West Virginia State University
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Research Reporter

Rr

winter 2013–14

State receives $1.7M in capacity-building grants

Student chemistry group wins award

'Research Rookies' creating science MVPs

RISINGSTaR

WVSU student researcher wins HEPC's STaR Symposium competition

Research Reporter
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winter 2013–14

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ON THE COVER

Hannah Cavender, winner of the student science video competition, undergraduate division, at this year's STaR Symposium. Read more about Hannah's award on page 4.

Award-winning research. Three little words that only begin to describe the research investments and accomplishments occurring on the campus of West Virginia State University. We are proud of both our students and the faculty who have guided their development from a simple interest, into a passion for science that will continue for years to come.

For instance, two of State's undergraduate research students recently competed for a statewide award. Not only did one student win the coveted recognition, together their appearance in the final round of competition made WVSU the only institution to have multiple finalists in the undergraduate category.

We are now poised to take such student research interests to the next level. With financial support from grants, business and industries in the community, our Research Rookies and Full STEAM Ahead programs are flourishing. At the same time, a WVSU student-led science group continues to pay-it-forward, investing in the next generation of college student researchers—and they have received top honors for their generosity and service.

In many ways, improving future student achievements begins by investing in faculty. That is why, this fall I announced a new program for our faculty researchers to enhance their own experiences. By *Promoting Excellence in Education through Research*, or *PEER*, the University, through the Research and Development Corporation, is committing grant funds for the next five years to foster and encourage the advancement of faculty research and scholarly work. This commitment holds promise for great discoveries impacting everyday lives of our friends, family and neighbors today and long into the future—and it all begins at State. State is a small campus with big possibilities for our students, our faculty and our community!

These are just some of the examples behind those three little words, award-winning research.

GO STATE!

Brian O. Hemphill, Ph.D.
President

West Virginia State University continues to place high priority on strengthening its research mission. Over the past 15 years, WVSU has significantly increased research activities across the University landscape. As a land-grant university, we are charged with participating in applied research activities that address key environmental and socioeconomic issues of the communities and citizenry we serve. To those facts, and with stakeholder input, WVSU is developing programs in emerging research areas.

We are currently expanding our bioenergy research portfolio to include the exploration of increased bio-oil concentration in plants, for the purpose of augmenting their carbon yield used for biofuel production (e.g. ethanol and biodiesel). With the addition of a new faculty research position in bioenergy, supported in part by a grant from American Electric Power and the West Virginia Higher Education Policy Commission Research Trust Fund, State will be positioned as an important player in the field of biomass to biofuel production.

WVSU has been engaged in bioenergy research for more than a decade through a focus on waste management and enhanced biogas production via anaerobic digestion technologies. This cutting-edge research program has been possible thanks to the successful establishment of a pilot plant scale, thermophilic anaerobic digester on campus. This 10,000-gallon digester contains a complex, heterogeneous mixture of microbes that biodegrade organic waste materials at very high temperatures in the absence of oxygen. This research program will continue to investigate how anaerobic digestion technologies can be improved and best used to produce bioenergy from waste biomass using thermophilic anaerobic microbes.

Additionally, as a result of the natural gas boom associated with the Marcellus and Utica Shales and feedback from related stakeholders, the University is exploring the advancement of energy research in the areas of catalytic conversion of coal to liquid, as well as conversion of shale gas to downstream intermediates and products. To support this proposed research effort, we will begin the search for a new chemical engineer faculty member with expertise in catalytic conversion research associated with natural gas and coal.

Finally, the expected increase in energy-related jobs in West Virginia and the region is going to require a workforce educated in STEM - Science, Technology, Engineering and Mathematics. WVSU has a well-established Center for Advancement of Science, Technology, Engineering and Mathematics (CASTEM) that focuses on advancing STEM skillsets via educational outreach for K-16 audiences. And the new Research Rookies program, supported in part by a grant from AEP, is providing opportunities for freshmen and sophomores to participate in field and laboratory experiential, hands-on research early in their academic experience, thus preparing them for careers in STEM fields.

