**Marshall University**
NSF grant awarded for Scanning Electron Microscope

**West Virginia University**
Model to predict greenhouse gases, carbon storage developed

**Alderson Broaddus University**
Student experiences biomedical research through WV-INBRE

# NEURON

**West Virginia's Journal of Science and Research**

***FALL 2018***

**West Virginia State University**

## David H. Huber

**Environmental microbiologist researches how stressors affect microorganisms that combat river pollution and improve water quality**


# PROPOSAL REVIEW SERVICE

***Available to all STEM faculty at West Virginia's colleges and universities***

Have your proposals reviewed by an external panel of experts prior to submission. Email your proposal, the solicitation to which you are responding, and any reviews of prior submissions to Dr. Jan R. Taylor, director of West Virginia Science & Research at the West Virginia Higher Education Policy Commission, at **jan.taylor@wvresearch.org**. All proposal materials must be sent at least three weeks before necessary revisions are needed for submission.


**FALL 2018**

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**ABOUT**

West Virginia Science & Research, a division of the West Virginia Higher Education Policy Commission, provides strategic leadership for the development of competitive academic research opportunities in science, technology, engineering and mathematics. The office directs the National Science Foundation's Established Program to Stimulate Competitive Research (EPSCoR) in West Virginia, coordinates scientific research grants to academic institutions from federal and state agencies, and conducts outreach activities to broaden the public's understanding of science.


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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.


*Photo courtesy of David H. Huber*

***Huber environmental microbiology lab collecting sediment cores from the Kanawha River***

## INSIDE THIS ISSUE

# News briefings

### Davis & Elkins College professor and Elkins residents published in Journal of Exercise Physiology

A six-month case study conducted by Davis & Elkins College Professor of Biology Dr. Shawn Stover and Elkins residents Scott Stephenson and Carl Bolyard was published in the October issue of the Journal of Exercise Physiology online. Titled "Effects of Increased Caloric Intake on Resting Metabolic Rate and Respiratory Quotient during a Ketogenic Diet," the study was supported by an NIH grant awarded to the West Virginia IDeA Network of Biomedical Research Excellence. The study explored the metabolic effects of a ketogenic diet – one that is high in fat and low in carbohydrates.

### West Virginia State University receives INSIGHT Into Diversity Magazine's 2018 Inspiring Programs in STEM Award

West Virginia State University (WVSU) received the 2018 Inspiring Programs in STEM Award from INSIGHT Into Diversity magazine, the largest and oldest diversity and inclusion publication in higher education. The Inspiring Programs in STEM Award honors colleges and universities that encourage and assist students from underrepresented groups to enter the fields of science, technology, engineering and mathematics (STEM). "Developing a highly diverse workforce is vital to meet the needs of tomorrow's society," said Dr. Micheal Fultz, a WVSU chemistry professor and faculty advisor for the University's American Chemical Society chapter. "We need people who can and will think outside the box of standard ideas to solve challenges in research and the health professions."

### Steffen, students conduct research on painted turtles at Shepherd

Dr. John Steffen, assistant professor of biology at Shepherd University, is trying to determine what function the red, orange and yellow colors on the painted turtle serve. Steffen and two student researchers, biology majors Rhett Quigley of Martinsburg and Ian Whibley of Berkeley Springs, spent the summer collecting painted turtles from area ponds, bringing them to a lab at Shepherd where they were cared for and monitored, then released back to their original homes. Steffen, who is a behavioral ecologist and herpetologist, said the data collected will help determine what plants may help turtles in the wild and what nutrients should be included in foods for pet turtles. Quigley and Whibley worked with Steffen throughout the summer through the Shepherd Opportunities to Attract Research Students (SOARS) program. In 2017, West Virginia Science & Research at the West Virginia Higher Education Policy Commission awarded Shepherd a three-year, $142,000 grant to provide stipends for science and mathematics students spending the summer helping professors with research.

