the NEURON

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Dr. Brian J. Anderson
West Virginia University

BRIAN J. ANDERSON

West Virginia native sets the world of energy research abuzz

Brian Anderson says that West Virginia University (WVU) is an unearthed gem in the world of energy research – and he has good authority to make that statement. The WVU assistant/associate professor was nominated last year by the United States Department of Energy (DOE) for the Presidential Early Career Award for Scientists and Engineers (PECASE). As reported in last quarter's *The Neuron*, Anderson was selected for the prestigious award - which is the highest honor bestowed by the U.S. government upon science and engineering professionals in the early stages of their independent research careers.

So what brought 35-year-old Anderson – a guy who grew up in Ripley, West Virginia - to this point in his relatively young career?

To start, Anderson had no shortage of role models in his formative years. His face lights up when he talks about two high school teachers who encouraged him in science and shaped his future: Ripley High School chemistry teacher Frank Hughes and biology teacher Barbara Heckert (who was also his quiz bowl coach). Also, his mother was an elementary school teacher and principal. Beyond the classroom, his father works on the chemical side of the oil and gas industry and involved Anderson in chemical experiments early in life.

After high school Anderson studied at WVU, receiving his Bachelor's Degree in chemical engineering. He went on to earn his Master's and Doctoral Degrees from Massachusetts Institute of Technology (MIT) in 2004 and 2005 respectively. Then, through a perfectly-timed series of events, Anderson returned to his undergraduate alma mater to teach and pursue his research interests.

At WVU, his career hit the ground running. While it is an extraordinary honor, the PECASE wasn't his first national recognition. He received the 2011 DOE Secretary's Honor Award for his work in response to the Deepwater Horizon oil spill and was selected to the National Academy of Engineering's 2010 Frontiers of Engineering Education Workshop. At home at WVU, Anderson was named the Statler College of Engineering and Mineral Resources Teacher of the Year in 2010.

To dig a little deeper, Anderson's research is well-timed for the state of West Virginia, the country and the world. The thrust of his work is in the areas of natural gas hydrates, thermodynamic modeling and sustainable energy and development in the area of geothermal systems.

Pictured right is a sample of ground Marcellus Shale prepared for optical surface analysis in Anderson's lab.

The Brian Anderson file:

B.S., Chemical Engineering, West Virginia University, 2000

M.S., Chemical Engineering Practice, Massachusetts Institute of Technology (MIT), 2004

Ph.D., Chemical Engineering, MIT, 2005

Assistant/Associate Professor, WVU, 2006-present

Photography by John Sibold

about the division of science and research

The Neuron is produced by the WV Higher Education Policy Commission's Division of Science and Research. The Division coordinates federal and state scientific research grants, including WVEPSCoR, to academic institutions in West Virginia and conducts outreach activities to broaden the public's understanding of science, technology, engineering and mathematics (STEM). Visit **www.wvresearch.org** for more information.
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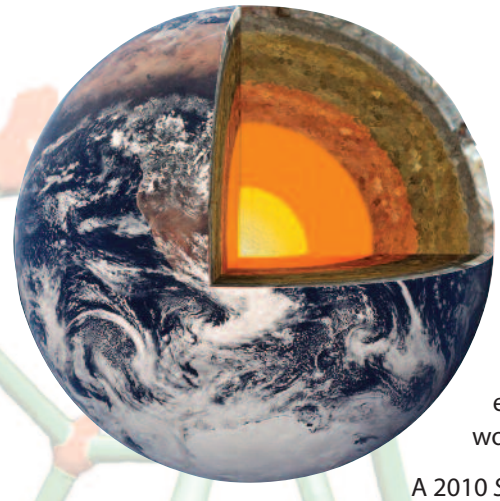


When asked to sum up his ambition Anderson said, "My ultimate goal is to find more viable indigenous energy sources. I want to leave a mark and show the world how great our state is."

A 2010 *Science* magazine article, titled "West Virginia is a Geothermal Hot Spot," reported a discovery that the state sits atop several hot patches of Earth - some as warm as 200˚C and as shallow as 5 kilometers. The magazine writer concluded that if engineers would be able to tap the heat, then West Virginia could become a producer of green energy for the entire region.

Anderson and his team at WVU are working on just that. They intend to find the most feasible ways to harness these hot spots. One approach they are working through involves directing CO2 into the ground through rock to bring the heat up – rather than using water. He said that even relatively low geothermal temperatures, such as those which are found in West Virginia, could be used to produce electricity in the future.

Anderson recently even addressed the U.S. House of Representatives and Senate on the topic of geothermal energy, as part of a National Science Foundation, American Association for the Advancement of Science and U.S. Geological Survey Briefing Series.

