for each experimental reach. Three-dimensional velocities will be measured near the boundary with a SonTek 16-MHz MicroADV (acoustic Doppler velocimeter). The ADV will record velocity for 2 minutes at 50 Hz. Velocity will be measured at 7 cm from the stream bed at a minimum of 25 points per square meter and an average spacing no less than 25 cm. Stage height and turbidity will be measured continuously during velocity measurements utilizing existing monitoring equipment including a stream gauge and multiple-parameter sondes. Turbulence kinetic energy, turbulence intensities, and Reynolds stresses will be evaluated using the measured velocity time series at each of the sampling locations. A randomized complete block design will be used to account for differences in velocity and turbulence with the blocks and treatments corresponding to the locations and restoration techniques, respectively. Results will provide a better understanding the influence of the restoration techniques on channel stability and flow heterogeneity.

Partial support for this work was provided by the National Science Foundation's ADVANCE IT Program under Award HRD-1007978. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

BRANDON ABBOTT, STEVEN PIFER, ADAM FISCHER, WESTLEY MULLINS, JOE EVANS AND GARY MORRIS. Glenville State College, Science and Math Department, Glenville State College Glenville, WV 26351.

Using the Process of Fermentation to Stimulate Interest in Undergraduate Science Laboratories

Fermentation such as beer brewing provides a hands-on approach that enables students to produce a tangible product; while still allowing for the collection of data that reinforces the major concepts of cellular respiration. The objective here is to develop a lesson plan for an undergraduate science laboratory that incorporates the study of fermentation into a 14 week semester. Fermentation is being used to teach aspects of cellular metabolism through measurements of changes in biological molecules (i.e. carbohydrates, proteins, and alcohols), and introduce the concepts of quantitative and qualitative analysis. Quantitative tests of biological molecules include the Bradford assay for proteins and the phenol-sulfuric acid test for carbohydrates. Qualitative test include the Biueret test for proteins and the Benedict's test for carbohydrates. As fermentation proceeds it is expected that sugar concentrations will decrease with a proportional increase in alcohol content, but the effect of fermentation on protein concentration is unknown.

Abstracts for Poster Presentation

ABSTRACTS FOR POSTER PRESENTATIONS

The data collected for carbohydrates and alcohol so far has followed the expected trends. A concurrent lesson plan is being developed that includes the methods and timeline used thus far. A future direction of this is to study if there is an increase in student enjoyment and interest in the laboratory experience verses the typical laboratory experience.

BRANDON ABBOTT, STEVEN PIFER, ADAM FISCHER, WESTLEY MULLINS, JOE EVANS AND GARY MORRIS. Glenville State College, Science and Math Department, Glenville State College Glenville, WV 26351.

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CAMILLE AGUIRRE, ADRIENNE WALKER, and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443.

Behavioral effects of serotonin and photoperiod in the Madagascar Hissing Cockroach, *Gromphadorhina portentosa.*

Behavioral syndromes ("Shy/Bold" syndrome) have been described in many species, including the Madagascar Hissing Cockroach, *Gromphadorhina portentosa* (Logue et al, 2009). Behavioral syndromes are observed in social animals, where individuals tend to be either more shy (or submissive) or more bold (dominant). We examined effects of photoperiod and serotonin levels and on behavioral syndromes two colonies of hissing roaches. Previous investigations have described behavioral effects of serotonin injections to *G. portentosa* (Conley & Bellew 2011, Walker et al 2012). Since serotonin levels in invertebrates fluctuate according to a circadian rhythm (Muszy ska-Pytel & Cymborowski 1977), we expect differences in behaviors from animals placed under different light:dark cycles. In this study, we examined behaviors in two colonies – a "long-day" 10:14 cycle and a "short-day" 4.5:19.5 cycle. For each animal in each colony, we measured the time to right itself after being flipped on its back (righting response) and the time to emerge from a shelter in response to a novel odor. Logue et al (2009) report that more dominant (or bold) animals flip more quickly and emerge more slowly from the shelter compared to submissive (or shy) animals. For the righting response, animals exposed to the long-day perform the same as those in short-day; whereas emergence time was longer in the short-day colony. Following serotonin injection, only one animal emerged from the housing and the righting was variable with many animals showing either a shorter time to right themselves or no change in righting time. Differences between the short-day and long-day colonies after serotonin injection can be compared. Overall, serotonin caused the animals to stop exploring since they did not emerge from the housing and many animals reduced their righting time – indicating that they became more "bold".

JOSEPH L. ALLEN and STEPHEN C. KUEHN, Environmental Geosciences Program, Dept. of Physical Sciences, Concord University, Athens, WV 24712. **Concord University microanalysis facility: Electron microprobe and micro-X-ray fluorescence for teaching and research in West Virginia.**

Concord University has recently established a new microanalysis user facility that is open for use by academic and commercial users in West Virginia. The facility provides instrumentation to analyze and map the chemical composition of natural and synthetic solid materials. The core of the facility is an ARL SEMQ electron probe microanalyzer (EPMA) and a Horiba XGT-5000 micro-X-ray fluorescence analyzer (micro-XRF). These major research instruments are complemented by a new atomic force microscope (AFM), a Raman spectrometer, polarized light microscopes (transmitted and reflected light), and sample preparation facilities.

The West Virginia Research Trust Fund and WV EPSCoR provided major support for initial operation and upgrade of the EPMA, which is the only electron microprobe in West Virginia. The EPMA uses a highly focused beam of electrons to generate X-rays in samples of solid materials, allowing non-destructive, quantitative chemical analyses of elements from carbon through uranium from spot sizes as small as 1 micron. Automated mapping of individual elements or back-scattered electrons is possible within areas as large as ~6 cm^2 at a resolution of < 2 microns. The EPMA is equipped with four wavelength-dispersive spectrometers (WDS) containing LIF/PET, PET/RAP, ADP/LIF, and TAP/OV60 analyzing crystals that enable quantitative analysis with a much higher accuracy and precision than is possible with energy dispersive spectrometers (EDS) typically found on scanning electron microscopes. Quantitative analysis functions (electron beam, WDS spectrometers, and sample stage) are automated using Probe for EPMA running on

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modern PC hardware. The EPMA is also equipped with a newly installed solid-state, EDS that operates without liquid nitrogen cooling. The new EDS and associated analytical software provides important enhancements to our analytical, X-ray mapping, and automation capabilities, including the ability to perform combined WDS+EDS analyses.

The micro-XRF complements the capabilities of the EPMA by providing qualitative and semi-quantitative elemental mapping of areas as large as 100 cm^2 with a resolution of 0.01-0.1 mm. Point analyses can be accomplished using two X-ray guide tubes that accommodate either a 10 micron or 100 micron spot size. Whereas EPMA requires careful preparation of polished samples for analysis under a high vacuum (3×10^{-6} Torr), the micro-XRF operates under normal atmospheric pressure and requires little or no sample preparation. It therefore has broader applications that extend to biological specimens, historical documents, art, and archaeology.

We are incorporating these instruments into the curriculum at all levels from introductory general education to advanced major courses in chemistry and geology. Among the first courses to use the instruments are petrology, mineralogy, analytical chemistry, a course on X-ray methods, and introductory geology. The EMPA is currently in use for undergraduate and faculty research. To serve off-site users, we are developing the capability for remote operation of most functions needed for quantitative analysis and X-ray mapping.

ALDO ALMEIDA, PADMA NIMMAKAYALA, NISCHIT ARYAL, SUMANTH MANOHAR, GOPINATH VAIJA, MARK CHATFIELD, AMD UMESH REDDY, Gus R. Douglass Institute and Department of Biology, West Virginia State University, Institute, WV, 25112, GAGAN KAUSHAL, School of Pharmacy, University of Charleston, Charleston, WV. Genomic Strategies to Mine Alleles **That Control Capsaicin, Dihydrocapsaicin and Related Compounds.**

The genus Capsicum consists of approximately 30 species and out of which only five species are domesticated. These are grouped into three complexes namely Capsicum annuum complex, Capsicum baccatum complex and Capsicum pubescens complex. HPLC quantification of capsaicin and dihydrocapsaicin is currently in progress to assess the natural variation among the group annuum. We designed primers for Caffeoyl COA methyltransferase and Vanillin Aminotransferease that are in the pathways of capsaicin and used to amplify the genomic DNAs and cDNA from the fruits at various developmental stages in various accessions. The cloned products were analyzed for the allelic variation. Current study is to identify functional alleles in precursor genes for capsaicin and related compounds and use them for the association mapping among 100 heirloom collections of annuum. FISH analysis for noting the copy number variation of these genes in the Capsicum genome is in progress. Results pertaining to various objectives as mentioned above will be discussed.

CAITLYN ASBURY and HEATHER KALB. Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Daily behavior patterns in various age groups of captive bred Malayan box turtles *(Cuora amboinensis).***

Malayan box turtles (*Cuora amboinensis*) are native to Southeast Asia and classified as vulnerable. A captive breeding population of approximately 43 wild-caught Malayan box turtles is maintained at West Liberty University. Over the past ten years they have produced over 199 offspring. In this study we are examining the daily behavior patterns of terrestrial and aquatic habitat use in thirty seven offspring ranging from six months to nine years of age.

The animals are maintained indoors at West Liberty University. There are 20 turtles ranging from six to 11 months and 17 individuals ranging from four to nine years in age. Each enclosure houses five or six similarly sized turtles with both terrestrial and aquatic areas. The older/larger turtles are in Waterland world enclosures with deeper water (approx. shell Dept.h) and a ramp to the terrestrial region. The youngest turtles are in flat plastic planted enclosures with shallow water dishes. Data were collected using time sampling during multiple two hour sessions spaced throughout the day. Activity level (active or inactive-no movement and limbs retracted) and location (buried, terrestrial, aquatic) were recorded.

The larger/older offspring are more often in the water and more active than the younger turtles. One would predict this pattern since the smaller animals would be more prone to predation when active. Results from this study can be used to help design more appropriate captive enclosures as well as to predict expected behaviors in non-captive populations. This study has been supported by the Dept. of Natural Sciences and Mathematics at West Liberty University.

JON-TAIT BEASON, ALEX ZWIERKO, and REBECCA S. LINGER, University of Charleston School of Pharmacy, Charleston, West Virginia 25304. V. JO DAVISSON, Purdue University College of Pharmacy, West Lafayette, Indiana. **Investigating the Allosteric Activation in Guanosine Monophosphate Synthetase.**

We are investigating the intramolecular signaling of catalytic events within guanosine monophosphate synthetase (GMPS), which converts xanthosine-5′-monophosphate (XMP) to guanosine-5′-monophosphate (GMP) through the incorporation of ammonia generated by glutamine hydrolysis. GMPS is a member of the triad glutamine amidotransferase (GAT) family, so classified by the hydrolytic cleavage of the gamma amide of glutamine and the incorporation of this ammonia into an acceptor substrate (amino sugars, amino acids and nucleotides). The triad GATs share a common protein fold where catalysis occurs using a triad of amino acids (cys, his, glu). Consistent within the triad GATs, the same face of the glutaminase domain docks against the varying acceptor domains. A main feature of the triad GAT family is the fact that glutamine hydrolysis is upregulated when the acceptor substrate active site is occupied.

In several of the triad GAT enzymes, we have identified interdomain contacts that may confer signaling between the distal active sites. We have studied these contacts in imidazole glycerol phosphate synthase and found that any mutation of these residues

(K196 and D359) causes a disruption of the allosteric signal that regulates glutamine hydrolysis. In the structure of GMPS, the interdomain salt bridge is made up by H186 and E383. We have made mutations at these residues (H186A, E383A, H186A/E383A, H186E/E383H), and performed kinetic analyses to determine the role of this interdomain salt bridge in the tight coupling of the two enzymatic reactions within GMPS.

Mutations at E383 decreased the K_m for XMP as much as seven-fold, despite this residue being distal to the XMP active site. Mutations at H186 greatly increased the K_m for glutamine, with the double alanine mutation showing a 100-fold increase in Glutamine K_m. Direct assays of stoichiometry, measuring the formation of GMP versus glutamic acid are ongoing. This project is funded through the NIH INBRE program for West Virginia, grant no: 01-054B-UC-2.

SIOBHAN BELLEW and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Characterization of courtship and agonistic calls in three species of hissing cockroaches: *Gromphadorhina portentosa, Aleuropoda insignis, Princisia vanwaerbecki.***

Several species of cockroaches, such as the Madagascar Hissing cockroach, vocalize during social interactions. The vocalizations are typically a broadband noise, commonly called a "hiss". We recorded male vocalizations from 3 species of hissing roaches (*Gromphadorhina portentosa, Aleuropoda insignis, Princisia vanwaerbecki*) during courtship and agonistic interactions. In broadband noise, the frequency with the most energy (ie. loudest) is called the dominant frequency. While each species displayed a range of dominant frequencies in agonistic hisses, most *A. insignis* agonistic hisses were higher (~ 11kHz) than *P. vanwaerbecki* (~ 8kHz) and *G. portentosa* (~5kHz). Most courtship hiss dominant frequencies were lower than agonistic hisses for *A. insignis* (~6kHz) and more similar to those of agonistic hisses for *P. vanwaerbecki* (~4.5kHz) and *G. portentosa* (~4kHz). On the basis of spectrograms, courtship hisses possessed some species-specific features; whereas agonistic hisses were more similar between species. For example, most *A. insignis* courtship signals were particularly distinctive, consisting of 3 narrowband frequencies, each <5Hz bandwidth. The results indicate that these species of hissing roaches possess differences in courtship and agonistic hisses both within and between species.

HANNAH BILLIAN, Dept. of Environmental Studies, Shepherd University, Shepherdstown, WV 25443. and STEVEN MARTIN, STEAVE SANDERSON, KAYLA WALKER, and QING WANG, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443. **Wolf Population Dynamics.**

The intention of this project is to demonstrate, through the use of differential equations, a model of gray wolf population variations at Yellowstone National Park from the year 1995 until today, as well as an examination of what the future may hold for the wolves within the park.

The wolf population has been of major concern to the park since the extermination of the wolves in 1920, leaving the area exempt of wolves for about 70 years. Following the reintroduction of wolves into the park in 1995, the population has slowly risen, and the elk and coyote populations have been greatly influenced by the wolves. By following a simple mathematical model of the interaction between these three species, it can be observed that the coyote population has a negative effect on itself, but there is a positive correlation between the coyote and elk populations, meaning more food is then available. The predator-prey model between the wolves and elk suggests that wolves only hunt the weak elk, thus indicating a long-lasting stable elk population.

Analyzing the change in wolf population over the years and comparing it to the population models can lead to finding a set of more exact parameters for the model as well as determine the wolves' carrying capacity, k, within the park. This obtained result can also be used to study the population dynamics of other species within an enclosed system such as a forest or national park, and help to determine what the best method of population control may be, or to determine what other animals could be introduced into the area.

