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# NEURON

WEST VIRGINIA JOURNAL OF SCIENCE AND RESEARCH

WINTER 2014



Dr. Andrew Nichols  
Marshall University

West Virginia Higher Education Policy Commission



WVPEPSCOR

# DR. ANDREW NICHOLS, Marshall University

## West Virginia native moves into the research fast lane at Marshall

Dr. Andrew Nichols loved hunting and fishing as a child growing up in Point Pleasant, West Virginia. That along with a fascination with Legos and enjoyment of math and science naturally set him on a path to become an engineer. During his freshman year at West Virginia University, he chose to study civil engineering because it would allow him to spend the most time outdoors.

It was at Purdue University, though, where he was pursuing his Master's and Doctorate Degrees in civil engineering, that he found that traffic engineering was a great fit for him.

While at Purdue, Nichols worked in a traffic lab which he credits with giving him invaluable hands-on experience with traffic signals to complement what he was learning in the classroom. He developed skills that allow him to not only use software in the office to study traffic patterns and design traffic signal timings, but he also learned how to program actual traffic signal controllers which are installed at all intersections – expertise, he said, that very few practicing traffic engineers have.

### The Andrew Nichols file:

- BSCE, West Virginia University, 2000
- MSCE and PhD, Purdue University, 2004
- Assistant Professor, University of South Carolina, 2004 –2007
- Assistant/Associate Professor, Marshall University, 2007-present
- Program Director, Intelligent Transportation System, Rahall Appalachian Transportation Institute, 2007-present



Andrew Nichols with Michael Audelo, an assistant engineer, monitoring traffic patterns

Photography by John Sibold

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His education combined with experience living in Columbia, South Carolina and working at the University of South Carolina gave him some insight into how his home state could improve.

Nichols said, "I was already interested in coming back to West Virginia, but the opportunity to be part of the new engineering program at Marshall University was an incredible incentive to make the move."

The research he is doing right now as an associate professor of engineering at Marshall is funded by the West Virginia Department of Transportation (WVDOT). His research promotes ways to make West Virginia roads and intersections safer and more efficient. He conducts research in conjunction with the Nick J. Rahall Appalachian Transportation Institute (RTI) at Marshall University - a leader in multimodal transportation and economic development in West Virginia and the Appalachian Region.

Nichols said, "I enjoy conducting applied practical research that the WVDOT has the opportunity to put into immediate use."

One of Nichols' projects involves evaluating the Intelligent Transportation System (ITS) that West Virginia put into place a few years ago. The overall goal of implementing ITS is to make it possible for drivers to make informed decisions while traveling through the placement of digital message signs along highways. Nichols will be using speed data collected by INRIX, which has a popular smart phone app for motorists, to evaluate performance of major roads in the state. He and his team will examine this data, collected in 2-minute intervals, to identify recurring trends in congestion as well as impacts of incidents, such as crashes and construction. This research will provide the WVDOT with quantitative tools to identify trouble spots and evaluate potential projects.

Nichols is also attentive to traffic signals in the state. As any driver can attest, a green light that's too short or a red light that's too long can be a huge contributor to traffic congestion and frustration. Conventional signal systems use pre-programmed, daily signal timing schedules, and there is no ability to take into consideration what might be actually occurring along that road on any given day.

Nichols has received funding to help the WVDOT implement Adaptive Traffic Signal Control along certain corridors across the state and evaluate its effectiveness - including highly traveled roadways in Morgantown, St. Albans and Teays Valley. This technology, which is achievable through the use of wireless sensors installed in the road, intuitively adjusts signal timings to accommodate varying traffic patterns and ease traffic congestion in real time.

Nichols and his team can monitor and study how the adaptive technology is functioning from their offices in Huntington. He said most areas in the state do not have control of their signal system because of a lack of resources and expertise. Most are maintained and operated by the WVDOT, which also has limited resources and expertise in the area of traffic signal systems. However, this presents a nice opportunity for him and the team at RTI.

"We are very fortunate to have a great working relationship with the WVDOT," Nichols said. "We are able to support their day-to-day activities with our traffic engineering expertise, which is a very unique role for universities in the United States."

To read more about Nichols - including an innovative "triangabout" (a term that he coined) intersection configuration that's being proposed for a hazardous and congested intersection in Morgantown, visit [www.wvresearch.org](http://www.wvresearch.org).



## about the division of science and research

The West Virginia Higher Education Policy Commission's Division of Science and Research directs the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR) in West Virginia. The division also coordinates scientific research grants to academic institutions and conducts outreach activities to broaden the public's understanding of science, technology, engineering and mathematics (STEM) disciplines. For more information, visit [www.wvresearch.org](http://www.wvresearch.org).

This material is based upon work supported by the National Science Foundation under Grant No. EPS 1003907. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



## WVU professor receives Presidential Early Career Award

Brian Anderson, GE Plastics Material Engineering Professor of Chemical Engineering at West Virginia University, has

been selected as a recipient of the Presidential Early Career Awards for Scientists and Engineers (PECASE), the highest honor bestowed by the United States government on science and engineering professionals in the early stages of their independent research careers.