Under the leadership of President Hemphill, with his emphasis on promoting and facilitating research across all areas of campus, and quality research faculty, WVSU is positioning itself to make significant contributions to the advancement of science and the enhancement of economic development in West Virginia, with the goal of increasing the quality of life for the citizens and communities served.

Orlando F. McMeans
Vice President for Research & Public Service

Grant Will Upgrade Chemistry Equipment at WVSU

West Virginia State University (WVSU) has been awarded a $20,000 grant from the West Virginia Division of Science and Research Instrumentation Grants Program to expand Science, Technology, Engineering and Mathematics (STEM) research and teaching capacity. Funds will purchase a new gas chromatograph (GC) system for the University's chemistry department.

The award is the latest in more than $600,000 in grant funds for the chemistry department over the past year and a half for equipment upgrades, including a new liquid chromatography–mass spectrometry (HPLC-MS) system and nuclear magnetic resonance (NMR) spectrometer. Such upgrades put state of the art equipment directly in the hands of students.

"The WVSU Department of Chemistry has acquired the instrumentation to do modern research while still maintaining a small university feel," said Dr. Micheal Fultz, assistant professor of chemistry at WVSU. "Students attain a hands-on knowledge in the use of these instruments, which they will apply in their various research projects."

WVSU instructors will now be able to be able to include GC-based laboratory activities in advanced undergraduate and graduate classes, including Organic Chemistry Lab, Biochemistry Lab, Instrumental Analysis and Environmental Microbiology.

The new equipment acquisition will also allow WVSU to support regional research and educational efforts in coordination with the West Virginia Education, Research and Technology Park, Kanawha Community and Technical Park, University of Charleston and West Virginia University Institute of Technology.

The West Virginia Division of Science and Research Instrumentation Grants Program is designed to encourage undergraduate students in West Virginia to continue careers in science, math and engineering. Instrumentation Grants seek to accomplish this by allowing the purchase of modern instruments for advanced undergraduate laboratories.

'Research Rookies' Creating Science MVPs

Program off to strong start after first semester

While some consider the term "organic pesticide" to be an oxymoron, Chemistry major Bridgett Dudding adamantly disagrees. Dudding spent the fall 2013 semester, her first at WVSU, in the lab of Dr. Micheal Fultz working to create an organic pesticide using glucose and dodecyl.

Dudding is one of nine freshmen taking part in the University's new Research Rookies program, funded in part by American Electric Power (AEP) to provide research opportunities to State students.

"I have learned methods for conducting research that I would not have otherwise known," Dudding said. "I've met a lot of good friends by being part of this program. It has broadened my knowledge, and I look forward to continuing next semester."

Through the Research Rookies program, WVSU offers college freshmen and sophomores an opportunity for meaningful participation in Science, Technology, Engineering, Agriculture and Mathematics (STEAM) laboratory research from their first semester on campus forward. Students are paired with a faculty member and receive a stipend to assist in their educational endeavors. Faculty mentors receive research-operating funds to support the students' research.

Students are now engaging in enriching research experiences that allow them to explore their intended majors, develop relationships with faculty in their field, and cultivate critical thinking skills – all with the ultimate goal of cultivating more STEAM majors for West Virginia.

"I hope students find the program valuable and that it helps them better understand their career choices," said Dr. Ami Smith, associate dean and associate director for Extension at WVSU and the Research Rookies program coordinator. "I hope it gives them hands-on learning experiences in the sciences that really solidify their decision to become STEAM-majors."

Smith's vision has become a reality already for students like Biology major Zacchaeus Lucas, who is working with Drs. Amir Hass and Dharmesh Patel, and Chemistry major Megan Guetzloff, who is working with Dr. Genia Sklute. Both students are involved in soil-related projects with the goal of improving

"The experiences I've gained through the Research Rookies program will better prepare me for... courses later in my studies."

–Megan Guetzloff
Chemistry major

environmental conditions.

"West Virginia has very poor soil because it's so acidic," said Lucas, whose work with Hass and Patel aims to decrease runoff and improve soil quality. It's an early introduction to hands-on lab work that is paving the way for students' academic careers.

"I haven't taken any organic chemistry courses yet," said Guetzloff, "but the experiences I've gained through the Research Rookies program will better prepare me for those courses later in my studies."

