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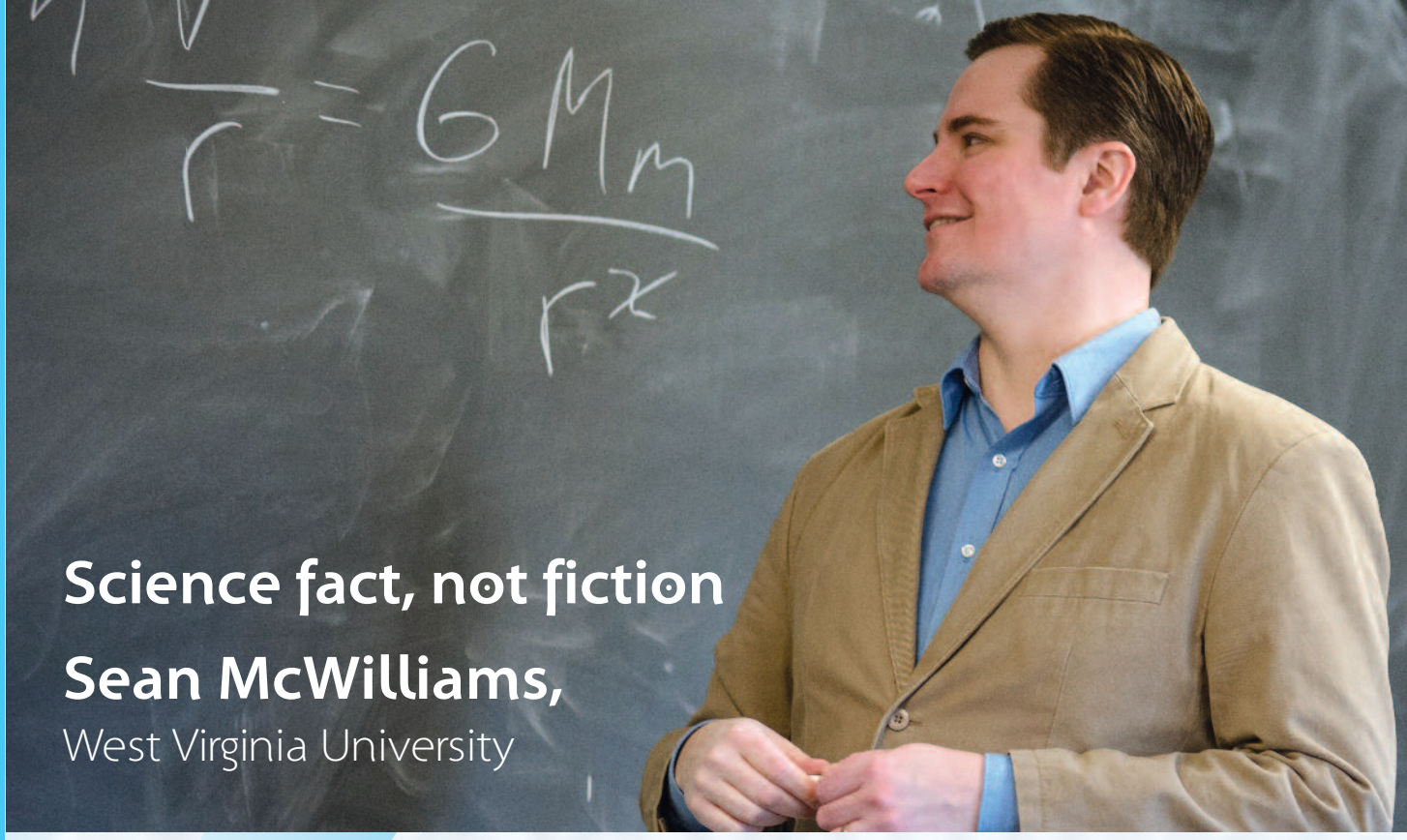
Sean McWilliams
West Virginia University



Science fact, not fiction

Sean McWilliams,

West Virginia University

Astrophysicist Sean McWilliams is at a serendipitous age in life. He's old enough to have played a major role in a discovery that, in essence, has launched a brand new frontier of science. But, he's still young enough to have the opportunity to journey through it for the duration of his career.

McWilliams made international headlines this winter as a member of the research team working on the Laser Interferometer Gravitational-Wave Observatory (LIGO) which detected gravitational waves, or invisible ripples in space-time.

The West Virginia University (WVU) Assistant Professor of Physics and Astronomy said that Albert Einstein first predicted the existence of gravitational waves 100 years ago, but until now, they had never been seen directly.

"This first observation of gravitational waves has deepened our understanding of the universe," McWilliams said.