Anderson was nominated for the award by the United States Department of Energy (DOE), one of 13 federal departments and agencies that join together annually to nominate the most meritorious scientists and engineers whose early accomplishments show the greatest promise for assuring America's preeminence in science and engineering and contributing to the awarding agencies' missions.

"I am truly honored to be chosen for the PECASE and to represent WVU and the Statler College of Engineering and Mineral Resources," said Anderson. "It is very important to me to carry on the long and distinguished legacy of energy research at WVU. As both a graduate of the Statler College as an undergrad and now as a faculty member, I am excited to be able to bring this award back to my alma mater. I am also very grateful for the ability to work with the researchers at National Energy Technology Laboratory and for the nomination."

Anderson has conducted extensive research in the areas of natural gas hydrates, thermodynamic modeling and sustainable energy and development in the area of geothermal systems. He was the recipient of the 2011 DOE Secretary's Honor Award for his work in response to the Deepwater Horizon oil spill and was selected to the National Academy of Engineering's 2010 Frontiers of Engineering Education Workshop. Anderson was named the Statler College's "Teacher of the Year" in 2010. In addition to his teaching responsibilities, Anderson serves as coordinator of strategic research in energy for WVU's Research Office.

"By virtue of this award, Brian Anderson has positioned himself as a rising star in the field of energy research and education," said Gene Cilento, Glen H. Hiner Dean of the Statler College of Engineering and Mineral Resources. "He will be a key player in WVU's plans to play a leadership role in the energy arena."

"In the short time that Brian Anderson has been on the faculty at WVU, he has made major technical advances while working closely with other universities, industrial companies and national laboratories," said Rakesh Gupta, Professor and George and Carolyn Berry Chair of Chemical Engineering. "The Presidential Early Career Award is well-deserved recognition not only of his current contributions but also of his future potential."

"The impressive achievements of these early-stage scientists and engineers are promising indicators of even greater successes ahead," President Barack Obama said. "We are grateful for their commitment to generating the scientific and technical advancements that will ensure America's global leadership for many years to come."

A native of Ripley, West Virginia, Anderson earned his Bachelor's Degree in chemical engineering from WVU in 2000, and his Master's and Doctoral Degrees from Massachusetts Institute of Technology in 2004 and 2005, respectively.

"By virtue of this award, Brian Anderson has positioned himself as a rising star in the field of energy research and education. He will be a key player in WVU's plans to play a leadership role in the energy arena."

Gene Cilento, Glen H. Hiner Dean of the Statler College of Engineering and Mineral Resources.

## West Virginia State University Awarded \$1.7 Million in Federal Grants

West Virginia State University (WVSU) has received grant funds totaling nearly \$1.7 million from the U.S. Department of Agriculture's (USDA) 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 WVSU 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 land-grant universities established in 1890. 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.

### 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



WVU receives  
**third straight  
invitation** to compete  
in NASA/NIA  
**robotics competition**

"We are honored and excited to be part of an elite group of eight universities selected to compete again this year,"

Powsiri Klinkhachorn  
professor of computer  
science and electrical  
engineering and team  
adviser.

For the third time in three years, a team of students from West Virginia University will put its engineering skills to the test when it competes in the Revolutionary Aerospace Systems Concepts-Academic Linkage Exploration Robo-Ops Competition.

Sponsored by NASA and organized by the National Institute of Aerospace, the competition will be held in June at NASA's Johnson Space Center in Houston.

"We are honored and excited to be part of an elite group of eight universities selected to compete again this year," said Powsiri Klinkhachorn, professor of computer science and electrical engineering and team adviser.

"To be selected three years in a row speaks well for the ability of our students. They have designed and built some of the best robots in the past, and we are hoping our previous experiences will help our team excel in 2014."

The rovers compete on a planetary analog environment under the supervision of NASA judges. Up to three members of the team, plus the faculty adviser, travel to Johnson Space Center for the on-site testing. The remaining team members stay behind at their respective universities to conduct "mission control" tasks. The prototype rovers will be tele-operated by the university team and must negotiate a series of obstacles while accomplishing a variety of tasks. Sample tasks include negotiating upslopes and downslopes, traversing sand and gravel pits, picking up specific rock samples and placing them on the rover for the remainder of the course and driving over rocks of specified diameter.

In 2013, the WVU team overcame some last-minute technical issues to finish fourth, while earning top honors for the best technical paper, the best looking robot and winning the slalom Olympic Challenge.

Joining WVU in the competition will be teams from Massachusetts Institute of Technology, University of Buffalo, University of California-Berkeley, University of Maryland, University of Utah, University of Wisconsin-Madison and Virginia Tech.



## NSF grant to **integrate robotics technology** into **middle school courses** in Mingo County

A program that introduces robotic technology into non-technical middle school classes will be used by rural West Virginia and suburban Pittsburgh schools in a federally funded research project to identify and nurture students with an affinity for science, technology, engineering and mathematics (STEM).

All 6th-, 7th- and 8th-grade students in Mingo County, West Virginia, and all 7th- and 8th-grade students at Springdale Junior-Senior High School in Allegheny Valley, PA - a total of 900 children annually - will use robotic kits developed at Carnegie Mellon University (CMU). They will use the kits to complete at least one project or assignment each year in required courses such as health, earth science and language arts.