Anderson also is the Coordinator of Strategic Energy Research in the WVU Office of Research and Economic Development - a role he's proud to play.

"I enjoy collaborating with people around the world about energy research. It's exciting to be able to build big teams of people from many different countries," Anderson said.

Speaking of collaboration, in addition to his own research and teaching responsibilities at WVU, Anderson was part of an 18-member international panel that produced an MIT-led study with the goal of providing an independent and comprehensive evaluation of an Enhanced/Engineered Geothermal Systems (EGS) as a major U.S. primary energy supplier. The group's other goal was to provide a framework for informing policy makers of what research and development support and policies are needed for EGS to have a major impact.

To learn more about Anderson's research, including a link to a short video from TEDx Pittsburgh where he explains it himself, visit **www.wvresearch.org**.

Kay Goodwin, Cabinet Secretary for the West Virginia Department of Education and the Arts, said, "The high school teachers who Brian credits with fueling his love of science should be pretty proud right now. His current contributions to the field are world-renowned - and his future is bright beyond measure."

Matthew Tacker, Graduate Student and Terry Ryan, Research Associate with Anderson

Marshall University and West Virginia State University partner in **clean water initiative**

Marshall University and West Virginia State University (WVSU) have partnered with the Charleston Area Alliance and others to create a center of innovation for water cleanliness and sustainability at the West Virginia Regional Technology Park in South Charleston.

The mission of the new West Virginia Water Sustainability Institute will be to develop and commercialize innovative technologies to maintain, improve and protect water supplies throughout the state.

Dr. John Maher, Marshall's vice president for research, said the university is pleased to join the effort.

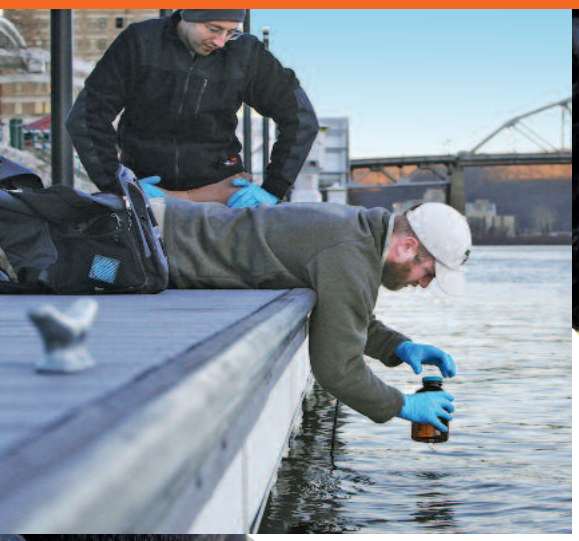
"The ultimate goal of the West Virginia Water Sustainability Institute is to harness the research assets of all the partners to make our water supply cleaner and safer, and to help industry innovate and create technologies that will support high-value jobs and investments right here in West Virginia," he said.

Maher said formation of the center is still in its early stages but that the institute will support the following types of research:

- Commercializing technologies that reduce hazards to freshwater sources.
- Commercializing technologies for rapid identification of water contamination.
- Developing custom solutions to water quality and quantity issues.
- Testing and evaluating technologies that maintain the integrity of the entire water distribution system.
- Providing independent assessments and reviews of potential hazards, technologies, contingency plans and related water quality issues.

In addition to Marshall, WVSU and the Charleston Area Alliance, the partners in the initiative include the Charleston Regional Chamber of Commerce, the Chemical Alliance Zone, the West Virginia Regional Technology Park and the Mid-Atlantic Technology, Research & Innovation Center (MATRIC).

WVU receives NSF grant to **study chemical leak's impact** in **Charleston area**



When a chemical spill contaminated the water supply for thousands of West Virginians in January, an interdisciplinary team of researchers at West Virginia University quickly sought – and received – a National Science Foundation (NSF) RAPID grant to collect and analyze samples.

The grant "will help our faculty to develop more comprehensive, interdisciplinary and innovative research approaches that could, for example, lead to cost-effective, remote and largely autonomous cyber physical systems monitoring of infrastructures that protect our water supplies from such chemical contamination," said Pradeep Fulay, the associate dean for research in the Benjamin M. Statler College of Engineering and Mineral Resources.

The $50,000 grant comes from the NSF's Chemical, Bioengineering, Environmental and Transport Systems Division's Environmental Engineering program.

"This is one of the largest human-made environmental disasters in this century. In instances such as this, where the situation is still developing and public health is involved, timing is everything," said the NSF Program Director William Cooper. "RAPID grants give researchers the support they need to be on the ground and to collect data immediately."