He said that Einstein's theory of general relativity describes the inner workings of gravity, which is the most important force on the scale of stars, galaxies and the universe as a whole. The theory describes space-time as a fabric permeating the universe. Einstein described space-time as flexible, able to be distorted and warped as large masses move through it. So, if large, dense masses move toward one another in a particular way, such as pair of black holes or neutron stars spiraling into one another, the disturbances in the gravitational field would, as a result, travel out as gravitational waves.

McWilliams' work with LIGO has focused on simulating and modeling gravitational-wave emission in order to detect the incoming signals and conclude details about their source. He has been a member of LIGO since 2005 and is WVU's institutional principal investigator for the LIGO Scientific Collaboration.

Photos by Alex Wilson

McWilliams said that in order to be admitted to the National Science Foundation-funded research team, he had to go through a rigorous application and interview process during which he had to describe what he would add to the team. Luckily for him, he had been studying the last phase of the merger of black holes longer than rmost people. In fact, he started studying black holes during his first year as an undergraduate student at Penn State University – so, unarguably, he had plenty to bring to the table.

McWilliams said he has always been a little impatient to learn about the unknown – a trait that seems to have followed him through life.

"As a kid I was always interested in what the next thing to learn would be," he said. "I was also very curious about things out in space."

As part of LIGO, McWilliams collaborated with his peers to perform some of the earliest supercomputer simulations of merging black holes and, in recent years, he has worked extensively on simulating and developing models for these signals as a part of the LIGO effort.

His expertise in this theoretical modeling also helps inform the observational astronomy work of WVU professors Duncan Lorimer and Maura McLaughlin.

"I was absolutely drawn to WVU in the first place because of the observational element of astronomy available here," he said.

This ever-mounting expertise will likely carry him through the end of his career. In the future, he hopes he will be part of the development of a Laser Interferometer Space Antenna, or LISA - a joint NASA- European Space Agency (ESA) project to develop and operate a space-based gravitational wave detector.

"LIGO is limited because it's on the ground, which is constantly shaking, so low frequencies cannot be detected. However, this is where we'd be able to detect more massive black-hole binaries," he said. "If we can put a detector in space, away from the ground noise, then we can discover so much more."

The development of LISA is currently slated for the year 2034 although ESA has recently begun considering additional or larger partner contributions and launching as early as 2029.

A self-proclaimed teacher at heart, McWilliams also finds the time to pass his love of learning onto the next generation. He mentors his students at WVU, but he also regularly speaks at local elementary schools.

He said, "If the students I speak to walk away with any new curiosity or knowledge about the universe, then my time with them has been success."

"This first observation of gravitational waves has deepened our understanding of the universe."

Sean McWilliams

Sean McWilliams talks with WVU students Nick Pingel, William Armentrout, Lucas Hunt and Amy Sardone.

about West Virginia 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.
Editor, Amanda Ramey (amanda.ramey@wvresearch.org).

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Concord hosts **distinguished lecturer**

EarthCube Distinguished Lecturer Denise Hills spoke at Concord University on April 20 on "Energy Resource Assessment and Data Preservation: What's the Connection?"

Hills is Director of Energy Investigations at the Geological Survey of Alabama and is based in Tuscaloosa. She also serves on the Engagement Team within EarthCube. She conducts and oversees research on the stratigraphy, geophysics and structural geology of petroleum reservoirs, including work with applications in enhanced oil recovery and carbon sequestration. Additional responsibilities include database creation for at-risk legacy data and presenting information to a wide range of audiences to increase the public's knowledge of the importance of geology.

The lecture at Concord dealt with the importance of Earth science data in the development and management of energy resources. According to Hills, energy development begins with resource assessment, but this can be expensive. One way to reduce these costs, she explained, involves reusing data originally collected for other purposes. Often, though, this legacy data is at risk of being lost. Rescue and preservation of such data are therefore critical to efficient, thorough and cost-effective resource assessment, Hills said.

Hills was brought to Concord as part of a three-stop lecture tour supported by the EarthCube Distinguished Lecturer Program. EarthCube is a cyberinfrastructure initiative for the geosciences funded by the National Science Foundation. EarthCube's project teams are creating frameworks for sharing data, software tools and models to enhance Earth science research to enable an integrated understanding of Earth systems.

BSC **BioMedical Club** hosts **Science Day** featuring **egg drop**

The BioMedical Club at Bluefield State College (BSC), in an effort focused upon increasing student enrollment in STEM majors, hosted its first Science Day in April.

In early April BSC students traveled to Southside K-8 School in McDowell County to talk with kids about the science behind an egg drop. They also served as mentors as the kids constructed egg drop contraptions. Then, on April 18, the Southside students traveled to BSC to participate in Science Day. Activities included presenting their egg contraptions in a science fair format, touring the college and hearing talks by admissions and financial aid representatives.