The three-year Creative Robotics project, supported by a \$1.5 million National Science Foundation (NSF) grant, seeks to increase the number and diversity of students in the STEM education pipeline.

"We're particularly interested in finding students who may not realize they have STEM-related talents or interests, or who otherwise have slipped through the cracks," said Dr. Illah Nourbakhsh, Carnegie Mellon University professor of robotics and the project's principal investigator. "Integrating robotics technology into classes such as art or health will give every student multiple opportunities to discover their STEM potential."

The kit consists of a customized control board along with a variety of lights, sensors and motors that can be connected to the controller without soldering. Students program their creations with an easy-to-learn, drag-and-drop environment that requires no prior experience with programming.

The project also includes faculty and staff members in the colleges of education at Marshall and West Liberty Universities in West Virginia including the June Harless Center for Rural Educational Research and Development.

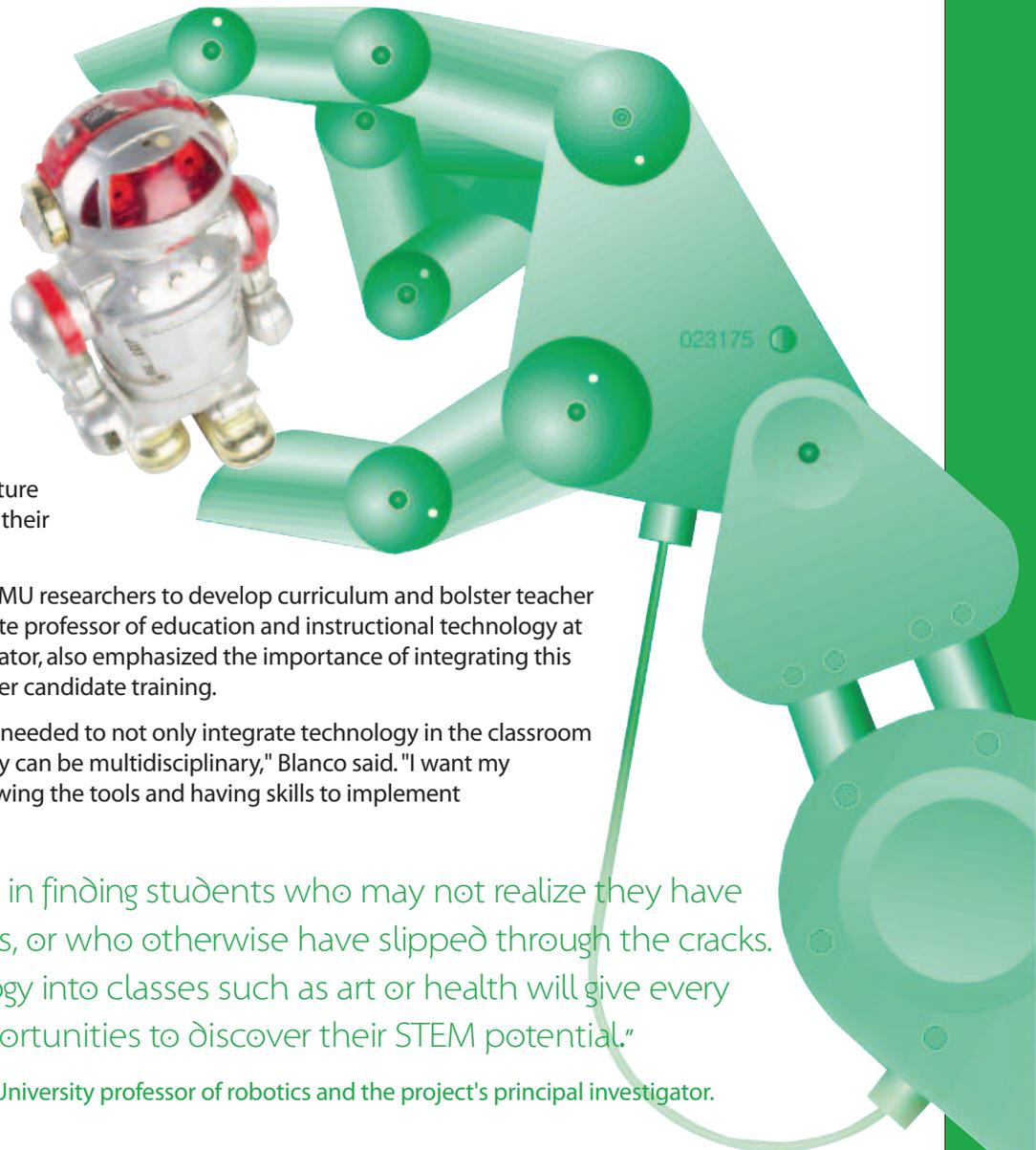
The CREATE Lab in the CMU Robotics Institute and the June Harless Center at Marshall train future teachers on how to use the kits in their classes.

