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West Virginia State University
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NEURON

West Virginia's Journal of Science and Research

WINTER 2021

UNIVERSITY OF CHARLESTON

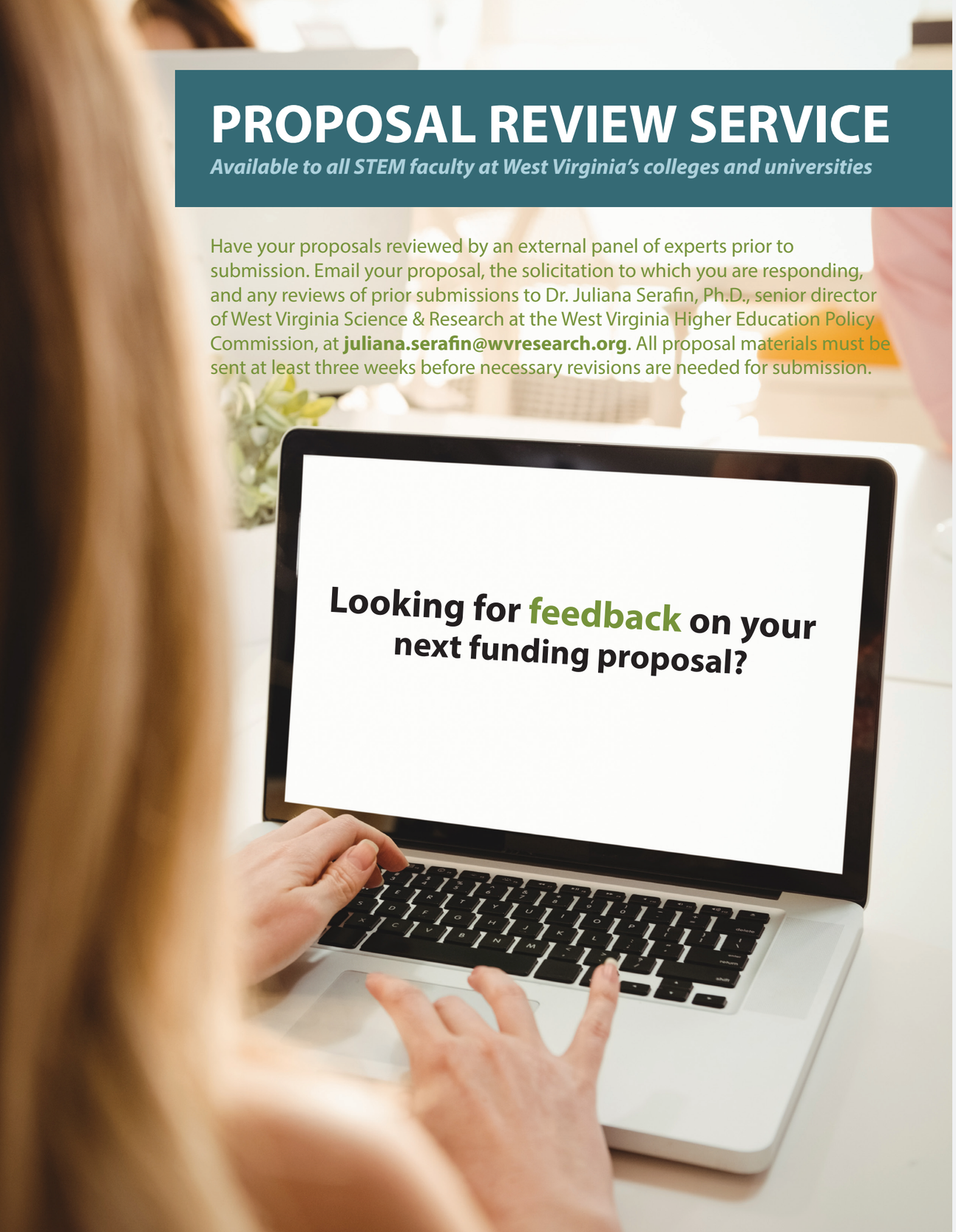
Aida Elisabet Jimenez Esquilin

Helping undergraduates find their research identity: UC professor strives to provide purposeful science experiments

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. Juliana Serafin, Ph.D., senior director of West Virginia Science & Research at the West Virginia Higher Education Policy Commission, at **juliana.serafin@wvresearch.org**. All proposal materials must be sent at least three weeks before necessary revisions are needed for submission.



