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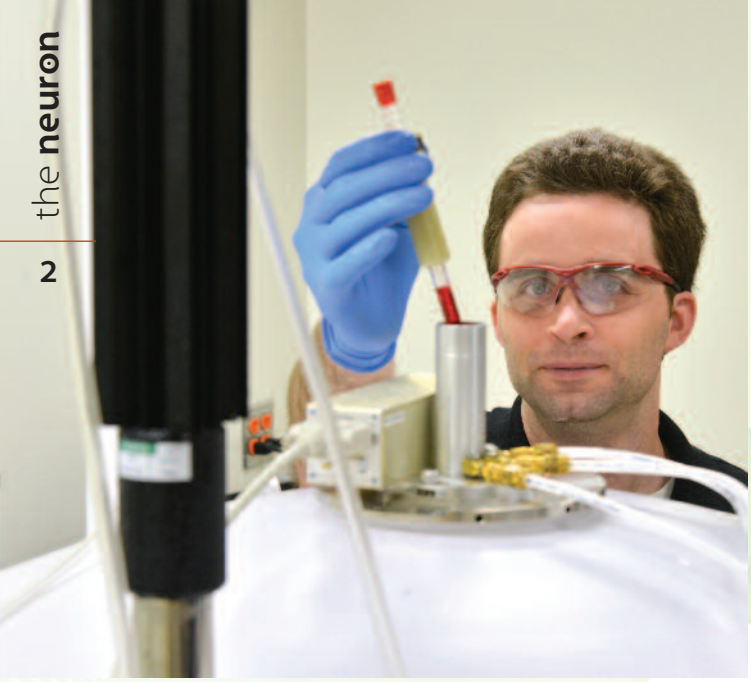
Summer 2015

Dr. Micheal Fultz
West Virginia State University



Photos by John Sibold

The chemistry of outreach

Dr. Micheal Fultz
West Virginia State University

Stacks of three-ring binders and accordion files line the shelves of Dr. Micheal Fultz's office. They contain some of his most valued documents. They aren't solutions to the long-held scientific mysteries of today's world, not archives of some of the greatest research projects and not even documentation of his past research projects.The documents are something of much more personal significance to Fultz: letters of appreciation from local school children and teachers.

By certain accounts Fultz, an associate professor of chemistry at West Virginia State University (WVSU), personally spear-headed more outreach projects during his short six years at WVSU than many do during an entire career – and it shows.

The students who write thank you letters to Fultz clearly find great fun and benefit in the science outreach activities that come to them via their K-12 classrooms from WVSU, but it's Fultz's undergraduate students who, he knows, gain as much benefit from the experiences.

Fultz oversees the student chapter of the American Chemical Society (ACS) at WVSU. He and the group, which annually consists of more than 20 students, regularly take science to kids by hosting educational programs for schools across the Kanawha Valley in West Virginia. These include lectures on topics such as green chemistry, career presentations and science-based, hands-on activities. They have also worked with groups like the Boy Scouts and Girl Scouts and take part in National Chemistry Week, Earth Day, National Lab Day, the Department of Energy's high school science bowl, Chemical Education Foundation's "You be the Chemist" and other events.

Fultz talks with student Aaron Smith.

Under his leadership, the group has won several national awards from ACS including three outstanding ratings, two commendable ratings, five Green Chemistry awards, four community interaction grants and three travel grants to attend the annual ACS national meeting with more grants and awards pending.

The group is consistently praised for outreach and educational efforts by award judges, with reviewers citing what they called an outstanding job promoting science to area youth.

"The ACS students are successfully continuing their mission to bring science education to young people," Fultz said. "We are taking science into schools on a regular basis to enhance science education at all grade levels."

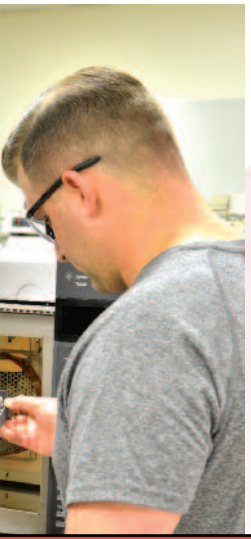
In addition to getting science into local schools, Fultz makes sure his undergrads have the opportunity to participate in science career preparation activities - including trips to professional and graduate schools in the region, attendance at local and national professional meetings and via networking with science professionals who live and work near WVSU.

Undergrad Research Assistant Emma Nellhaus works with Fultz.

He also ensures that all interested students have ample time in the lab to help him with his research. As you might expect from a chemistry professor, much of Fultz's work involves molecular activity. He explains that all molecules he studies are designed by nature for a particular purpose - such as to protect organisms from attack, to act as a chemical signals, and even to assist in digestion. Essentially all molecules have some function and, by nature, carry out some job in a cell – be it advantageous for the cell or detrimental.

As billions of dollars are spent on the development of pharmaceutical drugs in the United States every year, much research is being done on examining molecules within the drugs for activity. Fultz said that eventually many microbes develop resistance to the industry's current arsenal of drugs. This is why researchers, such as Fultz, see the need to develop a stronger, more diverse structural database to deploy against problem microbes so that physicians can ultimately have the upper hand against diseases and infections that the drugs need to fight against.