CHRIS D. BOSTICK, JOHN E. JETT, and PETER M. GANNETT, Dept. of Pharmaceutical and Pharmacological Sciences, West Virginia University, WV 26506, and DAVID LEDERMAN, Dept. of Physics, West Virginia University, WV 26506. **Single Molecule Direct Measurement of Electron Transfer in Cytochrome P450's and the Effect of Bound Substrates or Protein.**

Cytochrome P450's (P450's) are a large family (>11,000) of heme based proteins that play a crucial role in metabolism of exogenous substrates and oxygen transport. At the center of their mechanism of action is the ability for an electron to be transferred from an electron donor, Cytochrome P450 Reductase, to the center heme group. Although there have been extensive studies on Electron Transfer (ET) in heme based proteins, the process still remains unclear. Electrochemical studies have had some success in systems where the P450 is in solution or is an integral part of the electrode. However, these studies have been hampered by the ability of P450's to aggregate and a lack of control of the interactions with substrates. Based on previous work, our lab is developing a platform that isolates single P450's on gold pillars. Using this platform we have probed isolated P450's using Conducting Probe Atomic Force Microscopy (CAFM) and have obtained ET profiles of Cytochrome P450 CYP2C9 alone and in the presence of different substrates. Using CAFM we are able to gently interact with a single P450 enzyme molecule alone or with substrate bound, and measure current as a bias voltage is applied. The data we have obtained shows a correlation between the conductivity of the ET profile and the rate at which the given substrate is metabolized by the P450. For future studies we plan to expand these and test other P450 isozymes (CYP2D6 and CYP3A4) and their respective substrates. These experiments will allow us to gain a better understanding of ET, and can open up a new realm of studies. We acknowledge support from the National Science Foundation (Cooperative Agreement 1003907) and NIH (GM081348).

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DOUGLAS W. BRIGHT and J. MARK CHATFIELD, Dept. of Biology, West Virginia State University, Institute, WV 25112. **Developing a modern herbarium at WVSU.**

A herbarium is a repository for preserved plant voucher specimens. Voucher specimens are pressed, dried plants that are artifacts of the particular species that are preserved. Each specimen has an accompanying label that records the collector, the specimen identification data, the date of collection, and the area in which it was collected. Each specimen is an important resource that can be used for tracking plant distribution, ecological studies, plant anatomy studies, DNA studies, and multiple other botanical, environmental, ecological, and molecular studies.

Currently, over 200 specimens have been catalogued in the West Virginia State University collection. The goal is to increase this count to over 500 preserved, mounted, identified, and labeled specimens by year's end. It is not only the intent to establish a working herbarium, but to establish a modern working herbarium. GPS technology is in use to record precise location data that can be conveniently transposed to maps. Mounted specimens will be photographed using standard digital formats recognized by other herbaria and entered into an online version of the WVSU herbarium. The online database will include digital photographs of each specimen in its living state and of the environment it was found in. A website will be constructed to provide public access to the database and photographs. New techniques will also be developed to protect the plant specimens from insect damage, eliminating the use of toxic and harmful pesticides and chemicals.

WVSU offers an array of courses that could be enhanced by utilizing herbarium specimens. Courses such as General Ecology, Field Botany, Plant Physiology, Economic Biology, and Principles of Biology could all be improved from the presence of a herbarium. The aim of this project is to establish a working herbarium at WVSU and to provide a solid foundation of plant voucher specimens that can be used for both research and teaching purposes.

MARILYNN BURKOWSKI, ETHAN EPLING, JOSEPH BROWN, and DR. RICO GAZAL, Dept. of Land Resources, Glenville State College, Glenville, WV 26351. **Spatial distribution of plant invasives in West Virginia.**

The productivity of forest ecosystems in West Virginia is negatively impacted by the proliferation of non-native invasive plants. In 2007-2008, the Northern Research Station's Forest Inventory Analysis Program (NRS-FIA) surveyed the presence and extent of 20 invasive plants in West Virginia. Approximately 20% of permanent forested plots in 46 of the 55 counties were surveyed. The non-native plants were chosen based on range, invasiveness, and level of landowner interest. We generated maps and performed geospatial analysis using Geographic Information System (ArcGIS v.10). The most abundant invasive species was multiflora rose, (*Rosa multiflora*) which was present in 48% of the forested plots and 77% of the inventoried counties. Japanese stiltgrass *(Microstegium vimineum*) occurred in 52% of WV counties and was recorded in 24% of the sample plots. Nearly 25% of the sample plots containing Japanese stiltgrass had 25 to 70% cover. Autumn olive (*Elaeagnus umbellata*), tree-of-heaven (*Ailanthus altissima*), and garlic mustard (*Alliaria petiolata*) were present in 18, 14, and 10% of the forested plots, respectively. Each of West Virginia's ecoregions contains large number of invasive species with the Northern Ridge and Valley and Southern Unglaciated Allegheny Plateau Sections containing the highest amount of 85% (n=17). Among the 46 counties, Hardy County contained the largest number of invasive plants surveyed at 65%, while Lewis County held 50%, and Ritchie and Hampshire Counties contained 45%. Understanding invasive species and the environments where they exist is essential to gauge their impact and control their spread in West Virginia. Key site factors (elevation, aspect and slope), disturbance regime (land use types, amount of timber removal, degree of urbanization, fire occurrences and road density) and climate factors (temperature and precipitation) contribute to rapid increase in the distribution and abundance of non-native invasive plants.

ALAN CAMPBELL, CHENBO DONG, AND CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND CHENGCHENG XIANG AND NIANQUIANG WU, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown WV, 26506, AND JONATHAN DORDICK, Department of Chemical Engineering, Rensselaer Polytechnic Institute, Morgantown WV, 26506. **Activity and stability studies of bionano engineered hybrids for decontamination.**

Most of the current decontamination methods are corrosive and/or toxic and can cause collateral damage to goods and people. There is a critical need for a technology that allows decontamination to be non-toxic, non-corrosive and easily deployable. We are developing passive, self-cleaning decontamination surfaces using enzyme-based technologies. Specifically, our first approach involves direct attachment of enzyme (i.e., chloroperoxidase that generates hypochlorous acid) to nanosupports (i.e., carbon nanotubes or TiO2 nanobelts) through covalent binding with user-defined functionalities. In the second strategy, we use PEG-based spacers to separate the enzyme from the nanosupports and thus to reduce any unspecific binding or protein-protein interactions. The nanomaterial-enzyme conjugates are characterized in terms of loading, activity, and stability and the data is related to the structural changes in enzyme at the interface with the nanosupport (i.e., hydrophobicity/hydrophilicity, surface area, surface curvature, etc.). The nanomaterials offer high surface-volume aspect ratios that allow relatively high enzyme loadings and ease of recovery of the conjugates by filtration; the nanomaterial surface curvature enhances enzyme stability. The resulting nanomaterial-enzyme conjugates can be incorporated into paints, fabrics or polymer materials to generate composites with enhanced stability and decontamination capabilities to be tested against model bacteria or spores.

MIRANDA B. CARPER[1,3], GORAN BOSKOVIC[1,3], JAMES DENVIR[1,3], DONALD PRIMERANO[1,3], and PIER PAOLO CLAUDIO[1-3], [1]Dept. of Biochemistry and Microbiology, Marshall University, Huntington, WV 25755, [2]Dept. of Surgery, Joan C. Edwards School of Medicine, Marshall University, Huntington, WV 25701, [3]McKown Translational Genomic Research Institute, Marshall University Huntington, WV 25701. **Finding a bridge that connects the p53 and pRb tumor suppressor pathways.**

The tumor suppressors p53 and pRb regulate common cellular processes such as: cell cycle, DNA repair, apoptosis, differentiation, and senescence. p53 and pRb are two of the most commonly mutated tumor suppressor pathways and are both found to be inactivated in a variety of human malignancies including osteosarcoma. Evidence suggests p53 and pRb cross-communicate and have a synergistic impact on cancer growth. However, little is known on the communication that exists between p53 and pRb. The objective is to investigate the p53-pRb cross-talk to find protein(s) commonly regulated by both p53 and pRb with the aim to identify new molecular targets for cancer treatment.

In order to investigate the p53-pRb cross-talk pathway, an Agilent 44k whole human genome microarray analysis was performed on normal human lung fibroblast cells (WI38) following over-expression of p53, pRb, or both p53 and pRb with adenoviruses that express either p53 or pRb. WI38 cells treated with an empty adenovirus vector were used as control. Ingenuity Pathway Analysis (IPA) was used to analyze the microarray data and examine which molecular cellular pathways are modulated following p53, pRb, or both p53 and pRb over-expression. The known p53 target, Regulator of G-protein Signaling 16 (RGS16) was chosen for further analysis due to its interaction with commonly up-regulated oncogene pathways. RGS16, belongs to a large family of proteins that play a role in swiftly shutting down G protein-coupled receptor signaling pathways.

The microarray data showed RGS16 was up-regulated when p53, pRb, and p53/pRb were over-expressed in WI38 cells. To further support the microarray analysis p53, pRb, or p53/pRb were over-expressed in SAOS-2 osteosarcoma cells (p53 null, pRb truncated). Western blot analysis were used to examine the protein levels of p53, pRb, and RGS16 following p53 and/or pRb over-expression. Quantitative Real-Time PCR (qRT-PCR) was used to measure the relative fold-change of RGS16 mRNA, fold change was calculated using the $2^{-\Delta\Delta CT}$ method. The relative expression of RGS16 mRNA was significantly different from control in the p53 over-expressed cells as determined by a pair-wise t-test (Bonferroni-corrected >p=0.0443). Western blot analysis indicates the expression of RGS16 increases when p53, pRb, and p53/pRb are over-expressed exogenously. U2OS (p53 pRb wild-type) osteosarcoma cells were treated with Doxorubicin to cause the endogenous activation of p53 and pRb. Cells were collected at different time points up to 24hrs. Western blot analysis showed an increase in active p53 and pRb proteins. The relative levels of RGS16 mRNA increased (up to approximately 4 fold) as determined by qRT-PCR, however further experiments using siRNA need to be performed to show p53 and pRb independent regulation of RGS16. Our results suggest p53 and pRb regulate expression of RGS16. However, further experiments need to be conducted to verify that: 1) p53 and pRb regulate RGS16 endogenously, and 2) determine the function and therapeutic benefits of RGS16 expression contingent upon the p53 and pRb cross-talk.

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KEVIN CARTE, ANOJININE KARUNATHILAKE, and ROBERT HARRIS, West Virginia State University, Institute, West Virginia 25112, and ERIC BLOUGH, Department of Biological Sciences, Marshall University, Huntington, West Virginia 25701. **Expression of Titin, CCN and Extracellular Matrix Proteins in Smooth Muscle are Altered by Mechanical Stretch.**

The role of titin in stabilizing contractile filaments in striated muscle is well understood. Titin forms filaments that function as bi-directional springs that provide elasticity but limit cell lengthening and as such contribute to overall stiffness. The function of smooth muscle (SM) titin remains unclear, but as in striated muscle, it is reasonable to postulate that SM titin may contribute to stiffness. Unlike striated muscle, SM cells respond to stretch in a complex manner that involves an extensive change in morphology and reorganization of their cytoskeleton. SM cells may thus respond to changes in mechanical load with alterations in titin expression. The CCN proteins are a family of six secreted matri-cellular regulatory factors that function as regulators of the ECM components and as signaling proteins that are involved in a variety of important biological functions such as adhesion and extracellular matrix remodeling. The role of these proteins in vascular remodeling is just beginning to be understood. In this study, quiescent A7r5 SM cells were exposed to cyclic (dynamic) or static (step) mechanical stretch and expression of genes for titin, CCN proteins and extracellular matrix (ECM) proteins were determined (qRT-PCR). There was a decrease in expression of titin in response to 1hr (19%) and 2hrs (77%) of cyclic stretch. It is during this time that the cytoskeleton is relatively unloaded as it remodeling. At 6hrs of cyclic stretch, when the cytoskeleton had remodeled to a lower stretch orientation, the decline in titin mRNA expression was somewhat less than the 2hr value (38%). In contrast to cyclic stretch, cells responded to static stretch with an increase in titin expression (35%). Together, these data suggest that SM cells may alter expression of titin in order to modulate internal stiffness. In regard to CCN genes, stretch also resulted in increased expression of Cyr61 and NOV and decreased expression of Ctgf and Wisp1. For related ECM genes, there was an increased expression of Col8a1, Fn1, Mmp13, and PAI1 and decreased expression of Col1a1 with stretch. Some of these changes are consistent with decreased cell adhesion and increased migration. In conclusion, we believe that SM titin may play a sensory role for the cell and we conclude that the pattern of CCN expression supports changes in cell function that are associated with vascular remodeling. *(Supported by NIH Grant 5P20RR016477)*

HANNAH CAVENDER, SHAWN SIMMS, and GENIA SKLUTE, Dept. of Chemistry, West Virginia State University, Institute, WV 25112. **Reactivity and Diastereoselectivity of Acyl Zirconocene towards Chiral Sulfinimines.**

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Enantiomerically pure sulfinamines are important precursors to natural products and biologically active materials. The purpose of this research project is to synthesize enantiomerically pure sulfinamine from readily available starting materials in a single-pot operation. Unsaturated acyl zirconocene is a reactive intermediate and is highly susceptible to further conversions to a variety of carbonyl compounds. Starting from alkyne, hydrozirconation followed by carbon monoxide insertion will lead to the *in situ* formation of acyl zirconocene. This highly reactive species will then be subjected to a 1,2-addition reaction in a single-pot operation. The scope and the diastereoselectivity of this reaction will be investigated. The reaction between acyl zirconocene and chiral sulfinimines will lead to the asymmetric formation of chiral α–amino enone derivatives. Removal of the chiral auxiliary reveals α–amino enone.

JAMES CAVENDER, Dept. of Environmental and Plant Biology, Ohio University, Athens, Ohio 45701, and JOHN LANDOLT, Dept. of Biology, Shepherd University, Shepherdstown, West Virginia 25443, and HANNAH SUTHERS, 4 View Point Drive, Hopewell, New Jersey, and STEVE STEPHENSON, Dept. of Biological Sciences, University of Arkansas, Fayetteville, Arkansas 72701. **Ecological distribution of dictyostelid cellular slime molds in Mexico.**

Surveys for dictyostelid cellular slime molds that were carried out in various areas of Mexico over the past half century have yielded a considerable body of data relating to the ecological distribution of these organisms for one region of the Neotropics. The localities sampled included 14 different states and encompassed examples of vegetation types ranging from coastal plain and lowland swamp forest to oak, pine and alder scrub at elevations of 3,300 m in the Sierra Mountains. A least 33 species of dictyostelids were recovered, including several that have not yet been formally described. Samples collected in semi-evergreen rainforests yielded the most species (at least 24), whereas the lowest number (9) was recovered from deserts/thorn forests. The other major vegetation type sampled, tropical deciduous forests, had 14 species. The most abundant species were *Dictyostelium mucoroides*, *Polysphondylium violaceum*, *P. pallidum* and *D. purpureum*. The purpose of this poster is to provide a comprehensive overview of what is currently known about the dictyostelids of Mexico.