West Virginia Science & Research

WINTER 2021

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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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Above: Jemima Ayilaran, biology student and First2 Network club member at the University of Charleston, setting up in lab.

INSIDE THIS ISSUE

News briefings

New telescope at Green Bank Observatory will improve localization of Fast Radio Bursts

Thanks to a $1.7 million National Science Foundation grant awarded to Kevin Bandura, assistant professor in the Lane Department of Computer Science and Electrical Engineering in the Statler College of Engineering and Mineral Resources at West Virginia University, a new telescope is slated to be built at the Green Bank Observatory to pinpoint the locations of Fast Radio Bursts (FRBs) in far off galaxies, enabling the ability to finally discover the nature of these enigmatic objects.

FRBs are among the brightest sources ever seen in the sky, but their origin remains a mystery to scientists. The intense flashes of energy blaze for only a millisecond and then disappear. Although they can only be seen for a brief moment, the radio waves have travelled for billions of years through an ionized cosmic structure to be visible in the sky.

"Currently, most FRB positions are so imprecise that astronomers don't even know which galaxy they come from," Bandura said. "The new telescope, Outrigger, will solve that problem, determining the particular galaxy, and will go further, localizing the source to a specific region within the galaxy."

The new Outrigger telescope will work in conjunction with the existing Canadian Hydrogen Intensity Mapping Experiment, or CHIME, telescope, which is located half a continent away in British Columbia, to triangulate the locations of FRBs.

"The CHIME telescope will be making the detection, but the data will be saved from both telescopes, then we can use very long baseline interferometry techniques to really localize where it comes from," Bandura said.

The CHIME telescope is comprised of four cylindrical reflectors, 256 dual-polarized antennas for data collection and an F-engine and X-engine for data processing. To search for FRBs, CHIME continuously scans 1024 separate points on the sky. The new Outrigger telescope will have only one cylinder but will monitor the same area of the sky as the original CHIME telescope.

"From this, we will be able to understand a lot about what is happening between us and the FRB," Bandura said.

The development of this program will open the door for additional outriggers to be built later, allowing even sharper localization of radio bursts, and will pave the way for future construction of larger low-cost, high-throughput telescopes for more advanced transient searches and intensity mapping efforts to probe deeper into the cosmos.

National Weather Service coming to the West Virginia Regional Technology Park in South Charleston

The West Virginia Regional Technology Park (WVRTP) will soon be welcoming a new tenant.

The National Weather Service will relocate its office to a new building at WVRTP, one that can also house other tenants.

"The Tech Park is focused on science, research, and innovation," said Matthew Ballard, CEO and executive director of WVRTP. "With the National Weather Service, we bring onto our campus a branch of science focused on the processes and phenomena of the atmosphere, weather, water, and climate."

Additionally, the Science On a Sphere exhibit will also join the park, bringing with it various educational opportunities

Construction is expected to be completed in February 2022.

West Virginia's Higher Education Chancellor, Dr. Sarah Tucker, attended the groundbreaking.

FROM THE DIRECTOR: Juliana Serafin

West Virginia has available grant funding

Serafin

Photo courtesy of University of Charleston

With the development and rollout of the COVID-19 vaccines, we are reminded of research's importance in improving everyday life and the impact it has on the economy.

This issue of the Neuron highlights the recipients of our state-funded Innovation and Instrumentation Grants on page 13. We would like to take the time to briefly highlight all of the grants available through the Higher Education Policy Commission's Division of Science & Research. These grants are competitive, require the submission of a proposal for review and focus on STEM disciplines.

The Summer Undergraduate Research Experiences (SURE) provide money for undergraduate students to participate in research. The STEM Fellows Grant provides funding for Ph.D. students.

The Opportunity Fund provides awards to assist faculty with expenses related to proposal development and for outreach programs. The Innovation Grant provides equipment, supplies and minor renovations of laboratory spaces for undergraduate students. The Instrumentation Grant provides money to purchase equipment for teaching and research labs. Research Challenge Grants provide money for the development of research centers to impact workforce development. We also provide expert reviewer services to make grant proposals more competitive for federal funding.