### Smith on team receiving $4.5 million from NSF

Dr. Jack Smith, a senior research staff member of Marshall University's Center for Environmental, Geotechnical and Applied Sciences, was part of a team that received a five-year, $4.5 million grant from the National Science Foundation to build GeoEDF, a "plug-and-play" platform to allow researchers to easily access and process geospatial data. Smith is also an employee of West Virginia Science & Research at the West Virginia Higher Education Policy Commission.

*Photos courtesy of West Virginia State University and West Virginia Science & Research*

# FROM THE DIRECTOR: Dr. Jan R. Taylor

## *Early exposure to research experiences can influence students' career aspirations for a lifetime*

**Taylor**

With each passing generation, the world changes. Former notions evolve and give way to new ideas. Much of this progression can be attributed to the scientific discoveries of researchers working diligently at academic institutions across both our country and the world. Yet, there are still many students who struggle to ever reach the summit of college graduation let alone seek the higher degrees necessary for many science, technology, engineering, and mathematics (STEM) careers.

According to a 2010 study from the West Virginia Higher Education Policy Commission, first-generation students reported being less prepared for college-level coursework, including earning lower grades in high school, scoring lower on the ACT, and taking fewer math courses. The study also highlights how 90 percent of non first-generation students planned to attend college while just over 73 percent of first-generation students said they would enroll.

There is no overnight solution to this problem, but one new program I am proud to be a part of is working to help. The First2Network was recently awarded approximately $7 million from the National Science Foundation INCLUDES initiative to continue supporting rural, first generation STEM students in West Virginia by providing early research experiences and support through STEM skills development, peer mentoring, and student advocacy. To learn more, see page 9 of this issue.

Aspiring researchers with a passion for discovery that want to solve problems should not be held back by barriers out of their control. It's up to those of us already in these positions to serve as a guiding light.

Jan R. Taylor
Director, West Virginia Science & Research and NSF EPSCoR Project Director
West Virginia Higher Education Policy Commission

The Science & Research Council was established by the West Virginia Legislature in 2009. The goal of the Science and Research Council is to increase the capacity of the state and its colleges and universities to attract, implement and use cutting-edge, competitive research funds and infrastructure. Members provide expertise and policy guidance regarding federal and state programs including EPSCoR, the Research Challenge Fund, and the former Research Trust Fund. Representatives of government, industry, business and academia make up the council.

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*Director,* West Virginia Science & Research and NSF EPSCoR Project

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*Vice Dean for Research and Graduate Education,* Joan C. Edwards School of Medicine at Marshall University

MICROBIOLOGY

# WVSU's Huber researches how stressors affect microorganisms that combat river pollution and improve water quality

*Written by* **Angela Sundstrom**
*Photos by* **Todd Griffith, West Virginia State University Photography**

Water is essential for civilization. In 2010, 30 percent of Americans lived directly on the coastline, according to the National Oceanic and Atmospheric Association. Inland population centers are often based along major rivers, like the Mississippi and Ohio. With population comes human environmental impact. Appalachian rivers in particular are studied less, especially when it comes to microbial ecology. One local researcher hopes his work will yield new data.

Dr. David H. Huber, professor of biology at West Virginia State University, is an environmental microbiologist studying microorganisms living throughout the Kanawha River watershed. One of his current projects is the Appalachian Freshwater Initiative, funded by the National Science Foundation's (NSF) Established Program to Stimulate Competitive Research (EPSCoR).

"Our focus right now is the sediment on the bottom," Huber said. "That's the least understood part of the river."

Huber and his team of students use DNA-based methods for accessing the microbial diversity of sediment. This large scale DNA sequencing is called genomics or metagenomics. The team collects sediment samples, grinds them up to extract DNA, and then conducts the sequencing revealing billions of DNA base pairs. This provides a sample of the microbe genes and allows a look at the microbial processes based on the genes present.

Flowing water is also monitored. Automated devices, knowns as sondes, continuously record variable measurements at three specific locations in the river. The variables include temperature, pH, nitrates, sulphates, and more. Combining these water results with the sediment outcomes provides a full picture of what the river is like.

"A river in Michigan is different from a river in West Virginia, which is different from a river in Florida so there's a regional uniqueness to it."