ARGELIA CERVANTES, Escuela de Ciencias Biológicas, Universidad Autónoma de Coahuila, México, Department of Biology, West Virginia State University, Institute, WV 25112, and NAGAMANI BALAGURUSAMY, Escuela de Ciencias Biológicas, Universidad Autónoma de Coahuila, México, and DAVID H. HUBER, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25526. **Bacterial Diversity of a unique freshwater ecosystem, Cuatro Ciénegas, Coahuila, México.**

Microorganisms carry out many important processes occurring in ecosystems and are the principal contributors to the global cycling of nutrients. Knowledge of microbial diversity–function relationships is essential in order to understand the specific role of microorganisms in nature and how they respond to environmental changes. Cuatro Ciénegas valley in the state of Coahuila, México is a small area (840 km^2) with diverse oligotrophic aquatic ecosystems (*pozas*). The distinct biogeochemical characteristics of the valley have aided in the evolution of several endemic plant and animal species. The unique chemistry and geographical isolation of this ecosystem also implies that the microbial diversity may be unique. Microbial communities present in sediments taken from 6 different *pozas* and one water sample were studied with 454 pyrosequencing targeting 16S rRNA genes. Approximately 4000 sequences per sample were obtained and analyzed, which is much deeper coverage of diversity in comparison with previous studies. Our study also represents the first analysis of microbial communities present in these sediments. Phylogenetic analysis of the sediment diversity with the RDP (Ribosomal Data Base Project) demonstrated that the most abundant bacterial group is Unclassified Bacteria (47%), followed by the phyla *Proteobacteria* (29%), *Firmicutes* (9%), *Verrucomicrobia* (8%) and *Chloroflexi* (7%). Chao statistical analysis based on a 97% 16S rRNA gene similarity showed considerable difference in the microbial diversity of sediment (1,664 projected operational taxonomic units) and water (3,218 projected OTUs) from the same *poza*.

DAVID A.C. CHELF, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown WV 25443, and DR. JEFFERY GROFF, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown WV 25443. **The effects of synaptic noise on the spike-timing precision of an integrate-and-fire cortical neuron model driven by an integrate-and-fire-or-burst thalamocortical relay cell model.**

The thalamocortical (TC) neurons of the dorsal lateral geniculate nucleus (dLGN) receive input from the retina and relay this information to the primary visual cortex where higher visual processing occurs. Importantly, TC cells have low-voltage activated calcium channels that allow these cells to generate bursts of action potentials in response to retinal drive. The physiological role of these bursts is not well understood, but it is thought that perhaps they are generated by especially important stimuli or serve as a wake-up call to the cortex. On the other hand, the long temporal duration of bursts (as opposed to the short duration of single spikes) probably acts to reduce the spike-timing precision of the response generated by the post-synaptic cortical neurons receiving input from bursting TC cells. That is, there may be a great deal of variability in the timing of the postsynaptic response because the bursts last for 10-40 ms instead of the 1-4 ms duration of individual spikes. This research was initiated to study the temporal precision of these postsynaptic spikes by utilizing an ODE-based model of a cortical neuron synaptically connected to a busting TC neuron. The cortical neuron also receives synaptic noise, which is an aggregate of the activity of other neurons sending signals to the cortical cell. The timing of the noise spikes is modeled as a Poisson process. It was discovered through the course of the study that when the synaptic drive to the cortical neuron from the bursting TC cell is subthreshold, a moderate amount of synaptic noise from other neurons can stimulate a postsynaptic spike with high temporal precision, a phenomenon known as stochastic resonance. On the other hand, as the level of noise increases the temporal precision diminishes. This work was funded by a WV NASA Undergraduate Research Consortium Award.

FERNANDO A COSSO, Dept. of Mechanical and Aerospace Engineering, West Virginia University WV 26505. **Computer Aided Design Environment for Composites.**
The design of laminated composite materials is a complex process. It involves selection of a fiber and a matrix, the thickness and orientation of the plies, the fiber volume fraction and the stacking sequence. Also, it involves deciding whether to use short fiber, long fiber, and continuous strand mat or fabrics. All of these parameters influence the properties of the chosen material. Prediction of these properties is the objective of the micromechanics. Furthermore, macromechanics is responsible for obtaining mechanical properties of a laminate from the properties of the plies, thus adding complexity to the design process. Also, the mechanics of structures made out of composites is different from isotropic materials and requires special treatment—especially beams and columns of composite materials behave differently from conventional materials. In this work C# and ASP.Net were used to develop a website application, www.cadec-online.com, that allows users to calculate the properties of composite materials using different methods and in turn use those results as input for structural analysis. Microsoft SQL 2008 was used to achieve persistence of the entities used. Finally, C# code and FORTRAN code were used for the numerical calculations the composite material properties.

H. LEE DALTON II, SUMANTH MANOHA, PADMA NIMMAKAYA, YAN TOMASON, and UMESH K. REDDY, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25112-1000, and GURU JAGADEESWARAN and SUNKAR RAMANJULU, Dept. of Biochemistry and Molecular Biology, Oklahoma State University, Stillwater, OK 74078. **Differential expression of miRNA across the grafted tissues collected from scion and root stock belonging two different genera.**
Grafting is a commonly used horticultural technique that involves the insertion of the part of shoot (scion) of one plant into another plant (i.e. a rootstock) so that the two tissues merge, and join together to survive rest of the life cycle. It is well known that the type of rootstock used, affects the growth and response to biotic and abiotic stressors of scion plants. Often, vegetable grafting is employed to protect from the soil born pathogens or other abiotic stress like salt tolerance and drought to the scion plants. Several studies demonstrated that the plants that were scions undergo genetic changes and alterations that were transgenerational. However, there is no clear mechanism yet known that are involved in the long distance signaling or movement that causes such changes. Current research is an attempt to understand if miRNAs play any regulatory role that affects the genome of scion or rootstock in the grafted plants. Using real-time polymerase chain reaction (RT-PCR), we identified conserved and species specific miRNAs that actively regulate rootstock and scion due to the affects of the grafting of two species belonging to two different genera of the Cucurbitaceae family. Research showed increased endogenous conserved and novel miRNA regulation in grafted tissues.

NAIRITA DEB and WEIDONG LIAO, Dept. of Computer Science, Math, and Engineering, School of Natural Sciences and Mathematics, Shepherd University, Shepherdstown, WV 25443. **Hybrid CPU vs GPU Computing: A Comparative Study.**
Combining a programmable graphics engine and the CPU onto the same silicon chip is a miracle in metal. This model, named the hybrid chip, was first targeting netbooks where performance expectations are lower than PCs. Many examples in this effort can be seen from industry. Intel has launched Pinetrail which had graphics core into an Atom chip. AMD decided to step up and presented Bobcat CPU architecture. Intel then released CPU-die graphics within a year to win the market again. Arrandale launched Core i3 and Core i5 hybrid chips and at the end Sandy Bridge stole the thunder with its compatible motherboard technology.

Sandy Bridge was created based on a parallel pipeline computation model therefore no discrete graphics card were needed. Even better, Sandy Bridge is cheaper and faster that Nehalem architecture.

The advantage of hybrid CPUs is that they require less power. Meanwhile, having everything on *one* piece of silicon chip improves the performance. Latency between the GPU and CPU is reduced. According to Intel, this could be up to a four times performance boost.

Some may wonder why some people are still buying expensive add-on GPU PCs. It is mostly due to the fact that hybrid CPUs still cannot compete with computers with separate high-end GPUs for gaming. As a result, the younger generation who play games a lot still leans towards old fashioned CPUs with add-on graphics cards.

In conclusion, we believe hybrid CPU will dominate most of computer market for general public except the gaming and certain specialized areas, which may still favor computers with dedicated, high-end GPU cards.

The undergraduate research project as presented here is supported by SOARS scholarship grant.

AARON DEESE, JOSHUA VANOSDOL, and DONALD E. TRISEL, Dept. of Biology, Fairmont State University, Institute, WV 26554. **Effects of Nitrogen Deficiency and Toxicity on Photosynthetic Rates in *Lycopersicon esculentum*.**
The objective of this study was to determine the effects of nitrogen deficiency and nitrogen toxicity on the growth and photosynthesis rates in tomato plants. The methods of study included weekly observation, measurements of height and approximate diameters, visual descriptions, and data from the LICOR 6400 Portable Photosynthesis System. The plants were initially grown in aerated mason jars filled identical hydroponic solutions using the complete nutrition control solution. After two weeks, the plants were separated into four treatments with three plants per group. The treatments included the control with standard levels of N, a N-deficient solution, a solution with 2X higher than the standard level of N, and 10X higher than the standard.

All of the plants looked sickly and showed varying amounts of chlorosis and minor necrosis. The average height of the N deficient, control, 2X, and 10X plants were 21.3, 17.7, 24, and 18.7 cm respectively. The average photosynthesis rate of the control was the highest at 3.6 mol CO_2 m^{-2} s^{-1}, while he nitrogen deficient and 2X photosynthesis rates were approximately 3.1 and the 10X treatment was 3.3.

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LORI DINGESS, LAVANYA ABBURI, GOPI VAJJA and UMESH K. REDDY, Dept. of Biology, West Virginia State University, Institute, WV 25112. **Competition ability of *Arabidopsis* ecotypes.**
To test the competitive ability of ecotypes in different soil environment, we selected 10 ecotypes from different geographical regions. Two soil treatments were used, of which one was commercial soil mix and the other mine soil collected from the mine site. All the ecotypes were sown in small (Dept.h 2.5 inch) pots filled with arabi mix. These pots were kept for incubation at 4°C for 4 days to break the seed dormancy. Once the seedlings are grown, they were transferred to ArabiSun light stands for germination. After 14 days the plants were transplanted in to bigger pots (Dept.h 5 inch). Each pot had combination of two ecotypes of three plants each. Each combination was grown in three replications. Ecotypes were individually grown as controls to observe their solitary performance without any competition from the other ecotypes. ANOVA was carried out to find out the critical differences. Combinations and solitary controls, significantly different were analyzed to judge their competition ability. Mrk-0, Sorbo, Lz-0, N13 and Van-0 were the superior competitors. Ts-1, Sq-8 and Oy-0 were poor competitors. All the ecotypes performed well in combinations.

CHENBO DONG AND CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND DAVID LOWRY, MICHAEL KASHON, AND LINDA M SARGENT, National Institute for Occupational Safety and Health, Morgantown WV, 26505. **Nanoindentation analysis of epithelial cells incubated with carbon nanotubes.**
Carbon nanotubes (CNTs) "bottom-up" functionalization with biological molecules such as proteins or nucleic acids opened up exciting applications in bioengineering and biomedical fields. However, with current topics aimed at translating modified CNTs into potential therapeutic platforms, studies of their cytotoxicity are of urgent need. In here we unravel the biological complexity of CNT interactions with epithelial cells by building on latest technological advances. Specifically, by using Atomic Force Microscopy (AFM) we are probing topography and evaluating mechanical properties of cells incubated with CNTs, all with high spatial resolution and increased sensitivity. Our results demonstrate that spherical mapping of cells can be correlated to cell dynamics and thus provide the platform to develop further topologically based approaches to probe the structure-function relationship in live cells and cells treated with other nanomaterials.

ZACHARY DOUGLAS, SHANNON STEWART, ZHAOLIANG LI, HAITAO LUO, and YI CHARLIE CHEN. Natural Science Division, Alderson-Broaddus College, Philippi, WV 26416. **Kaempferol Inhibits VEGF Expression in Prostate Cancer Cells.**
Prostate cancer is the second leading cause of cancer deaths for men in America. Kaempferol is a flavonoid widely distributed in edible plants and has been reported to inhibit angiogenesis in ovarian cancer cells. To investigate whether kaempferol holds similar potential for angioprevention in prostate cancers, we studied cell viability, cell necrosis, and expression of several genes in 2 prostate cancer cell lines, employing MTS-based assay, LDH assay, qRT-PCR, Western Blotting, and ELISA, etc. Kaempferol reduced viability of both prostate cancer cells, and no necrosis was observed by kaempferol treatment. Expression of VEGF and HIF-1-alpha proteins was inhibited in both cell lines, while p21 mRNA was up-regulated in PC-3 cells. mRNA levels in ERR-alpha was reduced in PC-3 cells, and secretion of IL-6 was inhibited in DU-145 cells. In general, we found that kaempferol effectively inhibits VEGF expression in prostate cancer cells through multiple pathways/mechanisms. *(Supported by NIH Grant 5P20RR016477 to the West Virginia IDeA Network for Biomedical Research Excellence)*

COSTANDEINO DOURAKOS, ZHIJUN WANG, and QING WANG, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443. **Performance study of a TSP optimization problem solver using genetic algorithm.**
The purpose of this research was to determine the efficiency of the genetic algorithm when applied to the travelling salesman (TSP) optimization problem. The brute force permutation method was used to evaluate the accuracy of the results from the genetic algorithm. The encoding for the TSP problem was a list of nodes that represented the path. The genetic algorithm generated a certain number of random paths for the first generation. The paths were then sorted using the fitness function values, which were defined as the total path distances. Once sorted, a modified crossover method was applied to produce chromosomes for the next generation. First every two chromosomes were paired based on fitness function values. The crossover points were generated randomly and each parent chromosome passed partial genetic sequences to its children. The chromosomes were then subject to mutation where nodes were swapped to prevent local minimums in the search process. The average running time of the algorithm is linear for close-to-optimal solutions and polynomial with low exponents for optimal solutions in the simulation tests. Therefore, the genetic algorithm proved to be extremely efficient compared to the permutation method.

REEM ELDAWUD, CERASELA ZOICA DINU, Department of Chemical Engineering, West Virginia University, Morgantown WV, 26506, AND HOSAM A. ELBAZ, YON ROJANASAKUL, Department of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506. **Electronic platform used as a proxy to quantify cellular toxicity of anticancer drugs.**
Digitoxin is a cardiac glycoside known for its efficacy in treatment of heart failure. Recently, it was shown that this drug also exhibits strong cytotoxic effects against several types of cancers, from breast to prostate and lung cancer. However, the mechanisms associated with cellular exposure to digitoxin and it's selectivity towards cancer cells when compared to normal cells are still unknown. In this research we used a new technique called Electric Cell Impedance Sensing (ECIS) to assess digitoxin's kinetics and toxicity in real time. The approach is based on correlating the behavior induced by exposure to the drug of non-small lung cancer cells (NCI-H460) at interface with the electronic platform used as a proxy, into complex internal cellular signaling. In this approach, the cells immobilized on gold electrodes serve as an active platform; changes in impedance upon exposure to different drug concentrations are

measured and subsequent cellular structure-function relationships are derived. Our results provide novel means to investigate drug kinetics and metabolization in real time using a high throughput electronic platform and promise to extend such a cellular-based assay to studies of other analytes such as toxins in real time.

JOSE ESCOBAR and ISMAIL CELIK, DOE National Energy Technology Laboratory, Morgantown, WV 26506 , Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Faster Simulations for Pollutant Predictions using Detailed Chemistry.**

Emission of pollutants into the atmosphere represents a risk for the environment and human health. The main source of pollutants released into the atmosphere is the combustion of fossil fuels. Nitrogen Oxides (NO_X) are present in the pollutant gases and they are highly reactive in the atmosphere. NO_X leads to the formation of smog and acid rain. Environmental controls have lead research to find innovative strategies to reduce the negative impact of combustion in the environment. In the past, combustion design was aided by the compilation of large sets of experimental data and the development of empirical correlations which made the design of new combustors an expensive enterprise. Nowadays numerical simulations have become an important tool in research and design of combustion systems.