D&E senior Jay Adams, right, weighs Elkins runner Joe Biola, as part the wellness research study the college is conducting. The first set of results was recently published in The Journal of Exercise Physiology Online.

Davis & Elkins College researching **impact of exercise on wellness**

While most people are familiar with BMI and blood pressure levels, glutathione (GSH) may not be on everyone's wellness radar — but researchers at Davis & Elkins College (D&E) contend that it should be. The simple molecule has been nicknamed "the mother of all anti-oxidants."

Last year, 24 Davis area volunteers ran, swam, walked and worked out aerobically in order to participate in a study investigating the relationship between exercise and the Body Mass Index (BMI), cardiovascular health and glutathione levels.

The D&E research team, comprised of lead investigators Shawn Stover, professor of biology, and Carl Bolyard, a Davis Medical Center emergency department nurse, as well as students Carissa Dunn and Jeffrey "Jay" Adams, recently published a paper with their results in The Journal of Exercise Physiology Online, but they certainly aren't finished with the project.

"This is just the tip of the iceberg," Bolyard suggests.

Soon another set of volunteers will join the study and the team is hoping for an increased number of participants.

For the study, volunteers are asked to keep track of their exercise, eating and sleeping habits for a three-month period and go to campus monthly to be weighed and monitored. The most unusual part of this monthly visit is donating a saliva sample that provides information on GSH levels.

Stover has published three studies over the last 10 years analyzing the effect of exercise on GSH levels in mice and was pleased to work with Bolyard, both a D&E graduate and fellow runner.

"After doing studies utilizing mice, it was time to see if we could get similar results in humans," Stover says. "Because Carl is an avid local runner, he was a big help in recruiting volunteers."

For Bolyard it was a perfect way to combine his passion of running with research.

The saliva that is collected from volunteers, once processed with a centrifuge, is analyzed for its GSH concentration. Then the researchers investigate whether exercise and healthy lifestyles impact those levels. Basically, the higher the GSH level, the more the immune system is benefitted. The research is focused on determining whether living healthier by watching what you eat, exercising and getting enough sleep will help.

Stover said, "Not many undergraduates have the opportunity to publish in a peer-reviewed scientific journal. This type of experience will make our students very competitive for admission to medical, veterinary and graduate schools."

In the published paper, "Effects of Training Rigor on BMI, Cardiovascular Function, and Salivary Concentration of Glutathione", the authors concluded that long-term aerobic training reduces BMI and blood pressure. At the same time, GSH levels increase in response to aerobic activity.

WVSOM's current Project Seed participant

Project Seed takes root at WVSOM

In 1968, the American Chemical Society (ACS) established "Project SEED" to attract economically-disadvantaged high school students to science professions. More than 45 years later, this initiative has taken root at the West Virginia School of Osteopathic Medicine (WVSOM) where the program is entering its sixth year.

Dr. Kristie Bridges, associate professor in the department of biomedical sciences, has been the WVSOM program coordinator since its inception.

"Project Seed provides an opportunity for qualified students interested in science careers to conduct eight-to-ten weeks of hands-on chemistry research under a scientist's supervision," Bridges said.

In addition to exposure to chemistry research in a laboratory setting, participating students receive career counseling from their research supervisors, along with exposure to educational opportunities at the collegiate level. On occasion, Bridges has taken her Project SEED students to area universities for exploratory visits and interviews. Participating students have also presented their results at WVSOM's student research showcase and, on one occasion, at the ACS national meeting in Washington, D.C.

With the Project SEED program, inquisitive studentsare given the opportunity to experience the laboratory environment first-hand, opening their eyes to new educational, career and life possibilities.

For summer 2014, Dr. Joyce Morris-Wiman, will be the faculty mentor for WVSOM's Project Seed participants. Morris-Wiman's project is titled, "Aging-Associated Changes in Glial Distribution and Protein Expression."

An evaluation of the first 25 years of Project SEED found that 70 percent of SEED "graduates" went on to major in science at the undergraduate level and credited their experience in Project SEED as a factor in their decision. Seven percent of these students have earned Ph.D. degrees, 13 percent have earned M.S. degrees, 63 percent have earned B.S. degrees, with nine percent earning other degrees.

Cecilia Hernandez is Assistant Director of Endowed Programs (Education Division) at the ACS.

"Whether or not they choose scientific careers, Project SEED students are part of the fabric of a community that is more scientifically literate," Hernandez observed. "In addition, these students have attained educational levels not previously predicted based on their economic demographic."

Bridges has also evaluated the students who pass through WVSOM's Project SEED program. She shares her insight regarding the characteristics she believes contribute to success in the program.