Heavy industrialization in the previous century left much of the Kanawha River polluted. Surface mining emptied minerals into the river and acid mine drainage threatened water supplies. Some sections were even anoxic, or without oxygen. More recently, in 2014, a chemical tank located along the Elk River, a Kanawha tributary, leaked 4-methylcyclohexane methanol, an alcohol with a licorice odor, hampering the entire region's water supply. Huber himself was not able to drink tap water for weeks.

Yet, rivers are resilient and much of this can be attributed to microbes.

"It has recovered a lot. I don't want a negative story. It's a positive story. The river is getting better and better all of the time and the microbes are a big part of the recovery. They are the master bioremediation agents, the master cleansers of polluted water environments."

Through his research, Huber wants to gain a better understanding of why rivers are so resilient. It is still unknown how fast they recover and whether there are further influences slowing down or speeding up the process. Learning more can keep a watershed healthy for all of its many uses.

"The microbes are doing the work, and we want to understand how they do it, what their limits to tolerating stress are, and how they help the river to be resilient. That should be an interest to industries and even the average person who cares about the quality of water coming out of their faucet."

A recently awarded U.S. Department of Agriculture National Institute of Food & Agriculture grant for $595,000 will allow Huber and his team to expand on the foundational river research made possible by the


*Huber collecting gas samples from river sediment microcosms to evaluate microbial degradation of organic pollutants*

*Photo: Todd Griffith for West Virginia State University*


*Above (top left, moving clockwise): ignition test of biogas composition from Kanawha River sediment with Huber (center), Vadesse Noundou (left), and Larissa Kemajou (right); collecting river sediment cores near Kanawha Falls with Ifeoma Ugwuanyi (left), Kemajou (middle), and Huber; Huber in his WVSU lab with a Noundou (seated), Kemajou (left) and Olushola Awoyemi (right); deploying a submerged multi-probe sonde in the Kanawha River near Charleston with Huber (left, facing down), Emmanuel Chavarria (laying down), Alejandro Ramirez-Garcia (middle), Ugwuanyi (standing); collecting river sediment samples near Kanawha Falls with Noundou (left), Kemajou (right) and Huber; the intrepid river team at the Kanawha Falls site (left to right) with Huber, Kemajou, Noundou, and Ugwuanyi*

NSF EPSCoR Appalachian Freshwater Initiative funding.

Huber first discovered his passion for biology while exploring the terrain of his native Michigan. Time spent outdoors with family peaked his scientific curiosities. Their house was even on a lake.

"Where you grow up has a lot to do with your interests as you become an adult," Huber said.

Mentors also factor into the likelihood of a student chasing scientific aspirations and Huber had two: his older brothers who both earned biology degrees when Huber was still in middle school.

"They had a big influence on me. You know, the little brother looks up to the older brothers. They encouraged me."

West Virginia's up-and-down economy has challenged funding for K-12 education, and there is a certified teacher deficit, especially in science. Huber hopes the next generation will not miss out.

"People like me, the science professors or scientists, don't seem to have a lot of public contact, and we could probably do more about that. Politicians are on television all of the time, but the scientists are not."

Huber will continue to do his part, introducing students to real-world problem solving in their own backyard. He is proud to have hosted graduate students from Cameroon, Nigeria, Zimbabwe, Nepal and Mexico and hopes to see even more local students, of all ages and education levels, seeking science degrees. However, as appreciative as he is of funding, Huber is a firm believer that more money will not solve every problem.

"You have to have people who really care about these things and then take initiative to do the outreach. People who do the work, the science teachers and the scientists, need to somehow have more of a public voice."

*Photos courtesy of West Virginia State University and David H. Huber*



FUNDING

# Collaborative project working to sustain rural, first-generation students receives federal funding

*Written by* **Angela Sundstrom**

A team of higher education professionals recently received federal funding for an initiative to support rural, first-generation students interested in completing a degree in a science, technology, engineering or mathematics (STEM) field.