One of the main goals of today's combustion researchers is the accurate prediction of pollutant concentration. The challenge of such prediction is the small concentration of the pollutants, e.g. NO_X concentration is in the order of parts per million. Simplified models used to calculate NO_X concentration proved to predict trends of NO_X emissions but failed to calculate the actual concentrations. A possible solution to accurately predict both trends and quantities is the utilization of detailed chemistry models. Assumptions in detailed chemistry models are kept to a minimum (compared to simplified models) which could lead to more accurate results. However these detailed models cannot be implemented in computer simulations due to the number of chemical species and the wide range of characteristic time scales of these species.

The present study tackles the problem of using detailed chemistry in numerical simulations by the implementation of the chemical reactor network (CRN) concept. It consists in solving the problem in two steps. First, computational fluid dynamics (CFD) simulations of the burner are performed using a simplified chemistry model with the goal of obtaining the flow and temperature fields. Second, the CFD domain is divided into zones that share similar characteristics (e.g. temperature and water concentration) which are represented by simplified reactor models. The zones obtained from the division are simulated again using a detailed chemistry model. CFD simulations are performed using a commercial code and CRN are performed with an In-house code.

CFD simulations of a laboratory scale methane-air burner are performed using a reduced chemistry model that consists of 9 chemical species and 5 reactions. CRN simulations are carried out using a detailed mechanism with 53 chemical species and 325 reactions. Simulation results using CRN approach can be obtained in a time frame of only a day compared to the results of the CFD simulations that use more complete chemical models which can take a week. CRN concentration results match the high concentration species but there is discrepancy in the NO_X concentration, simulation improvements are in progress.

This technical effort was performed in support of the National Energy Technology Laboratory's on-going research in Gas Turbine Combustion Modeling under the RES award RES1000023 / 068.

SERGIO ESCOBAR, S. RAJU PAKALAPATI, and ISMAIL CELIK, DOE National Energy Technical Laboratory, Morgantown, WV 26505, Dept. of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26505. **Numerical study of Rotating Detonation Combustion for stationary power generation.**

The continuously growing energy demand combined with more stringent regulations for pollutant emission imposed on stationary power stations has motivated the quest for highly efficient, reliable and clean innovative technology concepts. Among different technologies being investigated, a renewed interest is now focused on pressure gain and supersonic combustion phenomena. This has occurred mainly because of the capability of increasing thermodynamic efficiency by up to 20% when compared with traditional turbulent flame combustors. The reduction of pollutant emissions such as nitrogen oxides (NOx) is also expected. Among current supersonic combustion technologies, Rotational Detonation Combustors (RDC) are the most attractive for stationary power generation. In this concept a transverse detonation wave continuously travels in the azimuthal direction of a toroidal chamber. In its simpler configuration, it consists of two concentrical cylinders and through the annular space between them a mixture of fuel and oxidizer is injected. By the means of direct initiation an oblique detonation wave is generated and is let to travel continuously in the azimuthal direction of the combustion chamber. During the last 20 years researchers have carried out numerical and experimental investigation in order to achieve an understanding of these complex phenomena. The majority of the previous studies, focus on the implementation of RDC for propulsion purposes, which reflects in the use of specific impulse and specific thrust as the predominant figure of merit.

The main objective of this study is to asses the feasibility of the application of RDC for stationary power generation. Geometrical and operational parameters are determined for a combustor. Emphasis is given to emission specially CO_2 and NOx. Transient pressure and temperature conditions for the flow at the outlet are to be used for future research on the design of the turbine stage to be used in conjunction with the combustor.

The study consists of numerical simulations of cases of increasing complexity. The cases are set up in order to determine the capability of commercial computational fluid dynamic (CFD) solver to predict compressible-supersonic-reacting flow. Under this

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methodology, initial simulations were carried out for H_2-Air mixtures. Chemical reactions were modeled using a 14 species and 43 reaction mechanism including NOx chemistry. Initially, stationary detonation wave simulations were performed. These results proved that the solver has the capability to capture sharp changes in temperature, pressure and velocity without compromising accuracy of the predictions. The following step consisted on determining the appropriate domain to simulate the RDC, as several previous studies the cylindrical chamber was simplified to a 2D rectangular domain with dimensions of the axial length and its circumference. Full RDC simulations were carried out for H_2-Air mixture and results were compared with experimental data showing god qualitative agreement. Current studies are focused on the implementation of a chemical mechanism to simulate coal syngas combustion.

This research project entitled *Simulation and Validation for Innovative Energy Concepts (S&V-IEC) WVU Combustion Modeling* and is being carried out by West Virginia University, Mechanical and Aerospace Department in support of DOE's National Energy and Technology Laboratory under the RES contract 1000023/134

RAQUEL FAGUNDO, MICHAEL LUCERO, and ZACHARY LOUGHMAN, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Epigean crayfishes of the Lower Kanawha River system: conservation and natural history.**
The Lower Kanawha River system's epigean crayfish fauna was surveyed during the summer of 2010. Goals of this project included determining the native fauna of the basin and identification of conservation concerns. Thirty seven 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 epigean crayfish fauna of the Lower Kanawha River system consists of three species: *Cambarus b. cavatus*, *Cambarus robustus*, and *Orconectes sanbornii*. The invasive crayfish, *Orconectes virilis*, was collected in every sub-basin within the system. This species has competitively excluded crayfishes in other West Virginia basins, and represents the most important conservation concern in the Lower Kanawha River system. Siltation associated with development and agriculture was another import cause of imperilment. Crayfish conservation efforts in the Lower Kanawha should focus on limiting the expansion of *O. virlis* and controlling siltation impacts throughout the watershed.

PUJYA WAGLE GAUTAM, Civil and Environmental Engineering, West Virginia University, WV 26506 and JENNIFER WEIDHAAS, Assistant Professor, Civil and Environmental Engineering, West Virginia University, WV 26506. **Spatial relationship between the trichloroethylene degrading bacteria *Dehalcooccoides* sp. sulphate reducers and methanogens during reductive dechlorination.**
Trichloroethylene is toxic compound and contaminates over 1000 groundwater sites in the United States. Several anaerobic bacteria have shown to reductively dechlorinate trichloroethylene through cometabolic process. *Dehalococcoides* sp. are the only known bacteria that can completely degrade toxic trichloroethylene to nontoxic ethene/ethane. In an anaerobic environment, *Dehalococcoides* sp. coexist with sulfate reducers and methanogens and these microorganisms may compete for the common substrate hydrogen, which is used by *Dehalococcoides* sp. during degradation of trichloroethylene. In the process of dechlorination of trichloroethylene to nontoxic byproducts, *Dehalococcoides* sp. might show the spatial relationship with sulfate reducers and methanogens while competing for the hydrogen. Understanding the spatial relationship between *Dehalococcoides* sp. and various microorganisms that compete for bioremediation substrates supplied to stimulate biodegradation of this toxic compound will aid environmental engineers during the design of remediation systems including understanding of when and where to bioaugment an aquifer undergoing bioremediation of trichloroethylene with *Dehalococcoides* sp.

Mixed cultures of *Dehalococcoides* sp., heterotrophs, sulphate reducers and methanogens were used to inoculate small reactor containing a glass microscope slide. Substrates for microbial growth in addition to trichloroethylene were dissolved into agarose and placed in the center of the microscope slide and incubated under anaerobic conditions. Fluorescent in situ hybridization (FISH) and quantitative polymerase chain reaction (qPCR) were used to quantify the concentration of *Dehalococcoides* sp., sulfate reducers and methanogens with distance from the food source (i.e. agarose) and the trichloroethylene.

MARCIA HARRISON-PITANIELLO, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. **Publishing your Teaching Resources through the National Science Digital Library.**
Educators spend considerable time preparing materials for classes. Developing these materials is time-consuming and often not appreciated in terms of annual reporting. How can educators become more efficient in building resources and lectures, but still offer the same level of excellence in teaching? The internet is a valuable resource, offering a wealth of material in nearly every topic. However, a general search may provide significant non-scientific material. One approach to solving these problems is to utilize The National Science Digital Library (NSDL), a collection of peer-reviewed research and teaching resources for the science, technology, engineering, mathematics, and social sciences. The objective of this poster will be to present an overview of the teaching resources available through the NSDL, with a focus on how educators can contribute their work for publication. The NSDL is a web portal that links to resources provided by their partner organizations, which represent numerous professional societies. Each partner organization oversees the collection, peer-review, and publishing of material related to their discipline. Through the descriptive information (metadata) provided with the submitted material, the topic is searchable through the NSDL. The resources represent a large variety of types, such as images, lab protocols, PowerPoint presentations, rubrics, videos, datasets, and research

articles. The Biological Educational Network (BEN) is one part of the NSDL network. The BEN Portal provides material from professional organizations such as the American Physiological Society, The Botanical Society of America, the American Society for Microbiology, and the Ecological Society of America, and is managed by the American Association for the Advancement of Science (AAAS). Currently, BEN hosts over 17,833 reviewed resources covering 77 biological sciences topics. Specific examples of resources from the BEN portal and other NSDL partners, as well as information on how to submit and search the NSDL, will be presented at the poster.

JASON R. HEALY AND RAE R MATSUMOTO, Dept. of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506, and PADMAVANI BEZAWADA, MATTHEW METCALF, CHRIS CUNNINGHAM, SUCHETA KUDRIMOTI, and ANDREW COOP, Dept. of Pharmaceutical Sciences, University of Maryland School of Pharmacy, Baltimore, MD 21201. **Pharmacological Characterization of Novel Opioid Agents Intended to Reduce Chronic Tolerance.**

The three opioid receptor subtypes mu, delta and kappa have long been associated with analgesia. Traditional opioid analgesics exert their effects through mu receptors located in the CNS; yet, side effects including tolerance are problematic. Therefore, there is a pressing need to identify a pharmacological agent that maintains potent analgesic properties while alleviating the side effects. Recent studies suggest that the development of an agent displaying dual properties of mu agonism and delta antagonism could be of benefit to individuals who require chronic administration of opioid analgesics. The design of novel agents is largely based on structure activity relationships (SAR) of potent mu agonists, the orvinols, as well as classes of opioid agents that elicit low efficacy towards the delta receptor, the indolomorphinans and the opioid benzylidenes. The lab of Dr. Andrew Coop has designed a variety of synthetic agents that address the issues herein. These novel agents have been tested for their binding affinity at the mu, delta and kappa receptors. Affinity data is obtained through radioligand binding assays using [^{3}H] [D-Ala^2, N-MePhe^4, Gly-ol]-enkephalin (DAMGO), [^{3}H] [D-Pen^{2,5}]-enkephalin (DPDPE) and [^{3}H]U69,593 for the mu, delta and kappa receptors subtypes respectively. Several agents, including UMB 425 and 426, display high affinity at the mu receptor and moderate affinity at the delta receptor, with moderate to low affinity at the kappa receptor. *In vitro* [^{35}S]GTP S functional assays were used to determine the agonistic/antagonistic properties of these compounds at the respective opioid receptor subtypes. [^{35}S]GTP S functional assay results indicate that UMB 425 and 426 behave as partial agonists at the mu receptor, whilst having antagonistic properties at the delta receptor. Lastly, *in vivo* animal models (i.e. hot plate, tail-flick) were used to identify the acute analgesic properties of UMB 425. Early indications suggest that UMB 425 has similar analgesic properties to morphine itself, while producing a longer analgesic response. Additional *in vivo* models will be designed to determine the level of tolerance developed by UMB 425 compared to the morphine positive control. This project is supported by the National Institute on Drug Abuse (DA-13583).

JEFFREY HECK, KOUROSH SEDGHISIGARCHI, and ASAD DAVARI, Dept. of Electrical & Computer Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136. **Real-time maximum power point tracking of photovoltaic arrays.**

Because of the electrical characteristics of photovoltaic (PV) cells, there exists a maximum power point (MPP) for all PV arrays. Directly connecting a load to a PV device can result in reduced efficiency. With direct connection, the device is unlikely to be operating at the voltage and current levels necessary to produce its maximum power output. Using MATLAB and Simulink, a controller was developed which locates and tracks the MPP of a PV array model using a modified perturb and observe (P&O) method. The controller adjusts the operating voltage of the PV array using a DC/DC converter. For development and simulation, this converter was modeled using elements from the SimPowerSystems toolbox inside Simulink.

After successful simulation, the controller was implemented using a dSPACE digital signal processor and hardware interface. The controller was attached to two Kyocera KC130TM PV modules, which were connected in series. The results of the implementation confirmed the validity of the simulation results. They showed significant increases in power output for many cases where directly connecting the load caused the operating voltage to be far from that necessary for maximum power output. In one case, the power output was increased by over 1000%. Future plans for this project include implementing the controller on a microprocessor for use in portable and commercial applications. A charge regulator will also be added to convert the PV outputs to levels appropriate for efficient battery charging.

This research was supported by the undergraduate research program at West Virginia University Institute of Technology.

LORI HENRY and HEATHER KALB. Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Preliminary study on nest site selection in a captive population of Malayan box turtle *(Cuora amboinensis)* housed indoors.**

Malayan box turtles (*Cuora amboinensis*) are native to Southeast Asia. This species is classified as vulnerable by the IUCN. West Liberty University maintains a captive breeding population of approximately 43 adults. The majority of adults were "rescues" from various confiscations of illegal shipments of animals entering China and have now been in captivity over five years. The animals are maintained in three large fiberglass enclosures that are predominantly aquatic with elevated dry platforms and a small nesting box filled with top soil. Ten to eleven females and one smaller male are housed in two of the three enclosures. The goal of this study is to determine what nest box "habitat" would be most preferred by the nesting females.

Gravid females were given the choice of two nesting boxes that varied by temperature (single source of direct heat/light versus no direct heat/light source) or by lighting (heat light versus a ceramic heat source). The number of females nesting in each nest box was recorded. Temperatures at nesting Dept.h in various parts of each nest box were also recorded. The data from this study will be

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used to improve our captive breeding habitat and can also be used to predict where wild individuals may be choosing to nest.

This study has been supported by the Dept. of Natural Sciences and Mathematics at West Liberty University. A grant from the 2010 WV EPSCoR Instrumentation Program allowed for the purchase of an ultrasound machine that was invaluable in monitoring the gravid females.

KATHERINE HOECK, Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown WV 25443, and DR. JEFFERY GROFF, Institute of Environmental and Physical Sciences, Shepherd University, Shepherdstown WV 25443. **Constructing an ultrasonic anemometer based on the ATmega328 microcontroller.**

We aim to develop a low-cost ultrasonic anemometer for wind turbine site assessment and wind energy research. The design of the ultrasonic anemometer includes two ultrasonic transducers, one that serves as a transmitter and one as a receiver, and a microcontroller to drive the transducers and process data. Our prototype is based on the Arduino platform and Atmel ATmega328 microcontroller. We find that an integrated 8-bit counter of the ATmega328 is well suited for driving the ultrasonic transmitter at 40 kHz and the integrated 16-bit counter is well suited for determining the time-of-flight of an ultrasonic pulse traveling from the transmitting transducer to the receiving transducer, where the onboard comparator is used for threshold detection in the receiver circuitry. We conducted a wind-tunnel experiment comparing the time-of-flight of ultrasonic pulses from the transmitter to the receiver and wind-speed values determined using a mechanical impeller-type anemometer. To show proof of concept, we plot the wind-speed data collected from the mechanical anemometer verse the clock-cycles that correspond to the time-of-flight of the ultrasonic pulses and fit the plot with a line. The linear relationship between the data sets is evidence that our prototype ultrasonic anemometer functions as predicted. The accuracy of the time-of-flight determination is still being examined. This work was funded by a WV NASA Space Grant Consortium Research Enhancement Award and Undergraduate Research Fellowship.

