

RESEARCH | OUTREACH

at West Virginia State University

Winter 2019

Honoring a STEM *Legend*

Alternative Vegetable Growing
System Helps Feed
McDowell County Residents

A SURE Thing

*Summer Research Program Provides
Hands-On Learning for Students*



WEST VIRGINIA STATE
UNIVERSITY

Research & Public Service

a message from the **ADMINISTRATION**



It is a time of tremendous growth for research at West Virginia State University, as we honor our past while looking toward an exciting future.

We recently paid homage to a Yellow Jacket legend, Katherine Johnson. Katherine's work as a "computer" for NASA helped the United States win the space race, and her roots at WVSU are being celebrated with the erection of a bronze statue in her honor, as

well as an endowed scholarship to help underrepresented youths further their career in Science, Technology, Engineering and Mathematics (STEM).

We are also excited to open the new Integrated Research & Extension Building on campus, which features custom-built research laboratories, cutting-edge classroom and meeting spaces, and a demonstration kitchen. The new building will allow us to expand our research, outreach and academic offerings for years to come.

WVSU has always led with a student-centered research mission. Our goal is to provide innovative, hands-on experiences for students, ensuring that when they leave campus, they are equipped with the knowledge and skills to continue their academic journey or transition into the workplace. In the pages ahead, you will meet several Yellow Jackets who are working on cutting-edge projects that are having an impact not only on the people of West Virginia, but worldwide. From Edgar Lopez-Torres, who is representing WVSU in Washington, D.C., to Hannah Mazon, who is spending her summers on an Iowa farm, to Edwina Barnett and Ky'Achia Atkins, who have expanded the Yellow Jacket Nation on an international scale, our students are making a difference across the nation and around the world.

Elsewhere in this new publication, you will meet a pair of scientists whose work is providing students with unique skills in genomics research, discover how aquaponics research is helping feed the citizens of one southern West Virginia community, and learn about a summer program that is preparing students to succeed.

These stories are only a glimpse at the exciting research happening at WVSU. And, be sure to explore the other half of the publication, which showcases how we are meeting our land-grant mission not only through research and education, but also innovative outreach and public service efforts.

A handwritten signature in black ink, appearing to be 'O. McMeans', written in a cursive style.

Dr. Orlando F. McMeans

Vice President for Research & Public Service

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The mission of West Virginia State University is to meet the higher education and economic development needs of the state and region through innovative teaching and applied research.



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A SURE THING

*Summer Research Program Provides
Hands-On Learning for Students*



Providing undergraduate students first-hand research experience is at the foundation of West Virginia State University's Research & Public Service division. A unique summer program is allowing research students to work directly alongside scientists.

The Summer Undergraduate Research Experience (SURE) is an eight-week summer program that pairs students with a faculty member for hands-on learning and experimentation.

"Students could be making molecules, looking at parasites, working on genetic experiences — a wide variety of opportunities," said Dr. Micheal Fultz, a WVSU chemistry professor and coordinator of the SURE program.

Funded in part through the West Virginia Higher Education Policy Commission, the Louis Stokes Alliance for Minority Participation, and the Expanded Program to Stimulate Competitive Research, SURE placed 21 students into research labs in 2018.

While primarily WVSU undergraduate students, Fultz said some participants are high school students recruited through the university's American Chemical Society's Project SEED initiative, which helps economically disadvantaged high school students receive research experiences like those available through SURE.

In addition to the lab experience, students attend seminars on such topics as careers in the sciences and job preparation. The program is leading to success for participants.

"Many of our SURE students have gone on to STEM careers and additional education," Fultz said.

Participants receive a financial stipend for participating in the program and, at the conclusion of the summer, must give an oral presentation to share their work and submit an abstract to participate in the annual Undergraduate Research Day at the State Capitol during the legislative session.



NEWLY OPENED INTEGRATED RESEARCH & EXTENSION BUILDING OFFERS STATE-OF-THE-ART FACILITIES

While West Virginia State welcomed thousands of alumni back to Institute in early October 2018 for the University's annual Homecoming celebration, another homecoming was taking place on campus.