Research Rookies is a component of the AEP Foundation Full STEAM Ahead program at WVSU, designed to increase interest among young people in energy, science and math. The initiative aligns closely with AEP's goals of improving lives by supporting access to higher education, protecting the environment, and aiding in the provision of health and public safety services to the community.

Research Rookies participants submit summaries of their work at the end of each semester and make presentations at the annual WVSU Research Symposium. The students' work is highlighted in the Spring Research Symposium bulletin, and students also apply to present their findings at the annual Undergraduate Research Day at the State Capitol in February.

Recently, The Dow Chemical Company Foundation committed to fund a new program at WVSU, also designed to increase the interest of young people in the fields of STEAM, and establish another Research Rookies platform.

The Dow High eSTEAM Program is designed for students ranging from kindergarten through college and will promote biology, chemistry and other STEAM-based education, while expanding opportunities for hands-on research among WVSU students. It is research expansion that excites program planners.

"I see the program expanding as our faculty and academics expand," said Smith. "During this first year, most of the students are placed with Biology faculty, with a few members of the Chemistry faculty being involved as well. In the future, I'd like to see the program expand to all of the STEAM disciplines."

New positions with Research Rookies will become available with the Fall 2014 semester. Candidates must be highly motivated, have a strong academic performance and a commitment to discovery. Incoming freshmen, rising sophomores and transfer students committed to a STEAM major with less than 60 credit hours are encouraged to apply.

Approved students receive a stipend of $1,500 per semester and are expected to commit to the program for one academic school year (two semesters). For more information and to apply online, visit **wvstateu.edu/Research/Research-Rookies.**

New Research Facilities Planned for WVSU

West Virginia State University will continue to expand its research capabilities with planned renovations to the Agricultural and Environmental Research Station (AERS) facilities in 2014.

"We're looking to add up to eight new greenhouses near the Curtis Complex on campus," said Dr. Jose Ulises Toledo, Associate Dean for Research and Public Service, "as well as new field space for experimental agriculture research."

Administrators are currently exploring the possibility of either renovating existing facilities or constructing a new research and extension building on the grounds of the former West Virginia Rehabilitation Center, of which WVSU recently assumed control.

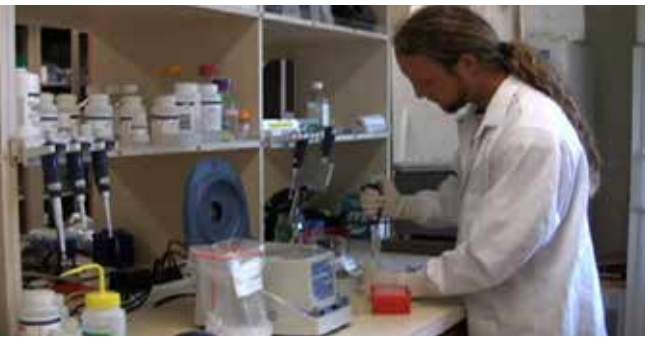
"This facility will house conference rooms, classrooms, labs and storage for research and extension programs," said Toledo.

The Rehab Center vision emerged when plans for a facility at the current AERS location, behind the campus baseball and softball fields, fell through because of underground instability.

While such unforeseen issues have delayed expansion efforts, administrators are confident that the exploratory plans underway now will result in an improved scope and vision for research and extension programs at the University.

"The new greenhouse facilities will be one of the first components visitors will see when coming to WVSU and will be a stepping stone for greater agricultural and environmental research and development," said Toledo.

WVSU student wins first prize in research video competition



Student Kevin Carte, working under the guidance of Dr. Umesh Reddy, was a finalist in the STaR video competition.

Hannah Cavender, a WVSU biology major, won top prize in the first-ever student science video competition at the fifth biennial Science, Technology and Research (STaR) Symposium in October.

Students from institutions across West Virginia entered the video competition, hosted by the West Virginia Higher Education Policy Commission's (HEPC) Division of Science and Research. The competition required students to produce a short video explaining their work to general audiences.

"It is exhilarating to win," said Cavender, who graduated from WVSU in December. "It's nice to see that when you invest yourself into a project and put your best foot forward to showcase it, it can really pay off."