At the end of the day, the kids tested their egg drop contraptions to see whether or not their eggs broke following a 10-foot fall. The winner was awarded a $500 scholarship to attend BSC upon graduation from high school. Funding was provided for the Science Day event through a NASA grant written by a BSC undergraduate student. The planning and execution of the outreach initiative was completed almost entirely by BSC BioMedical Club students.

Shepherd President leads **research team** that finds **breast cancer treatment strategy**

Shepherd University President Mary J.C. Hendrix is the senior author of findings published in the journal "Cell Cycle" about Nodal, a signaling molecule, which holds promise as a novel target in treating aggressive cancers, especially triple-negative breast cancer.

"Our research holds promise as a way to curb the spread of breast cancer and other aggressive cancers that are resistant to current therapies," said President Hendrix. "It is especially gratifying that the first author of this potentially groundbreaking research, Dr. Thomas Bodenstine, completed his postdoctoral training in the Hendrix Laboratory at the Stanley Manne Children's Research Institute, part of Northwestern University, where I served as the president and chief scientific officer until assuming the Shepherd University presidency in February."

Triple-negative breast cancer (TNBC) is an aggressive, difficult to treat form of cancer that lacks expression of key growth factors and does not respond to therapies that target these growth factors. As a result, patients diagnosed with TNBC must rely on traditional systemic neo-adjuvant chemotherapy, which is intended as a first-line treatment that sets the stage for subsequent therapies. Triple-negative breast cancer often relapses with metastatic involvement, at which point responses to therapy are poor. In order to effectively treat this aggressive cancer it is critical for new therapeutic targets to be identified.

Hendrix is part of the team whose preliminary data show that Nodal is highly expressed in TNBC and that treating Nodal expressing TNBC cell lines with an anti-Nodal antibody reduces the viability of cells that had been previously treated with a chemotherapeutic agent. The group's investigation indicates that when exposed to doxorubicin followed by anti-Nodal antibody, cellular stress and repair pathways are significantly impacted, resulting in cell death. These findings offer support for a combination therapy that can overcome TNBC aggressiveness and relapse.

Along with Bodenstine and Hendrix, co-authors include Dr. Naira Margaryan, Elisabeth Seftor, Dr. Luigi Strizzi, Grace Chandler, David Reed, Alina Gilgur, Janice Atkinson, Nida Ahmed and Matthew Hyser.

In the invited commentary on the research, "Targeting the untargetable? Nodal Expression in TNBC", authors Eric D. Young and Danny R. Welch said, "This paper establishes several findings with great potential for future clinical application." They note that combinations such as those proposed in this paper would provide patients with less residual disease and lower toxicity from chemotherapy.

The study was supported by a grant from the National Institutes of Health (NIH) and the Northwestern Memorial Foundation Dixon Translational Research Grant. Additional support was received through a Junior Investigator Award from the Brinson Foundation and the Kennedy Foundation at Presence Saint Francis Hospital.

Marshall University hosts **Forensic Science Research Day**

Marshall University (MU) Forensic Science Graduate Program student research studies were showcased at its Research Day event on Monday, April 25, 2016 at the MU Forensic Science Center.

Last summer, forensic science graduate students were selected for internships in federal, national, state, county and local forensic crime laboratories across the country where they received real-world instruction prior to officially entering the field of forensic science as working professionals in crime labs. The internships focused on research projects involving DNA analysis, digital forensics and forensic chemistry.

At the research day, presentation reviewers included representatives from the West Virginia Office of the Chief Medical Examiner; West Virginia State Police Digital Forensic Unit; Marshall University Forensic Science Graduate Program; Marshall University Forensic Science Center and its Forensic DNA Analysis Laboratory; Marshall University College of Science and the Marshall University Biomedical Sciences Graduate Program.

Dr. Pam Staton, program coordinator, said collaborative efforts between academics and practitioners benefit students of Marshall's Forensic Science Graduate Program and crime labs across the nation in many ways.

"The internship program provides crime laboratories with a steady stream of competent interns carrying out research projects that serve to move the profession forward," she said. "At the same time, Marshall's students gain exposure to the working world of forensic science, allowing them to make informed employment decisions and hit the ground running as new employees."

Staton said university forensic science programs are more effective when they have strong working relationships with crime laboratories. "Our goal is to produce excellent professionals for the law enforcement community, whereas law enforcement agencies wish to hire the best employees," she said. "Universities focus on research and education while crime labs focus on casework and training in a complementary fashion that serves to move the forensic science community forward."

The Forensic Science Center provides students with a unique environment for education and training in preparation for internships as it houses the nationally recognized and FEPAC-accredited Forensic Science Graduate Program, accredited Forensic DNA Analysis Laboratories as well as working forensic chemistry, forensic microscopy, digital forensic laboratories and a crime scene house.