CAITLIN HUDKINS, LAUREN SIBURT, and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of trace nutrient deficiencies on photosynthetic rates of *Solanum lycopersicum*.**

This study was designed to determine the effects of trace nutrient deficiencies on the photosynthetic rates of tomato (*Solanum lycopersicum*) plants. Plants were grown in hydroponics solutions missing a specific trace element (zinc, iron, copper, boron, or manganese and chloride) or a complete nutrition solution (control). Five plants were exposed to the deficiencies for 6 weeks and five additional plants grew for 3 weeks with complete solution and were then switched to a deficient solution for 3 weeks. Photosynthetic data was collected during light curve procedures using 250, 500, 1000, and 1500 PAR (mol of photons $m^{-2}s^{-1}$), using the LICOR 6400 Portable Photosynthesis System.

Preliminary results showed that the plants grown with an iron deficiency for all 6 weeks photosynthesized with a rate of 5.5 (mol CO_2 $m^{-2}s^{-1}$) at 1500 PAR, 6% higher than zinc, the second highest, at 5.2 and 49% higher than copper, the lowest rate, at 2.9. The plants exposed to an iron deficiency after 3 weeks photosynthesized with a rate of 10.6 at 1500 PAR, 52% higher than the second highest rate which was manganese at 5.1 and 67% higher than the lowest rate which was zinc at 3.5. With wilted, brown leaves and stunted growth, zinc deficient plants appeared to be less healthy than the rest.

JORDAN A. HUNTER, COLLEEN J. NOLAN, and CAROL ZYGAR PLAUTZ, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Long term memory formation and inhibition in *Lymnaea palustris*.**

The pond snail *Lymnaea palustris* is a simple invertebrate system that we have demonstrated can be used in behavioral studies. We used an operant conditioning schedule to screen for possible long-term memory (LTM) formation abnormalities following exposure to environmental contaminants. To stimulate pneumostome opening, snails were placed in hypoxic water, then subjected to three 45 min sessions with one hour between the first two sessions and 24hrs between the second and third sessions. For each session, a tactile stimulus was applied for every instance of an attempted pneumostome opening. LTM formation can be assessed by a significant decrease in number of openings from the first session to the third. Using these methods, we tested the effects of a widely used herbicide, Round-Up, on LTM. Several experimental sessions were administered in water containing 5x and 10x the EPA recommended concentration for glyphosate, a major component in Round-Up, in drinking water. Exposure at 10x concentration demonstrated impairment in LTM formation. Currently we are utilizing Western blotting to investigate the mechanism through which Round-Up inhibits LTM formation by looking at the up or down regulation of specific candidate molecules involved in the LTM process.

KAILEY IMLAY, Dept. of Biology, West Virginia University, Morgantown, WV 26506, and RYAN M. WILLIAMS and LETHA J. SOOTER, Dept. of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506. **Isolation of molecular recognition elements against Exotoxin A for application in toxin detection.**

Exotoxin A is secreted from *Pseudomonas aeruginosa* as a proenzyme that enters susceptible mammalian cells and catalyzes a reaction that blocks protein synthesis. It is thus toxic to both animals and humans. The pathogen is involved in hospital diseases and infections, common in patients with weakened immune systems and the toxin it secretes is used as a food poisoning agent in biowarfare. The objective of this study is to select molecular recognition elements (MREs) that bind to Exotoxin A with the highest affinity and specificity. Research is conducted by completing multiple rounds of *in vitro* selection using a pool of 10^15 different single-stranded DNA sequences against Exotoxin A. The *in vitro* selection and sequencing portion of the project is nearly complete. Binding studies are presently being performed. Once selected, these MREs will be incorporated into hand held assays to aid in the

detection of *Pseudomonas aeruginosa* Exotoxin A, aiming to decrease rates of illness. Research sponsors: National Science Foundation and Dept. of Defense.

DARRYL JOHNSON, MATTHEW ALT, EMAD KHAN, and QING WANG Dept. of Computer Sciences, Mathematics, and Engineering, Shepherd University, WV 25443, and BRITTANI LOVE, Dept. of Chemistry, Shepherd University, 25443. **Fundamental modes of elliptic drumheads in relation to eccentricity.**
Circular drumheads are simple instruments yet are unable to hold a tone; sound originating from a drum yields a dissonant clamor of frequencies that result in that ubiquitous thud we hear when we hit it. An analysis using the theories of partial differential equations shows that these aharmonic sounds are due to the fundamental modes of a circular disc. The properties of these modes are dependent on the geometry of the membranes boundary and an analysis on how complicated geometric shape can affect these modes and frequencies can lead one to understand the origin of a violin's rich timbre. We restrict ourselves to a simple set of geometric figures, ellipses, and study how the variation of a parameter, the eccentricity, will affect the shape of the standing waves on a membrane bounded by this figure and the frequencies of these standing wave vibrations. Our analysis first involves fixing a circumference and next involves fixing the area and with both we are varying eccentricity. We convert Laplace's equations into elliptic coordinates and use numerical methods to solve for the eigenfunctions to determine how they depend on eccentricity.

MORGAN JOHNSON and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Behavioral effects of Octopamine levels in the Madagascar Hissing Cockroach, *Gromphadorhina portentosa*.**
The neurohormone octopamine has been shown to modulate behavior in several species of invertebrates (Adamo et al 1995, Livingstone et al 1980), including the Madagascar hissing cockroach, *Gromphadorhina portentosa* (Conley & Baird 2011). In this study, we investigated behavioral responses before and after injections of various concentrations of octopamine, using saline injection as a control in *Gromphadorhina* species. In specific, we measured the time to right themselves after being placed on their backs, the time to emerge from housing to explore a novel odor, the velocity of antennal movements, the amount of time spent actively exploring (ie. walking) and the number of hisses elicited following a prod to the cerci. These behaviors were chosen to ascertain possible roles of octopamine in behavioral syndromes (shy/bold) as characterized by Logue et al (2009) and Conley & Baird (2011) as well as a possible role in modulating motor behaviors as reported in other many other invertebrate species (Orchard 1982, Mulloney et al 1987). After injections of high concentrations of octopamine, animals generally become unresponsive; whereas after injections of lower concentrations, the animals' behavior does not appear to differ from those animals who received saline injections. Unresponsiveness following injection of biogenic amines such as octopamine has been reported in other species (Livingstone et al 1980, Clotfelter 2007), yet previous investigations (Conley & Baird 2011) report greater differences before and after octopamine injection than were found in this study. This could be due to the concentrations of octopamine or the quality of the octopamine used. However, the animals used in this study may have been hybrids. Some species of hissing roaches have been reported to produce hybrids and it is possible that octopamine is responsible for different behaviors in different species of cockroaches. Further, octopamine levels have been found to vary according to season (high in the summer, Harris & Woodring 1992) and locomotor activity (Davenport & Evans 2003) in bees, locusts, and cockroaches – indicating that elevated levels may already have been present in some animals prior to injection since the data we report here were collected during the summer months. These results suggest that many factors may have contributed to the unresponsiveness and lack of differences in behavior after low doses of octopamine (vs. saline) and warrant further research on naturally induced modulation of octopamine under varying conditions.

AISHA KHAN and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Disturbance hisses in six species of hissing roaches.**
Several species of cockroaches emit hissing sounds in response to physical disturbances such as handling. The hisses consist of broadband noise and have been previously described in two species – *Gromphadorhina portentosa* and *Elliptorhina chopardi*. In this study, disturbance hisses were recorded from six species of cockroaches: *Gromphadorhina portentosa*, *Gromphadorhina grandidieri*, *Princisia vanwaerbecki*, *Aleuropoda insignis*, *Elliptorhina javinica*, and *Elliptorhina chopardi*. Most of the disturbance hisses were from females. In broadband noise, the frequency with the most energy (ie. the loudest) is called the dominant frequency. The results of the current study show that of the six species recorded, *P. vanwaerbecki* displayed the lowest dominant frequency (~6.4kHz), whereas *A. insignis* displayed the highest dominant frequency (~11.2kHz). *E. javinica* (~9.7kHz), *E. chopardi* (~9.9kHz), *G. portentosa* (~7.7 kHz) and *G. grandidieri* (~8.8kHz) all displayed intermediate dominant frequencies. The dominant frequency ranges among the six species vary considerably due to the broadband nature of the signals. These results show that the different species of cockroaches emit a broadband noise in response to disturbances that appear to differ from other acoustic signals, such as courtship calls, as reported by Nelson & Fraser (1980), Sueur & Aubin (2006), and Bellew & Conley (2011).

MIN KOOK KIM, Dept. of Integrated Science and Technology, Marshall University, Huntington, WV 25575, and JOHN J. DAIGLE, School of Forest Resources, University of Maine, Orono, ME 04469. **Analysis of vegetation diversity using remote sensing technology on Cadillac mountain summit, Acadia National Park.**
While park & recreation ecology has played an important role in identifying plant response characteristics as well as species diver-

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sity after being disturbed by trampling or off-trail hiking, the challenge is to verify the result of those recreational impacts when a site boundary is relatively large for on-site measurement. In this study, we utilized remote sensing technology for identifying vegetation diversity at a large spatial scale and eventually for assessing efficacy of employed site and visitor management strategies. By using multi-spectral high resolution remote sensing datasets obtained in 2001 and 2007, a supervised classification was applied to produce modified plant family level classifications in the vicinity of the summit loop trail, Cadillac Mountain, Acadia National Park. Based on the classification results, the Euclidean Distance (ED) was calculated to compare *beta* diversity between the study site and a nearby control site with no/little visitor use. Additionally, the Shannon-Weiner (SW) diversity index was statistically tested to directly compare *alpha* diversity between the two sites based on 30m^2 plots created. Vegetation diversities were lower at the experimental site both in 2001 and 2007 (all $p < 0.001$), showing no positive relationship with the employed management strategies in terms of enhancing vegetation diversity during the examined analysis time frame.

AMANDA R. KULICK, Pre-forensics, West Virginia University, Morgantown, WV 26506, and RYAN M. WILLIAMS, Dept. of Basic Pharmaceutical Sciences, PO Box 9530, West Virginia University, Morgantown, WV 26506, and LETHA J. SOOTER, WVNano Initiative, Dept. of Basic Pharmaceutical Sciences, PO Box 9530, West Virginia University, Morgantown, WV 26506. ***In Vitro* Selection of PETN Molecular Recognition Elements Using Capillary Electrophoresis.**

Pentaerythritol tetranitrate (PETN) is a plastics explosive that has threatened public safety and national security on several occasions. Current methods of detection for this explosive using vapor pressures are not very reliable; the molecule does not have a high vapor pressure. PETN also lacks metal and will not be recognized by a metal detector. Using capillary electrophoresis (CE), a molecular recognition element (MRE) with high affinity and specificity is being isolated through the *in vitro* selection process. The target, PETN, is mixed with approximately 10^{14} single stranded DNA molecules and CE is used to separate bound from unbound DNA. CE is a powerful method of separating compounds based on a molecule's size to charge ratio. Currently, one round of selection has been completed. A total of 4-6 rounds are expected to be necessary. This MRE will be incorporated into a sensing device so that PETN will be both identifiable and detectable in very low amounts. It is anticipated that this device will help protect people from terrorist attacks. It may also be used by the military to protect our service members. Research Sponsor: DoD and NSF.

FOREST LEFEVRE, Dept. of Biology, Marshall University, Huntington, WV 25755, and JEFF KOVATCH, Dept. of Biology, Marshall University, Huntington, WV 25755. **Effect of time out of water on non-lethal prediction of soft tissue mass and metabolic rate for the freshwater mussel, *Pyganodon grandis*.**

Animal tissue mass is widely used as a predictor of organismal metabolic rate. For some animals, including freshwater mussels, physiologically inactive shell can comprise a substantial portion of total mass. Also, variation in soft tissue mass may exist during development for some animals which has led to the use of dry tissue mass a predictor of metabolic capacities. A non-lethal method to estimate physiologically active soft tissue mass is presented. Soft tissue mass here includes all fluids between the valves including mantle cavity water, which can be ejected by mussels when removed from the water. Including mantle cavity water in mass-based metabolic rates estimation can contribute unnecessary error. Live specimens of the freshwater mussel *Pyganodon grandis* ($n = 10$) were used to determine rate of mantle water excretion. Linear shell or valve metrics were used to calculate soft tissue mass. Mussels were set out of the water for 45 min and their mass was recorded in 5 min intervals. The time to negligible rate of mantle cavity water loss was calculated, $t = 7.6$ min. The relative error on soft tissue mass estimation for not performing this method is ~ 4 % [0.5-9%]. Estimated regressions of metabolic rate as a function of organismal mass are given for *P. grandis* and errors and daily energy requirements are discussed.

MEAGAN LESSER, ALICIA ROSE, and SARA SAWYER, Dept. of Science and Mathematics, Glenville State College, Glenville, WV 26351. **The effects of temperature on integrin distribution in the aposymbiotic tropical sea anemone, *aiptasia pallida*.**

Temperature-induced Cnidarian bleaching can result from several different cellular phenomena including loss of cell adhesion and apoptosis. We have been investigating the role of the cell-substrate adhesion molecules, integrins, in temperature-induced coral bleaching. Integrins mediate a variety of signaling pathways that control cell survival and proliferation as well as cell adhesion. Using two different antibodies, we have previously shown that there is a large amount of integrins localized at the base of the ectoderm and endoderm in the symbiotic sea anemone, *Aiptasia pulchella*. Temperature shock from 25°C to 30°C for more than 12 h reduces this integrin staining compared to control animals. We are currently investigating whether temperature shock from 25°C to 30°C affects integrin distribution in aposymbiotic anemones to determine the role of the algae in this phenomena. The distribution of integrins in aposymbiotic anemones that have been temperature shocked for 12 and 24 h is similar to control animals. These data suggest that temperature shock affects symbiotic and aposymbiotic anemones differently and suggests temperature stress to the symbiotic algae contributes to the altered distribution of integrins observed in symbiotic anemones. We are in the process of investigating additional timepoints to clarify how temperature affects integrin distribution. In addition we are investigating how downstream signaling from the integrins is affected by temperature stress.