"The students who do best as Project Seed participants have a solid work ethic," she explained, "but they also need persistence. Failure is a critical component of experimentation. Since most experiments fail multiple times before they ever achieve success, it helps if students are not easily frustrated. Of course, it also helps if they're passionate about the subject."

It is clear the qualities that bode well for scientific success also bode well for success in life. And with the Project SEED program, inquisitive students are given the opportunity to experience the laboratory environment first-hand, opening their eyes to new educational, career – and life – possibilities.

project SEED

Brain Expo returns to Marshall University

More than 630 elementary school children from around the tri-state region visited Marshall University's Memorial Student Center at the end of February to participate in activities designed to help them learn about the brain and nervous system.

The sixth Brain Expo at Marshall featured more than 25 interactive stations for children to explore how the various parts of their nervous system are responsible for how their bodies function. They also learned how healthy lifestyle choices lead to better brain health.

Activities included testing their reflexes, playing memory games, coloring their own "brain hats" and building brain cell-shaped key chains.

More than 200 Marshall students and faculty from the university's College of Science and Psychology Department, as well as the Department of Neuroscience at the Joan C. Edwards School of Medicine, helped oversee the activities. The St. Mary's Medical Center also was on hand with a station about brain and spinal cord safety.

The Brain Expo at Marshall was founded by Dr. Nadja Spitzer and Dr. Brian Antonsen, both of whom are neuroscientists and assistant professors in the university's Department of Biological Sciences.

"Events like the Brain Expo are an excellent way to increase public awareness of brain research at Marshall and gain the interest of students who may choose a career path in science, technology, engineering or mathematics," said Spitzer, who is the program director. "Our goal is to interest children in science and research at a young age by using games and activities that demonstrate the relevance of neuroscience in everyday life."

Spitzer said anyone interested in next year's program can send an e-mail to brainawareness@marshall.edu.

The Brain Expo is supported by the National Science Foundation (Cooperative Agreement Award number EPS-1003907), Marshall's College of Science, Department of Biological Sciences, Cell Differentiation and Development Center and the Joan C. Edwards School of Medicine's Biomedical Sciences Graduate Program.

WVU researcher's **groundbreaking findings on climate** and **Genghis Khan's empire** appear in National Academy publication

Hessl holding a cross-section of wood from a preserved log.
Photo: Kevin Krajick, Lamont-Doherty Earth Observatory Columbia University

A new report co-authored by a West Virginia University (WVU) researcher confirms that the weather was on Genghis Khan's side as he expanded his empire and that current drought conditions in Mongolia could have serious consequences.

Amy Hessl, professor of geography at WVU, is one of the authors of "Pluvials, Droughts, the Mongol Empire, and Modern Mongolia," which will appear in the latest issue of the Proceedings of the National Academy of Sciences.

This groundbreaking research appeared in The Guardian, The Economist, Scientific American, Science and National Geographic outlets after it was first announced. This paper is the first official academic record of the research that shows astonishing and, until now, counter-intuitive data on a 1,112-year period at the site of the world's largest contiguous land empire.

The magnitude of the finding hinges on the team's discovery of wood that provides an extensive climate record of the period through tree rings. The tree rings' tale of ebbs and flows in water availability show that Genghis Khan took power during a severe drought, but that the rapid expansion of his empire coincided with the wettest period for the region during the last millennium.

Though political realities would have also played into Genghis Khan's power grab, the regional climate at the time supports the empire's expansion, according to the findings. The climate provided literal horsepower as his armies and their horses fed off the fertile land.

"Such a strong and unified center [under Genghis Khan] would have required a concentration of resources that only higher productivity could have sustained in a land in which extensive pastoral production does not normally provide surplus resources," the report states.

While the ramifications for history are significant, so are those for today. The report's authors put forward that human-caused warming has "exacerbated" the drought in central Mongolia, similar to a drought event that coincided with Genghis Khan's rise to power.

"If future warming overwhelms increased precipitation, episodic 'heat droughts' and their social, economic, and political consequences will likely become more common in Mongolia and Inner Asia," according to the report.

Freshman engineering program welc

In order to provide another level of support to freshman engineering students, West Virginia University's Statler College of Engineering and Mineral Resources is seeking help from a furry friend.

Marlon Brando is a five-year-old Australian Labradoodle. Born in Australia, he moved to North Carolina as a puppy and is now a member of the "staff" in the College's Engineering Learning Center (ELC).

Michelle Poland, a freshman engineering adviser, spearheaded the effort to bring Brando to the College and has completed training to be his handler. The idea for a therapy dog first popped into her head when a coworker brought her dogs to the ELC last fall.

"A bunch of people looked up and were smiling. And I thought, 'Hmm, that's interesting.' So I started looking around to see how we could make this happen," recounted Poland.