One example of a natural product is spathoside - which was isolated from the stem bark of the African tulip tree. Different parts of this plant have been used for many years in Central Africa to treat ulcers, filaria (tropical disease), gonorrhea, diarrhea and fever. Natural spathoside shows a broad diversity of biological activity, showing potential activity against many bacteria. On the basis of this potential, it is Fultz and his WVSU colleagues' desire to understand the origin of that biological activity, and his research group is undertaking an extensive investigation into the synthesis of spathoside and a number of derivatives. One of the major focuses of the project is to determine which of its eight diasteromers is the true natural product and how that affects the biological activity with hopes that it will lead to an opportunity for a new nature-based drug product in the United States. This work is funded by the Division of Science and Research via an EPSCoR grant. Much of this research is carried out using instrumentation purchased by grants awarded by the West Virginia Research Trust Fund.



Fultz said he always enjoyed science and knew he wanted to go down that path in life, but it was enrolling in an organic chemistry class as an undergraduate at the University of Tennessee at Martin that really sparked an interest and made him truly enjoy the complexities of chemistry. He even had professors who allowed him to teach general chemistry labs under their supervision.

"That's when I really discovered that I loved chemistry and that I loved to teach – as an undergrad," said Fultz.

Perhaps that's why his passion for undergrad students at WVSU is so strong.

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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WVU faculty member receives **CAREER award** to make **self-driving cars safer**

As at least one prototype of a self-driving car hits the road this summer, a researcher at West Virginia University (WVU) is already working to find ways to make them safer.

Yaser Fallah, assistant professor of computer science and electrical engineering, has earned a prestigious CAREER award from the National Science Foundation (NSF) for his work to increase the safety and efficiency of automated vehicles by sharing information over a wireless network. The award comes with more than $400,000 in funding over a five-year period.

> "Since a part of the CAREER project is directly applicable to my EcoCAR 3 work, we will also coordinate with other outreach activities involving the team at the local and national levels."
>
> *Yaser Fallah*

While many car companies have already installed active safety features like automatic braking and lane departure warnings, Google's self-driving car prototype, being released this summer, features no steering wheel or pedals and is driven strictly by computer. While mainstream use of these vehicles is still a few years away, connecting them to a wireless network would allow them to share real-time information with each other on traffic conditions, roadway hazards and dangerous conditions that they can't see through other advisories.

By taking a cyber-physical systems approach, which considers the interaction of computational, networking and physical processes of a system, Fallah expects to provide the tools needed for enabling cooperation between automated vehicles.

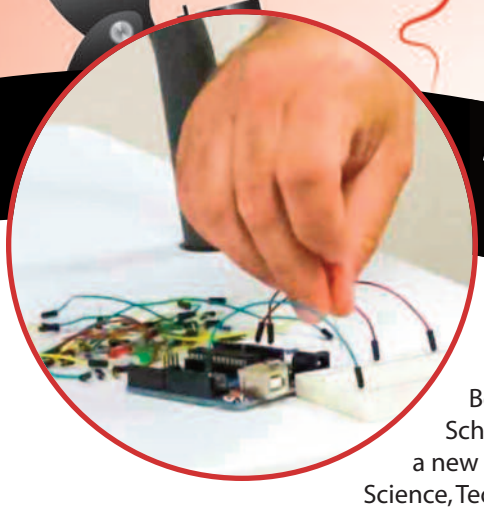
"The exchange of information would allow each vehicle to be aware of its surroundings up to few hundred meters away, well beyond what each vehicle - or its driver - could sense," said Fallah. "This awareness can then be used to control and coordinate the action of these vehicles, which can achieve higher levels of efficiency and safety that would not be possible otherwise.

"This research directly contributes to current national efforts in connected vehicle program, which are led by the U.S. Department of Transportation, and the efforts by industry and academia to develop automated cars," Fallah said.

Fallah plans to engage undergraduate students, particularly those involved in WVU's EcoCAR 3 team, in his research. Funded by General Motors and the U.S. Department of Energy, EcoCAR 3 challenges university teams to redesign a Chevrolet Camaro to reduce its environmental impact, while maintaining the muscle and performance expected from this iconic American car. Fallah serves as an advisor to the team.

"There is a five-year senior design project, complementing EcoCAR 3, that will help our students become familiar with advanced subjects in vehicle automation, communication and automated driving," Fallah said. "Since a part of the CAREER project is directly applicable to my EcoCAR 3 work, we will also coordinate with other outreach activities involving the team at the local and national levels."

The NSF's Faculty Early Career Development, or CAREER, program supports junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations.



Fairmont State University receives grant to launch **new STEM initiative in public schools**

Thanks to a $107,000 grant from the Claude Worthington Benedum Foundation, the Fairmont State University (FSU) School of Education, Health and Human Performance has entered a partnership to launch a new program called "EnergyMakers" - designed to give West Virginia children 21st century Science, Technology, Engineering and Mathematics (STEM) skills, plus life and career skills.

Dr. Jeremy Price, Assistant Professor of Education in the Master of Education Digital Media, New Literacies and Learning program, is the primary author of the grant.