HOPE LIMA and JEANNE SULLIVAN, Dept. of Biology, West Virginia Wesleyan College, Buckhannon, WV 26201. **Male body size, male-male dominance and courtship displays affect female mate choice in *Melopsittacus undulatus* (budgerigars).**

Social interactions in flocking budgerigars (*Melopsittacus undulatus*) may affect female mate choice. Previous studies have failed to

show dominance hierarchies within wild flocks, and little has been reported concerning the effect of courtship displays, body size, and level of male activity on male mating success. This study utilizes focal-animal sampling to collect data. Here we present evidence showing that during times of increased reproductive competition (having a nest box present), dominance within a captive flock plays a role in female mate choice. We also link an increased body size to dominance within the flock, and thus, increased success in gaining a mate. Also within our captive flock, an increased level of courtship during the pre-laying and laying periods results in gaining a social mate and increased reproductive success. Locomotion did not prove to play a significant role in female selection, but for a small sample size there is a trend in that direction and would need further investigation. *(Supported by West Virginia Wesleyan College Semester Undergraduate Research Experience (SURE) Grant; provided by WV HEPC, Division of Science and Research)*

H. JANE LONG, Dept. of Psychology, West Virginia State University, Institute, WV 25112. **On choosing a pet: Characteristics of patrons adopting an animal from a local shelter.**

People choose to adopt animals from their local shelter for many reasons. This study was to determine whether those who choose to adopt from their local shelter share any demographic characteristics. This study was conducted from June through August of 2011. The Putnam County Animal Relief Center (PARC) location was used as the location of this study. Participants were those adopting animals from the Putnam County Animal Relief Center who voluntarily completed a survey that was provided by the relief center personnel. Surveys asked participants to select their demographical characteristics from a grouping provided. This included gender, age range (in groupings of 10 years), number of children (if any), and whether they had adopted any animals before. They were asked to indicate whether they utilized the internet in their selection of a pet, and whether they were familiar with the adoption procedures such as the amount of the adoption fee. A sematic differential scale was included, and participants were asked to mark where they felt their personalities fell between *outgoing* and *shy*. Lastly, participants were asked to briefly explain what led to their selection of the chosen pet. After the surveys were compiled, each answer was listed in terms of its incidence. Of the 34 surveys completed and collected, the majority were females between 30 and 39 years of age. The majority had children, which was also one of the leading determining factors for their pet selection. Most respondents described themselves as being fairly outgoing. The majority had other animals, many of which were previously adopted. This study may serve as a baseline for future studies with a focus on whether or not demographical characteristics affect the decision to adopt an animal from a local shelter.

VIJAY MANICKAM, ISMAIL CELIK, JERRY MASON, and S. RAJU PAKKALAPATI, CFD&AMP center at the Mechanical and Aerospace Engineering (MAE) Department, College of Engineering and Mineral Resources (CEMR) WVU, Morgantown, WV 26505. **Quantification of mixing in two fluid micro-channels for biomedical applications.**

In the last decade micro-channels have found applications in a variety of fields such as Microbiology, Biochemistry and Electronics. Micro-channels enable the efficient use of space and material required for processes of interest. For instance, the pharmaceutical industry makes extensive use of micro-channels. The drug delivery systems often have to administer multiple fluids to the target area of concern and hence the need to develop short channels that have high mixing efficiency, i.e. mixing is desired in a very short time (or distance). For this purpose, many design options are being proposed in the literature. For example, one popular design utilizes baffles at the base of the channels which aid in mixing. To assess the effectiveness of such devices many experiments need to be performed thus increasing the design cycle and the cost. Computational fluid dynamics(CFD) can and is being used to shorten this design cycle by performing parametric analysis, However, due to numerical errors it is also necessary to verify and then validate the numerical models to ensure that the predictions are indeed accurate. In this study a new verification algorithm is proposed to access mixing. The theory behind the approach is to develop a technique that will follow fluid particle trajectories and calculating their statistics. Simulations of flow inside a popular design of micro-channel are performed using the commercial CFD solver ANSYS FLUENT. The mixing in the channels is studied by detailed analysis of the predicted flow field using visualization software TECPLOT and applying the newly formulated technique for quantification of mixing. Furthermore the validity of this approach was tested against experimentally available data. The new method is shown to closely emulate the experimental findings. In the future, this approach can be used to characterize the mixing potential of micro-channels used in various applications, effectively reducing the time and cost involved in developing superior designs.

This research work was sponsored by the CFD&AMP center headed by Dr. Celik at the Mechanical and Aerospace Engineering (MAE) Dept., College of Engineering and Mineral Resources (CEMR) WVU.

AMRUTA MANKE and YON ROJANASAKUL, Dept. of Basic Pharmaceutical Sciences, West Virginia University, Morgantown WV 26505, and TODD A. STUECKLE and LIYING WANG, National Institute for Occupational Safety & Health, Morgantown WV 26505, and CERASELA ZOICA DINU, Dept. of Chemical Engineering, West Virginia University, Morgantown WV 26505. **Novel synthetic cardiac glycosides for Anti-cancer Therapy.**

In recent years, several cardiac glycosides (CGs) have shown significant anti-cancer properties and are being investigated for their potential use in oncology. In order to identify and understand the mode of action of these compounds against cancer, our group recently evaluated novel synthetic analogs of digitoxin (DTX), a prototypical cardiac glycoside, in a non-small cell lung cancer (NSCLC) H460 cell line. These compounds at therapeutically relevant doses of 10-40nM reduced NSCLC proliferation of tumor cells and increased programmed tumor cell death. Moreover, these anti-cancer effects have been found to be selective against tumor cells. However,

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one current theory of carcinogenesis involves normal epithelial cells undergoing transition to a mesenchymal cell phenotype (EMT) which is characterized by increased tissue invasion and rapid proliferation, that ultimately leads to metastasis

The aims of this study were: 1) To observe if low doses of DTX analogs affect EMT signaling pathways, and 2) whether these analogs can reduce tumor aggressiveness and metastasis by reducing invasion, ability to recruit new blood supply, and resistance to cell death.

D6-MA, an -L-rhamnose monosaccharide analog of DTX, was prepared using a selective palladium glycosylation technique. H460 cells were treated with different concentration of either DTX or D6-MA. MTT, Matrigel transwell and 2D Matrigel assays were used to study proliferation, invasion and angiogenesis of treated H460 cells respectively. Isolated mRNA from untreated as well as treated cells were subjected to whole genome expression microarray analysis following by Ingenuity Pathway Analysis (IPA) to identify potential novel anti-cancer signaling pathways. Western blot analysis was utilized to study protein expression for key regulators of the EMT related signaling.

D6-MA (~5- 10 nM) showed 4 to 5 fold greater potency at reducing proliferation, invasion, capillary formation and programmed cell death resistance ability than DTX (~20 – 40 nM). Genome profiling and IPA demonstrated that D6-MA reduced lung cancer-related signaling and EMT associated gene expression. Western blot analyses indicated that sub-therapeutic doses of DTX and D6-MA were successful at reversing several of the known biomarkers and transcriptional activators associated with promoting EMT.

In conclusion, our data suggests that sub-toxic doses of DTX analogs and DTX reversed expression of known biomarkers and transcriptional activators that promote EMT in NSCLC. This signaling correlated with a reduction in aggressive, metastatic behavior of NSCLC towards a more benign and less invasive tumor phenotype. The study highlights the importance of novel synthetic CG drugs against NSCLC and how their design is helpful towards a safer and effective approach in potential anticancer therapies. This research holds promise for novel lung cancer treatment options and for translation into improved health care for West Virginia residents.
Disclaimer: The findings and conclusions in this abstract are those of the authors and should not be construed to represent National Institute for Occupational Safety and Health or any agency determination or policy.

SARAH MATHIS, CANDACE M. HOWARD, and PIER PAOLO CLAUDIO, Dept. of Biochemistry and Microbiology, Translational Genomic Research Institute, Marshall University, Huntington, WV 25755, and JAGAN VALLURI, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755, and GERRIT A. KIMMEY, Dept. of Medical Oncology, St. Mary's Hospital, Huntington, WV 25702, and THOMAS DOUGHERTY, Dept. of Pathology & Marshall University, St. Mary's Hospital, Huntington, WV 25702. **Personalized Chemotherapy Identified for a Case of Progressing Spinal Ependymoma**

Administration of ineffective anticancer therapy is associated with unnecessary toxicity and development of resistant clones. Many attempts have been made over the years to develop an *ex-vivo* anti-cancer test that would provide clinically relevant treatment information. Each time patients are treated, they have a high chance of relapse and their cancer may become more resistant to therapy.

Unlike bulk of tumor cells, cancer stem cells (CSCs) resist chemotherapy and can regenerate the various cell types in the tumor, thereby causing relapse of the disease. Thus, development of a test that identifies the most effective chemotherapy management offers great promise for individualized anticancer treatments.

The test we developed (ChemoID^{SM}) involves growing primary cell cultures from tumor biopsies. CSCs are then enriched using a rotating wall bioreactor and immunophenotyped by flow cytometry. Both bulk of tumor cells and CSCs are exposed to a variety of chemotherapeutic agents in a range of concentrations. A full dose-response curve is generated for each drug evaluated, and the data are presented as a cytotoxic index (% kill).

A 19-year-old patient affected by a recurring undifferentiated spinal ependymoma was biopsied in July 2009. The primary cell culture obtained was immunophenotyped showing an elevated percentage of CD133(+) cells. Patient had already been treated in the past three years by cyber knife, surgery, and several chemotherapy regimens, but was recurring on average of 3-5 months.

Arabinoside-C, busulfan, cisplatin, Camptosar (CPT-11), etoposide, methotrexate, and oxaliplatin were tested in various concentrations flanking the clinically relevant doses. ChemoID^{SM} determined that the most effective treatments for this ependymoma were CPT-11 or Cisplatin as measured on both bulk of tumor cells and CSCs. Patient was treated with a regimen of Avastin and CPT-11, and showed no disease progression for 18 months.

More testing is needed for this new assay that could lead to more effective anticancer treatments.

HANNAH MICK and MARCIA HARRISON-PITANIELLO, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. **Development of a screening method for identification of new proteins that regulate gravitropism kinetics in *Arabidopsis thaliana*.**

Gravitropism is a plant growth response to gravity in which differential cellular growth in the stem allows for upward curvature. Gravitropism kinetics is the rate of gravitropic curvature. Studying the gravitropic process is essential for understanding how plants respond to environmental stimuli by adjusting their growth response and orientation. The objective of the study was to develop a screening method to identify new players in the regulation of gravitropism kinetics in the stem of *Arabidopsis thaliana*. The screening method has two parts consisting of a gene search from Correlated Gene microarray database and gravitropism screening using infrared time lapse photography and MATLAB analysis programs. The literature was reviewed for known genes that produced proteins involved in gravitropism. Combinations of these genes were searched in the Correlated Gene Search microarray database to find potential genes also involved in regulating gravitropism. Co-expressed genes which were available as homozygous knock-out mutants

through Salk Institute Genomic Analysis Laboratory were ordered through The Arabidopsis Information Resource. Time-lapse of dark grown *Arabidopsis thaliana* were taken with IR backlighting to eliminate phototropic response. Individual frames were analyzed using a student-written MATLAB program to measure the change in angle from the tip to the base of the stem. Correlated Gene search yielded genes co-expressed with genes of known gravitropic involvement (threshold greater than 60%). A total of 14 homozygous knockout mutants were ordered to be screened in comparison to wild type *Arabidopsis thaliana*. The MATLAB program produced precise measurements of the angle between the tip and base of the plant stem, showing a standard deviation of ≤4.6° for three measurements at several time points. The angle measurement will be used to screen mutants by comparing changes in gravitropism kinetics with wild type plants. Mutants showing altered gravitropic response will be characterized using a more mathematical approach to evaluate curvature kinetics. In conclusion, Correlated Gene Search may be useful for identifying genes potentially related to a specific biological function for *Arabidopsis thaliana*. The phenotypic screening method is a novel application for defining gravitropic kinetic phenotypes in the stem of homozygous knock-out mutants of *Arabidopsis thaliana*. Characterization of selected mutants will lead to identification of new regulatory elements involved in gravitropism and, thus, will contribute to a general understanding of how gravitropism is regulated in the stem. This material is based upon work supported by the National Science Foundation under Cooperative Agreement Award number EPS-1003907 and by NASA WV Space Grant Consortium under award number 91-175-B-MURC.

MATTHEW MOCNIAK, QING WANG, and ZHIJUN WANG, Dept. of Computer Science, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443. **Genetic algorithm based analysis and numerical study of an SIR model for contagious disease patterns.**

This purpose of this research is to apply genetic algorithms from AI and numerical simulations to approximately solve and study coupled differential equations from an SIR model, which model the spread and control patterns of contagious diseases such as the H1N1 influenza. The SIR and related models describe the dynamics of susceptible, infected, and recovered subpopulations within a given population for infectious diseases. The model was brought back to attention with the outbreak of SARS and H1N1. Control parameters in the model were experimented in order to find the optimal values that could put the disease under control at the fastest rate possible. A new mutation method was developed and applied to the genetic method. Instead of using a totally random number, a random number was generated for a gene in the range of two neighbor genes to smooth the functional curves. By using the customized version of genetic algorithm, the average error rate can be much reduced. This research shows the potential of applying genetic algorithms to solve more complex mathematical models within a reasonable time frame.

ROBERT MORRIS, MICHEAL FULTZ, and THOMAS GUETZLOFF, Dept. of Chemistry, West Virginia State University, Institute, WV 25112. **Microwave Syntheis of N-Phenyl succinimides.**

Finding new and cleaner methods to synthesize complex functional groups has become economically viable due to the increased environmental regulations and cost of research. N-Phenyl succinimide derivatives have been shown to be significant anti-microbials and insecticides so they are vital to a sustainable society. This work explores the steric and electronic variabilities of the aniline while exploring the scope of the electrophile, succinic or maleic anhydride. Interestingly when maleic anhydride was used as the electrophile, hydration of the alkene provided hydroxysuccinimide product upon isolation. Isolation of the product from water and ethanol provides a cheap and environmentally friendly method of purification. All of this work was done by microwave irradiation in 10 minutes versus traditional methods of heating for 8 – 10 hours. This work was funded by the West Virginia State University NASA Research Enhancement Award.

JOSHUA MULLENAX, PRATRICK BROWNING, WADE HUEBSCH, and EDWARD M. SABOLSKY, Dept. of Mechanical & Aerospace Engineering, West Virginia University, Morgantown, WV 26506. **Electrochemical and Mechanical Evaluation of Multifunctional Lithium Ion Batteries.**

In today's market, there is an increasing demand for more conformable lithium ion batteries with a high-energy density and improved packaging design (high specific volume density) for applications in wearable electronics, transportation, and unmanned/robotic vehicles. However, in the pursuit of these battery structures, research has primarily focused on the alteration of the battery pack as a complete volumetric unit. The length, width, and thickness of the rectangular or cylindrical battery pack are typically modified to fit into a specific system. Another more volume efficient method of incorporating the batteries into a structure is through the interconnection of discrete, isolated batteries within structural layers of the material or component. Although this has proven to be effective, even more advancements will be made by incorporating the structure into the battery instead of the battery into the structure. The aim of this alternative approach is to make the battery itself capable of bearing significant mechanical loads by changing the composition of the battery electrodes and separator material.

The goal of this current work is to design a battery that serves as the structural material as well as the power source for the vessel. The combination of the mechanical and electrochemical aspects within one material defines the component as a multifunctional material, or in this case, a multifunctional battery. Previous work has focused on the design and construction of a novel multifunctional lithium ion battery structure, where the reinforcement fibers were utilized as active components within the electrodes and sep-

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arator. Cyclic voltage-capacity testing of several fibrous composite reinforcement materials, such as various carbon fiber and fiberglass materials, were tested as the anode and separator materials, respectively, within a conventional liquid-electrolyte based lithium ion battery. Additional work focused on investigating an approach to modify a conventional lithium ion pouch battery architecture by creating perforations through the cell architecture in order to reduce delamination or wrinkling of the battery during bending loads. This current work is to combine the previous success with the future aim of making the battery an integral part of the composite structure instead of a separate piece embedded within the structure.