Research has shown that human-animal interaction can benefit one's overall mental and physical health, reduce stress factors and improve one's overall mood. WVU is among other top universities

that use therapy
California-Berkle

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"There's more to
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academically."

West Virginia Wesleyan seeing **increased interest** in **physics** and **engineering**

The physics and engineering labs at West Virginia Wesleyan College are booming. There are currently 97 students majoring in either Physics or the Dual-Degree Engineering program, which is an increase from 82 majors just last year. Dr. G. Albert Popson, Jr., department chair and professor of physics and engineering, believes the strong program incentives are attracting so many students to the program.

"Our NASA affiliation attracts quite a few students to our program," said Popson. "Other students are attracted by the Dual-Degree Engineering Program articulation agreements we have with WVU, UVA and Virginia Tech."

Wesleyan's affiliation with NASA helps both the faculty and students. This year, 11 physics students had NASA Fellowships, which provided funding for research with Wesleyan faculty. Last summer, six physics students benefited from NASA funding for research. Overall, faculty members benefit from NASA funding for research, new educational initiatives and community outreach.

"We had ten students who we paid to work on research projects at the college last summer, as well as at NASA-Langely, NASA-Glenn and Penn State," remarked Popson. "A group of students is involved in a special NASA space systems course, and they plan to launch their apparatus into Earth orbit in about six months."

The Dual-Degree Engineering program is designed for students who want to prepare for careers in engineering by starting their studies at a small college rather than a large university. After three years at Wesleyan, the student transfers to one of the articulation universities. After about two years at the university, the student earns both a physics degree from Wesleyan and the university's engineering degree.

omes **therapy dog**

dogs, like Emory University, the University of
y and Columbia University to name a few.

first therapy dog at WVU. WVU's Carruth Center
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nonprofit service dog training center in
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y dog to the College of Engineering and was
at the organization wanted to donate Brando.

goal is to make the ELC a place to provide
students in all aspects of their lives, not just

being successful than just tutoring students.
their needs," said Poland." If a student is
esick, they aren't going to be successful

"With a haptic device matched to educational software, students can interact with three dimensional objects that are displayed on a computer screen. They can feel shapes and textures of a plant cell. Or experience the difference in how much objects weigh on other planets, explore a volcano and feel the lava flow and more."

Dr. Marjorie Darrah

WV Success Story: eTouchSciences

Fifteen years ago, Dr. Marjorie Darrah began working on ways to make it more exciting for students to learn science and math. By using the technology of haptics to add the sense of touch to math and science lessons, she reasoned that student learning would not only be more productive, but also more fun.

"With a haptic device matched to educational software, students can interact with three dimensional objects that are displayed on a computer screen. They can feel shapes and textures of a plant cell, for example. Or experience the difference in how much objects weigh on other planets, explore a volcano and feel the lava flow and more," Darrah, Associate Professor of Mathematics at West Virginia University, explains.

Darrah found a willing industry partner in Information Research Corporation (IRC), headquartered in Bridgeport. With IRC's assistance and partnership, she secured funding from the highly competitive Small Business Innovation Research (SBIR) award program through the U.S. Department of Education.

"I couldn't have launched eTouchSciences without support from Bob Wentz and Brad DeRoos of IRC," Darrah said. "Their knowledge in the areas of business planning, marketing and software development were instrumental in forming the enterprise."

"Darrah's vision to make learning math and science more successful and fun was inspiring, and IRC was pleased to work with her on an SBIR proposal in which software would be developed to help students with visual impairments learn science and math more effectively," Wentz said.

Twenty software lessons have been developed which are now commercially available. The novel aspect of these science and math lessons – which are \targeted toward middle-school students – is that objects on the computer screen can be touched using a haptic (tactile feedback) gaming controller.

"I like to say that I took a gaming controller used most often in violent video games and redeemed it for educational purposes," Darrah says.

When Darrah began this work, the cost of the device needed to run the software she was developing was about $40,000. Over the years, as technology and manufacturing have improved, the device became much more affordable—around $200—making it accessible for schools.

The case of eTouchSciences could be used as a model for how academicians can successfully pursue entrepreneurial endeavors. While the WVU associate professor brought her educational skills, subject matter expertise and technical know-how to the startup, her effective partnership with an industry collaborator helped provide the technical, business and marketing skills needed to launch a new enterprise.

eTouch Sciences was awarded the TechConnect Spirit of Innovation Award for "StartUp Innovation of the Year," has made significant market headway and has gained national attention during just the last 12 months.

For more information, visit www.etouchsciences.com.