"The internship program provides crime laboratories with a steady stream of competent interns carrying out research projects that serve to move the profession forward."

Dr. Pam Staton

WVSU student group named **Outstanding Chapter** by **American Chemical Society**

The student chapter of the American Chemical Society (ACS) at West Virginia State University (WVSU) received its fourth consecutive Outstanding Chapter Award for its 2014-2015 activities. The group also received Green Chemistry Chapter recognition for the sixth year in a row. Participants received their honors at a national ACS meeting in March.

The group of more than 20 students was praised for outreach and educational efforts by award judges, with reviewers citing what they called an outstanding job promoting chemistry to area youth. Student participants regularly visit schools in the Kanawha Valley to help teach science to K-12 youth.

"The ACS students are successfully continuing their mission to bring science education to young people," said Dr. Micheal Fultz, associate professor of chemistry at WVSU. "We are taking science into both public and private schools on a regular basis to enhance science education at all grade levels."

The group hosts educational programs for schools throughout Kanawha and Putnam counties, which include lectures on topics such as green chemistry, career presentations and science-based, hands-on activities. They have worked with groups such as the Boy Scouts and Girl Scouts, and they take part in National Chemistry Week, Earth Day, National Lab Day, blood drives and other events.

Scientific video journal visits WVU research facility

JoVE, a peer reviewed scientific video journal, recently visited West Virginia University (WVU) to film a segment on technology created at the Center for Alternative Fuels, Engines and Emissions (CAFEE).

JoVE heard about the technology through a paper published by CAFEE researchers in Environmental Science and Technology. While working on an Environmental Defense Fund grant, the researchers needed an accurate, mobile measurement system to quantify methane emissions because the equipment on the market just wasn't cutting it.

"We needed something easy to transport and accurate, but it also needed to be able to handle the measurement amounts we were focusing on in the study, which we just couldn't find," said April Covington, a doctoral mechanical engineering student from Sylvania, Georgia, at CAFEE.

CAFEE developed a full flow sampling system to meet its needs. A provisional patent for the system has been filed by Derek Johnson, research assistant professor; Nigel Clark, professor; Zachary Luzader, computer software engineer; Christopher Rowe, engineering technician and Covington.

The team hopes that new greenhouse gas regulations will eventually lead to commercialization of the system. Phone calls have been rolling in from companies and organizations wanting to learn about and utilize the machinery for emissions testing in the field. But with CAFEE's busy research schedule, the system is booked solid - traveling across the country to states such as Texas, Ohio and Arkansas.

Junior faculty members from sta

The Faculty Early Career Development (CAREER) program is the National Science Foundation's (NSF) most prestigious award in support of junior faculty. These faculty members 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.

Not one or two, but three faculty members in West Virginia received the CAREER award this year: Marshall University's Dr. Nadja Spitzer and West Virginia University's Dr. Jennifer Weidhaas and Dr. V'yacheslav (Slava) Akkerman. Each award comes with at least $500,000 in funding over a five-year period.

Dr. Chuck Somerville, dean of the Marshall College of Science, said he is very excited for Spitzer and what her success means for the progress of world-class research at Marshall.

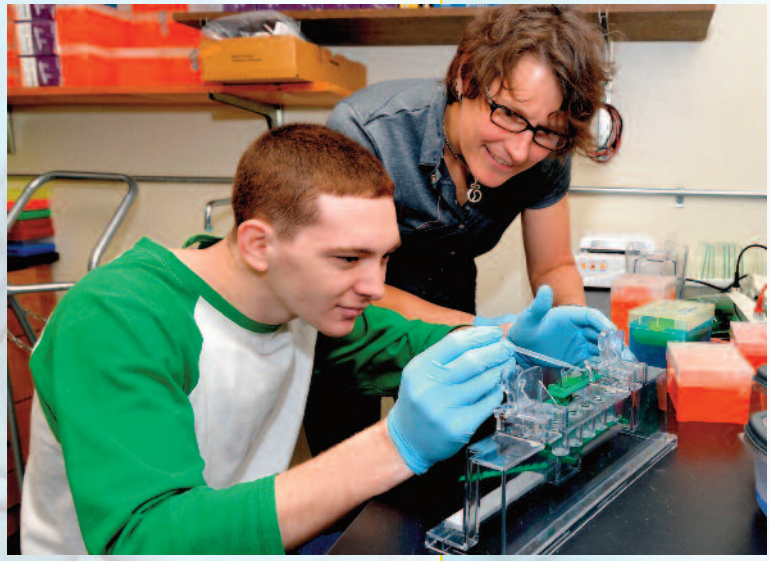
"Through the NSF-EPSCoR RII program, we were able to provide the kind of infrastructure and support that it takes to be competitive," Somerville said. "Nadja took full advantage of that support and brought a tremendous amount of talent and hard work to the mix. She has proven that Marshall students and faculty are prepared to compete on a world-wide stage."