After years of working out of the West Virginia Regional Technology Park in South Charleston, three University research scientists, along with their technicians and students, were relocated back to campus into the newly completed Integrated Research & Extension Building.

Known formerly as the F. Ray Power building, and located in the former West Virginia Rehabilitation

Center property adjacent to campus, the Integrated Research & Extension Building offers state-of-the-art laboratory space for the latest cutting-edge research.

Led by Dr. Jose Ulises Toledo, Interim Associate Vice President for Research, work on the four-story building began in 2016, and included extensive renovations to turn what had been an administrative office building into a facility that now houses five brand new research labs spread over the third and fourth floors. These labs are being used to conduct research associated with Aquatic Toxicology, Bioenergy, Plant Genomics and Horticulture, and Soil Science.



“Providing new research space to accommodate continuous growth of research and its associated demands is a strategic institutional priority,” said Vice President for Research & Public Service Dr. Orlando F. McMeans. “As the University strengthens efforts to increase and diversify its research portfolio, via the further attainment of externally sponsored and internal funding support, significant research infrastructural improvements, including development of additional research space, are expected to take place.”

Dr. Sanju Sanjaya, director of WVSU’s Energy and Environmental Science Institute, was one of the researchers who relocated from the Tech Park to the Integrated Research & Extension Building, and said that the new lab facilities will be beneficial for students and researchers alike.

“We were able to design the labs that we wanted, and my lab was designed with an open lab concept to enhance collaboration among students and researchers,” Sanjaya said. “Students will be more comfortable working in this format. This lab is comparable to a Research I facility.”

In addition to the research labs on the third and fourth floors, the first floor of the Integrated Research

& Extension Building features a host of amenities, including a brand new 94-seat auditorium complete with charging stations at each chair.

In addition, the newly renovated first floor features a multipurpose classroom, a dual conference room, an instructional kitchen classroom, a microscopy room, a walk-in cooler and an additional soil laboratory.

The second floor of the building is currently shelled and is ready for future renovations to accommodate additional academic and research programming at the University.

The University acquired the approximately 32,000-square-foot building in June 2013 when the West Virginia Department of Administration transferred ownership of the former West Virginia Rehabilitation Center property to the University. Since acquiring the approximately 20 acres of property, the University has razed some of the other former rehabilitation center buildings that were no longer structurally sound.

The \$7 million renovation of the Integrated Research and Extension Building began in 2016 and was paid for entirely with federal and grant funding.

WVSU STUDENT NAMED COMPETITIVE SCHOLAR IN WHITE HOUSE INITIATIVE ON HISTORICALLY BLACK COLLEGES AND UNIVERSITIES

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

In the course of their one-year term, Competitive Scholars will learn and share proven and promising practices that support individual and HBCU competitiveness, with the goal of strengthening prospects for career and life success.

"There have been so many great opportunities provided to me thanks to being a student at West Virginia State University," Lopez-Torres said. "I look forward to representing WVSU as an HBCU Competitive Scholar and participating in this important discussion at the national level."

Comprised of undergraduate, graduate and professional students, Competitive Scholars are recognized for successfully preparing to compete for top opportunities that improve long-term outcomes. They were selected from among several highly distinguished HBCU students, based on their academic achievement, campus and civic involvement and entrepreneurial ethos or "go-getter" spirit.

As an 1890 Competitive Scholar, Lopez-Torres attended the 2018 National HBCU Week Conference in Washington, D.C., last fall, where he participated in workshops designed to improve leadership, encourage ongoing personal and professional development, and discover areas of innovation and entrepreneurship.

The accolade is only the latest for Lopez-Torres, who is an active presence on campus.

During his academic career at WVSU, Lopez-Torres, a chemistry major, has been a valuable member of the school's chapter of the American Chemical Society (ACS). In 2018, he was one of 15 undergraduate students in the world to receive the Student Leadership Award from ACS. The program recognizes emerging leaders in the ACS student chapter network and helps them prepare for leadership opportunities at volunteer organizations and in their professional career.

"Edgar is the first student from State to be selected for this honor," said Dr. Micheal Fultz, WVSU chemistry professor and advisor to the ACS chapter. "He is an incredible student with limitless potential."