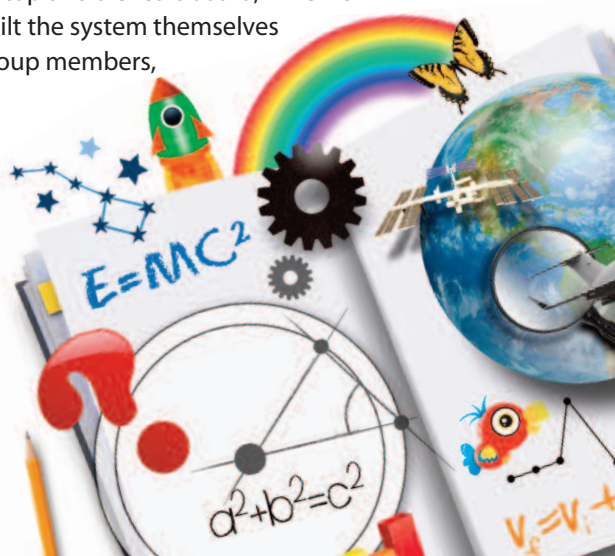
"We are very excited by the work ahead of us, and we think it will make an impact on how STEM education is handled in elementary schools in North Central West Virginia and the Northern Panhandle - and potentially beyond," Price said.

TEKids of Morgantown, the partnering organization, has been creating and providing after-school, summer and weekend STEM-related programs for K-12 students in North Central West Virginia since 2012. FSU's partnership with TEKids means that faculty members will serve as curricular and evaluation consultants for the project and will provide support in building a learning community among the teachers involved. FSU graduate students in the M.Ed. Digital Media, New Literacies and Learning program also will provide assistance.

The project initially will focus on Harrison, Monongalia, Ohio and Preston counties. The intent is to serve the third- through fifth-grade students and educators in the Fairmont State Professional Development Schools Partnership and the schools of Ohio County, particularly targeting schools in under-served urban and rural settings.

Example scenario:

In an EnergyMakers classroom, a small group of fifth-graders gather around a laptop and a circuit board, which is collecting information from probes about air quality and energy use. The kids built the system themselves from components and plans made available to them. On the laptop, the small group members, along with students around the state, are monitoring the same shared data. One student notices an unexpected reading and points it out to her teacher. The teacher logs into the online EnergyMakers Teacher Community of Practice website and posts a question to other teachers about the reading. Within a day, other teachers respond and share similar readings found by their students. The teacher then works with a technology expert and a pedagogy expert on the EnergyMakers team to develop a plan for working with the small group on interpreting the data. The process goes so well that the teacher gathers the entire class around the small group and has the student who found the reading explain to her classmates the significance of the data.



Forensic Science Center director addresses state prosecutors about advances in DNA technology

Marshall University Forensic Science Center Director Dr. Terry W. Fenger delivered a presentation to West Virginia prosecutors in June about the latest advances in DNA technologies to gain more data from evidence.

The West Virginia Prosecuting Attorneys Association and the West Virginia Prosecuting Attorneys Institute sponsored the annual 2015 Summer Meeting at the Stonewall Jackson Resort in Roanoke, West Virginia.

Fenger's presentation was titled, "Process Improvement in a Changing Landscape." It addressed the latest technologies and developments in the area of DNA analysis and its value as an investigative tool for criminal justice purposes.

"In support of the continuing education process, it is important to provide prosecutors with updates on new technological advances as well as how these advances relate to privacy issues," Fenger said.

"New technologies are still in the developmental stages and may allow DNA found at crime scenes to yield information on traits, revealing how the perpetrator looked in appearance, such as ethnicity and overall facial features."

West Virginia State University hosts **20**th **Annual Research Symposium**

The 20th annual Research Symposium and Spring Convocation took place at West Virginia State University (WVSU) this spring with the goal of sharing information and celebrating the scientific research being conducted by students.

The symposium, hosted by the WVSU College of Natural Sciences and Mathematics, featured presentations by NASA research scholarship recipients and poster presentations by participants in WVSU's Research Rookies program.

"The symposium provides a public forum for our students to share their scientific research with a wider audience," said Dr. Naveed Zaman, Interim Dean of WVSU's College of Natural Sciences and Mathematics. "When students become part of a research group, it not only reinforces their scientific skills but makes them feel like part of a family, so this is also a celebration of their hard work and accomplishments."

Dr. Jose Carlos Aponte, research associate from NASA's Goddard Space Flight Center in Greenbelt, Md., delivered the keynote address, and the event also featured an induction ceremony for the Beta Kappa Chi Scientific Honor Society.

WVSU partnered with American Electric Power, Dow and AT&T to develop the Research Rookies program, which provides stipends for freshman and sophomore students who engage in yearlong research projects alongside WVSU scientists.

The research symposium and convocation were sponsored by the NASA West Virginia Space Grant Consortium.

WVSU student Brandi Bricker explains her research poster to WVSU President Brian O. Hemphill and American Electric Power's Jeff LaFleur at the College of Natural Sciences and Mathematics 20th annual Research Symposium and Spring Convocation.

WVU's Dinu to lead new **biomedical engineering program**

Cerasela Zoica Dinu, associate professor of chemical engineering at West Virginia University (WVU), has been appointed associate chair of the department and will lead the Statler College of Engineering and Mineral Resources' program in biomedical engineering. The major, which was officially launched in 2014, is offered at the undergraduate level.

The biomedical engineering discipline is among the fastest growing engineering disciplines due to the rapid advancement of medical technologies and treatment and diagnosis strategies; in fact, many are claiming this century as the one that will revolutionize the biological sciences. A recent study by CNN predicts a 10-year job growth rate of 27 percent in the industry.

According to Dinu, one of the things that makes WVU's program different is its multi-disciplinary focus in such areas as biomaterials, nanotechnology, biomedical imaging and biomechanics.