"As dean, it is extremely gratifying to yet again see two young faculty members recognized for their research at a national level," said Gene Cilento, Glen H. Hiner Dean of West Virginia University's Statler College. "It speaks to the quality of research being done by Drs. Weidhaas and Akkerman and their recently- hired colleagues at WVU, which plays a role in the economic development and health of West Virginia."

Spitzer and **silver nanoparticles**

Spitzer is Marshall's very first winner of this particular NSF recognition. She is an assistant professor of biological sciences in Marshall's College of Science and earned the award for her work to study how exposure to silver nanoparticles could be affecting the brains of children and adults.

According to Spitzer, many common consumer products like clothing, toys and food containers claim anti-microbial properties that feature silver nanoparticles applied as coatings to the product. She said that although silver has been used as an antimicrobial since ancient times, the use of pure manufactured nanoparticles—tiny beads of silver—is new.



Dr. Nadja Spitzer (right) works with a student in her lab.

She added, "Unlike more traditional forms of silver, these nanoparticles are able to bypass human defense systems and enter tissues like the brain, where they tend to stay and accumulate. Over the course of a lifetime, then, people can be exposed to low doses of silver nanoparticles shed from the products we use daily, through ingestion or inhalation.

"In my lab, we are interested in the changes or damage that may be happening in the brain due to this low-level chronic exposure, which is currently thought to be non-toxic."

Spitzer said even though she is not a toxicologist in the traditional sense, she always has been concerned about the things to which humans are exposed.

As part of the project, students from the university also will be going out to elementary schools throughout rural West Virginia to teach children scientific concepts in entertaining, interactive ways.

ate receive major **CAREER awards**

Weidhaas and **water safety**

Jennifer Weidhaas, assistant professor of civil and environmental engineering at WVU, earned the award for her work in detecting biological contaminants in environmental samples.

Declining water quality and quantity have become global issues of concern, requiring research into ways to carefully manage our water resources. One hindrance to providing clean drinking water and safe recreational waters is the presence of waterborne pathogens.

"With increasing water scarcity predicted in the future, we need tools to more accurately monitor and protect our nation's water resources," Weidhaas said. "Unfortunately none of our current testing methods meet all criteria established for water quality monitoring. Therefore, there is a critical need for tools to more accurately determine the microbial safety of our water."

Weidhaas, who works on water quality issues ranging from rapid response to chemical spills to improving the microbiological quality of water, plans to develop a rapid method for tracking hundreds of waterborne pathogens as well as statistical tools for identifying the source of water impairment. She will develop a microarray – or lab on a chip – that can simultaneously detect hundreds of pathogens, fecal indicator bacteria and microbial source tracking markers.

Weidhaas will involve both graduate and undergraduate students in the project, resulting in them becoming trained in cross disciplinary subjects such as molecular biology, microbiology and environmental engineering. Women who are secondary school teachers will be introduced to the results through the creation and demonstration of learning modules through the WVU Association for Women in Science.

Akkerman and **fire**

V'yacheslav (Slava) Akkerman, assistant professor of mechanical and aerospace engineering at WVU said this award will allow him to further his work on promotion and prevention of flame acceleration and transition to detonation.

People who witness a fire oftentimes report hearing an explosion that resulted from a chemical reaction. Investigators then begin to look for clues in an effort to understand if that reaction happened at a speed below that of the speed of sound – known as deflagration or flame – or above – known as detonation. If the fire involved both, investigators then look for clues as to how fast the event moved from deflagration to detonation.

"From a practical consideration, the deflagration to detonation transition (DDT) events influence countless disasters, such as explosions in power plants and mining accidents, that claim hundreds of lives every year," said Akkerman. "On the positive side of things, however, DDT can be employed in advanced technologies such as micro-combustors and pulse-detonation engines of next-generation hypersonic aircraft. This makes DDT an intriguing phenomenon with applications ranging from combustion and inertial confined fusion to thermonuclear supernovae."

Akkerman's research will bridge the gap between fundamental studies and practical applications by characterizing the mechanisms promoting, controlling or preventing the DDT process. He will investigate the possibility of replacing a hazardous detonation in energy-efficient manufacturing with a safer alternative combustion regime. Additionally, a novel predictive tool for fire safety and DDT risk assessment will be developed, which is important for West Virginia with an economy that relies heavily on coal mining and shale gas drilling industries.

As part of the award, Akkerman will integrate his research into an extensive education module that promotes awareness of advanced combustion research in schools and colleges.

Engineering Challenge Camps for kids planned at WVU

Registration is open for West Virginia University's (WVU) Engineering Challenge Camps. The camps, hosted in the Statler College of Engineering and Mineral Resources, features something for students at virtually every education level.