WVSU professors **published** in **four leading scientific journals**

Two West Virginia State University (WVSU) professors, Drs. Umesh Reddy and Padma Nimmakayala, jointly published three articles about their pepper and watermelon genomic research in the leading scientific journals PLOS ONE, Molecular Genetics and Genomics and Molecular Breeding.

Reddy also published an article about his research with the sorghum genotype in the Environmental and Experimental Botany Journal.

"This research will greatly impact public and private vegetable breeding endeavors to develop high yielding and value added vegetable varieties," said Reddy. "The pepper genomic research Dr. Nimmakayala and I conducted brought new answers to the questions of how genes in peppers make them either very hot, moderate or sweet, and what genes alter the size of the pepper fruit."

The pair has also started researching why watermelons grown in the United States are more susceptible to a variety of diseases, Reddy added.

In addition to his pepper and watermelon research, Reddy also studies the genus of grasses *Sorghum*. His published article examines the physiological differences among *Sorghum* genotypes under high temperature stress and how that impacts grain yield. This research is to understand how climate change would impact plant growth.

Reddy is a professor of biology at WVSU. Nimmakayala is an associate research professor.

Pepper research was conducted in collaboration with professor Doil Choi of Seoul National University, South Korea. Watermelon research was conducted in collaboration with Drs. Todd Wehner of North Carolina State University and Amnon Levi of the United States National Vegetable Research Laboratory located at the USDA Agricultural Research Station in Charleston, South Carolina.

Aldo Almeida, Lakshmi Abburi and Lavanya Abburi are graduate students who participated in the published research, along with research associates Robert Cantrell and Gopinath Vajja.

> "This research will greatly impact the public and private vegetable breeding endeavors to develop high yielding and value added vegetable varieties."
>
> Dr. Umesh Reddy

WVU **researchers** participate in **methane quantification campaign**

As shale gas drilling continues to expand across the United States, the study of its utilization and the potential climate implications associated with methane leaks and losses has ramped up across the country. Researchers from West Virginia University's Center for Alternative Fuels, Engines and Emissions (CAFEE) are teaming with the Environmental Defense Fund to conduct comprehensive methane leak and loss audits at five sites in the Barnett Shale near Fort Worth, Texas.

The two teams from WVU, who did much of their work last October, were led by Derek Johnson, principal investigator and research assistant professor in WVU's Mechanical and Aerospace Engineering Department.

"The responsible use of shale gas is a research focus for WVU," Johnson added. "This type of research can help to better understand the methane loss associated with the growing natural sector, which includes natural gas used for power generation and as a transportation fuel."

The audits are based on a measurement campaign conducted in the active shale producing basin in Texas. These sites included pipeline compressor stations and injection well sites. These measurements will help to compare bottom-up and top-down methods for regional methane loss quantification.

A combination of teams from top industry and academic research institutions from around the country worked in tandem to collect methane emissions data across using ground-based, vehicle and aircraft measurement tools.

WVSU announces **new faculty research grants program**

West Virginia State University (WVSU) has launched a new program, Promoting Excellence in Education through Research (PEER), to support faculty research during upcoming semesters. The first PEER grants have been selected and will be awarded this summer to faculty-led projects that advance the university's research capacity.

"West Virginia State University provides affordable, quality education thanks to ouroutstanding faculty and their commitment to be at their best," said WVSU President Brian O. Hemphill, who first announced the project at his State of the University address last fall. "Through PEER we offer additional support to our faculty, while advancing research campus-wide."

PEER supports faculty research by providing financial assistance and release time to encourage and foster the advancement of research and scholarly work, and to leverage these resources in order to attract funding to promote and support the enrichment of academia and student learning at WVSU.

Up to 10 grants will be awarded to faculty during the fall and spring semesters, as well as five summer research grants, each with a maximum value of $5,000.

PEER is administered by the WVSU Research and Development Corporation, with support from U.S. Department of Education Title III funds, as well as state and WVSU Foundation funds and private dollars.

CART at Bluefield State presents **prototype projects** at ITC gathering

The Center for Applied Research and Technology (CART) at Bluefield State College showed off a few prototype products that it developed for RSL Fiber Systems (RSL) for members of the Innovation Transfer Consortium (ITC) at the group's February meeting at Alderson Broaddus University.

CART marketing director Deborah Griffith demonstrated two of RSL's fiber optic-illuminated personal safety products designed for use in underground mining. She also described the development process behind several other CART prototypes, detailing how technology provided cost-effective solutions to long-standing problems in areas as diverse as robotic vehicles and methane sensing.

Established in 1998, CART is a private, not-for-profit organization that provides leadership in applied engineering research and development and conducts focused product development and rapid prototyping.