It was Fultz who first suggested Lopez-Torres get involved with ACS. The University's active, award-winning student chapter is known for its community outreach efforts and bringing chemistry education and activities to elementary-age students throughout the region.

"Interacting with the kids is great," Lopez-Torres said. "The opportunity to get even one young person interested in science makes it all worthwhile."

A California native, Lopez-Torres's family moved to West Virginia when he was a child. He graduated from Herbert Hoover High School before enrolling at State, where he first studied psychology before becoming a chemistry major. Slated to graduate in the spring of 2019, he is eyeing medical schools. He is planning to take the Medical College Admission Test soon, and credits WVSU with the strong foundation needed to get him there.





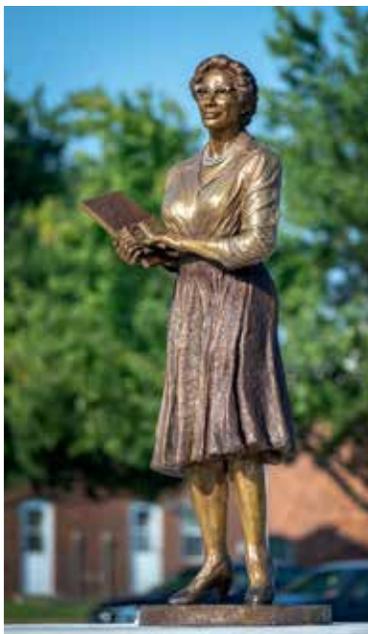
Honoring a STEM Legend

WVSU Unveils Katherine Johnson Statue, Scholarship

West Virginia State University and the WVSU Foundation have honored distinguished NASA mathematician and WVSU alumna Katherine Coleman Goble Johnson with the establishment of an endowed scholarship and the erection of a bronze statue on campus.

A dedication ceremony for the statue and scholarship was held in August 2018, the day before Johnson's 100th birthday. The statue is located on WVSU's quad, the heart of campus.

"Rarely are we presented an opportunity to attach ourselves to a historic moment. I believe this is one of those times," said WVSU President Anthony L. Jenkins. "Despite her numerous accomplishments, she never forgot WVSU, White Sulphur Springs, nor the state she loves so dear. Then, as throughout her life, Katherine has embodied the true essence of a West Virginian; strong values, unbreakable resolve and a work ethic that is second to none."



The life-sized bronze statue depicting Johnson during her years as a mathematician at NASA was created by West Virginia sculptor Frederick Hightower, an alumnus of WVSU.

The endowed scholarship builds upon Johnson's legacy as a pioneer in mathematics and will benefit students majoring in Science, Technology, Engineering and Mathematics (STEM), with emphasis on assisting talented individuals who are underrepresented in those fields. The scholarship is endowed at \$100,000.

Johnson received the Presidential Medal of Freedom in 2015, the highest award that can be bestowed upon

a civilian. A native of White Sulphur Springs, W.Va., Johnson first came to Institute at the age of 10 to attend the high school that used to be part of West Virginia State's campus. After graduating from high school at age 15, she immediately enrolled for college classes at West Virginia State. Johnson excelled in her studies and graduated summa cum laude in 1937 at the age of 18 with bachelor's degrees in mathematics and French.

Johnson's pioneering work as a "computer" at the National Advisory Committee for Aeronautics (NACA) and later at NASA, has been widely recognized following publication of the book, "Hidden Figures," and by the movie of the same name.





USDA SCHOLARSHIP PROGRAM LEADS WVSU STUDENT TOWARD VETERINARY CAREER

Hannah Mazon's start toward a biology degree from West Virginia State University began with an entirely different goal in mind. The hopeful veterinarian was eyeing other academic opportunities when a tour of the WVSU campus changed her path — at first temporarily.

“I fell in love with campus, so I enrolled and planned to transfer after freshman year. Once I got into the classroom, however, I enjoyed it even more than I thought I would, so I stayed.”