The design of composite multifunctional batteries for optimal performance involves the proper selection of the materials, architecture, and electrical interconnection. The ultimate goal is to incorporate a battery with a continuous composite fibrous fabric within a structured vessel. This current work includes a survey of the electrochemical potential of multiple composite fabrics, such as carbon fiber, fiberglass, and Kevlar, as substitutions for electrode and separator materials. Each material is examined by a typical cyclic voltage-capacity testing, in addition to impedance evaluations for a better understanding of the lithium intercalation into the carbon fiber composites; as well as the effect of different separator materials on the ion's diffusion path through the cell. In addition to this electrochemical testing, flexure and tensile mechanical data of various geometries of perforated pouch cell architectures are examined under varying structural loads while being discharged.

EVA A. MULLINS and DONALD E. TRISEL, Dept. of Biology, Chemistry & Geosciences, Fairmont State University, Fairmont, WV 26554. **The effects of mycorrhizal fungi on strawberry plants.**

This study was designed to determine the effects of different amounts of mycorrhizal fungi on strawberry (Tristar) plants. Three groups of four plants each were treated with increasing amounts of inoculum (0 tsp., 1 tsp., and 3 tsp.) and grown in the greenhouse at FSU under standard conditions. To determine which treatment resulted in the best growth and development of the plants, weekly observations of the stem height, number of leaves, and overall appearance were recorded. In addition, a light curve dataset was obtained using three leaves from every plant at 250, 500, 1000, and 1500 µmols $m^{-2}s^{-1}$ using the LICOR 6400 Portable Photosynthesis System.

Preliminary results showed the control group (containing no added microbes) at the quantum flux rate of 1000 µmols $m^{-2}s^{-1}$ had the highest average photosynthesis rate at 7.73µmols CO_2 $m^{-2}s^{-1}$. Plants treated with 1 tsp. had a 25.36% decrease and plants with 3 tsp. had a 41.91% decrease.

ROUNAK NANDE[1], MICHAEL S. GOSSMAN[2], JEFFREY P. LOPEZ[2], CANDACE M. HOWARD[1], JAMES DENVIR[1], and PIER PAOLO CLAUDIO[1,3], [1]Dept. of Biochemistry and Microbiology, Translational Genomic Research Institute, Marshall University, Huntington, WV [2]Tri-State Regional Cancer Center, Radiation Oncology, Ashland, KY. [3]Dept. of Surgery, Marshall University, Huntington, WV. **Comparison of microbubble assisted p53, pRB, and p130 gene therapy in combination with radiation therapy in prostate cancer *in vitro and in vivo*.**

There are limited options for patients with therapy resistant prostate cancer. The ineffectiveness of current treatments is due to loss or mutation in p53 and/or pRB. We used a novel approach using adenoviral (Ad) delivery of cell cycle proteins encapsulated inside microbubbles (MBs), in combination with radiation to target p53 and pRB mutant prostate cancer cells. MBs deliver effective therapeutic Ads, combined with ultrasound-targeted microbubble destruction (UTMD), allowing for a site-specific gene transfer system.

DU145 radio-resistant human prostate cancer cells were exposed to 10 and 20Gy of x-ray radiation *in vitro*. Immediately after irradiation, cells were transduced with Ads carrying p53, pRb, or p130. Cell death was evaluated by flow cytometry and Annexin-V assay between 24-96-hours.

DU145 tumors were grown to a volume of 200 mm^3 in *nude* mice in their flanks. Mice were treated with intravenous injections of the Ads, each at concentration of 10^4 pfu/µL, ± MB. Intravenous treatments were compared to intratumoral injections of the Ads. Combinational therapy groups were irradiated at 8Gy, and injected intravenously with MB/Ads ± ultrasound, every week for 4 weeks. Gene transfer was confirmed by western blot analysis.

In vitro, a higher percentage of cell death was observed in 20Gy vs. 10Gy irradiated cells. Cells transduced with adenoviruses carrying RB, p53, and p130 showed a decreasing order of cell death. Combination of radiation and p53 or RB Ads treatments showed increased cell cycle G1 arrest, while p130 combination treatments demonstrated G0 arrest when compared to control Ad or radiation alone.

Statistically significant ($p<0.05$) reduction of the ultrasound-targeted MB/p53 or RB Ad transduced tumors was observed when compared to intratumoral treatments or radiation alone. Ultrasound targeted MB/Ads in combination with x-radiation therapy resulted in the most efficient treatment.

Combination treatments of radiation and UTMD increase the treatment potential of therapy resistant prostate cancer.

BAHAR NOORBAKHSH, RAE MATSUMOTO, Dept. of Basic Pharmaceutical Sciences, School of Pharmacy, West Virginia University, Morgantown, WV 26505, and CHRISTOPHE MÈSANGEAU, CHRISTOPHER MCCURDY, Dept. of Medicinal Chemistry, School of Pharmacy, University of Mississippi, University, MS 38677. **Pharmacological characterization of sigma-2 receptor compounds: putative aids in the treatment of cocaine abuse and addiction.**

Cocaine is a powerful psychostimulant that is highly abused by 1.9 million people in the United States. It accounts for more emergency Dept. visits than any other illicit drug. Even with the high rate of cocaine abuse, no FDA approved pharmacological treatments exist. Many attempts at finding a pharmacotherapy for cocaine abuse and addiction have been made, but proven unsuccessful.

Cocaine is known to bind sigma receptors at physiologically relevant concentrations, deeming them candidate novel targets for the study and development of cocaine pharmacotherapies. Two subtypes of sigma receptors have been described, sigma-1 and sigma-2. Minimal information is known about the function of sigma-2 receptors in relationship to cocaine-induced effects. This is in part attributed to the absence of highly selective ligands. The present study was aimed at finding novel sigma-2 compounds and determining their abilities as possible treatments for cocaine abuse and addiction.

Three novel compounds, CM398, CM777 and CM775, were found through radioligand binding assays, in rat brain homogenates and liver P2 membrane, to possess substantially high affinities for sigma-2 receptors versus sigma-1 and non-sigma receptor sites. Subsequently, the effects of these compounds on acute cocaine toxicity were studied through cocaine-induced convulsion behavioral tests. Male, Swiss-Webster mice were pretreated with CM398, CM777 or CM775 followed by administration of a convulsive cocaine dose (70 mg/kg, i.p.). All three compounds significantly attenuated the convulsions by at least 50% (Fisher's exact test, $p<0.05$ to $p<0.001$). Furthermore, locomotor activity experiments, performed on the mice, aimed at studying the impact of CM398, CM777 and CM775 on cocaine's stimulant effects. Pretreatments of the compounds to a stimulatory locomotor dose of cocaine (30 mg/kg, i.p.) resulted in significant decreases in cocaine's locomotor hyperactivity (one-way ANOVA, followed by post-hoc Dunnett's test, $p<0.05$ to $p<0.001$). Yet, when administered alone as a pretreatment, the compounds had no significant effect on locomotor activity (one-way ANOVA, $p>0.05$).

The sigma-2 receptor compounds CM398, CM777 and CM775 were able to significantly assuage the acute toxicity and stimulant effects associated with cocaine exposure. These ligands may serve as future pharmacological agents to aid in the treatment of individuals suffering from cocaine abuse and addiction. (Supported by grants from the National Institute on Drug Abuse/National Institutes of Health DA013978, DA023205)

THOMAS RICHARD and JENNIFER WEIDHAAS, Civil and Environmental Engineering, West Virginia University, WV 26506. **Adsorption and bioremediation of explosive compound: IMX-101 and constituents.**

As the US military begins replacing TNT with the newly approved IMX-101 munition formulation, research should be directed to understanding the environmental transport and fate of IMX-101. It is possible that the manufacture and use of IMX may result in local contamination, and may pose a risk to human health and the environment. Since, this compound has only recently been developed and approved, its constituents it have not been extensively studied and there is a need to explore IMX-101 fate and transport in the environment.

IMX-101 is an insensitive muntion that is composed of 2,4-Dinitroanisole (DNAN), 3-nitro-1,2,4-trizole-5-one (NTO), and Nitro guanidine (NQ). Five IMX degrading organisms have been isolated during this study. These organisms were inoculated into liquid media with IMX constituents added to serve as a carbon source, nitrogen source, or both. Rates of degradation for each of the contaminants will be used to determine the Michael-Mentens growth kinetics, and will be presented.

To measure retention of this compound in soil, adsorption studies were undertaken to determine the amount of IMX adsorption to clay, sand, and organic material. Adsorption of IMX-101 to these soils was measured over a 24 hour period and monitored over several time points, while desorption was monitored over the following 20 hour period with time points taken at start and conclusion of the desorption experiment. Additionally, concentrations were varied from 1 to 100 mg/L IMX. The results of these experiments will be discussed. Determination of degradation kinetics and soil adsorption will provide valuable information to aid in the task of contaminated site cleanup and the design of effective industrial water treatment systems.

WILLIAM ROLLYSON and MICHEAL FULTZ, Dept. of Chemistry, West Virginia State University, Institute, WV 25112. **Progress toward the synthesis of (±)-spathoside.**

Many pharmaceuticals that are on the market today are derived from natural products. These products are used to treat 48 of 55 types of listed human ailments. Spathoside was isolated from African Tulip tree bark and has been shown to be active against both gram positive and negative bacteria. The structure of the molecule was determined by spectroscopic techniques, however the stereochemistry of the three different stereocenters is still currently not known. The progress of the synthesis and the proposed completion show how all 8 of the possible structures can be derived from cheap, chiral starting materials for continued biological studies. This work was funded by the West Virginia State University Faculty Research and Development Cooperation.

KAMRAN ROSTAMI and FARSHID ZABIHIAN, Dept. of Mechanical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136, and ASAD DAVARI, Dept. of Electrical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136, and GIFTY OSEI-PREMPEH, Dept. of Chemical Engineering, West Virginia University Institute of Technology, Montgomery, WV 25136. **Polymer electrolyte fuel cells fueled with carbon monoxide.**

Fuel cells fueled by solid carbon presents a more environmentally friendly way of burning carbon and a great alternative to hydrogen fuel cell for mobile application. However for a direct carbon fuel cell (DCFC), the three phase contact between solid fuel, elec-

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trolyte and catalyst pose a problem. Carbon can be preprocessed to generate gases as fuel for use in fuel cell. The objective of this project is to manufacture and test a proton exchange membrane fuel cells (PEMFC) that can be fueled with carbon monoxide. Conventional polymer electrolyte fuel cell (PEFC) cannot be fueled with CO because their platinum-based catalyst is strongly poisoned. In this project, platinum- ruthenium-based alloy has been used to produce the electro-catalyst for anode and cathode. The manufactured electro-catalyst has been used to make a single PEFC. The single cells have been tested by using the facilities of the WVU Tech and its industrial partner American Science Technology (AST).

Performance scan tests have been performed to estimate the relationship between voltage and current (current density) of the cell, this data can be used to estimate the output power of the cell at various operational conditions. Longevity test of the single CO-PEFC has been done to observe the degradation of the fuel cell power output after certain period of time.
Currently, the feasibility of the carbon monoxide-fueled PEFC has been proved. The next objective of the project is to optimize the cell in terms of power output, efficiency, and longevity. Also, attempts have been made to reduce consumption of catalyst, which is one of the main contributors to the cost of the cells. This project will eventually lead to the development of a stack of fuel cells that can produce significant amount of electricity.

JULIA R. SALING, LEAH D. STARKEY, and MATTHEW J. ZDILLA, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and DEVAN M. BASIL, Dept. of Community Medicine, West Virginia University, Morgantown, WV 26506.
Correlations between zinc intake and taste perception of zinc sulfate solution.

Despite the physiological importance of zinc, mensuration of zinc nutriture remains to be elucidated. We performed a correlational study of 285 female college students and found a positive correlation between daily intake of zinc and taste perception (R^2=.85). Zinc intake was calculated using a previously developed zinc-specific food frequency questionnaire (ZnFFQ). Perception of zinc was gauged by both the Bryce-Smith Zinc Taste Test (ZTT) and a visual analog scale (VAS). The ZTT was used to measure zinc taste perception by grading an individual's response to oral exposure of a 0.1% zinc sulfate solution on a whole number scale ranging from 1 to 4. The VAS allowed individuals to rate the intensity at which they perceived the zinc sulfate solution by marking an intersecting line across a continuous line measuring 100mm. Both the ZTT scores and mean VAS scores were strongly correlated with one another (R^2>.99). Individuals who, as measured by the ZnFFQ, had daily zinc intake below the recommended daily allowance (<8mg/d, n=62), within the recommended intake range (8-40 mg/d, n=196), and above the tolerable upper intake level (>40mg, n=14) of dietary zinc showed significant difference in their ability to perceive the zinc sulphate solution as measured by both the VAS (P=.03) and the ZTT (P=.03) using one-way ANOVA. Our conclusions support the use of both the VAS and ZTT as non-invasive auxiliary methods of assessing zinc nutriture. Our results warrant further investigation among larger and more diverse populations.

CHRISTOPHER D. SEAL, Dept. of Chemistry, Shepherd University, Shepherdstown, WV 25443, and COLLEEN J. NOLAN, and CAROL ZYGAR PLAUTZ, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Analysis of StAR protein abundance in snails *(Lymnaea palustris)* chronically treated with the herbicide Round-Up.**

The purpose of this study was to ascertain the impact of the commercial herbicide Round-Up on StAR (steroidogenic acute regulatory protein) expression in the aquatic snail *Lymnaea palustris*. StAR protein is key in the production of the sex hormones testosterone and estrogen in that it facilitates the transfer of cholesterol into the mitochondrion where it is subsequently cleaved and converted into these hormones, and it is the rate limiting step in the steroidogenic pathway. Therefore, a disturbance in the abundance of StAR protein in this organism could be the cause of reproductive disturbances observed in chronic Round-Up studies performed in our lab (J. Cain, unpublished). We examined the solution Round-Up, as well as its primary components glyphosate (herbicide) and POEA (polyethoxylated tallow amine, surfactant) in order to determine which component resulted in the greatest impact on StAR abundance, or if the combination of these components results in a synergistic effect. Snails were subjected to chronic exposure in solutions of these compounds for a period of six weeks and then collected for StAR protein analysis by SDS-PAGE and Western blot.

Preliminary results from densitometric analysis indicated that the abundance of StAR protein in glyphosate treated snails was reduced 8.66% versus control, while POEA treated snails exhibited a 22.52% reduction in abundance versus control. The reduction in abundance of StAR protein in the POEA snails suggests that this component of Round-Up could be the cause of the reproductive disturbances observed in *Lymnaea palustris*. Studies are continuing to elucidate the effect of each component of Round-Up on StAR abundance; in the future we will examine other components of the steroidogenic pathway.