First2 Network was awarded approximately $7 million from National Science Foundation (NSF) INCLUDES, a grant program designed to enhance U.S. leadership in STEM with a commitment to diversity, inclusion and broadening participation in these fields. First2Network develops and pilots activities for rural, first-generation students attending West Virginia colleges and universities.

The project has three objectives: Improving student preparation for college and the subsequent transition; replacing institutional practices that stifle development of STEM self-efficacy; and developing an ambassadors program that guides undergraduates though the disconnect between home life and STEM education.

West Virginia Science & Research (WVSR), a division of the West Virginia Higher Education Policy Commission, serves as the backbone for this project, with an NSF award of $1,645,998 to provide management, financial and communications support.

"We lose promising first-generation students during their freshman or sophomore years due to lack of mentorship, among other causes," said Dr. Jan Taylor, director of WVSR and one of five co-principal investigators on this project. "Working with all stakeholders, including students, to create a network of support will increase the number of first-generation college students graduating in STEM fields."

Co-principal investigators include: Taylor, Sue Ann Heatherly of Green Bank Observatory, Dr. Erica Harvey of Fairmont State University, Sarah Riley of the High Rocks Educational Corporation and Dr. Gay Stewart of West Virginia University.

**West Virginia students' expressed and measured STEM interests in 2017**

**59 percent** expressed an interest in STEM

**24 percent** both expressed an interest in STEM and had a measured ACT Interest Inventory score pointing to a STEM field

*The data used in this graphic represents all ACT-tested students in West Virginia's 2017 graduating class.*






*Photos courtesy of First2 Network Alliance*

# National Science Foundation grant awarded for Scanning Electron Microscope at Marshall

*Written by* **Jean Hardiman**

The National Science Foundation (NSF) has awarded nearly $400,000 to the departments of Chemistry, Geology, Engineering, Physics, Biological Sciences, and Forensic Science at Marshall University to purchase a Field Emission Scanning Electron Microscope (SEM).

The grant was awarded through the NSF's Major Research Instrumentation Program, established to help faculty members who need expensive research instrumentation acquire the equipment at little cost to their universities. Scanning electron microscopes allow scientists to look at surfaces and observe molecular structures at the nanometer scale.

Faculty at West Virginia State University (WVSU) and the University of Charleston (UC), as well as scientists at Alcon Laboratories and the SOGEFI Group, also participated in the grant. The team of 11 faculty members was led by Marshall Assistant Professor Dr. Rosalynn Quiñones (Chemistry) and Marshall Associate Professor Dr. Aley El-Shazly (Geology).

The microscope will make significant contributions to participating faculty members' research programs while also being used extensively in the teaching laboratories in geology, chemistry, physics, engineering, biological sciences, and forensic science at Marshall University and chemistry at WVSU and UC.

"The research that will be enabled by the [SEM] is meritorious and spans nanoscience, geology, materials engineering, biology, and petrology," the NSF noted. The foundation also stated, "The panel noted a strong commitment to education in the proposed outreach activities in research and training."

"It is clear that the NSF review panel recognized the multiple benefits that will be provided by the acquisition of this instrument at Marshall," said Dr. Charles Somerville, dean of Marshall's College of Science. "We have a 20-plus year record of maintaining a SEM facility for teaching, research, outreach and economic development. This review panel saw our students, faculty and community as a good investment."

Although primarily intended as a research instrument, instructors will use the new SEM in teaching laboratories that will have a direct impact on at least 150 students annually. According to Dr. Michael Castellani, director of the Marshall's Division of Physical Sciences, "The opportunity for so many undergraduate students across such a wide array of disciplines to use an instrument such as this in labs is unusual. Some of these students will start using the SEM in their sophomore years both in classes and research. The use of sophisticated instrumentation in teaching is one of the main tools for drawing students into research and hence improving their overall STEM education."

### PRINCIPAL AND CO-PRINCIPAL INVESTIGATORS

***Dr. Rosalynn Quiñones, Chemistry***
"Study of Perfluorophosphonic Acid Surface Modifications on Zinc Oxide Nanoparticles" and "Controlling Surface Properties of Metal Oxide Nanoparticles using Self-Assembled Monolayers and Polymer Brushes."