Cavender was one of four undergraduate finalists chosen to travel to the symposium, held in Morgantown, and present their work to a panel of judges. Kevin Carte, another WVSU student researcher, was also chosen to present, making WVSU the only institution to have multiple finalists in the undergraduate category.

"I am so proud of Hannah and Kevin for their commitment to research and desire to help others through their work in University labs," WVSU President Dr. Brian O. Hemphill said. "State is home to some of the most rigorous research curriculum and having both students reach the finals—and one take the top prize—is a testament to our dedicated and outstanding faculty who continue to deliver an affordable, high-quality education."

Cavender received a cash prize for her winning video, which deals with aluminum.

"We are interested in capturing aluminum and holding it in place," she said in the video. Aluminum exists in soil and, when soil becomes acidic, it can interact with plant roots and negatively impact plant size and fruit production.

Cavender's research was conducted in the lab of Dr. Genia Sklute. Carte's research was conducted in the lab of Dr. Umesh Reddy.

the evolution of energy
STaRSymposium2013

Senior Hannah Cavender conducted her award-winning research in the lab of Dr. Genia Sklute.

Area youth will benefit from funds to expand agriculture education at a kid-friendly level.

W.Va. State University Awarded $1.7 Million in Federal Grants

Funds focus on sustainable agriculture, food security and STEM education

WVSU has received grant funds totaling nearly $1.7 million from the USDA's National Institute of Food and Agriculture (NIFA) for projects addressing food security, sustainable agriculture, youth development and online education.

The University's awards total approximately $1.69 million. This is the second consecutive year State has been awarded the maximum amount of funds eligible.

"To receive this level of funding two years in a row speaks volumes about the talented research and teaching faculty at State," said Dr. Orlando F. McMeans, vice president for Research and Public Service.

WVSU is one of 18 institutions eligible to compete in the program, exclusive to the nation's 1890 land-grant universities. The monies fund four proposed research, teaching and extension projects, including a joint initiative with Alabama A&M University.

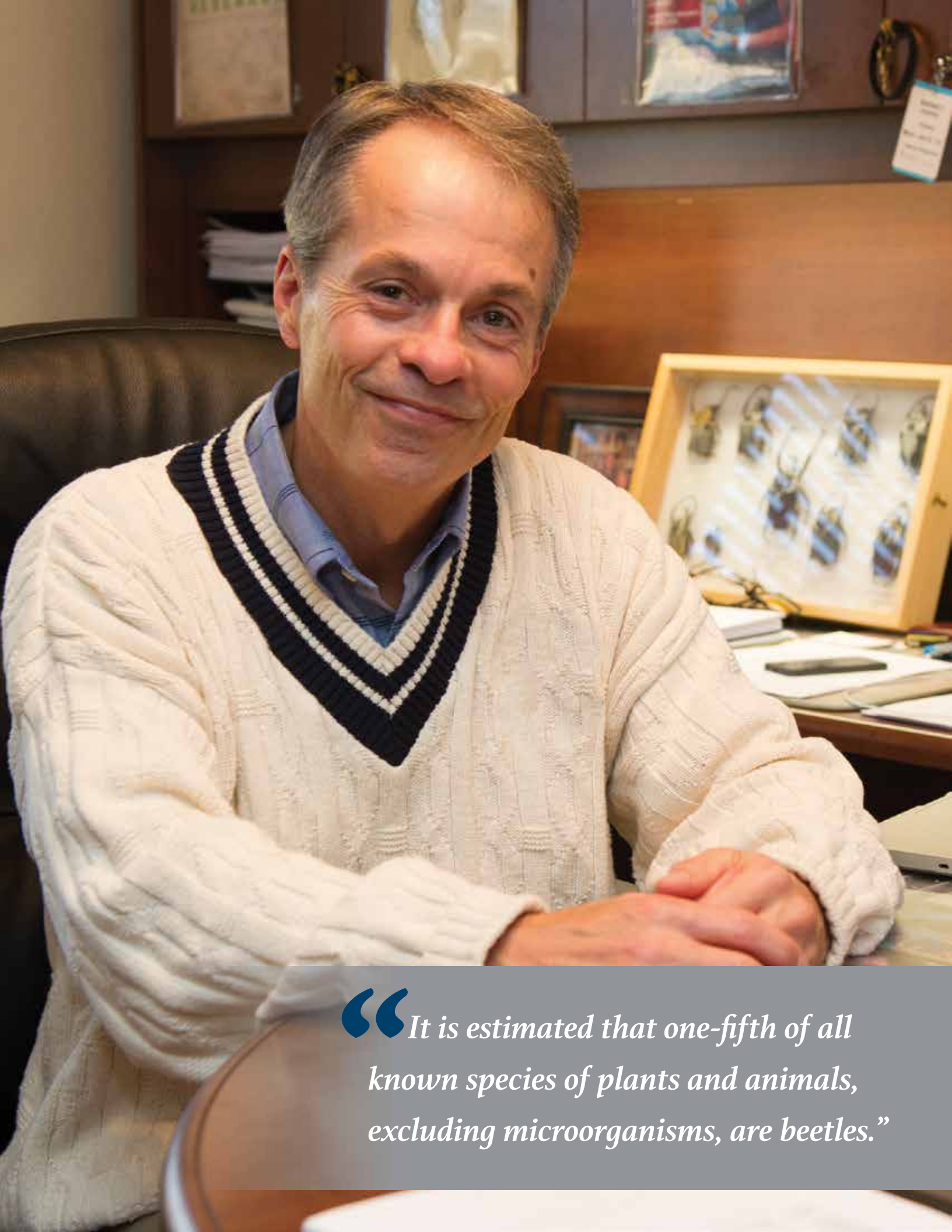
Three of the projects deal with improving food security in West Virginia through research and teaching. One project focuses on improved fruit quality and disease-resistant traits by studying gene mapping in watermelons. Another seeks to develop an "Introduction to Molecular Breeding" summer course to teach students current techniques in plant genomics.