A scholarship opportunity with the USDA has allowed Mazon to broaden her horizons even further. She's spending her summers living in Iowa and working at the National Animal Disease Center, researching the transmission of *E. coli* between cattle and humans and volunteering on a horse farm.

“We are looking at how farmers can decrease the spread of *E. coli* on farms and in pastures,” she said, “so a lot of what we do in the lab is being applied hands-on for farmers who might not have the scientific background.”

Discovering a love of research has certainly broadened Mazon's skillset, as well as her collegiate experience, if not her ultimate goal.

“The scholarship and being here at WVSU has provided a great opportunity to expand my interests. I love being in the lab and doing research, but my passion still lies in veterinary medicine.”

Mazon is part of WVSU's USDA/1890 National Scholars Program, which provides scholarships to students seeking a bachelor's degree at one of the nation's 1890 Historically Black Land-Grant Institutions, of which WVSU is one of 19 total. Students must major in a field of study relating to agriculture, food, natural resource sciences or a related discipline.

When she graduates from WVSU with a bachelor's degree in biology, Mazon still plans to pursue a degree in veterinary medicine, and encourages other Yellow Jackets to explore opportunities that may lie outside their initial goals.

“Try things you're not qualified for,” she says to other students. “That sounds like weird advice, but I applied for a program that I didn't feel I had a chance of being accepted for, and it's led to one of the best experiences of my life.”



Alternative Vegetable System Helps Feed Mc County Residents

An alternative growing method for fresh vegetables is helping feed the citizens of Welch, W.Va., thanks to an initiative led by the University's Agricultural and Environmental Research Station. An aquaponics system, installed at the Welch Armory, recently produced 150 pounds of fresh lettuce that was donated to residents of a local housing community.

Aquaponics refers to a system in which fish waste supplies nutrients for plant growth. The armory's system, consisting of three 1,200-gallon tanks filled with tilapia inside a high tunnel structure, is connected to a

recirculating hydroponic growing system, which allows plants to grow in the absence of soil in a raised-bed environment.

Part of a research project led by WVSU Biology Professor Dr. Jonathan Eya, waste from the fish is used to feed the plants through the recirculating water system.

Varying levels of nutrients are provided to the fish in each tank to study the effects of differing feed levels on both fish and plant growth, which, in the initial



Growing Dowell

pilot phase, consisted of lettuce and kale varieties. The project's first lettuce harvest was donated to residents at Elkhorn Terrace in Welch.

Such aquaponics systems could provide a more sustainable, environmentally friendly alternative growing method for West Virginia farmers on land that isn't well suited to traditional agriculture.

The Welch Armory is located at 600 Stewart St. in Welch.





THE GOOD PHYTE

Phytochemical Research at WVSU Impacting Human Health, Agriculture

A conversation about the work of Drs. Umesh K. Reddy and Padma Nimmakayala can be quite revealing and surprisingly diverse, touching on everything from how eating watermelon can improve sexual stamina to why fruit flies are a good indicator of human genetics.

The married West Virginia State University scientists are working on a variety of plant research projects relating

to disease resistance, the environment and phytochemicals, which are chemical compounds that plants produce to help them ward off predators and diseases.

The scientists are working to identify nutraceutical benefits of crops such as watermelons and peppers. “Nutraceutical” refers to food that not only supplements diet but also assists in treating or preventing disease or provides other medicinal benefits.



The work is poised to impact West Virginia's agriculture industry, especially in terms of watermelon.

"Watermelon cannot grow properly in West Virginia," Reddy said, pointing to the acidity in the state's soils. "Soil pH is very low here, which is a killer to watermelon. But we have identified a technique that grafts watermelon seedlings onto calabash, which can do very well in acidic soils."

Calabash is a gourd variety whose rootstock is more conducive to growing in the state's soils, making it an ideal candidate for the grafting techniques Reddy and Nimmakayala are studying.

The results are producing large, marketable fruits with value-added, disease-resistant properties — a win-win for West Virginia and the nation as a whole. Their disease-resistance work in watermelon was recently published in the *American Journal of Horticulture Research*. This paper won a national award as the Outstanding Vegetable Research Publication for the year 2017 by the American Society of Horticulture Science.