***Dr. Aley El-Shazly, Geology***
"Tectonometamorphic Evolution of the Western Blue Ridge: Insights from the Little Pine Garnet Mine Assemblages" and "Origin of Migmatites and Dikes in the Blue Ridge, Southern Appalachians."

***Dr. Iyad Hijazi, Engineering***
"Research in Material Science and Engineering."

***Dr. Sean McBride, Physics and Physical Sciences***
"Liquid-Surface Experiments on Nanometer Length Scale: Nanoparticle Stability at Liquid Interfaces,""Liquid-Surface Experiments on Nanometer Length Scale: Flow in Confined Geometries," and "Self-Assembled Nanoparticle Membranes: Mechanical and Properties of Self-Assembled Nanoparticle Free Standing Membranes."

***Dr. Michael Norton, Chemistry***
"Nanoplasmonics for Molecular Sensing."

### SENIOR PERSONNEL

***Dr. James Joy, Biological Sciences***
"Employing Light Microscopy and SEM to Characterize Sensory Sensillae that Monitor Blood Flow in the Tsetse Fly (Glossina m. morsitans) Food Canal."

***Dr. Victor Fet, Biological Sciences***
"SEM study of Arachnid sensory morphology."

***Dr. Ana Peña-Alvarez, Engineering***
"Investigation on the Mechanical Properties of Elastomeric Nano-Composites to be used as Flexible Actuator Materials for Soft-Robotics."





# Model to predict greenhouse gases, carbon storage in coastal wetlands under changing conditions developed at WVU

*Written by* **Mary C. Dillon**

A pair of researchers from West Virginia University have developed a new model to reliably predict the greenhouse gas fluxes of carbon dioxide and methane in coastal wetlands under rising temperatures and changing environments.

Omar Abdul-Aziz, associate professor of civil and environmental engineering, and Khandker S. Ishtiaq, a postdoctoral fellow, have developed the model, which was published in a recent edition of the American Geophysical Union's "Journal of Geophysical Research: Biogeoscience."

Coastal wetlands play an important role in mitigating the effects of green house gases by efficiently removing atmospheric carbon. However, climate change mitigation benefits have to be achieved through conservation and restoration of coastal wetlands.

The developed model, which takes sunlight, soil temperature and salinity into account, is a novel and first-of-its-kind empirical tool that can be used for estimating and predicting green house gas (GHG) fluxes and carbon storage using a minimal amount of observational data. Presented in a simple spreadsheet, it can be applied to explore various climate change scenarios, which will aid the development of appropriate GHG offset protocols for setting monitoring and verification guidelines for coastal wetland restoration and maintenance projects.

"Modeling and predicting wetland GHG and carbon storage has been an extremely challenging undertaking for decades," said Abdul-Aziz. "Coastal wetlands provide numerous benefits, including attenuation of storm surges and critical habitats for many endangered species. Our paper, for the first time, provides a relatively simple, science-based and user-friendly solution to a very complex problem that hampers the restoration and management of coastal wetlands."

Using the model, the researchers demonstrated a potentially higher rate of atmospheric carbon removal by the coastal wetlands in New England in 2050 and 2080, compared to the current rate.

Photo: West Virginia University

**Abdul - Aziz**

"Our findings also demonstrated that the model is potentially applicable to wetlands along the Atlantic, Gulf and Pacific coasts of the U.S. and beyond (e.g., Canada, China and Japan)," Abdul-Aziz said. "The new model would help the coastal stakeholders (e.g., reserve managers, practitioners and policymakers) to formulate guidelines for restoration and maintenance of the coastal wetlands under the rising temperature and changing environment."

The research has been funded by grants from the National Science Foundation and the National Oceanic and Atmospheric Administration. Joining Abdul-Aziz and Ishtiaq on the project team are collaborators from Woods Hole Oceanographic Institution, U.S. Geological Survey Woods Hole Coastal and Marine Science Center, Marine Biological Laboratory, University of Rhode Island and Waquoit Bay National Estuarine Research Reserve in Cape Cod, Massachusetts.