To increase the prevalence of online learning opportunities in the food and agriculture fields, a third project will develop online learning modules and training programs for agricultural sciences. A fourth grant will launch a new 4-H extension program to teach preschoolers about agriculture, health and nutrition using Science, Technology, Engineering and Mathematics (STEM) techniques.

Launched in 1990, the 1890 Institution Teaching and Research Capacity Building Grants Program strengthens the linkages among the 1890 institutions, other colleges and universities, USDA and private industry, while improving the quality of academic and research programs at the 1890 institutions. The program focuses on advancing cultural diversity in the scientific and professional workforce by attracting and educating more students from underrepresented groups. It is authorized by section 1417 (b)(4) of the National Agricultural Research, Extension and Teaching Policy Act of 1977.

The full listing of grants awarded to WVSU is as follows:

- **Dr. Padma Nimmakayala** - Summer Academy of Plant Breeding: A Platform to Develop Minority Workforce in Molecular Plant Breeding - $120,000
- **Dr. Umesh Reddy** - Diversifying the Watermelon Cultivar Genetic Base Using Genomic Selection to Improve Nutraceutical Traits and Use Them as Parental Lines - $444,346
- **Dr. Mehdi Seyedmonir** - Learning and Teaching Biological and Agricultural Science Online: Increasing Success through Comprehensive Training, Development and Research - $533,674
- **Dr. Ami Smith** - 4-H Planters: Preschoolers Learning Agriculture, Nutrition, Technology, Engineering, Reading and Science - $598,556



"It is estimated that one-fifth of all known species of plants and animals, excluding microorganisms, are beetles."

WVSU Administrator Published in Zoology Journal

Dr. Robert J. Barney, interim assistant vice president of Research and Public Service at West Virginia State University, recently published a manuscript in the international journal, ZooKeys.

Barney's article, "*Pachybrachis* (Coleoptera, Chrysomelidae, Cryptocephaline) of Eastern Canada," reports on two new national records of rare beetles found in remnant natural areas and protected habitats. The research is part of an extensive review of the distribution and natural history of this beetle genus.

"Before we can preserve and conserve the planet's biodiversity, we must first identify and document it," said Barney. "I study beetle biodiversity because it is estimated that one-fifth of all known species of plants and animals, excluding microorganisms, are beetles."

