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On Top of Marcellus

By Randy Wells

Look at a map of the Marcellus shale formation, that vast deposit underneath thousands of square miles of New York, Pennsylvania, Ohio, West Virginia, and Maryland that may hold enough natural gas, some say, to power America for decades. That dot on the map, near the geographic center of the Marcellus formation, is the Indiana campus of Indiana University of Pennsylvania.

Geography graduate students Brian Flick, left, and Alex Hall monitor water quality in and around the Beaver Run Reservoir.

Top: An energy team subcommittee is planning educational workshops on issues relating to Marcellus shale gas drilling. From left: Laura Helmrich-Rhodes, Thomas Gerber, John Benhart, Deanne Snavelly, and Steve Hovan.



KEITH BOYER

Not only is IUP located on top of one of the largest natural gas deposits in the world, it is also well-positioned, by virtue of its diverse and knowledgeable faculty, to capitalize on the growing demand for information about the Marcellus play and for guidance on how to use it profitably and safely.

Several IUP faculty members with interests in various energy-related research projects had been meeting informally to compare notes when Deanne Snavelly, a chemistry professor and administrator at Bowling Green State University, arrived at IUP in 2011 to become dean of the College of Natural Sciences and Mathematics. Shortly after her arrival, she began looking for ways in which faculty expertise could have an impact on the community and the economy.

The contributions of the faculty team are an example of “higher education serving the community, state, and the United States” in the quest for sustainable energy.

“It’s hard to avoid the shale gas development in this area,” Snavelly said. “There are some really interesting questions, questions that can be answered by science. I quickly learned we have very strong interdisciplinary faculty expertise that could help in answering important scientific questions.”

Some of those questions, she said, address regional planning issues and the environmental effects surrounding drilling in the Marcellus formation. For example, how does gas well drilling affect watersheds, not only near the drilling sites, but far downstream?

Under Snavelly’s guidance, the “energy team”—with professors from the Geography and Regional Planning, Geoscience, Safety Sciences, and Chemistry departments, for starters—has been meeting regularly.

“From my perspective, it’s very important that these kinds of initiatives come from faculty, and that it’s the faculty group that decides, ‘What are we good at? What do we want to do? How can we contribute?’”

Team members began working on two major focuses, Snavelly said. One was to do what they specialize in—education—but do it through two-day workshops in which faculty members would discuss their disciplines as they relate to shale gas drilling. The target audience for the workshops, which may be held as early as June, will be county commissioners, township supervisors, municipal authority members, and others in government who are decision-makers on issues related to shale gas.

The second thrust is to develop research ideas surrounding Marcellus shale. It would be the kind of research, Snavelly said, that industry and other organizations aren’t going to do.



The Chemistry Department analyzes water samples collected near shale gas drilling sites. From left: faculty member Nathan McElroy; Amy Rydeen, a senior Chemistry major; and Pearl Kwantwi-Barima, a Chemistry graduate student.

“But a university is a place where new knowledge is discovered,” she said. She sees the contributions of the faculty team as an example of “higher education serving the community, state, and the United States” in the quest for sustainable energy.

How much natural gas the Marcellus shale deposit holds, and how much is recoverable, is subject to debate. The Marcellus Shale Coalition, an industry group, cites a report from worldwide financial firm ITG Investment Research that the formation contains about 330 trillion cubic feet of gas.

Steve Hovan, IUP’s Geoscience Department chairperson and an energy team member, prefers the more specific estimate published by the U.S. Energy Information Agency that the Marcellus formation holds 400 trillion cubic feet of technically recoverable gas reserves.

In 2012, Provost Gerald Intemann asked the deans of colleges to think about developing “research clusters,” or teams, when making their requests for new and additional faculty members. Snavelly said the deans were encouraged to consider people whose expertise is related to something others in the department are doing.

“So the university funded what we call the Marcellus Shale Gas Research Cluster, and we’re hiring four faculty members who will be members of this team,” she said.

The new hires are expected to include a hydrogeologist and a mineralogist in the Geoscience Department, a Safety Sciences professor with expertise in energy development, and a new professor for Geography and Regional Planning with expertise in environmental and watershed-based planning and stream restoration/remediation approaches related to energy development.

According to John Benhart, Geography and Regional Planning chairperson, the energy team has attracted faculty members from across the university who were involved in many types of energy research “in their own specific areas of expertise.”

Since coming together as a team, “we can share ideas and learn what other experts at the university are doing,” Benhart said. And that has uncovered some synergies in their research projects.



Last school year, members of the Ladies of Safety student group toured a WPX Energy drilling site in Derry Township, Westmoreland County. From left: faculty advisor Laura Helmrich-Rhodes, Christina Deitman '12, Danielle Anna, Kiley Walker '12, and Erica Crossland.