# Alderson Broaddus student experiences biomedical research through WV-INBRE

*Written by* **Lora Owston**

From a young age, Morgan Winterbottom found herself enamored with science. She often fantasized about potential dream careers during her childhood, and the area represented a driving force in her life as she grew older. When Winterbottom enrolled at Alderson Broaddus University (AB), she knew the biology program perfectly suited her goals.

"I wanted to see the research side of things," Winterbottom said. "It's kind of behind the scenes, but research leads into the pharmaceutical aspect of medicine."

This past summer, Winterbottom participated in a nine-week internship through West Virginia IDeA Network of Biomedical Research Excellence (WV-INBRE) that allowed her to complete graduate-level diabetes research. WV-INBRE is a federally funded program that provides opportunities for biomedical research with an emphasis on chronic diseases. The program consists of a consortium between Marshall University, West Virginia University and an additional 14 partner institutions.

"I'm really appreciative of going to AB in general because I feel like I wouldn't have had this opportunity anywhere else," Winterbottom said. "It was so amazing to be at the small school that I love and get a big school research opportunity."

Winterbottom conducted her internship at the Robert C. Byrd Health Sciences Center of West Virginia University under the guidance of John Hollander, professor and vice chair of exercise physiology. Hollander's laboratory specializes in cardiovascular research, which profoundly impacts the region.

According to the most recent data from the Behavioral Risk Factor Surveillance System, West Virginia possesses the highest adult rate of diabetes in the United States. Winterbottom's research examined type 2 diabetic patients to see how epigenetic changes were occurring in their DNA.

"In a lot of research, you use mice or other lab animals," Winterbottom said. "The real interesting thing we did was use human heart tissue samples. Ruby Memorial Hospital was right next door to the lab, so we could collect samples from right atrial appendage tissue."

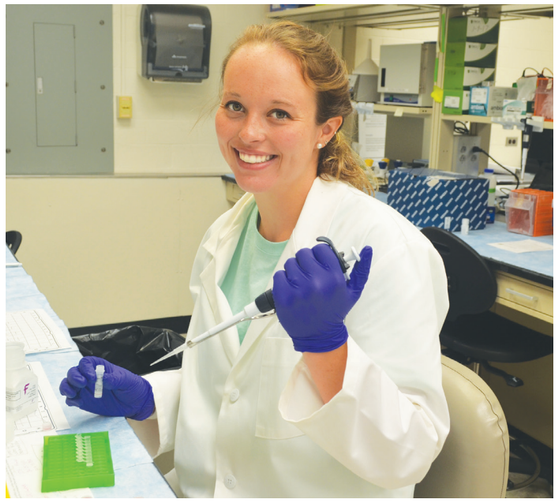
Traditionally, patients undergoing coronary bypass surgery have a piece of their right atrial appendage removed to allow the bypass machine in the heart. This is usually discarded as medical waste. However, for Winterbottom, this novel aspect provided a more personal touch to her research.

"In using tissue from the patients here, I think that our results were influential on the people around us and the people coming to that hospital," Winterbottom said.

Winterbottom's time in Hollander's lab gave her a newfound appreciation for research, and she believes studying both the heart and a prominent disease will prove invaluable during her experience with health care.

"Morgan was very interested in what we were doing and integrated well with the students and staff in the laboratory," Hollander said. "She was very reasonable and enthusiastic about anything you threw at her."

Yi Charlie Chen, professor of biology at Alderson Broaddus University, works closely with the WV-INBRE program. He explains that conducting biomedical research can be quite expensive, but this program provides research opportunities for students that cannot be facilitated in the classroom. Winterbottom was one of two AB students to participate.



**Alderson Broaddus University student Morgan Winterbottom works on her research project, Epigenetic Regulation of the Nuclear Genome in Type 2 Diabetes Mellitus, in the Robert C. Byrd Health Sciences Center at West Virginia University.**

*Photo: Alderson Broaddus University*

"The idea is to encourage undergraduate students from small schools who are interested in biomedical research," Chen said. "If they like it, it can influence their career decisions or push them to do more research."