"We have complimentary and multi-disciplinary expertise that can help us bridge with colleagues at WVU's Health Science Center and the state's growing biomedical industry," said Dinu.

"Together, we can educate the next generation of professionals that can make a difference in the design and development of new technologies for our healthcare system. "I am looking forward to the challenges of this position and working together with my colleagues across WVU in an effort to advance the program," she added.

Dinu's expertise lies in the areas of nanomaterials for biomedical and engineering applications and in nanotoxicology. She recently earned a prestigious CAREER award from the National Science Foundation for her work to identify technologies capable of increasing the world's energy portfolio while reducing environmental impact.

Dinu received her doctorate in biology from Max Planck Institute of Molecular Cell Biology and Genetics and Dresden Technical University in Germany. She earned her master's and bachelor's degrees in biophysics and physics from the University of Bucharest in Romania. Dinu was named one of the Outstanding Researchers in the Statler College in 2014 and the New Researcher of the Year in 2011.

RCBI, Mountwest launch **additive manufacturing degree program**

College students in West Virginia now can complete a degree with a concentration in additive manufacturing, better known as 3D printing. The Robert C. Byrd Institute for Advanced Flexible Manufacturing (RCBI) and Mountwest Community and Technical College are partnering on a new Additive Manufacturing concentration in the Engineering Design Technology program at Mountwest. Students enrolled in the program will attend classes at both sites.

The program gives students hands-on experience with 3D printers and includes Rapid-Prototyping Techniques, Engineering Design and Additive Manufacturing Techniques courses.

Additive manufacturing starts with a computer-aided design (CAD) file that shows the desired object in three dimensions. After the CAD sketch is produced, a 3D printer reads the digital data from it and "prints" successive layers of material in layer-upon-layer fashion to fabricate an actual object.

West Virginia Water Research Institute to co-host **Water Resources Conference** this fall

The West Virginia Water Research Institute and the Virginia Water Resources Research Center at Virginia Tech will co-host the 2015 Water Resources Conference of the Virginias, which will take place October 5 and 6 at Stonewall Resort in Roanoke, West Virginia.

The conference combines exceptional educational programs with opportunities for researchers, policy makers, state and federal agencies, environmental consultants, private organizations and the public to share in the latest information, technologies and research relating to West Virginia's and Virginia's water resources.

The theme for this year's conference is "Water – Energy – Agriculture." Researchers from colleges and universities, state and federal agencies, private organizations, consulting firms, industry and students have been invited to submit abstracts for consideration for oral presentation. Abstracts were solicited in all areas related to water resources including agriculture, energy, monitoring, policy, supply, technology, water quality and others.

"Agriculture and energy are the two biggest consumers of water in the United States," said Dr. Paul Ziemkiewicz, director of the West Virginia Water Research Institute. "We need to find technical, management, policy and economic solutions that will lessen the water requirements of the energy and agriculture sectors while finding better ways to treat and use marginal water resources. West Virginia is the headwaters for many of the nation's major rivers and West Virginia University is a regional leader in water research. Our goal for this conference is to initiate an open dialogue among policy makers, water users and researchers and move toward solutions that will apply across the country."

For more information about the 2015 Water Resources Conference of the Virginias, including registration details, visit www.wrcvirginias.org.

Marshall College of Science dean appointed to **national environmental advisory board**

Dr. Charles C. "Chuck" Somerville, a professor of biological sciences and dean of the Marshall University College of Science, has been appointed to the U.S. Army Corps of Engineers Chief of Engineers Environmental Advisory Board (EAB). The advisory board was created by the Chief of Engineers, Lt. Gen. Frederick J. Clarke, in 1970, as a means for him to gain outside, expert and independent advice on environmental issues facing the U.S. Army Corps of Engineers.

Board membership consists of 5-10 people. Selected members are eminent authorities in the field of natural, social and related sciences. They also are multidisciplinary, with an equitable distribution of fields of interest as well as geographical location.

"I am delighted to be selected as a member of the U.S. Army Corps of Engineers Chief of Engineers Environmental Advisory Board," Somerville said. "I have had a chance to meet with the other board members, and they are all highly qualified and accomplished people. I am honored to have the opportunity to serve with them, and I am excited to dig into the work of the board and to do what I can to contribute to the missions of the EAB and the Corps."

Somerville said he was nominated by a person he works within the Louisville Corps of Engineers.

Somerville joined the Marshall faculty in 1997 as an assistant professor of biological sciences, where he studied the biodegradation of chlorinated solvents in mixed wastes and microbial community dynamics in large river systems. He served as head of the Department of Biological Sciences from 2005 to 2009 and has been dean of the College of Science since 2009. In 2011, he was elected as a Fellow of the Linnean Society of London.

During the annual National Summer Transportation Institute 4-H camp, students entering seventh through ninth grade toured several sites throughout the Kanawha Valley, including Charleston's Yeager Airport, to learn more about transportation.