Ten West Virginia institutions are current recipients of these grants. The goal is to provide assistance to our students and faculty in building research capacity, making the transition to larger federally-funded programs and expanding the positive effects of research on society.

For more information, we encourage you to visit wvresearch.org/programs.

Julie

Juliana Serafin, Ph.D.

Senior Director of Science & Research, West Virginia Higher Education Policy Commission, and Project Director, WV EPSCoR

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.

Science & Research Council Members

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Chancellor, West Virginia Higher Education Policy Commission

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Senior Director, West Virginia Science & Research, and *Project Director,* WV EPSCoR

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Jose Ulises Toledo, Ph.D.
Vice President for Research and Public Service, West Virginia State University

Above: Processing and measuring Epifagus haustorium specimens for DNA extraction later

Photo by Brock Burwell for University of Charleston

Helping undergraduates find their research identity

UC professor strives to provide purposeful science experiments

Written by **Angela Sundstrom**
Photos by **Brock Burwell for University of Charleston**

Aida Elisabet Jimenez Esquilin, Ph.D. believes in meaningful research experiences.

“What really drives me is trying to figure out how I can fulfill my own research curiosity, but in the context of student learning at the undergraduate level,” she said.

Jimenez Esquilin, an associate professor of biology and biology program director at the University of Charleston (UC), strives to introduce hands-on research at every turn. In 2019, she was part of a faculty group awarded a National Science Foundation (NSF) Scholarships in Science, Technology, Engineering and Mathematics Program (S-STEM) grant.

The S-STEM grant program, according to NSF, funds institutions of higher learning in the United States that then implement their own scholarship program and select recipients based on the eligibility requirements described. For UC, the award created the Scholars Program for Environmental Challenges. This scholarship is worth up to $9,500 annually for 12 students majoring in either biology, chemistry, dual chemistry-biology, data analytics or computer science. It also provides professional development, mentorship from faculty and hands-on research opportunities embedded in coursework. The hope is to learn what works best from recruiting, selecting and retaining this group so it can be applied to the entire biology program. Applications are still being accepted for the next cohort.


Jimenez Esquilin

Photo by Brock Burwell for University of Charleston

The idea for this grant was not completely new, as Jimenez Esquilin had previously implemented Course-based Undergraduate Research Experiences, known as the CURE model. The approach embeds research questions directly into the curriculum, allowing undergraduate students the chance to engage in actual research activities based on the hypotheses proposed by their instructor.

Searching for both time and available funding to continue upgrading lab equipment is also a focus. In 2018, Jimenez Esquilin was awarded an Instrumentation Grant – funded by the Research Challenge Fund and managed by the West Virginia Higher Education Policy Commission – to purchase a real time PCR machine for measuring gene expression. This new machine cuts students’ wait time tremendously. For example, a CURE-modeled lab lasts two hours. The real time PCR machine runs reactions in approximately 20 minutes as opposed to the older machine’s nearly 90 minutes.

Jimenez Esquilin is acutely aware of the difficulties faced in gaining real research experience early in college.

“I started washing dishes,” Jimenez Esquilin said. “I thought I was going to work in the lab and research, but most of the time what I found myself doing was washing the glassware in the lab as an undergraduate.”

Institutional factors can inadvertently damage the confidence of new college students which then leads to issues in success and retention. Jimenez Esquilin believes that primarily undergraduate institutions, like UC, have an advantage when it comes to incorporating undergraduates into research because they have fewer of the very people who usually occupy those roles: graduate students.

Jimenez Esquilin's current research with her students uses next generation sequencing to elucidate the microbiome of *Epifagus virginiana* and its possible role in colonization.

Epifagus virginiana, also known as a beech drop, is a parasitic plant resembling a brown stick that targets only one species: the American Beech Tree. It colonizes the root of the tree and doesn't photosynthesize.

"I always joke that it doesn't have much right to call itself a plant because it doesn't do the basic things we usually associate with plants," Jimenez Esquilin said.

Two undergraduate students contribute to this project in summer research funded by the Appalachian College Association (ACA) Ledford scholars.

"It allows students who may not have ever experienced knowing a researcher or understanding what research is to kind of gain appreciation for that from the beginning all the way to the end," Jimenez Esquilin said. "So, when they leave here, they're more prepared."