Faculty members will work with CMU researchers to develop curriculum and bolster teacher training. Dr. Harold Blanco, associate professor of education and instructional technology at Marshall and co-principal investigator, also emphasized the importance of integrating this technology into pre-service teacher candidate training.

"My goal is to give them the tools needed to not only integrate technology in the classroom but to show them how technology can be multidisciplinary," Blanco said. "I want my students to graduate already knowing the tools and having skills to implement technology in the classroom."

*"We're particularly interested in finding students who may not realize they have STEM-related talents or interests, or who otherwise have slipped through the cracks. Integrating robotics technology into classes such as art or health will give every student multiple opportunities to discover their STEM potential."*

*Dr. Illah Nourbakhsh, Carnegie Mellon University professor of robotics and the project's principal investigator.*



# Higher Education Policy Commission recognizes recipients of state-fund at Undergraduate Research Day

## INSTRUMENTATION GRANTS

This award funds scientific equipment for advanced undergraduate laboratories.

**Hornng-Jyh Yang** West Virginia University Institute of Technology  
*Introduce the Refraction Microtremor (ReMi) Shear Wave Technique to Civil and Electrical Engineering Students at WVU Tech*

**Dana Alloway** Concord University  
*Materials Science Instrumentation for Undergraduate Teaching and Research – Infrared Spectrometer Reflectance System & Programmable Spin Coater*

**Theunis van Aardt** West Liberty University  
*NMR spectrometer update to improve Synthetic Organic Chemistry Instruction at West Liberty University*

**Michael Fultz** West Virginia State University  
*Acquisition of a New Gas Chromatograph at WVSU*

**Laura Robertson** Shepherd University  
*Acquisition of a microfluidics system to assess size, quantity, and quality of DNA, RNA, and protein for use in undergraduate science education and research*

**Jacquelyn Cole,** Shepherd University  
*Liquid Chromatography Front-End for a Quantitative LC/MS/MS in Proteomics and Metabolomics*

**Michael Kirkpatrick** Wheeling Jesuit University  
*Psychophysiology Lab Enhancement at Wheeling Jesuit*

## INNOVATION

This award is used for creative improvements to scientific equipment and facilities, curriculum, classroom instruction or delivery.

**Sher Hendrickson-Lambert** Shepherd University  
*Enhancement of undergraduate science education through creation of the Laboratory of Genomic Diversity*

## Summer Undergraduate Research Experience (SURE) Grants

These grants help colleges and universities provide summer/semester research experiences to undergraduates in STEM (science, technology, engineering and mathematics) fields.

**Joseph Horzempa** West Liberty University  
*Training Opportunity for Pre-Professionals, Educators and Researchers in undergraduate STEM investigations -- "TOPPER"*

**Keith Garbutt** West Virginia University  
*West Virginia University Summer Undergraduate Research Experience (WVU-SURE)*

**Michael Norton** Marshall University  
*Marshall University Undergraduate Research Experience Program: SURE*

**Colleen Nolan** Shepherd University  
*Shepherd Opportunity to Attract Research Students II (SOARS)*

**Katherine Harper** West Virginia State University  
*WVSU SURE 2014*

## PUI INCUBATOR GRANT

The PUI program is designed to foster stronger research and collaboration among primarily undergraduate institutions and community and technical colleges with the themes of bio nanotechnology, biology and biotechnology.

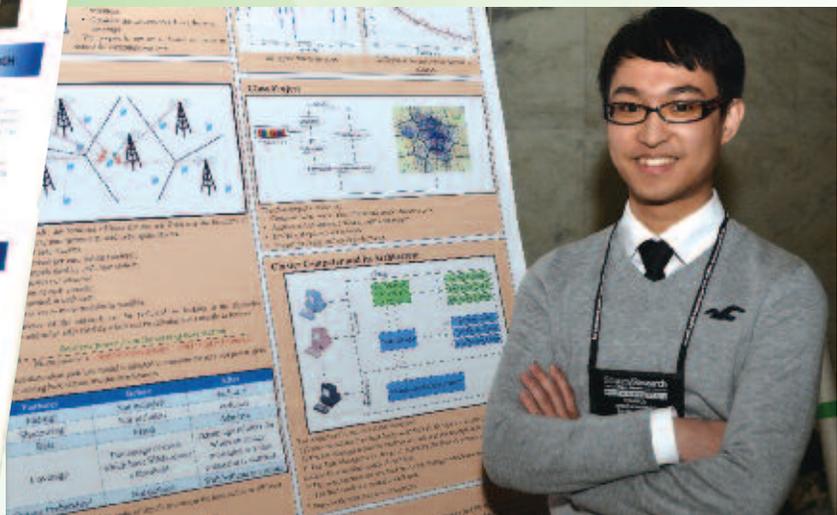
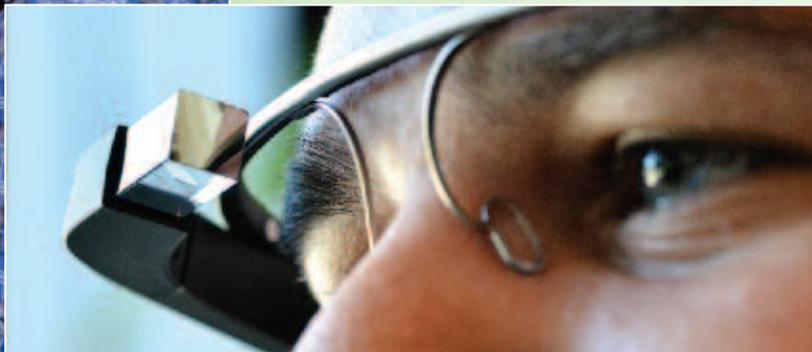
**Timothy Corrigan** Concord University