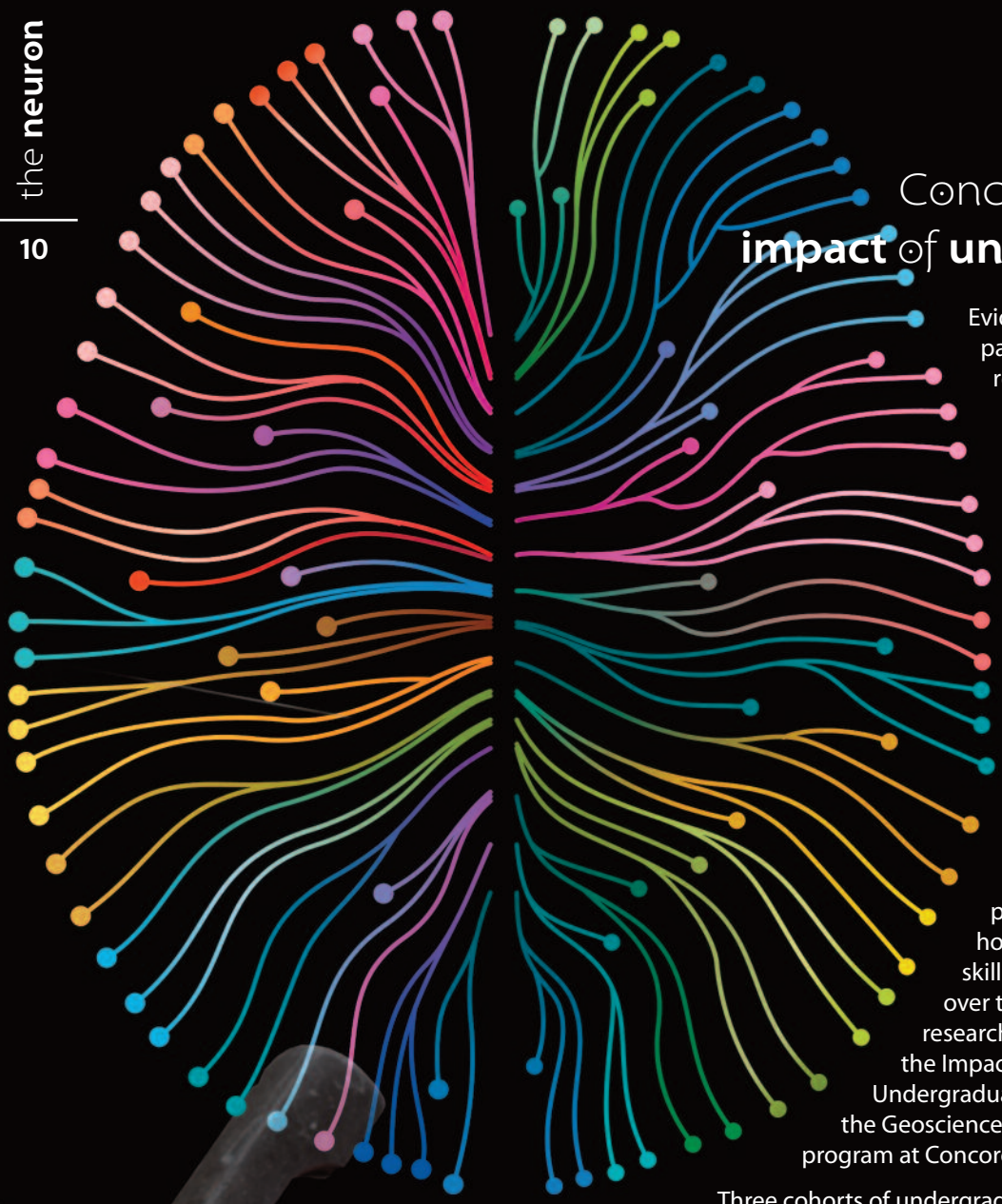
Camp helps **state youth** explore **STEM careers**

The annual National Summer Transportation Institute (NSTI) 4-H camp for students entering seventh through ninth grades took place at West Virginia State University (WVSU) in June.

Hosted by the WVSU Extension Service, the camp connects students' passion for science, technology, engineering and math (STEM) with planes, trains, automobiles and other modes of transportation.

"With one in seven jobs in the United States being in the transportation industry, this camp is a great way for our youth to learn about career opportunities in a fun, exciting and educational format," WVSU STEM Education Coordinator Jaime Adkins said. "They experience firsthand what make these industries work and visit sites to see what life is like on the job."

Camp participants heard from industry leaders in water, air, rail and highway transportation and conducted hands-on engineering experiments showing the science of transportation in action. Additionally, youth visited locations to see firsthand what a career in transportation involves. WVSU Extension Service partners with the West Virginia Division of Transportation and the U.S. Dept. of Transportation's Federal Highways Administration to host NSTI.



Concord University to study **impact** of **undergraduate research**

Evidence-based research indicates that participation in undergraduate research results in numerous cognitive, personal and professional gains among STEM students. It also increases retention by building confidence and motivation, which helps students to learn and gain self-identity as a scientist. However, most undergraduate research experiences are fairly short, ranging from a few weeks to a year in duration and may not allow enough time for independent scientific thought and other more sophisticated cognitive gains to mature.

A new study funded by the National Science Foundation's (NSF) Improving Undergraduate STEM Education (IUSE) program aims to determine when and how different research and communication skills develop and mature in undergraduates over the course of a multi-year undergraduate research experience. The study, titled "Testing the Impact of a Multi-year, Curriculum-based Undergraduate Research Experience (MY-CURE) in the Geosciences", will be carried out in the geology program at Concord University.