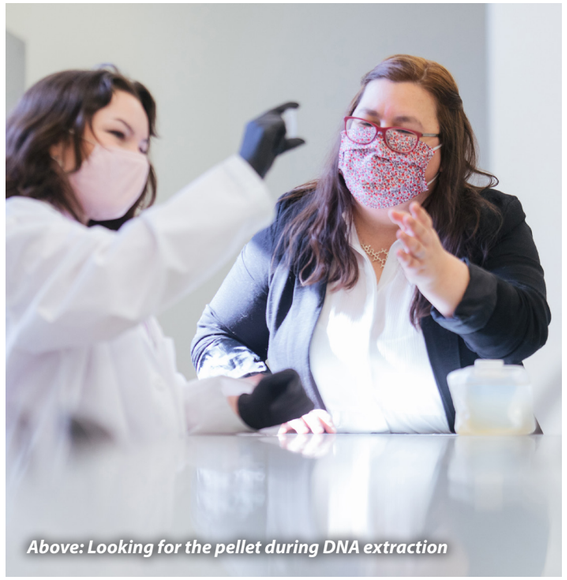
Initiatives that connect undergraduates with peers from similar backgrounds can boost retention, especially for first-generation and other underrepresented minorities in science, technology, engineering and mathematics (STEM). Jimenez is a mentor in the First2 Network, a statewide collaboration supporting these very students by providing summer research, leadership training and on-campus clubs.

> **"We had all of these plans and then COVID happened."**
>
> ***- Aida Jimenez Esquilin, Ph.D.***

Jimenez Esquilin earned her bachelor's degree in molecular biology from University of Great Falls in 2001, her master's degree in biology and microbiology from the University of Colorado in 2003 and her doctorate degree in soil microbiology from Colorado State University in 2006. A native of Puerto Rico, she struggled in the past to explain her microbial ecology expertise to family and friends.

"My mom didn't understand because if you don't do something like medical school or nursing school or something that has a license in Puerto Rico, nobody understands what you are trying to do," Jimenez Esquilin said.

Her love for microbiology began in high school after a science fair project involving the effectiveness of lemon juice or citric acid as an anti-microbial. In college, once she was given responsibilities beyond dish washing, that love was affirmed. Water sample collecting at estuaries, collecting anti-microbial producing bacteria in desert soils and observing what happens to microbial communities after a forest fire were the types of hands-on projects she craved.



Above: Looking for the pellet during DNA extraction

Jimenez Esquilin is aware how much her own personal experience shaped today's outlook. She always viewed providing undergraduate research opportunities as a necessity, but also connecting those experiences to their surroundings. She and other colleagues in the program are building a partnership with the West Virginia Department of Environmental Protection so students can help run analyses to identify toxic algae in regional waterways, an identified need. For now, though, that is on hold.

"We had all of these plans and then COVID happened."

So, Jimenez Esquilin continues tweaking lessons, modeling experiments and recruiting applicants so her vision fully comes to life. Until then, she encourages students to get curious and use their freshman year to find a true passion.

"Challenge yourself to do something you may not have tried before," Jimenez Esquilin said. "You may think your future self as one very specific thing but having an early research experience in ecology may open up a world of science you did not know you loved."

Photo by Brock Burwell for University of Charleston

Statewide partnership among WVU, Marshall and DHHR leads to identification of SARS-CoV-2 variants in West Virginia

Courtesy of **Marshall University**

Working together comes naturally for West Virginians; the pandemic has brought that sense of cooperation to light in many ways. This is true for scientists at Marshall University, West Virginia University and the West Virginia Department of Health and Human Resources as they work together to identify variants of the SARS-CoV-2 virus.

Utilizing an automated system and whole genome sequencing, the team – led by **Peter Stoilov, Ph.D., Peter Perrotta, M.D.,** and **Ryan Percifield, M.Sc**., at WVU and **Jim Denvir, Ph.D**., and **Don Primerano, Ph.D.**, at Marshall – is set to analyze hundreds of samples per week from across the state in their genomic core facilities.

Denvir developed the analytic pipeline for calling the virus genetic variants based on whole genome sequence data derived from SARS-CoV-2 positive cases.