The series features four week-long camps for high school students, who have the option to stay overnight in a WVU residence hall and will have evening activities led by camp counselors who are WVU engineering students. There are also three week-long day camps for middle school students and three weeks of half-day camps for elementary school students.

"For the fifth year, we have expanded our camp offerings to try and meet demand," said Cate Schlobohm, outreach coordinator in the Statler College. "This year we will be able to serve more than 400 campers, and we have designed new curriculum to appeal to different interests."

For curriculum, fee information and to register, go to http://statler.wvu.edu/outreach/camps. Space is limited.

The Middle School Engineering Challenge Camp, "Ages of Engineering," will kick off the series on June 20-24. The camp, which will focus on great discoveries and inventions that have shaped modern-day engineering, will also take place on June 27-July 1 and July 25-29.

For the fourth straight year, the college will host an all-female STEM camp, "Growing Roots in STEM," which will take place June 26-July 1. Designed for girls interested in science, technology, engineering and mathematics (STEM), the camp will have an engineering focus, but will also demonstrate how a career in engineering can be tied into forensics, pharmaceuticals, beauty product development, design and architecture and more. Campers will meet and work with female faculty members and female alumnae on design projects and various competitions.

Other camps, which are co-ed, include "Engineering in Action" and "Engineering in Entertainment," both scheduled for July 10-15, and "Engineering in Sustainability" on July 17-22.

"Once Upon Engineering" is the theme for the elementary school camps, which will be the weeks of July 18-22, July 25-29 and August 1-5. These camps will focus on the STEM behind fairy tales.

Marshall receives **Environmental Partnership Award** for stormwater program

Marshall University received the 2016 Environmental Partnership Award from the West Virginia Department of Environmental Protection (WVDEP). Under the leadership of Marshall's environmental specialist, Travis Bailey, the university has made strides to improve the region's water quality through its stormwater program according to Matt Collier, environmental inspector for the WVDEP.

"Through Travis' efforts, Marshall has installed green roofs throughout campus and continues to comply with the MS4 permit requirement of capturing the first one inch of rainfall from new development with the building of their new athletics complex and engineering building," Collier said. "Marshall's timely response and attention to detail helped to keep sediment out of the storm sewer system, which ultimately flows to Huntington Sanitary Board's Combined Sewer System (CSO). This helps to prevent pollutants from reaching the Ohio River and any blockages within the aging CSO system."

Bailey said the disposition of stormwater is limited to three ways: evaporation, absorption or going down the drain.

"If stormwater goes down the drain, then there is a good chance it will enter the Ohio River. Stormwater is known to carry pollutants (bacteria, nutrients, metals, etc.) into the receiving streams," Bailey said. "These pollutants can impact aquatic life, recreational use and probably most importantly our drinking water. Marshall's team can't clean up the river all by ourselves, we can only do our part, but we can show others what does and does not work based on our own trials of new technology."

Bailey noted the university has been able to install two green roofs, which act as sponges to absorb water and allow plants to use the pollutants. He said the soil acts as a filter and will delay the discharge of the water, help insulate the building to lower energy use and increase the longevity of the roof.

"We want to help educate and show people that they don't have to be an engineer or have a lot of money to implement most of these practices in their homes," Bailey said.

> **"We want to help educate and show people that they don't have to be an engineer or have a lot of money to implement most of these practices in their homes."**
>
> Travis Bailey

Article co-authored by WVU physician named **one** of **25 "hottest"**

Dr. Geraldine Jacobson, chair of the WVU Department of Radiation Oncology and physician-in-chief of radiation oncology for the WVU Cancer Institute, is co-author of a special article in Practical Radiation Oncology that was named one of the "Top 25 Hottest Articles" in the journal.

"Choosing Wisely: The American Society for Radiation Oncology's Top 5 list" highlights radiation oncology interventions that should be discussed between physicians and patients before treatment is initiated. The five items provide opportunities to offer higher quality and less costly care. The article is among the 25 most downloaded articles from Practical Radiation Oncology, which is one of three journals published by the American Society for Radiation Oncology.

West Virginia State University designated a Tree Campus USA® from National Arbor Day Foundation

West Virginia State University (WVSU) received its third consecutive designation as a Tree Campus USA® from the National Arbor Day Foundation for its commitment to effective urban forest management. To date, WVSU remains the only institution of higher education in West Virginia to hold such a designation.

"West Virginia State has taken the initiative to ensure that our campus trees remain healthy and beautiful by using proper management techniques," WVSU Extension Agent Brad Cochran said. "Tree Campus USA is a designation that we continue to be very proud of."