Each year, Chen invites the WV-INBRE internship program director to speak in his classes at AB. Although Winterbottom observed these presentations several times, Chen represented the deciding factor in her participation.

"Dr. Chen really inspired me – he's super passionate about this and really encourages students to apply," Winterbottom said.

Winterbottom is a senior student and will graduate in May of 2019. Her goal is to begin AB's physician assistant program. However, she hopes that this experience signals the beginning of her research endeavors, not just the end.

"I don't know whether it's feasible or not, but I'd really like to pursue research again," Winterbottom said. "Even in my career as a PA, I want to take time to do this."





# ARC director speaks at Bluefield State manufacturing engineering center opening


**Appalachian Regional Commission Executive Director Scott Hamilton cuts the ribbon with Bluefield State College President Dr. Marsha V. Krotseng and CEME Director Jeff McFadden.**

*Photo: Bluefield State College*

*Written by* **Jim Nelson**

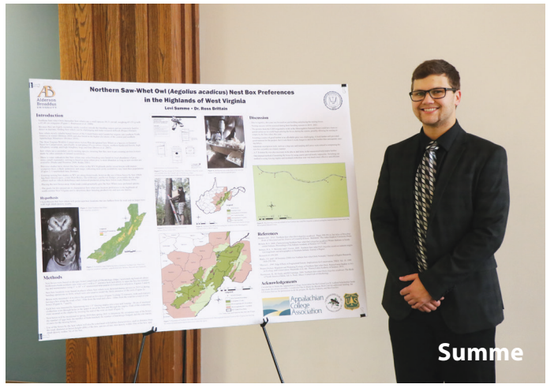
Appalachian Regional Commission (ARC) executive director Scott Hamilton was a featured speaker during the November 1 grand opening of the Center for Excellence in Manufacturing Engineering (CEME) at Bluefield State College. The CEME's establishment was underwritten by a $1.5 million Appalachian Regional Commission POWER grant. The grand opening attracted regional business leaders, legislators, officials from local municipalities and counties, and the community.

Jeff McFadden, assistant professor of mechanical engineering Technology at BSC, was the lead author of the CEME proposal, whose points of focus include helping transition displaced workers from mining-sector jobs into skilled jobs in manufacturing and industry; providing students who enter the program with skills and knowledge in high demand in the marketing sector; serving as a research and development asset for local industry through collaborative robotics; and manufacturing and consulting support to help companies transition to new areas of manufacturing.

"ARC seeks to invest in projects where the return on our investment is going to provide hope, and opportunity, and dignity to the community and to individuals who get jobs to provide for themselves and their families," Hamilton said. "That is what this grant is about - innovation and transformation of communities. I have been very impressed by what I have seen here at the Center for Excellence in Manufacturing Engineering."


## WVU researcher wins R&D 100 Award

Dr. Vinod Kulathumani, associate professor of computer science and electrical engineering at West Virginia University, is part of a research team that has won the R&D 100 Award, known as the "Oscars of Innovation," as determined by a panel selected by "R&D Magazine." Kulathumani developed an ultra large scale sensor network for detection of storm water overflow in real-time.




## AB student receives research scholarship

Five thousand dollars was awarded to Levi Summe of Alderson Broaddus University from the Appalachian College Association for his senior research project on Northern saw-whet owls. Summe is from Mullens, West Virginia and plans to continue pursuing natural resource research in either forestry or wildlife management after graduation.


## WVSU scientists receive national award

West Virginia State University researchers received a Vegetable Publication Award from the American Society for Horticultural Science. "Genetic Diversity in the Desert Watermelon Citrullus colocynthis and its Relationship with Citrullus Species as Determined by High-frequency Oligonucleotides-targeting Active Gene Markers," was recognized as a most outstanding paper.


## WVSU student named competitive scholar in White House Initiative on HBCUs

West Virginia State University senior chemistry major Edgar Lopez-Torres was one of 63 students from throughout the nation selected as 2018 HBCU Competitive Scholars by the White House Initiative on Historically Black Colleges and Universities (HBCUs), the Initiative's highest student recognition.