**Charlie Chen** Alderson-Broadus



# ded research grants

Nearly one hundred undergraduate students and several faculty members from 13 West Virginia colleges and universities presented their research and were recognized with grant awards at Undergraduate Research Day at the West Virginia Capitol on January 30.



Photography by John Sibold

## West Liberty University researcher names newly-discovered crayfish species in honor of feuding family

The famous Hatfield and McCoy rivalry has a new namesake. West Liberty University researchers, along with biologists from the United States Geological Survey (USGS) Cooperative Research Unit based out of West Virginia University and the Midwestern Biodiversity Institute (MBI), recently named a new species of crayfish *Cambarus hatfieldi*. It's also known as the Tug Valley Crayfish, in honor of the family feud.

"The new species' worldwide distribution is limited to the Tug Fork river basin and its tributaries in Southwestern West Virginia, Eastern Kentucky and a small portion of Virginia, though the majority of the animal's range occurs in West Virginia," explained Dr. Zachary Loughman, West Liberty University assistant professor of biology.

"Since this is the same region of the famous Hatfield and McCoy rivalry, we thought it was only fitting to name the animal *Cambarus hatfieldi*, especially since the majority of its range occurs in West Virginia," Dr. Loughman said.

Loughman is known nationally for his work with crayfish, and has named two other species in addition to the Tug Valley Crayfish.

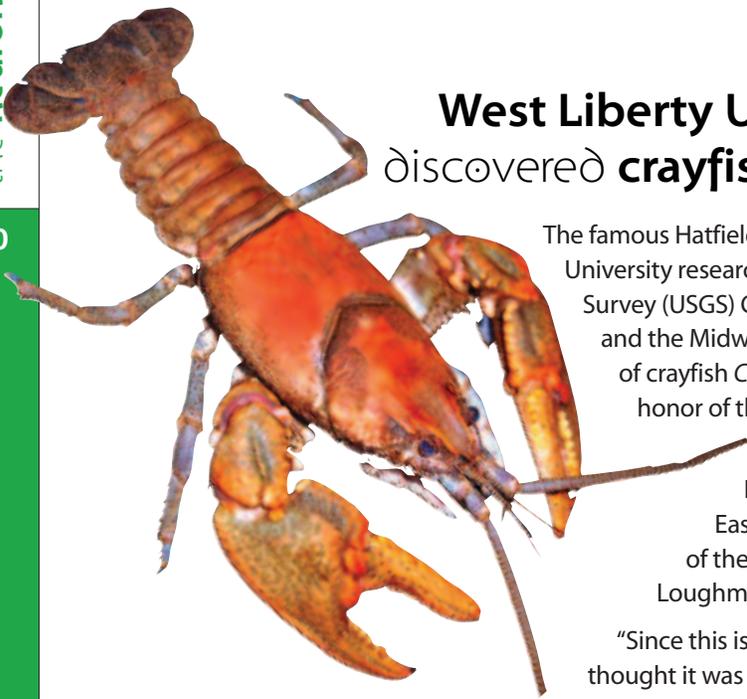
"Initially in 2009 when we first encountered the species I thought it was another species of crayfish not typically found in West Virginia. In the lab I realized it was anatomically different from the species I thought it was, but wanted to make sure. This led us to use genetics techniques to differentiate *C. hatfieldi* from other species. Genetics results confirmed my hunch."

Loughman worked with his West Liberty University colleague Dr. Evan Lau, biology student Raquel Fagundo, Dr. Stuart Welsh (USGS) and Roger Thoma (MBI) to describe the crayfish. The results of their work were published in *Zootaxa*, a leading international academic journal dedicated to the description of new species of animals, in December.

Fagundo, who is a college senior in West Liberty's Ecology, Evolution and Organismal Biology major, performed much of the molecular genetics work under the guidance of Dr. Lau. Dr. Stuart Welsh, Division of Forestry and Natural Resources, West Virginia University, was a partner with Loughman on this project, as well as a recently completed West Virginia crayfish atlas project that involved sampling crayfishes across the state. Mr. Roger Thoma, Midwest Biodiversity Institute, Hilliard, Ohio, completed fieldwork in Kentucky, and determined the Tug Valley crayfishes distribution in that state as well as Virginia.

"The discovery and naming of the Tug Valley Crayfish is why I became a biologist and enjoy teaching at West Liberty University," said Loughman. "This type of research and work is happening daily in the biology labs and classrooms at West Liberty, and we are proud to see the results published."