The energy team wants to learn what kinds of training and research will meet the needs of the Marcellus exploration and drilling industry, Benhart said, and what skills graduating students should have to obtain jobs in related fields.

Another goal, he said, is to establish a focused research agenda that contributes to the knowledge base of the Marcellus industry. He cited as an example the team's interdisciplinary project to document characteristics of watersheds in the Laurel Highlands region, both to understand baseline water quality parameters in advance of drilling and to establish benchmarks for restoring resources, if necessary.

Benhart said the department is well suited to study watershed characteristics and the impact of energy development on surface and groundwater because of its use of geospatial technologies and expertise in environmental planning and analysis.

"We want to operate as scientists and experts who can be objective regarding techniques and results," he said, emphasizing the importance of maintaining neutrality on what has often been a controversial issue.

The department is developing an energy geotechnology/environmental compliance concentration, through which students will learn to use advanced techniques to determine where to drill wells, how to protect water wells and drinking water, and where to explore for natural resources such as gas, coal, and wind.

These graduates will be in high demand in the public and private sector, Benhart said, because of their understanding of the science and regulatory framework of the energy industries and of related technologies.

But some students and faculty members are already demonstrating expertise that can

be useful to the shale gas industry and to communities where wells are being drilled.

Since 2011, Brian Okey, a Geography and Regional Planning faculty member, has been supervising students monitoring the quality of water in the Beaver Run Reservoir in Westmoreland County. The reservoir is a drinking water source for about 130,000 people in Westmoreland, Armstrong, and Indiana counties.

Marcellus shale gas wells are being drilled near the reservoir on land leased from the Municipal Authority of Westmoreland County, but Okey said the monitoring also looks at the effects on the water from agriculture, coal mining, and nearby highways.

"Projects such as this offer students an excellent opportunity to do research in the public interest," he said.

While the Beaver Run project fits well with the skills of his department, Okey said the expertise of the Chemistry Department is crucial for the water analysis. The municipal authority had done some water sampling previously at the reservoir on a limited basis.

"They were looking for certain parameters that were telltale of water quality, such as nitrates or chlorides," said Chemistry faculty member Nathan McElroy '94. "When they contracted with us, they were interested in a few more parameters that they didn't have the ability to test and even ones that could be, if found in higher levels, indicative of a problem."

The samples come from all around the reservoir, even its tributaries upstream, McElroy said. "Some of them are very far away from the drill pads. We also started sampling before any fracking started." Fracking refers to hydraulic fracturing to release the gas from the shale rock.

So far, according to McElroy, the sampling and monitoring have not raised any alarms. The data is available for public viewing at www.iup.edu/magazine/beaverrun.

A few graduate and undergraduate students have been helping with the chemical analysis, some as a project for independent study, some for an hourly wage.

For nearly two years, Geoscience faculty member Katherine Farnsworth and her students have been monitoring water quality in some Indiana County streams with the Evergreen Conservancy and the Pennsylvania Senior Environmental Corps, two volunteer organizations. They have been monitoring the impact abandoned coal mines and, more recently, gas wells have on the streams. The volunteers and students visit the streams every two weeks to retrieve information collected on instruments called dataloggers.

"Those dataloggers are recording just the temperature of the water, the water depth, and total dissolved solids, which technically is measuring conductivity," Farnsworth said.

The information gleaned by the dataloggers could be used to alert the state's Department of Environmental Resources if something irregular is detected.

"The question is, what is irregular?" Farnsworth asked. "And that's what I'm trying to understand—what's happening on an everyday basis and seasonal pattern. I'm using that data to try to understand the natural background character of these streams." Detecting even a trickle of pollution would be difficult if the background levels were not known.

Another area involved in Marcellus shale exploration is the university's Institute for Mine Mapping, Archival Procedures, and Safety. The institute has about 21,400 digitized maps of old and abandoned coal mines, predominantly around Western Pennsylvania, in an online, searchable database.

IMAPS Director Robert Wilson '89, M'93 said drillers have been consulting the database to learn if abandoned coal mines exist where they want to drill for natural gas.

A second IMAPS database can be used to support the state's pre-drilling permitting process and is being developed with the Marcellus Shale Coalition, Wilson said. About 35 students assist him in managing the databases.

For a decade, Laura Helmrich-Rhodes '88, M'93, of the Safety Sciences Department,

has been an instructor for the 10-hour Occupational Safety and Health Administration training program required of workers going onto natural gas drilling pads. She said the incidence of fatalities and injuries at gas and oil drilling sites is not greater than in other industries.

"It is dangerous, but it is certainly not the most dangerous work in the state," she said.