Extensive photographs, distribution maps and plant associations are presented in the journal to exhibit the northern limits of these North American leaf beetles.

In November, Barney participated in an international beetle surveying initiative along the Texas-Mexico border in the Lower Rio Grande Valley National Wildlife Refuges. His group collected beetles using surveying techniques to document the biodiversity of species in these protected areas. The group documented, for the first time in the United States, several specimens of a species of *Diabrotica*, which also contains several agricultural pests, such as the spotted cucumber beetle and corn rootworms. The trip was held in conjunction with the national meeting of the Entomological Society of America, the Coleopterist Society and the Entomological Collections network.

Barney's manuscript was published in issue no. 332 of ZooKeys in September and features Barney's photography on the cover. It is currently available on the ZooKeys website.

ZooKeys is a peer-reviewed, open-access, online and print, rapidly produced journal launched to support free exchange of ideas and information in systematic zoology, phylogeny and biogeography.

Renowned Scientist Visits WVSU

Renowned scientist Dr. Boddupalli Prasanna, director of the International Maize and Wheat Improvement Center (CIMMYT) Global Maize Program in Nairobi, Kenya, presented a seminar on the WVSU campus in November.

"It is a great honor for WVSU scientists and students working on various crop biotechnology programs to host an international leader like Dr. Boddupalli Prasanna," said Dr. Umesh Reddy, associate professor of biology at WVSU. "Dr. Prasanna is currently leading maize genetics in an effort to feed third-world countries across the globe."

Reddy, along with WVSU associate research professor Dr. Padma Nimmakayala, traveled with a group of students to CIMMYT in Kenya for two weeks over the summer to study disease resistance in crops, changing climates and environmental conditions (see sidebar). This was part of a collaboration between WVSU and several non-profit agricultural research organizations in Asia, Africa and Mexico.

Prasanna discussed "Germplasm Characterization and Molecular Breeding for Tropical Maize Improvement" at the seminar.

As the CIMMYT Global Maize Program Director, Prasanna leads a strong team of maize scientists focused on the development and dissemination of high-yielding, stress-resilient and nutritionally enriched maize cultivars. He works in close collaboration with an array of public and private institutions and has helped build partnerships with leading multinational companies for leveraging cutting-edge technologies for maize improvement.

Prasanna's current global maize program is funded by the Bill and Melinda Gates Foundation, whose primary goal is to enhance health care and reduce extreme poverty worldwide, as well as expand educational opportunities and access to information technology across the United States.

Research students study agricultural systems in Africa

During a recent research trip to Africa, a group of WVSU students gained firsthand experience with international agriculture. For two weeks, the group visited the International Maize and Wheat Improvement Center (CIMMYT) and studied disease resistance in crops, as well as changing climates and environmental conditions.

The visit was part of an international agricultural research collaboration between WVSU and several non-profit agricultural research organizations in Asia, Africa and Mexico.

"The goal of this program is to expose our undergraduate students to the impact of genomic and genetic research on global agriculture and sustainability in developing countries," said Dr. Padma Nimmakayala, WVSU associate research professor.

Nimmakayala is hopeful this program will provide unique learning opportunities for future students through summer internships and training programs in modern plant breeding at various research institutes in India, Kenya, Mexico and the Philippines. Such international collaboration will produce "scientific entrepreneurs" that will build careers, translating genomic and genetic knowledge into innovation and application, she said.

The research experience was funded by USDA-NIFA 1890 Capacity Building Grant Award #2012-38821-20044.

Energy expert visits W.Va. State University research project

A leading renewable energy expert is working with WVSU's Agricultural and Environmental Research Station to evaluate the use of biochar as a value-added product for the biomass-to-energy industry. Ken Moss, founder and CEO of Piedmont BioProducts LLC in Gretna, Va., has served on forums alongside clean energy experts and Tom Vilsack, U.S. secretary of agriculture, to explore bioenergy and energy opportunities for rural economic development.

Moss recently visited WVSU's research facilities to explore collaboration on the biochar project. Biochar's potential for renewable energy, its positive effects on climate change and enhancement of agricultural productivity is a growing research topic, and one that WVSU is glad to be partnered with Moss to explore.