Research in Loughman's lab focuses on crayfish natural history, taxonomy and conservation biology, with an emphasis on crayfishes that occur in West Virginia. He and his biology students travel throughout West Virginia and the southeastern United States surveying crayfishes. In addition to this work, his research teams study the ecology of high elevation burrowing crayfishes, investigate the systematics of the *Cambarus robustus* complex and maintain the West Liberty University Astacology Collection, which currently houses 1,500 lots of catalogued crayfishes from across West Virginia and the southeastern United States.





## High school students in West Virginia hoping to launch satellite

Students at South Charleston High School (SCHS)

are engaged in a hands-on project that they hope will end with a satellite being launched into outer space.

Students, teachers and volunteer mentors at the school are designing and building Near Space Satellites that carry miniaturized scientific payloads designed to measure cosmic rays and environmental parameters such as air pressure and temperature using high altitude balloons. This project involves the students building and using two ground control stations. SCHS students will be utilizing the school's amateur radio club's FCC license and the fixed ground control station radio equipment to communicate with astronauts on the International Space Station and interact with other satellites in orbit.

The launch of the school's first Near Earth Satellite is slated for the spring. Given favorable winds, the instrument payloads will rise up to 100,000 feet—the edge of outer space. Then, the helium-filled balloons will burst under pressure and a parachute will deploy to carry the satellite and its sensors back to Earth. The balloon flight should allow the students to video the balloon's ascent in an effort to characterize flight behavior and improve future design and performance. The gamma-ray experiment being flown will allow students to conduct post-flight analysis of the solar radiation levels experienced during flight.

Students are directly involved in the design and building of both the reentry vehicle and electronic components.

"They build the components, launch what they created to collect real environmental and performance data and get it back for analysis," says Joe Oliver, SCHS Computer Science Teacher. "They're doing real science that is not coming out of a textbook; it's a rich experience for them."

The class is seeking donations to purchase equipment for the project. People interested in helping the students achieve their goal can visit [indiegogo.com/projects/near-space-project](http://indiegogo.com/projects/near-space-project) for more information.

The above photo from left to right; Dr. Oliver, Shawn Estep, Shelby Combs, Tiffany Grigsby, Kenneth Radilias, and Logan Shomo.

## 8th graders encouraged to learn about nanotechnology with Nanooze magazine

Students at middle schools across the state received the second West Virginia-focused edition of Nanooze, a magazine about nanotechnology.

Nanooze was provided free to all eighth-grade grade students by the Division of Science and Research as part of an effort to stimulate interest in science, technology, engineering and mathematics (STEM) careers among middle school students.

"To be economically competitive now and in the future, West Virginia needs more college graduates, and particularly we need to graduate more people trained in STEM fields," said Dr. Jan Taylor, Director of Science and Research. "We hope this magazine and the guidance of classroom teachers can move our state toward the goal of increasing the number of students graduating in STEM fields every year."

Packages of Nanooze were mailed to all public and private schools in West Virginia with enough magazines for each of the nearly 22,000 eighth-grade students. An electronic version is available at [www.wvresearch.org/nanooze](http://www.wvresearch.org/nanooze). Individuals can request additional printed copies of the magazine at no cost through the website.



## Brownfields Assistance Center at Marshall expands partnership to explore land use

Officials at the West Virginia Brownfields Assistance Center at Marshall University announced in early December an expansion of their partnership with the West Virginia Division of Energy's Office of Coalfield Community Development to explore the reuse and redevelopment potential of land that has been surface mined.

Over the past several years, the two organizations have worked together to demonstrate and evaluate renewable energy applications on former surface-mined properties. Projects have included assessments of wind, solar and biomass energy, as well as hydropower.

The December announcement includes two initiatives that will further those efforts and adds a new project to study redevelopment opportunities.

According to Center Director George Carico, the Division of Energy and the Appalachian Regional Commission are providing \$355,000 in funding for the three new projects, which will be completed over the next two years.

Carico said, "We continue to play a primary role in reuse and redevelopment of West Virginia's surface mine lands for progressive and innovative new purposes, and welcome the opportunity to expand our efforts in bringing new life to these properties after mining activities have been completed."

Carico said that for the first project they will use state-of-the-art Sonic Detection and Ranging (SODAR) equipment to continue wind measurement studies designed to help identify promising wind energy sites. Through the second initiative, the Brownfields Assistance Center will administer a grant program to support renewable energy projects on surface-mined land. Competitive grants of up to \$40,000 each will be awarded to projects with the potential to yield renewable energy from biomass, wind or solar sources. The third project will involve a study of various options for redeveloping surface mine sites to meet local or regional economic development needs. The options to be evaluated include commercial or industrial applications, specialty housing and agricultural or recreational use.

The West Virginia Brownfields Assistance Center at Marshall University is a program of the university's Center for Environmental, Geotechnical and Applied Sciences (CEGAS).



## Open house introduces students to STEM disciplines

West Virginia University Institute of Technology (WVU Tech) hosted an Engineering & Sciences Open House for more than 1,200 students in grades 6-12 last fall. The event was sponsored by the Dow Chemical Company.