Three cohorts of undergraduates will participate in the study over the next three years. The undergraduate research projects are embedded within a five-semester sequence of courses that span the traditional core of the geology curriculum. The student projects are based on rock samples that formed in an exhumed, 1.4 billion-year-old fault zone that was once seismically active. Each group of students will study different samples in the laboratory as a major component of four courses over a two-year span and then conduct fieldwork on them at a research site in the Colorado Rockies during Concord's 5-week summer geology field camp. A significant part of the student research will be to examine the chemistry and microstructure of the samples using Concord's electron microprobe facility. As a broader impact of the study, the students will generate social media content about to their research experience designed to attract West Virginia high school students to the research.

The project will be led by Joseph L. Allen, professor of geology and Stephen C. Kuehn, associate professor of geology, both of whom are in the environmental geosciences program at Concord. Dr. Elizabeth Creamer, professor of educational research and evaluation in the School of Education at Virginia Tech will work with the team to evaluate student learning.

A summer mini-grant from the West Virginia Higher Education Policy Commission's Division of Science and Research provided funding for preparation of the proposal.

WVU-led research: **decreasing biodiversity affects remaining plants' productivity**

Biodiversity, another word for the collection of life on Earth, has far-reaching effects, from the largest cities to remote, rural communities, and is key to the planet's overall existence. A team of researchers has now found a way to measure the impact of losing that biodiversity, which could help inform conservation efforts.

"The loss of biodiversity is threatening ecosystem productivity and services worldwide, spurring efforts to quantify its effects on the functioning of natural ecosystems," said Jingjing Liang, assistant professor of forest ecology in West Virginia University's Davis College of Agriculture, Natural Resources and Design.

A team of scientists, led by Liang, used data from Alaska's boreal forests to develop a model that measures and quantifies the effects of plant productivity resulting from a loss of species diversity. Other researchers were from the University of Washington, University of Alaska Fairbanks, University of Minnesota, University of Western Sydney and the U.S. Geological Survey. The results of their research were published this spring in the Proceedings of the National Academy of Sciences of the United States of America.

Previous research has focused on the positive role of biodiversity on resource acquisition by species in a system. This new research incorporates both resource acquisition and resource utilization efficiency to show that biodiversity loss reduces plant productivity.

"Here we demonstrate that there is a positive externality of biodiversity conservation; that is, conserving the diversity of plant species may help to maintain ecosystem services for current and future generations," Liang said.

> "We demonstrate that there is a positive externality of biodiversity conservation; that is, conserving the diversity of plant species may help to maintain ecosystem services for current and future generations."
>
> *Jingjing Liang*

Shepherd professor and students help with **stink bug research**

A Shepherd University professor and several students are involved in multi-state, multi-institutional research to find ways to keep the brown marmorated stink bug from damaging organically-grown crops. Dr. Clarissa Mathews, professor of environmental studies and chair of the Institute of Environmental and Physical Sciences, is leading the effort, with research taking place at Shepherd and at her Berkeley County farm.

This is the third year for the research project. Mathews said the project is looking at environmentally benign ways to deal with agricultural damage caused by brown marmorated stink bugs, which made their way from Asia in packing crates and were first discovered in this country in the late 1990s. Mathews said a few years ago the brown marmorated stink bug population exploded, causing great economic harm to farmers.

Mathews and several Shepherd students are involved in the research project, headed by Dr. Anne L. Nielsen from Rutgers University. The goal is to find ways to control the stink bugs without using chemicals. The project involves 13 farms in seven states, 12 universities, a nonprofit organization and the United States Department of Agriculture (USDA). The grant for the research, titled "Whole-farm Management Strategies for Brown Marmorated Stink Bug," came from the USDA Agricultural Research Service.

The local research is taking place in a lab at Shepherd, at two nearby USDA facilities and at Redbud Farm in Berkeley County. Mathews said the study is looking at what's called trap cropping—planting a border of crops that are attractive to the stink bug around a cash crop - in this case peppers.

At the lab, Shepherd students are utilizing the EntoVision lab imaging system, which Mathews purchased with an Instrumentation Grant from the West Virginia Research Challenge fund - which is administered by the Higher Education Policy Commission's Division of Science and Research.

"This is a very specialized microscope computer system that allows you to take photographs of insects in a very useful way and do detailed microscope work," Mathews said.

Data from all 13 farms will be sent to Mathews, who will compile the final results.

New **light-curable bone stabilization system** used on first U.S. patients

Felix Cheung

The first two U.S. patients have been successfully treated with an innovative medical device through a clinical trial underway at the Marshall University Joan C. Edwards School of Medicine, in collaboration with the Marshall Clinical Research Center and Cabell Huntington Hospital.

The institutions are working in conjunction with IlluminOss Medical, a commercial-stage medical device company focused on minimally invasive orthopedic fracture repair, as part of its U.S. Lightfix clinical trial for the treatment of impending and pathologic fractures in the humerus due to metastatic carcinoma.

The surgeries were performed by Felix Cheung, M.D., associate professor and chief of the division of orthopaedic oncology at the School of Medicine. Cheung is a board-certified, fellowship-trained orthopaedic surgeon specializing in tumors of the musculoskeletal system and joint replacement surgery.

Gene DiPoto, senior vice president of research and development at IlluminOss Medical, worked closely with Cheung and his team to facilitate the successful surgeries. Assisting Cheung was Franklin D. Shuler, M.D., Ph.D., associate professor and vice chair of research in the department of orthopaedic surgery.