"Ongoing surveillance and focused efforts to characterize the virus in areas of outbreak will identify the SARS-CoV-2 variants that may impact the future of the COVID-19 pandemic in West Virginia," said **Laura Gibson, Ph.D.**, senior associate vice president of Research and Graduate Education, WVU Health Sciences. "And it will detect new variants that arrive from outside or emerge in the state."

Despite the ongoing vaccine rollout and relaxing of public health guidelines, concerns have arisen over variants. All of the Center for Disease Control's currently designated "Variants of Concern" have been detected in West Virginia. In the lab of WVU Virologist **Ivan Martinez, Ph.D.**, researchers are working to better understand how COVID-19 variants evolve and to potentially lead to the development of therapeutics or vaccines.

> **"Ongoing surveillance and focused efforts to characterize the virus in areas of outbreak will identify the SARS-CoV-2 variants that may impact the future of the COVID-19 pandemic in West Virginia."**
>
> ***Laura Gibson, Ph.D.***

"As the task force sequences samples in West Virginia, I would not be surprised if we found a West Virginia variant with one or two mutations," Martinez said. "That's normal. It's a natural competition. It's just pure biology."

"Every new COVID positive case has the potential to generate a virus that is more virulent or more transmissible," said Primerano, professor and vice chair of biomedical sciences at the Marshall University Joan C. Edwards School of Medicine. "Proactively monitoring and testing positive patients for known or novel variants can help improve therapies and mitigate outbreaks."

Fairmont State receives grant for local waterway rehabilitation

Courtesy of **Fairmont State University**

Dominion Energy awarded Fairmont State University (FSU) a $25,000 grant for ongoing restoration and preservation in Marion County.

This grant was provided through the Environmental Education and Stewardship Grant program offered by Dominion Energy and funds will be used to establish a monitoring station with equipment that measures water and environmental conditions at Hickman Run Stream. This station will allow FSU faculty and students to remotely collect data to assess the current conditions of the stream and the overall impact of the project's rehabilitation efforts.

"We are happy to award this $25,000 Environmental Stewardship grant to the Hickman Run project," said **Christine Mitchell**, chair of the WV Community Investment Board for Dominion Energy Charitable Foundation. "Rehabilitating an impaired stream is a great example of working together with our communities toward a more sustainable future."

When permanently installed, the new water monitoring equipment will provide continuous monitoring of the stream's water quality and provide additional data on rainfall, air temperature, wind speed and other important information that improves analysis of stream health.

Glenville State College biology students Brittney Jenkins, Hannah Guthrie, and Emily Turner discuss tree foliage during a trip to Cedar Creek State Park with Science and Mathematics Department Lab Manager Chris Carver (second from left).

Glenville State College biology students collecting, archiving local plant samples

Courtesy of **Glenville State College**

Glenville State College (GSC) biology students have been working to catalog samples of the plant varieties found at Cedar Creek State Park.

Working under the guidance of Assistant Professor of Biology **Dr. Jeremy Keene,** the students have been preparing the samples for archival in GSC's extensive herbarium.

The ongoing project is part of a research-based class that provides students with field experience that will be valuable upon graduation.

"We collect plant samples as a snapshot in time of what was growing and/or flowering at the state park," Keene said. "These specimens can be used over time to compare changes in the community like species diversity or flowering times."

"Doing this type of project makes learning more hands-on, actually being outside makes learning much easier," said **Brittney Jenkins**, a junior biology major from Weston. "I've always loved science. I actually came to GSC with college science credits, so it's just come naturally I guess."

Hannah Guthrie, a junior biology major from Rock Cave adds that the work is valuable career preparation. "This type of project gives us an idea of what we'll be doing when we're out, away from Glenville, in an actual 'in the field' situation," she said.

Glenville State's herbarium, which is located in the Science Hall, contains several hundred plant samples with specimens dating back as far as the 1950s. Some pieces in the catalog were donated, but most have been collected from the local area.

Photo courtesy of Glenville State College

West Virginia State University researchers identify arsenic stress-regulating gene in plants

Courtesy of **West Virginia State University**

Research at West Virginia State University (WVSU) has led to the identification of a gene that may be a positive regulator of arsenic stress tolerance in plants. The work was published in the December 2020 edition of the Journal of Hazardous Materials.

