



## WVU professors to study shale issues with grant funding

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Six West Virginia University professors will explore complex shale gas issues ranging from the potential impacts on heart health, water resources, the chemical industry and policy development not only in West Virginia but also around the world.

Each professor won a \$10,000 research grant from WVU's National Research Center for Coal and Energy and Office of Research as part of their newly launched WVU Shale Gas Network.

Research projects include improving the safety and efficiency of shale gas exploration and production, developing new methods to use shale gas in chemical manufacturing, studying the potential impact of shale gas production on cardiovascular health and researching the development of shale gas in other countries.

One of the international studies will examine regulations for protecting water in an arid region of Argentina while another will look at the possible effects on governments and companies of China's entry into shale gas development.

NRCCE Deputy Director Trina Waffe announced the awards at the third annual Enhancing Public Understanding of Shale Gas Issues Conference, held at the Hilton Garden Inn in Morgantown and sponsored by the WVU Extension Service Natural Gas Education Team.

Waffe, who coordinates the Shale Gas Network, said it will create opportunities for WVU researchers to collaborate and generate ideas in support of the University's Mountain of Excellence in Shale Gas Utilization. The award winners will present their work at the Network's November meeting.

"These awards will enable WVU researchers to develop proofs of concepts for their ideas about important shale gas issues that could lead to larger projects funded by some of this country's major research organization such as the National Science Foundation, the U.S. Department of Energy and the National Institutes of Health," said NRCCE Director Richard Bajura.

The Research Office estimates that more than 60 faculty members are engaged in some facet of shale gas research. Their work covers the spectrum from extraction to utilization to policy and economic impact.

"Our goal is to see even greater engagement across the WVU community," said Fred King, vice president for research. "WVU seeks to be the thought leader regarding the global opportunity that shale gas presents. We hope to bring together scholars, developers, and stakeholders as we grow our Mountain of Excellence related to shale gas."

Award winners include Jessica Hoover, assistant professor in the Department of Chemistry, who will study how to convert natural gas with its single carbon atom and four hydrogen atoms into hydrocarbon molecules with three, four, or five carbon atoms.

"These lower hydrocarbons are essential for manufacturing synthetic rubbers and plastics," Hoover said. "Right now, we make them from petroleum because we can't make them from natural gas."

Brian V. Popp, an assistant professor also in the Department of Chemistry, will be researching the use of natural gas as a feedstock for the chemical industry. He also plans to develop a program of study from his research to educate students, especially U.S. armed forces veterans, for careers in science, technology, engineering and math to support a chemical industry renaissance in West Virginia.

J. Ryan Shackleton, an assistant professor in the Department of Geology and Geography, will be studying fracture patterns in shale outcrops at the earth's surface to develop a tool to predict fracture patterns in shale deep in the subsurface. Fractures and rock layers form a complex plumbing system that allows oil, gas, and water to move through the subsurface.

"That plumbing system can be detrimental when hydraulically pressurizing the rock to create new fractures because pressure rushes into the natural fractures instead of creating new fractures near the wellbore," Shackleton said.

He will be working with researchers from the University of Aberdeen in Scotland to create a 'fracability index' based on the outcrops that could make hydraulic fracturing safer, more predictable and more efficient for production of oil and gas.

Heather Basara, who joined WVU in April as an assistant professor in Department of Occupational and Environmental Health Science, is teaming with School of Public Health Research Assistant Professor Travis Knuckles to identify specific emissions of ultrafine particles that might lead to more cases of heart disease among people living or working near hydraulic fracturing well sites. People living in Appalachia already suffer from heart disease at higher rates than the rest of the U.S. population.

The scientists say that very little is known about Appalachian residents' exposure to air pollution near hydraulic fracturing operations. To protect their health, it is critical to determine the composition of the ultrafine particles released during hydraulic fracturing.

"We want to understand how these particles contribute to poor heart health and what role any pre-existing disease may play," said Basara.

Alison Peck, an associate professor in the College of Law who works with the College's Center for Energy and Sustainable Development, will be developing recommendations for regulations to protect water resources in connection with shale gas development in Argentina.

In April 2014, Chevron and Argentine oil and gas company YPF announced a \$1.24 billion partnership to develop gas from the Vaca Muerta shale in Argentina's Neuquén Province, located in Patagonia. It is the first commercial development of that nation's shale gas resources. Existing regulations are limited to oil and gas law dating back to the 1970s that may not adequately address this new type of energy development.

Water is scarce in Neuquén Province and local citizens have actively opposed shale gas development without an assessment of its environmental impacts. Peck, who speaks fluent Spanish, will work with faculty at the University of Palermo in Buenos Aires to identify the top priorities for water resource protection and other environmental protection in the region. She will create regulatory recommendations for use by the Argentine government, industry, civil society and academic researchers.

Peck said that her long-term goal is for the WVU Center for Energy and Sustainable Development to become a clearinghouse for countries worldwide seeking legal guidance as they develop their shale gas resources.

Usha C.V. Haley, professor in the Department of Management of the College of Business and Economics, will focus on China. Her project aims to further understanding of the resources, players, strategic risks, and rewards of China's shale gas development.

China has the world's largest shale gas reserves on paper, with strong provincial and central governmental support for drilling and using the gas. China also relies on multinational companies' fracking and drilling technologies to access this resource.

Haley previously studied China's entry into other energy-related sectors such as solar, coal, steel and auto parts to learn how China's influence dramatically affected those global markets. With this award, she will explore the international strategic ramifications of Chinese shale-gas development for companies, governments and technology.

"Within five years, largely through government subsidies and policy, China became the largest manufacturer and exporter in these global industries, drastically changing their technological trajectories, pricing, development, and international trade patterns," Haley said. "The story holds the promise of repeating in shale gas."

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