In addition to helping develop the university's two-day workshops on Marcellus exploration, Helmrich-Rhodes is involved in making IUP's curriculum more responsive to the needs of students preparing to work in the drilling industry. She has developed two three-credit courses that, once approved, will be open to students in any major.

"I think our graduates have an opportunity to mold this industry."

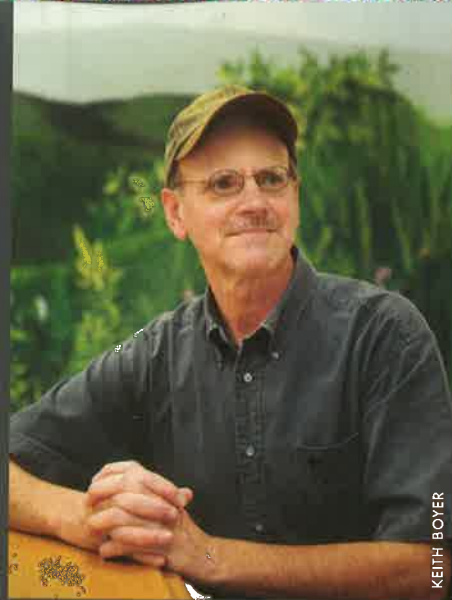
And, while internships are required of all Safety Sciences majors, the gas and oil sectors offer more internship opportunities than other industries, according to Helmrich-Rhodes. Some petrochemical companies have been willing to take IUP students at the end of their sophomore year and allow them to work with the company during a summer.

"They're great to have in class" when they return, she said. "They have all these other experiences they can bring to the classroom."

With that level of student preparation and the faculty's service as a resource on Marcellus shale, Helmrich-Rhodes believes the university will play an important role in the future of shale gas in the region.

"In academia, we have procedures, solid research and activities. I think that's where government is going to get the best information," she said. "It will be nice for us to have a positive impact on the way this plays out."

"Particularly for Safety Sciences, I think our graduates have an opportunity to mold this industry in protecting employees from those safety and environmental health hazards." 🍷



Jim Dougherty, director of the Center for Northern Appalachian Studies

aspects of Marcellus shale exploration and development, including the historical, social-environmental, legal, political, and health issues related to gas extraction. The topic was also prominent at the Appalachian Studies Association national conference held at IUP last spring.

Sociology faculty member Jim Dougherty, who directs the center, participated in an Anthropology Department field school last summer in which IUP students interviewed drilling industry representatives and people in the community who have some connection to Marcellus drilling or with underground hydraulic fracturing, or fracturing, to release the gas from the shale rock. Some comments received from residents, he said, were critical.

"To make a long story short, there are people here who are not cheerleaders for Marcellus shale drilling, and they are concerned about the history of extractive industries in Pennsylvania, going back to the days of the timbering industry and the mining industry," Dougherty said. "We are looking at it from that historical vantage point, and we're very concerned about what kind of impact this might have on our environment. We don't want to be repeating the history that occurred through timbering and coal mining here."

A future field school may focus again on Marcellus shale drilling.

"The story is not over. The legacy is being written as we go along," Dougherty said.

A recent development in the story is that IUP may have a direct benefit from the Marcellus shale formation in the future.

Under the Indigenous Mineral Resources Development Act, enacted in 2012, 50 percent of all revenues generated from Pennsylvania State System of Higher Education lands will be retained by the university where the mineral or gas is located, 35 percent will be distributed among the universities where no mineral resources have been leased or extracted and will be used for deferred maintenance or energy improvements, and the remaining 15 percent will be shared by all 14 schools in the State System for tuition reduction scholarships. The act was sponsored by state Senator Don White, who represents all of Indiana County and some surrounding areas.

According to Mark Geletka, associate vice president for Facilities Management at IUP, four gas wells were drilled on the main campus in the 1980s and were dedicated to the university's cogeneration power plant. Those wells were capped long ago.

Geletka said there are no immediate plans to explore or drill for gas on IUP property, in part because of depressed natural gas prices. If IUP does benefit from the Indigenous Mineral Resources Development Act, it may be through new technologies that would allow horizontal drilling under IUP land from Marcellus pads located on nearby properties.

Under a Watchful Eye

The Center for Northern Appalachian Studies at IUP began looking into Marcellus shale exploration and drilling several years ago. The mission of the center is to foster an enhanced understanding and appreciation of the richness of the region's diverse cultural heritage.

The center acknowledges the benefits of Marcellus shale natural gas development: jobs, energy, and economic gains for secondary businesses and industry. But in November 2010, it sponsored a three-day symposium examining other

"We don't want to be repeating the history that occurred through timbering and coal mining here."