"Biochar is a very interesting by-product that could greatly improve fertility and productivity of Appalachian soils," said Dr. Amir Hass, assistant research professor at WVSU. "Working with Ken and exploring the nature and use of biochar is a very intriguing research endeavor, one of great practical applications and economic and environmental impact."

Biochar is charcoal produced for use as a soil amendment. Given its inherent carbon-based properties and stability, biochar can be used to improve soil functions while avoiding detrimental effects on the environment. Benefits to using biochar as a soil amendment include a strengthened ability to absorb water, aiding plants during drought periods, and nutrient availability and delivery at a stronger pace than other soil amendments.

Ken Moss, founder and CEO of Piedmont BioProducts LLC, visited WVSU's research projects to expolore collaborative opportunities.

The current project explores the improvement of chemical and physical properties of biochar and evaluation of its impact on soil properties, plant growth and the environment, said Hass. "We are working on developing a procedure to improve biochar physical properties," he said. "We also use extraction of digested dairy manure to augment the biochar and improve biochar agronomic value."

Field and greenhouse studies are conducted in collaboration with the USDA Natural Resources Conservation Service (NRCS) at the NRCS Plant Material Center in Alderson, W.Va.

Piedmont BioProducts LLC is a renewable energy resource company dedicated to meeting the need for clean alternative energy produced on a renewable basis.

Student group named Outstanding Chapter by American Chemical Society

The student chapter of the American Chemical Society (ACS) at WVSU has received its second consecutive Outstanding Chapter Award for its 2012–2013 activities. The group also received Green Chemistry Chapter recognition for the fourth year in a row.

Since forming in 2009, the group has won two outstanding ratings, two commendable ratings, four Green Chemistry awards, three community interaction grants and two travel grants to attend the annual ACS national meeting.

The group of more than 20 students was praised for their 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 teach science to K-12 youth.

"The ACS students are quite busy in their outreach and science work," said Dr. Micheal Fultz, assistant 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 career presentations and science-based, hands-on activities as well as lectures on topics such as green chemistry. They have worked with such groups as the Boy Scouts and Girl Scouts, and taken part in National Chemistry Week, Earth Day, National Lab Day, blood drives and other events.

ACS members also participate in career preparation activities in the medical and science industry, including trips to professional and graduate schools, "Careers in Science" seminars, local and national professional meetings, and networking with regional science professionals.

Award-winning chapters were recognized in the November/December issue of inChemistry magazine and will be acknowledged at the upcoming ACS National Meeting in Dallas.

Research & Extension Advisory Council Holds Annual Meeting

The WVSU Gus R. Douglass Land-Grant Institute held its annual combined Research and Extension Advisory Council (REAC) Meeting in October to share recent program impacts and discuss strategies for the future of land-grant efforts at the University.

Moved from its previous presentation-style format, the gathering established work groups comprised of council members, extension staff and researchers to better communicate program successes and further develop future collaboration opportunities.

The REAC was established to gather information and feedback from programs to help meet National Institute of Food and Agriculture's (NIFA) goal of bringing together research, education and extension in a coordinated manner to advance knowledge for agriculture, the environment, human health and wellbeing, and communities.

Today, NIFA places higher value and priority on integration in program design and implementation in order to address the many complex problems facing agriculture in the United States. As funding priorities become more directed toward integrated programs, WVSU's research and extension initiatives will continue to seek opportunities for integration and to thoroughly engage our stakeholders and constituents.

Snapshot

Dr. Orlando F. McMeans, WVSU Vice President for Research & Public Service, met with Mr. Bobby Lewis, State Director for USDA Rural Development, on campus in December. Lewis was at WVSU to congratulate two student interns who will go to work full-time for the USDA after graduation.

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IMPACT

im·pact noun \'im-ˌpakt\

: the act or force of one thing hitting another

: a powerful or major influence or effect

Impact can be defined in multiple ways, and through the research and outreach work at West Virginia State University, we define it as change – a noticeable and measurable change for the betterment of our state's citizens.

To download a copy of WVSU's Impact Reports, go to wvstateu.edu/impact.