"We are excited for the opportunity to be the first clinical site in the U.S. to apply IlluminOss' technology to the treatment of a patient with a complex fracture and the results have been remarkable," said Cheung. "The patients were completely stable following the procedure and reported little to no discomfort. Having seen firsthand how effective the IlluminOss System is, I believe the benefits it provides to both the surgeon and the patient have the potential to make it a true game-changer in the way fracture repair can be approached."

Both patients were diagnosed with metastatic cancer and had a pathologic fracture of the humerus.

The IlluminOss System has proven successful in the treatment of over a thousand patients in Europe, where it is commercially available and has been in clinical use since 2010. Benefits observed from the use of the IlluminOss product in patients include smaller incisions, shorter procedure times and more rapid post-procedure patient mobility with reduced hospital stays and lower complication rates. Once cured, the implant provides longitudinal strength and rotational stability over the length of the implant and the small diameter of the flexible catheter gives the surgeon greater freedom of surgical approach. In many cases it allows the patient to get back to daily activities more quickly without the hindrance of a hard cast.

"We have had tremendously successful results treating complex fractures with the IlluminOss System internationally and are excited to now begin applying it to the treatment of patients with impending and pathologic fractures in our first U.S. trial," said Robert Rabiner, president of IlluminOss Medical. "The Joan C. Edwards School of Medicine is renowned for its commitment to providing excellence in both medical education and patient care and we are appreciative for the opportunity to work with such a well-respected team - led by Dr. Cheung - to help validate the effectiveness of our technology in the U.S."

WVU Tech student helps **transform engineering education** on the **national front**

WVU Tech's Amy Haddix is no stranger to advancing the field of engineering.

The chemical engineering major from Elkins, West Virginia, has served as president of WVU Tech's Student Government Association for the past two years. She also serves as secretary of both the WVU Tech chapter of the American Institute of Chemical Engineers (AIChE) and the Association for Women Engineers, Scientists, Or Mathematicians Empowerment (AWESOME). Promoting engineering education is just a part of who she is.

This spring, her passion for the field and leadership experience allowed her to represent WVU Tech at the American Society for Engineering Education's "Insights from Tomorrow's Engineers" workshop in Arlington, Virginia. Haddix was one of more than 40 engineering students from schools across the nation to attend the event.

"Only a small percentage of engineering schools in the country were present at this conference. Being able to say that WVU Tech was represented brings a chance for others to hear about the school and all it can do" said Haddix.

Funded by the National Science Foundation and ASEE, the event was the second phase of the "Transforming Undergraduate Education in Engineering" (TUEE) initiative, which is designed to determine the types of qualities engineering graduates should possess in the modern engineering environment.

The ultimate goal of TUEE is to create recommendations that colleges and universities can follow to instill these qualities in their engineering students. The multi-year series of meetings completed its first phase in 2013, when students defined 36 Knowledge, Skill and Ability traits (KSAs) that would prepare future engineers to address modern engineering challenges.

"These were things such as good communication skills, self-drive and motivation and the ability to identify, simulate and solve engineering problems," said Haddix.

During the phase 2 workshop, Haddix said students worked in teams to discuss the importance of these KSAs within the engineering profession and determine how each KSA was being promoted in the more than 70 colleges and universities represented.

For Haddix, the workshop was an opportunity to exchange ideas with students from colleges and universities of all sizes; ideas that she could bring back to WVU Tech.

"Every school operates differently. However, we can still experience some of the same problems and want the same solutions," she said. "The big thing that I took away is a national need for practical application in hard science and math classes, and projects in classes that apply classroom principles at an earlier level."

She said she's in the process of sharing what she learned, and that WVU Tech is producing graduates who can work effectively and confidently in the engineering industry.

An example of this, Haddix will graduate in May and has already committed to a production engineer position with the Dow Chemical Company in South Charleston, West Virginia.

WVU expert's take on the $100 million search for extraterrestrial intelligence at Green Bank Telescope

A West Virginia University (WVU) expert says humanity's first attempt to detect signs of alien life started 55 years ago in the university's backyard and is one of the only places in the world that an unprecedented reinvigoration of the search can continue.

Earl Scime, chair of the Department of Physics and Astronomy at WVU, said radio astronomer Frank Drake pioneered the search for extraterrestrial intelligence when he began Project Ozma at the Green Bank Telescope in the early 1960s. In late June, entrepreneur Yuri Milner and cosmologist Stephen Hawking announced Breakthrough Listen, the biggest scientific search for signs of intelligent life in the universe.

The 10-year, $100 million international initiative will use the world's two most powerful telescopes: the Robert C. Byrd Green Bank Telescope in Pocahontas County, West Virginia, and the Parkes Telescope in Australia. Using the high-powered instruments, scientists will gather data from the 1 million stars closest to Earth. Beyond the Milky Way, scientists will listen for signals from the closest 100 galaxies.

"The enormous size of the Green Bank Telescope and the advanced technology that it offers make it the most sensitive radio telescope in the world," Scime said. "There are very few places in the world where you can conduct this type of research, and West Virginia is one of them."

Scime said that the 100-meter dish glides around a 360-degree track, making it able to view nearly 85 percent of the celestial sphere. Its sophisticated detectors allow it to record even the faintest signals from space. With large amounts of dedicated time at the Green Bank Telescope, the program is 50 times more sensitive and will cover 10 times more of the sky than any previous programs dedicated to searching for extraterrestrial intelligence. The program will also scan at least five times more of the radio spectrum and will do it 100 times faster.