The annual event included guided tours of the university's labs and demonstrations with renewable energy, transparent engines, a concrete canoe and steel bridge, fuel cells, endoskeletons and exoskeletons and computer science projects.

"This open house event provides an excellent opportunity for students to explore careers in engineering and science related fields," explained Dr. Z Torbica, dean of the Leonard C. Nelson College of Engineering & Sciences.

"There is a world of opportunity available for workers with skills in STEM fields," said Tyler London, site leader of Dow's UCC West Virginia Operations site. "Employees in STEM-related jobs are going to be critical for helping to solve the world's biggest challenges like clean drinking water and alternative energy sources."

Students from Kanawha, Fayette, Clay, Nicholas, Raleigh, Braxton, Boone, Roane, Cabell, Putnam, Mingo, Lincoln and Logan counties were invited to participate. "We're hoping to see this event grow as more and more students explore careers in the STEM disciplines," added Torbica. "We recognize the critical need for these types of professionals in the future growth of our state and our nation."

## WVU alumnus named to Popular Mechanics '10 Innovators Who Changed the World in 2013'



Tim Kesecker, who earned his Bachelor's Degree in computer science from West Virginia University in 1985, was named to Popular Mechanics' list of "10 Innovators Who Changed the World in 2013," for his work on the X-47B, an unmanned aircraft that can take off and land on aircraft carriers out at sea.

The project was part of the U.S. Navy's Unmanned Combat Air System, or UCAS, demonstration, and was spearheaded by Northrop Grumman. Most runways are fixed, but the carrier is movable, not just geographically, but also physically. Not only can it be in a location one day and then move, but it is also being tossed by the ocean at all times.

Kesecker's team mixed new technology with existing aircraft components to develop a precision navigation system that sends information via transponders on the aircraft carrier to the plane so it knows where the carrier is at all times, down to an inch. These detailed positions are sent at a rate of 100 messages per second, which allows the plane to adjust its attitude as quickly as it would with a pilot.

Kesecker used the skills he learned at WVU to apply a systems engineering approach to the program management functions of monitoring, reporting, budgeting and scheduling the execution of the project. He was responsible for integrating 12 Integrated Product Teams, which designed, developed, integrated and tested the system. He also led the team through the relocation to Maryland for final flight testing.

A Martinsburg, West Virginia, native, Kesecker said that the Popular Mechanics honor "represents the work of the entire team. It's a springboard to more responsibility and leadership."

On being able to represent his home state on the Innovators list he said, "it means a great deal to me. West Virginia is part of me. I wear my WVU colors often. That's something everyone knows about me."

Being able to represent his home state on the Innovators list, "means a great deal to me. West Virginia is part of me. I wear my WVU colors often, that's something everyone knows about me."

## 'Research Rookies' program at WVSU offers freshmen and sophomores a jump start

While some may consider the term "organic pesticide" to be an oxymoron, chemistry major Bridgett Dudding adamantly disagrees. Dudding spent the fall 2013 semester, her first at West Virginia State University (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) and a grant from the Higher Education Policy Commission's Research Trust Fund, to provide research opportunities to WVSU 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.

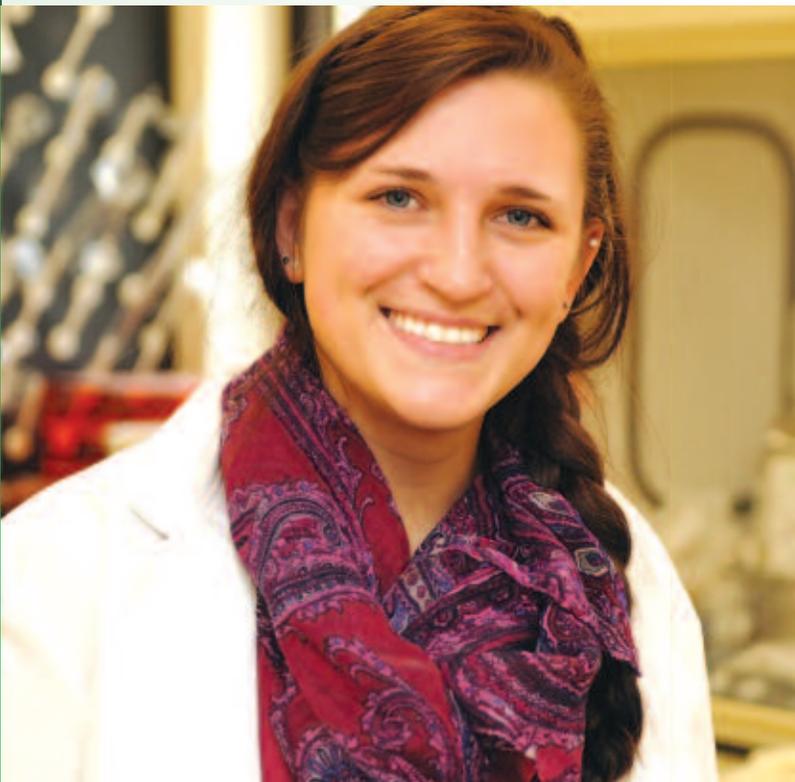
Students are now engaging in enriching research experiences that allow them to explore their intended majors, develop relationships with faculty in their field, and expand critical thinking skills – all with the ultimate goal of cultivating more STEAM majors for West Virginia.