Reddy and Nimmakayala's work has identified varieties of watermelon with high levels of citrulline, an amino acid that has been proven to help with such issues as cardiovascular disease, arthritis and sexual stamina. They have also identified peppers with high vitamin C content, useful to fight cancer. In the fall of 2018, the scientific journal *PLOS One* accepted their research paper, in which they used "ghost pepper," a primitive pepper type from India, in cell cultures of human renal adenocarcinoma to conclude that this pepper can aid in curing cancers.

"Fruit you purchase at the grocery store has low levels of citrulline," Reddy said. "We have identified varieties that are naturally accumulating up to 14 percent."

In the long run, this means West Virginia's farmers can incorporate such fruits into their agriculture enterprises, therein expanding their economic viability, and consumers can literally reap the health benefits of the harvest.

Such agricultural impact has been the driving force behind the couple's research since coming to the U.S. from their native India two decades ago. They arrived at Texas A&M University in 1997, when Reddy received a fellowship from the prestigious Rockefeller Foundation. They worked in genomics and

plant science there before moving to Alcorn State University in Mississippi and finally to WVSU, where they have been for 14 years. Such longevity at State has proven a bit surprising.

"When we came to State, we were worried whether our research would be accepted," Reddy said. "We got such a great reception here that we thought, let us call this home."

Now, their work is focusing not only on boosting West Virginia agriculture but also ensuring that students are well prepared for the workforce when graduating with their degrees from State.

Thanks to the innovative technology and hands-on nature of the research experience at WVSU, students are graduating extremely marketable, trained with firsthand experience on cutting-edge genomic technologies. Reddy and Nimmakayala's work is using high-end DNA sequencing equipment students will not find on any other campus in the state.

"When students trained in these techniques and with this equipment go out, they can immediately get jobs," Nimmakayala said. "Companies are looking for people trained in this technology."

Students trained in their laboratory have moved on to Ph.D. programs in prestigious labs at world-class institutions such as Copenhagen University, the Max Planck Institute for Terrestrial Microbiology, Rice University, North Carolina State University, Louisiana State University and Alabama A&M University.

Better crop varieties for West Virginia agriculture, better produce for consumers and a stronger workforce of trained scientists suggest that Drs. Reddy and Nimmakayala are indeed fighting a good "phyte" — and winning.

WVSU Students Selected *for* International Research Opportunities

Two West Virginia State University biology majors were selected to participate in international research opportunities during the summer of 2018. Students traveled to Costa Rica and France to conduct hands-on research alongside accomplished scientists.

Edwina Barnett traveled to La Selva, Costa Rica, through the Research Experience for Undergraduates for U.S. Underrepresented Minority Students Summer Program. Fifteen students were chosen nationally out of 200 applicants.

Her research consisted of seedling germination of an emergent tree, to see how different treatments would affect it. Barnett would locate a parent tree and then find seeds that were disbursed along the trails. After collecting the seeds, she recorded data on seedpod conditions, then treated the seeds and monitored them over a five-week period to see which treatments were germinating the fastest.

Ky'Achia Atkins traveled to Toulouse, France, where she attended a research workshop and had the opportunity to shadow a French scientist whose research was focused on Alzheimer's disease, which Atkins was able to shadow. "She opened my eyes to take everything seriously, because many people don't have this opportunity," Atkins said. "This is a great opportunity for an undergraduate student that I wouldn't have gotten the chance to attend without West Virginia State."

"It truly takes a village, and the relationships I have created at WVSU can attest for my success thus far and in the future," added Barnett.

Both students believe these summer research opportunities will diversify their skills sets, help make them well-rounded scientists in their fields and ensure they succeed.

The opportunities were provided through the Kentucky-West Virginia Louis Stokes Alliance for Minority Participation (LSAMP), a consortium of colleges and universities working together to create, enhance and expand programs designed to broaden participation and increase the quality and quantity of students from underrepresented populations who receive degrees in STEM disciplines. Program goals and activities focus on undergraduate research experiences, graduate school preparation and international experiences. LSAMP is a federally funded program through the National Science Foundation.



Edwina Barnett and Ky'Achia Atkins



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