For example, if a civilization located around one of the 1,000 nearest stars transmitted to Earth with the power of common aircraft radar, the Green Bank Telescope could detect it.

"WVU has had a close relationship with the Green Bank Telescope for more than 10 years," Scime said. "Our researchers conduct experiments, our faculty teach undergraduate and graduate students and we collaborate on educational opportunities for children at the site."

In 2013, WVU agreed to partner with the telescope to fund operations in exchange for dedicated operating time on the instrument. WVU faculty and the National Radio Astronomy Observatory, which manages the site, also created the Pulsar Search Collaboratory to help encourage the next generation of scientists.

WVU researchers also received a federal grant to build a new detector for the telescope to increase its field of view, allowing it to map the sky three to five times faster. In March, the National Science Foundation funded the NANOGrav Physics Frontiers Center that will use radio-timing observations of pulsars with the Green Bank Telescope to detect and study low-frequency gravitational waves. Maura McLaughlin, Eberly distinguished professor of physics and astronomy, was named co-director of the center and will contribute to the activities along with Duncan Lorimer, professor of physics and astronomy and Sean McWilliams, assistant professor of physics and astronomy.

Higher education can impact the **"Turning Point"** for young **West Virginians**

Natalie Roper, Executive Director, Generation West Virginia

In order to attract and retain young talent in West Virginia, we need to affect young West Virginians' perception of the state before the "turning point"—that moment when many decide their ambitions and dreams are beyond the Mountain State. For that future entrepreneur, nonprofit director, city mayor, accountant, lawyer, when is that "turning point" when they decide to take their talent elsewhere?

A 2012 study by WVU's Bureau of Business and Economic Research gives us insight into when this "turning point" might be. West Virginia is attracting the college age population (18-24 years old) at a higher rate than the national average. However, West Virginia is losing 25-34 year olds at almost double the rate of the national average. This suggests that the "turning point" for many West Virginians is likely before they are 25. Colleges, universities, and community colleges have the opportunity to shift this trajectory by connecting young West Virginians' ambitions to our state's opportunity before this critical "turning point."

Higher education needs to serve as a connector. Many leave the state without knowing the opportunities that exist here. At the foundation is a misperception of what West Virginia communities have to offer. Apprenticeships and internships are important tools in changing these perceptions and connecting students with West Virginia businesses and organizations that offer the opportunity to stay home while achieving career aspirations. Internship and apprenticeship opportunities allow students to develop lasting relationships with potential future employers while changing the perception that young people have to leave the state to find a great job.

Lack of economic diversification is a problem in the Mountain State, so what if West Virginia does not have the career opportunity that a student is working toward?

Higher education needs to empower entrepreneurs. Millennials are an entrepreneurial generation, but many leave the state due to a perception that West Virginia is not open to change, innovation, new ideas, and solutions. We are missing an opportunity to empower millennials to stay and create the changes West Virginia needs. Higher education institutions need to be the state's biggest entrepreneurial advocates to change this perception before our students come to a different conclusion. Our higher education institutions should believe in this generation's ideas more than anyone and empower them to turn those ideas for new farming solutions, art businesses, technology startups, etc. into action.

Our higher education institutions need to exemplify everything we want West Virginia to be. In order to change the outcome of that "turning point," young West Virginians have to see our state as a place for them whether they are a future entrepreneur, welder, teacher, or legislator. If we can connect more students with real world examples of the opportunity in the state and empower students to see themselves as part of West Virginia's solution, we will see a different kind of "turning point"—that moment when many young West Virginians realize they can do everything they've always wanted, right here at home.

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FROM THE DIRECTOR:
Some BIG news

As I hope you've have already heard, we, along with support from Governor Tomblin and our United States Congressional delegation, were recently able to announce a brand new $20 million award for West Virginia from the National Science Foundation (NSF)! In case you're wondering what this means for our state, I thought I'd give you some details here.

The money will be used to boost academic scientific research and significantly upgrade infrastructure at West Virginia University, Marshall University, West Virginia State University as well as at Shepherd University and West Virginia Wesleyan College. The winning proposal, titled Gravitational Wave Astronomy and the Appalachian Freshwater Initiative, will support both basic and applied research in water resources in West Virginia as well as gravitational wave astrophysics.

The gravitational wave research will focus on early universe cosmology and galaxies, along with relativity, gravity and compact objects in the local universe. The tools and models developed through this project will provide valuable inputs towards solving astrophysics challenges related to low-frequency gravitational waves and electromagnetic models. We are fortune to have the world-renowned Green Bank Telescope in our great state and much of this research is possible because of it. The water resources research will be coordinated through the Appalachian Freshwater Initiative. Its focus will be on investigating water quality in West Virginia as it relates to certain stressors.

As you can imagine, everyone involved in this project is very excited for what this new grant means for not only our institutions of higher education but also for our students and the general public. The money will allow the schools involved to enhance their STEM programs which I am confident will open more doors of opportunity for all of our current and future students. The increased infrastructure is important so that our state can become even more competitive as a research state – especially as science and technology career opportunities are increasing each year. Finally, this grant will ultimately allow our state to better prepare students in the STEM fields which will improve our workforce and move us to a more science and tech-based economy for the future.

The grant took effect immediately and will continue for five years. West Virginia was qualified to apply for and receive the highly-competitive award because of our state is part of NSF's Experimental Program to Stimulate Competitive Research (EPSCoR).

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Director of Science and Research
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