Tree Campus USA® is a national program created in 2008 by the Arbor Day Foundation to honor colleges and universities for effective campus forest management and for engaging staff and students in conservation goals. WVSU achieved the title by meeting Tree Campus USA's five standards, which include maintaining a tree advisory committee, a campus tree-care plan, dedicated annual expenditures for its campus tree program, an Arbor Day observance and a student service-learning project.

The Arbor Day Foundation has helped campuses throughout the country plant thousands of trees, and Tree Campus USA® colleges and universities invested more than $36.8 million in campus forest management last year.

Loughman and students study Texas crayfish

In March, West Liberty University Assistant Professor of Biology Dr. Zachary Loughman and his team of four students concluded a nearly two-year-long crayfish biology project that took them all the way to east Texas' Big Thicket National Preserve.

The study was a biotic inventory, meaning they canvassed the preserve for crayfish, catching as many as they could in order to figure out what species of crayfish are there, how abundant each species is, and what conservation recommendations to give to those in charge of the preserve. As part of the project, Loughman and his crew visited 100 sites.

According to Loughman, this study was different than past projects because of the unique wetlands habitats that are much different than Appalachian streams. The results of the inventory were 13 species of crayfish identified - one of them new. Loughman said that before they went to Big Thicket, only one species of crayfish was known to live there.

"The kind of fun, refreshing message for east Texas is it's the first place I've ever done a survey in which I can honestly say the crayfish are absolutely fine," Loughman said. "There were two species that you only find in that watershed, so basically the recommendation I'm making to the preserve is just to simply monitor them, make sure they're still there."

Ecologically, Loughman said they made important discoveries regarding a local crayfish species' direct association with a Texas plant species called the pitcher plant, as well as the importance of burrowing crayfish to the soil cycle.

The team expects to put together two publications from this trip by the end of May and June, and they have already begun presenting their results at conferences. But their success does not end there. Loughman said that thanks to their previous work with crayfish and exposure they have gotten from things like his appearance on the cover of the Winter 2016 issue of The Neuron, his lab has received $250,000 in grants since January. He has projects lined up for himself and his students for the next few years.

To Loughman, though, the most rewarding part of his research is when his students get recognized for the work that they do.

"None of this is possible without my students."

Dr. Zachary Loughman

Loughman's students Katie Scott, Zachary Dillard and Nicole Sadecky assist Photo Ark founder Joel Sartore as he photographs a crayfish while he was in Charleston for a recent Chancellor's STEM Speaker Series event.

As a follow up to Loughman's feature story in the last Neuron, the U.S. Fish and Wildlife Service and the Center for Biological Diversity announced on April 6 that two rare crayfish species found in scattered populations in sediment-imperiled streams in the Southern West Virginia coalfields have received protection under the federal Endangered Species Act. To read more about Loughman's research with crayfish species in West Virginia, visit The Neuron page at **wvresearch.org**.

Marshall dean receives **Outstanding Civil Engineering Educator** of the **Year** for **2015**

Dr. Wael Zatar, professor and dean of the College of Information Technology and Engineering at Marshall University, has been named recipient of the 2015 West Virginia Outstanding Civil Engineering Educator of the Year award by the West Virginia section of the American Society of Civil Engineers (WVASCE).

This award is a prestigious one, given to an individual who is a distinguished civil engineering educator, tenured faculty in a West Virginia Engineering School, a resident of the state of West Virginia at the time of nomination and a member of the American Society of Civil Engineers.

Only two awards have been given in West Virginia, and both recipients were faculty members at Marshall. Zatar was nominated by Shelley W. Porter, project manager of West Virginia American Water Company and a member of the WVASCE.

Zatar's research interests include, but are not limited to, bridge management, construction materials, highway testing, advanced experimental destructive and non-destructive testing, reinforced and prestressed concrete, ultra-high performance concrete, fiber-reinforced polymer composite bridges, green and sustainable highway structures and many more.

Zatar has over 25 years of research and experience in the field of pre-stressed concrete structures, seismic design and retrofit of bridge structures which gained him national and international acclaim as well as awards from the United States, Japan, Canada and Mexico.

He has been at Marshall for the past 10 years. He served as the interim dean of the College of Information Technology and Engineering (CITE) for nine months then later became the permanent dean of CITE in May of 2012. Zatar has more than 100 technical publications in book chapters, international journals, peer-reviewed conferences and technical reports. He currently is serving as a member of 31 national engineering/education committees. Additionally, Zatar has served as a reviewer and has participated in editorial boards of the American Society of Civil Engineers, American Concrete Institute, Prestressed Concrete Institute, Japan Concrete Institute and the Japan Society of Civil Engineers.

Zatar serves as the director for the Multi-Modal Transportation and Infrastructure Consortium, Marshall University's Transportation Center, Innovations and Asset Management of Sustainable Transportation Infrastructure Systems Program and associate director of the Mid-Atlantic Transportation Sustainability Center.