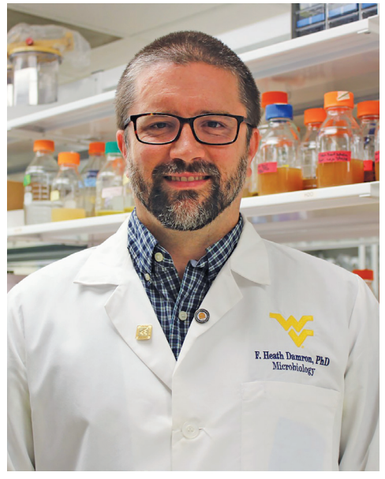
*Photo: West Virginia University, Alderson Broaddus University, West Virginia State University*





# COMMENTARY: F. Heath Damron, PhD

## *Vaccine development at West Virginia University*




**F. Heath Damron, PhD**

Vaccines have created a world where many infectious diseases are now forgotten. Most people today do not know what diphtheria is, nor do people remember when families lined up their kids to receive polio vaccines. However, there is still a great need for improved vaccines especially since it is apparent that many bacteria are becoming highly resistant to antibiotics. While Pharma companies are responsible for the clinical development phases of vaccine development, the majority of initial discoveries occur in the academic setting. Over the past year at West Virginia University, with funding from the Research Challenge Grant awarded by the West Virginia Higher Education Policy Commission's Division of Science & Research, we established a Vaccine Development center (VDc). Two major goals of the VDc are to stimulate vaccine-focused research and enhance STEM education and biomedical research training in the state.

At the onset, we aimed to focus on three bacterial pathogens that cause respiratory infections including whooping cough, tuberculosis, and bacterial pneumonia. *Bordetella pertussis* is a human-only pathogen that causes whooping cough or pertussis. The whole cell pertussis vaccine (DTP) was replaced with a protein sub-unit vaccine, DTaP, in the 1990s. Unfortunately, we now realize that the immunity provided by DTaP and the booster Tdap do not offer protection as long as that provided by whole cell pertussis vaccines (DTP). As a result, the immune responses of DTaP have less effect. In the Damron laboratory, we are focused on developing improved DTaP and Tdap to decrease the disease burden of pertussis.

Tuberculosis is the leading cause of infectious mortality worldwide. Dr. Cory Robinson, an Associate Professor in the Department of Microbiology, Immunology and Cell Biology, leads a team that seeks to understand the underlying strategies that allow *Mycobacterium tuberculosis* (Mtb) to infect and avoid host clearance. The only licensed vaccine available is not consistently effective and thus has been inadequate to combat the global burden of disease. The overarching premise of Dr. Robinson's research focuses on how an immune signal known as interleukin-27 (IL-27) opposes optimal vaccine responses. He proposes that if we can understand how to tune the IL-27 response during immunization we can enhance long-term protection.

Another member of the team, Dr. Mariette Barbier, is an Assistant Professor that studies the bacterial pathogen, *Pseudomonas aeruginosa* and develops vaccines as well as therapeutics. *P. aeruginosa* is an opportunistic pathogen causing a wide range of hospital-acquired infections such as pneumonia, urinary tract and surgical site infections. Dr. Barbier and her team have identified proteins that are highly expressed on the surface of the bacterium during infection. Using modeling and predictions, she developed a protein antigen that would induce antibody responses directed towards the iron acquisition systems of the bacterium. These immune responses can allow the host to detect and kill the infecting pathogen.

Vaccines protect all of us against deadly infections, but there is still a need to improve those we currently use (DTaP), develop new ones for deadly infections (Mtb and *P. aeruginosa*), and to build upon these discoveries by translating the findings into lifesaving therapeutics while training the next generation of exciting talent. Those are the goals of the WVU Vaccine Development center.

*F. Heath Damron is an assistant professor in the Department of Microbiology, Immunology, and Cell Biology at West Virginia University and director of the Vaccine Development Center at WVU Health Sciences.*

*Photo courtesy of F. Heath Damron*

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