DEEPAK SHARMA, Dept. of Biology, West Virginia State University, Institute, WV 25526, and DAVID H. HUBER, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25526, and TEODORO ESPINOSA-SOLARES, Agroindustrial Engineering Department, Universidad, Autonoma Chapingo, Mexico. **Bacterial community dynamics during codigestion in a thermophilic anaerobic digester.**

Microbial communities are dynamic and responsive toward fluctuating environmental conditions. This property is particularly important in industrial bioreactors which should maintain stable performance. We have been investigating the ability of the microbial community in anaerobic digesters to adapt to changes in organic feed. Digesters are used to treat concentrated organic wastes, and produce bioenergy (methane) as a byproduct. The bacterial communities of digesters represent an excellent model for elucidating microbial community structure-function relationships. The specific goal of this study was to evaluate how the bacterial community of a thermophilic digester responds to thin stillage (ethanol manufacturing waste), which contains high fat and protein content, as

co-digestate. Replicate laboratory treatment and control digesters were derived from a pilot plant digester stabilized on poultry litter feed (P). The feed composition of the treatment digesters was changed by codigestion with increasing ratios of stillage, followed by a return to 100% P. Bacterial community structure was evaluated using pyrosequencing of PCR amplicons that span the V6 region of rDNA. Stable performance was observed through 60% stillage as shown by a high level of methane in the biogas, COD removal, and lowering of volatile acids. However, 80% stillage caused a dramatic decrease in the performance of the treatment digesters. Coordinated changes in community structure occurred in both treatment reactors in parallel with stillage concentration. In particular, the abundance of the Thermotogae tracked both the increase and subsequent decrease in stillage. At 80% stillage, the abundance of a novel phylotype in the Thermotogae peaked at 25-35% of total bacterial abundance. In conclusion, codigestion with increasing levels of stillage in this high-performance thermophilic digester was accompanied by community structural adaptation.

KINSEY SKALICAN, SHANNON BERARDI, and ZACHARY LOUGHMAN, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074. **Life History of the Crayfish *Cambarus chasmodactylus* from the central portion of the species range.**

The life history of *Cambarus chasmodactylus* was studied in Anthony Creek, West Virginia from May through October 2011. Animals were collected monthly. Reproductive and molt states along with morphometrics were recorded for all individuals, after which the majority of animals were returned to the stream. Monthly, 10-20 females along with any ovigerous individuals encountered carrying eggs/instars were vouchered to determine egg/instar complement number. Non-reproductive females were dissected in the laboratory to determine monthly gonadic development. Among adults two mass molts, one in June and another in September, occurred over the activity season. The majority of males molted from form I to form II in May and back to form I following the September molt. Females displayed active glair glands May to late June, with ovoposition occurring July into early August. Females carried instars September through the fall and possibly into winter. Ovigerous females averaged 168 eggs/instars. Egg/instar complements were weakly correlated ($r^2 = 0.81$) to carapace length. Age histogram analysis indicated six size cohorts within the population with the largest individuals six years old or older.

LEAH D. STARKEY, JULIA R. SALING, and MATTHEW J. ZDILLA, Dept. of Natural Sciences and Mathematics, West Liberty University, West Liberty, WV 26074, and DEVAN M. BASIL, Dept. of Community Medicine, West Virginia University, Morgantown, WV 26506. **Correlations between a zinc specific food frequency questionnaire, zinc taste test, and a novel visual analog scale.**

Many methods of assessing zinc nutriture have been clinically implemented; however, there still remains contention regarding their effectiveness. Although zinc is an essential mineral, aberrant zinc nutriture is common throughout the world. We sought to examine correlations between a non-invasive zinc taste test, developed by Bryce-Smith and Simpson, and a novel visual analog scale. We conducted a correlational study of 285 female college students and found a positive correlation (R^2>.99) between the Bryce-Smith Zinc Taste Test (ZTT) scores and mean visual analog scale (VAS) scores. Both methods of quantifying taste perception were then compared to daily zinc intake as gauged by a zinc specific food frequency questionnaire (ZnFFQ). The ZTT was used to quantify zinc taste perception by grading an individual's response to oral exposure of a 0.1% zinc sulfate solution on a whole number scale ranging from 1 to 4. The VAS allowed subjects to rate the intensity at which they perceived the zinc sulfate solution by marking a perpendicular line through a continuous line measuring 100mm. Individuals were separated into four groups based upon their corresponding ZTT score. Using one-way ANOVA, ZTT groupings did not yield a significant difference between daily zinc consumption (P=.32). However, four VAS groupings of individuals marking between 0-25, 25-50, 50-75, and 75-100mm, respectively, showed significant difference (P=.049). Furthermore, individuals who, according to the ZnFFQ, consumed an average daily intake above the tolerable upper limit (>40mg, n=14) of dietary zinc had significantly different scores on the VAS (P=.005) when compared to individuals whose intake was at or below the tolerable upper limit (≤40mg, n=258). Under the same constraints, the ZTT also showed a significant difference between the two groups (P=.03). Additionally, when the VAS scores of all participants were split into two groups at one location along the VAS, and analyzed by an unpaired t-test; the most statistically significant difference between the average zinc intake of each group (P<.0001) occurred between those individuals marking ≤82mm (n=256, =15.1mg) and those marking ≥83mm (n=16, =29.4mg). In conclusion, our data support the utilization of a VAS, gauging perception of a 0.1% solution of zinc sulfate, as an adjuvant method of assessing zinc status. Our findings warrant additional study of the VAS, ZTT, and ZnFFQ in larger and more diverse populations.

BERNIE SUPERAK, JADE BENNETT, and DONALD E. TRISEL. Dept. of Biology, Fairmont State University, Fairmont, WV 26554. **Effects of global warming on photosynthetic rates and CO_2 compensation points of C3 and C4 plants.**

This study was designed to predict the effects that global warming may have on crops in the future. For our study, green beans (*Phaseolus vulgaris*) and corn (*Zea mays*) were grown in Fairmont State University's greenhouse. The leaves of both the corn and green bean plant were exposed to the same controlled environment. To test the effect of global warming on our two plants, we performed an A/Ci curve and collected data at temperatures of 25 °C, 30 °C, and 36 °C. The variables and responses of the plants to the variables were conducted and measured with the LICOR 6400 Portable Photosynthesis System.

Preliminary results in green beans showed a photosynthesis rate of 8.38 umol CO_2 m^{-2} s^{-1} at 25 °C. There was a 20% increase in maximum photosynthetic rate at 30 °C and a 40% increase from 25 to 36 °C. In addition, CO_2 saturation points for bean were increased from 600 at 25 degrees to 900 at 30 °C while no saturation point was reached in the 36 °C experiment.

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LESLEY SWISHER and CAROL ZYGAR PLAUTZ, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Using cold-shock gynogenesis to identify novel phenotypes in random mutagenesis screens of *Xenopus tropicalis*.**

The Western clawed frog *Xenopus tropicalis* possesses many advantageous characteristics that favor its use in forward genetic screens; thus, it has become a prominent model organism in the study of vertebrate development. Gynogenesis, via the trajectory of the cold-shock method, produces progeny that may be screened for novel recessive mutations. Females of F1 generation of mutagenized *X. tropicalis* produce oocytes; cold-shock inhibits extrusion of the polar body during meiosis generating diploid gynogenetic embryos when fertilized with UV-irradiated sperm (to allow no paternal genetic contribution).

Among the mutant phenotypes preliminarily unveiled were *u-gut* and an abnormal darting behavior, and we are currently working to confirm these mutations via natural mating. This experimental research is in concurrence with other large scale efforts to identify and characterize mutations of *X. tropicalis*, and ultimately such work contributes to the Dept.h of knowledge surrounding the function of the genes orchestrating vertebrate development.

JONICA THOMPSON, SUMANTH MANOHAR, PADMA NIMMAKAYA, YAN TOMASON, UMESH K. REDDY, Dept. of Biology and Gus R. Douglass Institute, West Virginia State University, Institute, WV 25112-1000, and GURU JAGADEESWARAN and SUNKAR RAMANJULU, Dept. of Biochemistry and Molecular Biology, Oklahoma State University, Stillwater, OK 74078. **miRNA-guided gene regulations control the phenotypes of isogenic diploid and tetraploid watermelon lines.**

Several studies indicated that the miRNAs play an important role in regulating many genes pertaining to biological and metabolic processes, including tissue identity, developmental timing, and response to environmental stress. Seedless watermelon types are highly preferred by the US consumers, which are generally, bred using diploid and synthetic tetraploid types. Synthetic tetraploid watermelons are developed by colchicine treatment of diploid lines. Our laboratory developed isogenic tetraploid lines from the diploid watermelon types and selfed them for several generations. These isogenic diploid and tetraploid lines were phenotyped for three seasons, which indicated that the vegetative tissue is larger than the diploid and fruits are generally of the same size. Our current research was to identify epigenetic mechanisms underlying the phenotypic differences of isogenic diploid and tetraploid. Two small RNA libraries were generated from the pooled RNA isolated from different tissues (leaf, stem, as well as flesh, rind and placenta from the fruits) separately for isogenic diploid and tetraploid watermelons and sequenced on Illumina HiSeq to identify not only conserved miRNAs but also novel miRNAs differentially expressed in diploid and tetraploid watermelon. Approximately 5 million reads were obtained from each of these libraries and initial sequence analysis indicated that the identification of 130 miRNA homologs belonging to 23 conserved miRNA (miR156/157, miR159, miR160, miR162, miR164, miR165/166. miR167, miR168, miR169, miR170/171, miR172, miR319, miR390, miR393, miR394, miR395, miR396, miR397, miR398, miR399, miR408, miR528, miR894 and miR2111) families. Of these conserved miRNAs, miR156 expressed more abundantly in tetraploid stem and fruit than the diploid. miRNA168-1 (leaf and stem), miRNA168-2 (leaf and fruit), miRNA164 (leaf and fruit), miRNA166 (leaf and stem) were the most abundantly expressed in diploid tissues than the tetraploid. Most importantly, analysis also has revealed that more than a dozen of novel miRNAs that were identified also to be differentially expressed among the diploid and tetraploid lines. These initial results suggested that the phenotype differences among the diploid and tetraploid watermelon are controlled by miRNA-guided gene regulations.

CHAD VANORSDALE, JORDAN CANNIN, JESSICA NOVAK, and WEIDONG LIAO, Dept. of Computer Science, Math and Engineering, School of Natural Sciences and Mathematics, Shepherd University, Shepherdstown, WV 25443. **Mobile Computing: Hardware, Software, and Security.**

Mobile Computing is becoming a trending topic in computer science with the advent and popularity of smartphones and tablets, such as Apple IPad. These devices allow for people to continue using their computers while on the go in an as-you-need-it way. Smartphones allow for computing power to be held in your pocket, and readily available for everyday tasks such as calculating while shopping or scanning information about a device while shopping. Tablets are very easy to be carried and handy. They provide easy access to surfing the web, photo editing, or other quick tasks as you need them, with little barrier to entry such as long boot times or long resource load times.

These smartphones and tablets have created a surge in the computing industry with companies rethinking every aspect of computing. Processors are being redesigned to be more powerful while also being smaller and more battery efficient. Displays are being made for interactive and of better quality to suit the smaller screen sizes. Batteries are being made more efficient and compact to fit into small devices. Software is being designed with the idea that people are no longer tied to their computer, but instead must be able to utilize on the go. Location services are adding a new level of interactivity to the software as well as cloud storage and augmented reality.

In our poster presentation we identify how people are taking these ideas into consideration to create efficient and useful mobile computers. We look at what processors are being used and why. We also discuss how battery life is taken into consideration and how it may be improved. In addition, the approach used to process graphics and images and effects it produces on the mobile device are also discussed. Finally we describe the security and privacy concerns that must be considered when using mobile computers, both from the perspective of the device itself and from the networking perspective, especially cloud storage.

ADRIENNE WALKER, CAMILLE AGUIRRE, MORGAN JOHNSON and RUTH CONLEY, Dept. of Biology, Shepherd University, Shepherdstown, WV 25443. **Modulation of Behavioral Syndromes by Serotonin and Octopamine in the Madagascar Hissing Cockraoch, *Gromphadorhina portentosa*.**

Behavioral syndromes (ie. shy vs. bold) have been described in many social species, including the Madagascar Hissing Cockroach, *Gromphadorhina portentosa* (Logue et al 2009). We investigated the effects of biogenic amines octopamine and serotonin on behavioral syndromes. We expect serotonin may increase boldness, whereas octopamine may increase shyness. We tested 30 animals for behavioral syndrome by measuring the time to right themselves after being placed on their backs and emerge from housing to explore a novel odor. Bold animals right themselves more quickly and take more time to emerge from the housing (Lodge et al date, Conley & Baird 2011). Our results confirm this finding and show that after serotonin, animals tend to decrease righting time whereas after octopamine, animals tend to increase righting time. Emergence time was variable, however nearly all animals did not emerge from the housing following both serotonin and octopamine injections. We compare our results to saline-injected control animals. Social behaviors monitored before and after serotonin injection indicate that animals had more fights with head-butting and tail-wagging after the injections. This suggests that bold animals possess elevated serotonin and shy animals possess elevated octopamine and that these biogenic amines modulate behavior.

NICHOLAS ZIMMERMAN and KEVIN DALY, Dept. of Biology, West Virginia University, WV 26506, AMANDA KULICK, Dept. of Forensics and Investigative Sciences, West Virginia University, WV 26506, and RYAN WILLIAMS, Dept. of Basic Pharmaceutical Sciences, West Virginia University, WV 26506, and LETHA SOOTER, WVNano Initiative, Dept. of Basic Pharmaceutical Sciences, West Virginia University, WV 26506. **Selections of odor-binding Molecular Recognition Elements using CE-SELEX.**

Molecular recognition elements (MRE's) are short strands of ssDNA that bind to a target molecule with high affinity. Such properties make them ideal for identifying a desired target molecule. MRE's have been isolated for a variety of molecules in the past, but selection for odor molecules is relatively new. Cadaverine, the target of this study, is a by-product of decaying tissues, and is noted for its pungent smell. The goal of the study is to isolate MRE's that bind to cadaverine, and use them in the production of an odor-sensing device, or eNose. A cadaverine sensing device would be an invaluable tool to law enforcement when searching for missing bodies. Successful completion of this study would allow for future work on a biosensor capable of detecting a wide array of odors.

Selection of the MRE's is accomplished by positive *in vitro* selections. A library containing ~$1x10^{14}$ random strands of ssDNA is narrowed down to 10-15 strands that bind to the target molecule with high affinity and specificity. Capillary Electrophoresis (CE) is the method used for separations, and utilizes high voltage to separate a mixture that is injected onto a capillary; molecules are separated due to their differences in size and charge. Prior to selections, the target and DNA are allowed to incubate. Precise selections can be made because target-bound strands migrate through the capillary at a slower rate than unbound strands. The molecules are identified by their UV absorbance as they pass by a detection window in the capillary. The bound strands are amplified using PCR, and tested for purity by gel electrophoresis. After agarose gel purification, the DNA is separated into single strands, and used in the next round of selection. MRE's isolated after 4-6 rounds of selection will be sequenced and assayed for binding activity. Two rounds of positive selections have been completed. Research Sponsor: NSF and NIH.

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