"Arsenic, which can often be found in West Virginia soils as a result of extractive industries such as coal mining, is known to be extremely toxic to plants and animals in its inorganic form, as it negatively affects plant growth and development," said WVSU research scientist **Dr. Umesh K. Reddy.**

Arsenic has no known biological benefit, and the source of arsenic poisoning is through food and water, Reddy said. Poisoning with arsenic causes cancers, cardiovascular diseases, erectile dysfunction, diabetes and Alzheimer's disease, and can induce homicidal and suicidal tendencies among humans.

Reddy and others were able to identify the novel gene Arabidopsis F-box protein AT2G16220, or Arsenic Stress-Related F-box (ASRF), through a genome wide association study, an approach used in genetics research to associate specific genetic variations with particular diseases.

Reddy's team then developed mutant plant seedlings that did not contain the ASRF protein gene and determined that they showed high sensitivity to arsenate stress, which significantly affected growth when germinated on or exposed to arsenate-supplemented growth regimes.

> **"This research has the potential to have enormous implications for enhancing agricultural crop production not only in the U.S. but also around the world."**
>
> ***José Ulises Toledo, Ph.D.***

Plant seedlings containing the ASRF gene were less affected by arsenate stress and showed only slightly reduced growth in comparison, suggesting that the ASRF protein is important for arsenate stress resistance.

Reddy

Photo courtesy of West Virginia State University

"This research has the potential to have enormous implications for enhancing agricultural crop production not only in the U.S. but also around the world," said WVSU Vice President for Research and Public Service **Dr. José Ulises Toledo**, who is working with Reddy to explore opportunities for commercial applications associated with the study's findings.

The study, entitled Arsenic Stress-Related F-Box (ASRF) Gene Regulates Arsenic Stress Tolerance in Arabidopsis thaliana, was a collaborative project between WVSU; the SRM Institute of Science and Technology in Chennai, India; and the Universidad Autónoma de Coahuila in Saltillo, Mexico.

A portion of the study is available for free on the website of the Journal of Hazardous Materials. The full version is available for purchase.

The work is the latest in a series of publications of the genomics research being conducted in Reddy's lab at WVSU. Other studies have appeared in recent editions of the International Journal of Molecular Sciences and Plant Molecular Biology, among others.

Above: Professor Jim Anderson has received a $151,000 grant from the Environmental Protection Agency to validate a new measurement technique for wetland restoration in West Virginia. Pictured is a high-elevation wetland in Tea Creek Wildlife Management Area near W.Va. Route 150.

WVU researchers investigate recreating wetlands and West Virginia

Courtesy of **West Virginia University**

Wetlands are essential for their ability to clean water, reduce flooding and promote biodiversity; however, these valuable ecosystems have been destroyed across West Virginia, forcing scientists to recreate the habitats.

One West Virginia University researcher has taken a novel approach - surveying shrubs at ground level and observing growth in fractions of an inch to predict if new ecosystems will thrive.

According to **Jim Anderson**, professor of wildlife and fisheries resources in the Davis College of Agriculture, Natural Resources and Design, current evaluation methods rely on short-term 'snapshots' like stem count or canopy coverage, which are not reflected in ecological restoration trend data.

"Restoration often takes longer to become evident than the required monitoring period allows," he said.

Anderson's method advances and revises the criteria used to gauge restoration success using intensive vegetation sampling of woody species for estimates, which will better ensure restoration success during and after the monitoring period.

The recipient of a $151,000 grant from the Environmental Protection Agency, Anderson will spend the next two years validating a new measurement technique of wetland restoration throughout the state. He will work closely with the West Virginia Department of Environmental Protection, the state agency that oversees wetlands.

"Historically, there have been a number of metrics to identify progress or success of mitigated wetlands," Anderson said. "The general metric has been percent of stem survival and canopy cover, but that's highly variable. We're measuring shrubs at the ground level. We're not talking about feet; we're talking about an inch or a half an inch."

Larger wetlands in West Virginia include Canaan Valley in Tucker County and Cranesville Swamp in Preston County.

"The majority of our wetlands are pretty small," Anderson said. "People probably don't even recognize them because they don't look like the big Florida Everglades or the big swamps from Georgia and South Carolina."

West Virginia has lost much of its wetlands because they are in lowland areas where people build roads and housing developments. West Virginia wetlands are incredibly important and fragile because they comprise only 1.5 to 2 percent of the landscape, making them a dire focal point for Anderson as well as conservation agencies.