Scientific discovery **fuels minds, futures**

Paul Hill
Chancellor, West Virginia Higher Education Policy Commission

As a young boy growing up in rural West Virginia, I loved discovery. I was fascinated by the idea of putting two things together and getting something entirely new, how rainwater engineered the landscape and why frogs croaked in the spring. So I was drawn to science.

Scientific research is profoundly fascinating. Something starts as an idea, and with analytical powers, deep study and experimental creation, you end up with a problem solved, questions answered or a discovery made.

Students from across our state who were at the Capitol for Undergraduate Research Day at the Legislature understand how exciting that is. As part of the event, they showcased research projects in areas ranging from biochemistry to geosciences.

For these students and young people across the state, we must continue making progress toward an economy fueled by innovation and discovery. That's why we are encouraging innovation and entrepreneurship through advancements like the Regional Technology Park in South Charleston and the I-79 Technology Park in North Central West Virginia — places where high-tech businesses converge with higher education, research and new opportunities.

And under the leadership of Gov. Earl Ray Tomblin, West Virginia continues working to spur early interest in science, technology, engineering and math (STEM), while also attracting investments in our state — investments that lead to new, high-tech careers and sustained economic growth. To take full advantage of these burgeoning opportunities, we need young people with an innovative spirit.

If West Virginia is to grow economically, then we need creative, strong minds to make it happen. And we must support those minds. Our merit-based financial aid program, the PROMISE Scholarship, has done just that by providing more than $400 million to more than 35,000 West Virginia students from all 55 counties. West Virginia also offers the Engineering, Science and Technology Scholarship, which is available to qualified students interested in pursuing an education in these critical fields.

With all of our financial aid programs combined, West Virginia is 8th in the nation in aid provided to college students. That's something I am very proud of, and something we absolutely must continue.

As a state, we also have invested in science and research activities that have resulted in celebrated progress at colleges and universities across our state. These efforts were highlighted in 2008, when the State Legislature created the Research Trust Fund — better known as "Bucks for Brains" — which invested $50 million that doubled private gifts and has expanded research and infrastructure in areas linked to economic development, health care and job growth.

Our undergraduate researchers are carrying forward that great momentum. They represent what the future of our state can be — if we encourage them, support them and inspire more students like them.

If you are a student who aspires to scientific studies or careers, there are some important steps to consider.

First, take STEM courses in high school — and don't shy away from the difficult ones. It's important to dig in at the highest levels so you're ready for the demands of college. Next, study broadly. Take chemistry, math courses, physics, biology. All of these areas and numerous more are increasingly interrelated. So if you have a strong, broad background, you'll be prepared for what your future holds — and you might end up on a career path you didn't expect. Also, work collaboratively. Individual research is becoming shared research. Be prepared to work as a team — because big problems require the collaboration of a lot of people with big ideas.

And lastly, I'm sure other students, loved ones and friends look up to you and admire your dedication. That means you have a real opportunity to inspire them. Let them know that it's cool to be smart. It's something that you have to dedicate yourself strongly to, but it's something you should embrace. And it's something you should be proud of.

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Division of Science and Research
West Virginia Higher Education Policy Commission
1018 Kanawha Blvd E Suite 1101
Charleston WV 25301-2800
304.558.4128
www.wvresearch.org

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FROM THE DIRECTOR:
The state of research

Researchers in West Virginia have made some pretty remarkable discoveries over the last year that displays to the world that we are on the map. Below are a couple very recent examples.

- Researchers at Marshall recently found that blocking the blood supply of small cell lung cancer tumors with a small synthetic molecule may help reduce their growth and actually delay the re-growth process after treatment. This is critical because small cell lung cancer is considered to be the most lethal of all lung cancers. Marshall's Dr. Piyali Dasgupta presented these findings to a national audience at the 2016 Experimental Biology Conference in San Diego.
- The Center for Gravitational Waves and Cosmology at WVU brings together experts from across departments and institutions who are working to characterize the universe and understand its origins. It is a collaboration focused on working together to pursue fundamental research in gravitational wave astrophysics and cosmology. Last year, this collaborative approach enabled WVU to become a lead university in a $14.5 million National Science Foundation (NSF) grant to create and operate a Physics Frontier Center, as well as a $2 million NSF grant to expand the reach and impact of WVU's highly successful Pulsar Search Collaboratory student science education initiative. The groundbreaking potential of the center's work was confirmed by the announcement of the observation of gravitational waves that confirmed the final prediction of Einstein's theory of relativity.

This is just a snippet of the good news I could have referenced. So, as proponents of the STEM fields and scientific research we must work together to inform decision-makers about this great research and the importance of funding because, without it, none of this could have been possible. The answers to some of the world's foremost mysteries may lie within someone at one of our universities, and we must support them.

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

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