"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, as well as Chemistry major Megan Guetzloff, who is working with Dr. Genia Sklute. Both students are involved in soil-related projects with the goal of improving environmental conditions.

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.



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

## Commentary

### West Virginia Higher Education is **Leading the Way**

Dr. Paul Hill, Chancellor, West Virginia Higher Education Policy Commission

#### *Leading the Way: Access. Success. Impact.*

West Virginia's new five-year master plan for higher education, is a comprehensive blueprint for increasing access to postsecondary education for our students and ensuring their success by obtaining credentials - so our students, in turn, have a lasting impact on our state.

Increasing the number of West Virginians with high-quality postsecondary credentials is essential for our economic future. Research conducted by Dr. Anthony P. Carnevale of Georgetown University predicts that West Virginia needs to produce an additional 20,000 graduates by 2018 over current degree production merely to sustain – not grow or diversify – the state's economy. That statistic fuels the fire and should show us just how important it is that we, as a system, work together.

Leading the Way articulates both broad goals and specific objectives for the coming years, particularly addressing critical subpopulations of West Virginia students. The plan imagines a leading role for public higher education in moving West Virginia toward a more diverse and robust economy that is competitive in a global, knowledge-based marketplace.

It has been recognized that college graduates have a profound civic, social and economic impact on their local communities and the state as a whole. In addition, West Virginia's four-year institutions of higher education directly contribute to the economic, cultural and social vitality of their respective regions.

One of the goals outlined in the Leading the Way Master Plan is to increase the impact that public colleges and universities have on West Virginia through production of qualified graduates who are ready to contribute to the workforce and the community. The Plan also calls for the provision of needed services and research and development that promote knowledge production and economic growth.

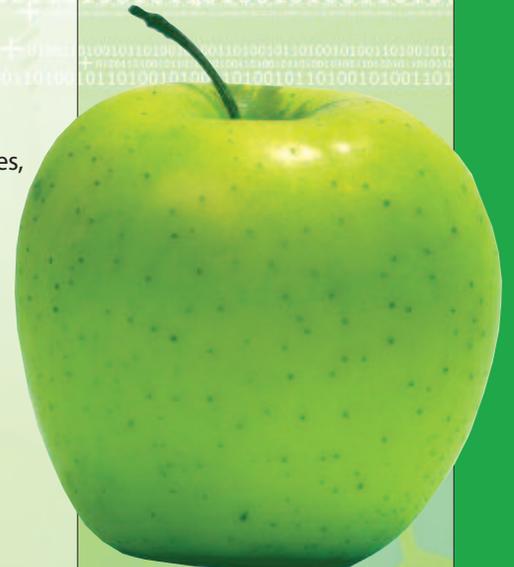
#### **The following are a few ways we'd like to see that happen.**

- Increasing the number of degrees awarded annually at the undergraduate and graduate levels overall and in needed areas.
- Addressing regional economic needs through developing pathways to the West Virginia workforce for students and recent graduates.
- Decreasing the federal student loan cohort default rate at system institutions.
- Increasing research and development activities which contribute to West Virginia's economic growth.

#### **Our ongoing efforts include:**

- Coordinating and supporting service and civic engagement efforts between campuses, professional organizations, state agencies and local communities.
- Identifying grant opportunities that can benefit both the state and its institutions, including assisting faculty members in pursuing external research funding.
- Promoting fiscal responsibility by ensuring that student debt levels after graduation are manageable and by working with institutions and the legislature to make sure that tuition remains affordable.

West Virginia's science and research community is central to these efforts, and the Higher Education Policy Commission looks forward to continuing our work with you to reach the ambitious goals before us - and to ensure that our students see great success and have a positive impact on our state for years to come.



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## FROM THE DIRECTOR: Outreach to our future researchers

One of our goals is to get more West Virginia kids headed to college to pursue a STEM-related degree. In this issue of the Neuron, in addition to the many stories

you will find about researchers doing wonderful things at our state's colleges and universities, you'll also see a smattering of articles that demonstrate how folks are working to keep kids interested in science, technology, engineering and math fields.

There is a story about a National Science Foundation grant that's giving middle school students in Mingo County a chance to experience robotics technology in their non-technical classes. The goal, as you'll read, is to find students who may not realize they even have an interest in a STEM field. There are also some high school students in South Charleston who are hoping to launch a satellite into space this spring as well as a report on WVU Tech's recently successful Engineering and Sciences Open House for students in grades 6-12.

At the Division of Science and Research, we mailed out our second West Virginia edition of Nanooze magazine to middle school science students last fall. We anticipate that this nanotechnology-themed magazine will inspire some young minds in our state to dig a little deeper into science by showing them how businesses and people in our state are using nano in their everyday lives.

We also maintain a page on our website that keeps track of STEM-focused events and activities in West Virginia targeted toward elementary, middle and high school students. Please feel free to join our outreach and share this page ([www.wvresearch.org/STEM](http://www.wvresearch.org/STEM)) with the families in your life!

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