"That's usually what you're trying to do: get that historic hydrology back," Anderson said. "Then the plants and animals will generally follow. It's relatively quick, too. We studied a wetland in Pleasant Creek Wildlife Management Area. Within several months of restoration, we already had otters back into that wetland site, which was formerly a dry field. They respond quickly."

Photo courtesy of West Virginia University

Higher Education Policy Commission awards grants to assist with scientific improvements

Written by **Angela Sundstrom**

Faculty members at six West Virginia colleges and universities were awarded approximately $148,000 in funding for scientific equipment and curriculum improvements.

West Virginia Science & Research (WVSR), a division of the West Virginia Higher Education Policy Commission (Commission), awarded five Instrumentation Grants and two Innovation Grant to eligible instructors and researchers across the state. These grants offer assistance to primarily undergraduate institutions to ensure students have the necessary modern resources for furthering their studies in science, technology, engineering and mathematics (STEM).

Instrumentation and Innovation Grants are supported by the Research Challenge Fund, established by the West Virginia Legislature in 2004 to further build research capacity and competitiveness.

Courtney Campany, Ph.D., assistant professor at Shepherd University, received $29,723 to purchase a portable infrared gas analyzer to measure plant leaf gas exchange. This instrument will provide hands-on, processed-based exploration of photosynthesis and also serve as an interdisciplinary research tool.

Joanna Webb, Ph.D., associate professor at West Virginia Wesleyan College, received $39,750 to partially fund the purchase of a NanoImages SME-4500 M Plus scanning electron microscope. The instrument is capable of analyzing inorganic and organic samples with little-to-no sample preparation.

Rodney Tigga, Ph.D., assistant professor at Concord University, received $20,000 for a benchtop CEM Discover 2.0 Microwave Synthesizer. This microwave heating is faster, safer, and more cost-effective than conventional alternatives in preparing high-quality and reproducible materials.

Cecilia Melton, Ph.D., assistant professor at Shepherd University, received $19,379 for two a supercritical fluid extraction system and a milling instrument. Both instruments will increase students' technical training and scientific literacy.

Crystal Boudreaux, Ph.D., assistant professor at the West Virginia School of Osteopathic Medicine, received $20,000 for a BioRad ChemiDoc Imaging System. This system allows for sensitive detection of nucleic acids and proteins in a single system unit.

Clinton Johnson, Ph.D., assistant professor at Davis & Elkins College, received $19,956 to develop guided-inquiry labs around the educational instrumentation provided by Vernier.

Kayla Lantz, Ph.D., assistant professor at Fairmont State University, received $20,000 to purchase to purchase a gel permeation chromatography-size exclusion chromatography instrument.


Burke-Spolaor

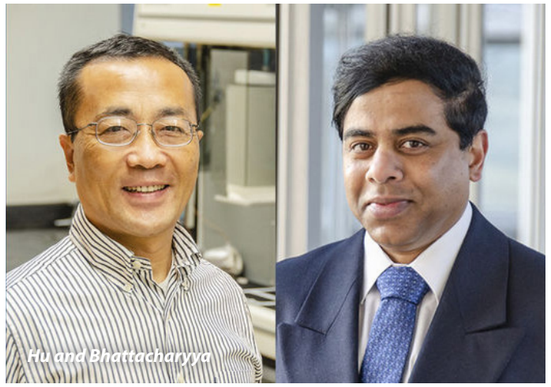
WVU astrophysicist and emerging leader named 2021 Sloan Research Fellow

Sarah Burke-Spolaor, Ph.D., an assistant professor of astronomy at West Virginia University, is one of 128 young faculty members from the U.S. and Canada to receive the competitive award. Burke-Spolaor's research focuses on phenomena that change rapidly in the universe, especially fast radio bursts and gravitational waves.