ITC was created by TechConnectWV with support from the Claude Worthington Benedum Foundation, the Higher Education Policy Commission, West Virginia University and Marshall University as a new way for researchers at West Virginia's primarily undergraduate public and private institutions of higher education to evolve research into products, industries and jobs through partnerships with the private sector.

Anthropologist using **3-D printing technology** for **research** and **teaching**

As a biological anthropologist and assistant biology professor at Marshall University, Dr. Paul Constantino studies human evolution. His research focuses on how the skull and teeth have developed and how diet has influenced that development.

Ironic perhaps, is that someone studying and teaching about humans who lived tens of thousands of years ago is using one of today's hottest technologies in his lab and classroom. He recently bought a state-of-the-art 3-D printer to give students in his human anatomy courses hands-on access to replicas of specimens they are studying.

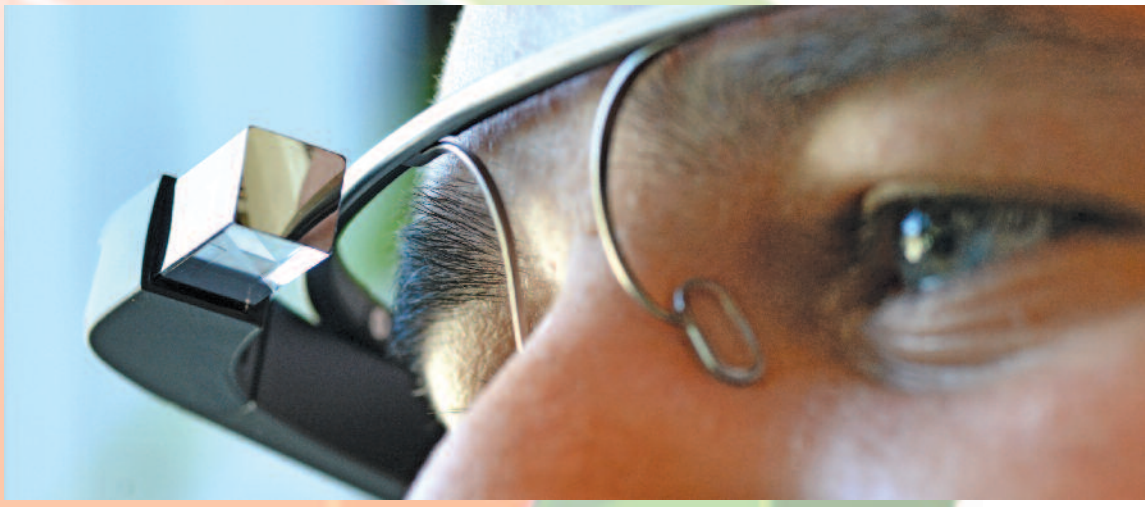
He said, "We purchased the printer so we could make reproductions of specimens at the size we need to inspect them. For example, some of the teeth we are examining are tiny, almost microscopic, so they are very difficult to see. Now we can print a model of that tooth that's large enough to handle and shows all the detail, right down to the ridges and grooves on the surface of the actual specimen."

Or, he adds, perhaps the actual specimen they want to see is one-of-a-kind and in a collection on the other side of the world. All Constantino's team needs is a 3-D data file of the object and they are able to print a realistic model they can hold in their hands in Huntington.

Constantino is working to get the word out that access to the equipment is available to other Marshall departments.

"We want to make sure this valuable tool is used as much as possible. The equipment has to be run regularly to keep it in working order, so we are making it available to the university community," he said. "We can provide scaled-up versions of whatever faculty and students might be studying—molecules or microbes, for instance."

Prompted by a research barrier, **Marshall student creates Google Glass app**



Marshall University computer science/information technology student Dylan Watson was selected as one of the first 8,000 Google Glass Explorers after entering (and winning) a contest about what he'd do if he had Glass. He got the idea for his entry after a real-life stumbling block.

While working on a research project about autonomous vehicles at the University of Arizona, Watson was collaborating with a partner who is a Spanish-speaking Puerto Rican native. While his partner knew a little bit of English, the two often were forced to communicate by drawing pictures.

Watson said, "I thought to myself: there has to be a better way of doing this."

This barrier motivated Watson to create a Google Glass application (app) called, "Wearable Integrated Translator to Break Down communication Barriers" – or WIT.

Using the WIT app, users create a "chat room" that other Glass users can join. A user can instruct the device to start listening for translation using the phrase "Ok Glass, start translating." Glass immediately sends the words that the user is saying to Watson's application server, where it identifies the message as well as the languages that the other members of the chat room speak. Then, the user's original message is sent to the other chat room members' devices where the message is displayed on their screen or played in their native language using the Glass ear piece. Fundamentally, if someone uses Watson's Glass app, creates a chat room with international colleagues and says "hello," some people may hear "hola" while others hear "bonjour."