Marshall Medical School

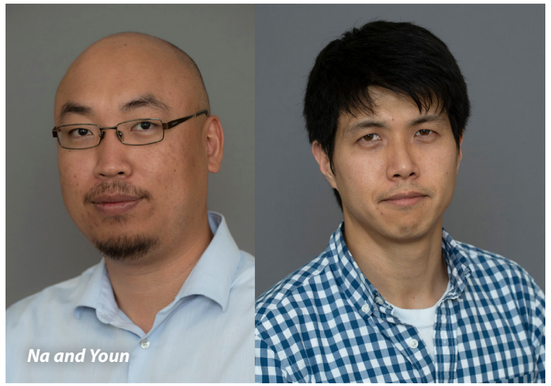
Marshall University scientists awarded NIH grant focused on kidney disease in women

Marshall University's **Komal Sodhi, M.D.**, and **Joseph I. Shapiro, M.D.**, were awarded a two-year $440,000 grant from the National Institutes of Health (NIH) Office of Research on Women's Health (ORWH) to determine whether cognitive impairment in chronic kidney disease is more pronounced in women.


Hu and Bhattacharyya

NETL and WVU engineers receive award for transformational energy technology

A project between the National Energy Technology Laboratory and West Virginia University researchers **John Hu** and **Debangsu Bhattacharyya** received the prestigious IChemE Global Award for the development of a new microwave ammonia synthesis process that can utilize renewable electricity to make ammonia.


Na and Youn

Marshall engineering to benefit from $25,000 EPA research grant

Dr. Sukjoon Na and **Dr. Sungmin Youn**, assistant professors of civil engineering at Marshall University, received a $25,000 research grant from the U.S. Environmental Protection Agency (EPA). Their winning project is titled "Nanoclay Reinforced Recycled HDPE to Replace PVC and PE Water Pipe Materials."

Photos courtesy of West Virginia University and Marshall University

COMMENTARY: Michelle Richards-Babb, Ph.D.

Investing in undergraduate research opportunities is worthwhile

Undergraduate research is alive and thriving in West Virginia. In this, the state is at the forefront. The inherent value of undergraduate research is undeniable.

The Council on Undergraduate Research (CUR) defines undergraduate research as "an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline." Along with internships, service learning and collaborative projects, undergraduate research has been recognized by the Association of American Colleges and Universities as a "high-impact" practice. In other words, participating in research increases student's engagement with their major and connection to their institution, which, in turn, promotes collegiate persistence.

Hundreds of peer-reviewed research studies provide evidence for the benefits of undergraduate research. Higher collegiate grade point averages, increased enrollment in advanced STEM coursework and improved understanding of graduate school are just a few of its benefits. Further, students who engage in undergraduate research develop high-quality relationships with faculty members and graduate students that provide crucial psychosocial and academic supports. Providing undergraduate research opportunities for students throughout the state is not only economically beneficial for institutions - through retention of students - but promotes equity as underrepresented students benefit more from research engagement.

Undergraduate research programming is evident at institutions throughout the state. The state-sponsored Summer Undergraduate Research Experience (SURE) program currently has six funded sites supporting cohorts of students in full-time research during the summer months. Three different NSF-funded Research Experience for Undergraduates (REU) sites in chemistry, robotics, and astronomy allow students from primarily undergraduate institutions to engage in full-time summer research at an R1 institution. Concord University will administer its first NSF-funded REU site this summer where students will study the "architecture of earthquakes" during an arctic expedition to Greenland. The University of Charleston received an NSF-grant to partially fund its development of academic-year Course-Based Undergraduate Research for chemistry and biology students. Several programs statewide provide research supports for students from underrepresented populations including the First2 Network two week summer research internship sites for rising freshmen, first-generation students with strong interests in traditional STEM majors. WVU offers an academic-year Research Apprenticeship Program (RAP) for students with little or no research experience to begin as early as their freshmen year. In addition, there is the Research Rookies program at West Virginia State University and research internships offered through the WV IDeA Network of Biomedical Research Excellence. These are just a few of the programs that support West Virginia's undergraduates in research.

The recently held 18th annual Undergraduate Research Day at the Capitol (URDC) event highlighted the thriving nature of undergraduate research in West Virginia. Held virtually on March 5, more than 80 undergraduates presented research they carried out at one of 11 different institutions. This event was held in the midst of a global pandemic at a time when many national and international conferences are still being canceled or postponed.

West Virginia's students are researching topics important to them and topics that directly impact West Virginia. Our state's future depends on this generation of students. They are the innovators, business owners, legislators and decision makers of tomorrow. It is important that we amplify their undergraduate research stories so that all understand the importance of continuing to invest in education and research throughout the state.

Photo courtesy of Michelle Richards-Babb


Richards-Babb

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