Watson said, "With easier communication, the doors for more inter-global collaboration will be open."

The Google Glass Explorer Program was designed by Google for people who wanted to get involved in the Google Glass technology early and help shape its future.

Photos: Watson demonstrates his WIT app using the Google Glass.

"I thought to myself: there has to be a better way of doing this."

Dylan Watson

Commentary

ChemCeption — Another Link in the Research Chain

Kevin DiGregorio, Executive Director, Chemical Alliance Zone

I often find myself in the middle of a discussion between those who believe we need to funnel most of our research in West Virginia toward industrial uses and those who adhere to a more traditional view of academic research. It's an argument that has become more prevalent over the last few decades, especially as industry has downsized its R&D efforts and relied more on academic pursuits.

And where am I in that argument? Squarely in the middle.

If I'm talking with someone who thinks our universities and colleges need to do nothing but applied research for business and industry, I argue instead that basic research has an essential purpose, contributing to fundamental understanding of science and technology.

However, if I'm discussing the issue with someone who believes we should concentrate only on academic research, I argue that applied research has a significant place, providing assistance to industry, economic benefit to our citizens and real-world experience for researchers and students.

In the end, we need to focus more of our research dollars on problems directly applicable to business, and we need more of our research focused on innovation, leading to new products, technologies and even start-up companies.

That is, we need more — many more — researchers who are also entrepreneurs. But those entrepreneurial researchers also need help to get their technologies to market. That's where ChemCeption comes in.

ChemCeption is a new incubator just launched by the Chemical Alliance Zone (CAZ). Located at the West Virginia Regional Technology Park (WVRTP), ChemCeption is the only incubator in the nation focused solely on commercializing chemistry-based technology. It is an innovation hub for researchers, entrepreneurs, start-ups and small companies wanting to market innovative technologies or products involving chemistry, from traditional to green, water to plastics and biotechnology to energy.

ChemCeption includes three start-up companies from West Virginia, a larger anchor tenant and an affiliate member that is a start-up headquartered in Florida. The inclusion of an affiliate member demonstrates the uniqueness of ChemCeption — a combination of both rare commercialization facilities at the WVRTP and exceptional commercialization expertise with one of CAZ's strategic partners, the Mid-Atlantic Technology, Research & Innovation Center (MATRIC). In fact, MATRIC will provide technical expertise and support to ChemCeption members while two other partners, INNOVA Commercialization Group and the WV Small Business Development Center, will provide comprehensive entrepreneurial, start-up and business services.

ChemCeption provides a key link in the research chain. Contrary to what many believe, it is important and necessary to conduct "research for research's sake." But it is also important, and perhaps more so, to conduct research that solves real-world problems, sometimes leading to new products, technologies and companies.

The tagline for ChemCeption is simple — "Bringing Chemistry-Based Technologies to Market." But it is also profound. After all, don't we conduct research with the idea of benefitting society? If so, what better way than to commercialize new technologies, products and services that improve our way of life while also creating jobs, wealth and opportunities for our citizens?

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FROM THE DIRECTOR: The PECASE comes to West Virginia

This issue's featured researcher is the first-ever West Virginia recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE). Brian Anderson has received quite a bit of national attention over the last few months, and we knew he deserved to be featured in West Virginia's science and research journal as well. The PECASE embodies the high priority placed by the U.S. government on maintaining the leadership position of our country in science by producing outstanding scientists and engineers and nurturing their continued development. As you can imagine, Brian is among pretty elite company – fellow PECASE recipients this year include scientists from Princeton, Stanford and Harvard.

In addition to finding methods for developing indigenous energy sources, I believe Brian has discovered something else in his young career that we didn't include in the cover story. It's something that not every researcher fully grasps. While great science and discovery are at the heart of research, relationships are also very important.

Brian seems to naturally develop relationships. It is evidenced throughout his life – from the teachers in high school who fueled his love of science to MIT connections who invited him to collaborate on an international study. Most recently the U.S. Department of Energy, who nominated him for the PECASE, is sending him to the International Conference of Gas Hydrates in Beijing this summer. Usually three representatives are chosen for the conference, but because of budget restraints they're only sending one – and they prefer Brian. Opportunities like this don't just come knocking on everyone's door, though. They come when you've built and maintained relationships with people throughout your life.

Not only is Brian an associate professor at WVU, but he is also a Ripley, West Virginia, native and a WVU undergraduate alum - proving again that our homegrown students can and will do great things. They deserve continued support from the state and encouragement as they pursue their research interests at our colleges and universities.

Jan R. Taylor, Ph.D.
Director of Science and Research
West Virginia Higher Education Policy Commission

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