SU geologists and a College of Law alum help chart New York’s stake in global energy production as prospects for widespread shale gas development carry monumental repercussions on political, economic, public health, and environmental fronts

BY TOM WILBER

PHOTOS BY JAMES PITARRESI
A rig at a farm in Susquehanna County, Pennsylvania, targets the Marcellus Shale. New technology enables wells to be drilled vertically to depth and then horizontally through shale formations to ready them for fracking.

Photo (left) from the Climate Change 101 web site. Reproduced with permission from Paleontological Research Institution, Ithaca, New York.
MARY BETH AND MERWYN JONES live on a wooded hillside above the Susquehanna River valley, near the hamlet of Apalachin, in New York’s Southern Tier region. Hiking paths weave through stands of hardwoods surrounding their colonial home and a large red barn. Springs and rivulets from the hill above feed ponds before draining into nearby Deerlick Creek and, by way of various channels over and through the land, the Susquehanna River. It’s a place where the couple’s three boys built forts and caught frogs in their youth, and the Joneses are keen to see it preserved for future generations.

The family’s 50-acre tract, a fragment of a large farmstead active generations ago, is not much different than adjoining land flanking the Susquehanna River valley meandering along New York’s border with Pennsylvania. Once heavily farmed, this region is now more fallow than productive, but still possesses a bucolic richness sought by lovers of country life. The land also harbors a kind of richness sought by others: natural gas in the bedrock below. In this region, and across the country, burgeoning shale gas development is altering demographic, economic, and physical landscapes. At the heart of the matter is a practice called “fracking”—industry slang for high-volume hydraulic fracturing—the injection of pressurized chemical solutions into well bores to fracture bedrock and release gas. Developments in fracturing chemistry, combined with advancements in mechanical technology that allow well bores to be steered horizontally through large mantles of shale, have made once-inaccessible shale formations lucrative targets for energy companies.

Some fear that shale gas development holds empty promises at the expense of fresh water supplies. Others believe overblown fears about water pollution will stifle wealth and economic development inherent in the resource. As a longtime resident of Tioga County and owner of the Tioga County Courier, Mary Beth Jones is keenly attuned to these issues, and sums up the dichotomy that drives the debate over shale gas. “We are a poor county and a county with beautiful water,” she says.

Last summer, a team of researchers from Syracuse University’s Department of Earth Sciences visited the Joneses’ property and 79 other places across four New York State counties along the Pennsylvania border to collect water samples in an area viewed as the frontier of shale gas development. Their goal is to help resolve questions about one of the most controversial environmental issues in New York State’s history. Convictions about undesirable consequences of shale gas development, and the sums of money at stake, have caused a bitter ideological fight pitting advocates of environmental sustainability and public health against those seeking energy independence and economic growth. New York has become a key strategic point for all sides. As anti-drilling protesters march on Albany, the state’s lawmakers consider policy, and landowners consider terms for signing over rights to their land to drilling operators, SU faculty and alumni are shaping legal and scientific baselines on which major decisions will be made.

The SU water project is called SWIFT, for Shale-Water Interaction Forensic Tools. It’s led by Earth sciences professor Don Siegel and faculty colleagues Gregory Hoke, Laura Lautz, and Zunli Lu. Siegel, who specializes in hydrology, is chair of the Water Science and Technology Board of the National Research Council, among other distinguished positions. And he has appeared (unpaid) in commercials as an

The SWIFT (Shale-Water Interaction Forensic Tools) team of researchers from the Department of Earth Sciences is collecting well water samples to analyze and create a baseline data set that will allow them to gauge any changes in the water, should hydraulic fracturing for shale gas become a reality in New York’s Southern Tier region. Pictured are professors Don Siegel (above left), Zunli Lu (second from left), and Laura Lautz (at right, facing page), along with graduate student Sunshyne Hummel (third from left).

The hydrocarbon alternative to shale gas is mountain-top removal for coal, and the problems that go along with burning it. To me, that is the larger environmental problem.”

—Don Siegel, Earth sciences professor
enthusiastic defender of shale gas development. His partisanship makes him a controversial figure and a target for critics. His position is derived from what he characterizes as an obligation on principal to debunk “extreme conjecture or wrong information” about the potential for toxic fracking solutions to migrate from gas production zones into water supplies. While Siegel acknowledges fracking poses risks from spills and mishaps, he believes these risks are manageable, and secondary to another environmental concern: “The hydrocarbon alternative to shale gas is mountain-top removal for coal, and the problems that go along with burning it,” he says. “To me, that is the larger environmental problem.”

The SWIFT team is collecting samples over land that represents the front line of a controversy that extends beyond natural science. Here, Chris Denton L’77, a College of Law alumnus, also plays a defining role. Rather than forensic chemistry, Denton employs statutory law and grassroots organization to serve property owners dealing with companies known for predatory tactics to acquire mineral rights. Working with the New York State Farm Bureau, Denton helped landowners form collectives to learn the ropes about mineral leasing and increase their effectiveness negotiating complex and high-stakes deals. “In 2007 and 2008, the money became so big that people stopped reading the leases,” Denton says. “They had no experience with this and they were dazzled. Since then, educational meetings have evolved into a community action movement that deals not just with leasing, but with many of the political and social aspects of shale gas issues.”

Money, Land, and Water
Much of the focus over the controversy in New York has been on land and water. Although easily taken for granted in urban plumbing systems, water is a prominent ecological and aesthetic feature of the Southern Tier countryside. It trickles through creeks, percolates from springs that feed ponds, and recharges aquifers. It’s part of a vast network of groundwater sources, generally pure enough without treatment or filtration to provide potable water to tens of thousands of homes outside the reach of municipal water works. Yet without the monitoring controls of municipal water, these natural systems are especially vulnerable to accidents or carelessness. Agricultural runoff, defoliants sprayed on pipelines, illegal dumping, and spills have always been a concern for Mary Beth Jones and other rural residents. “Even if there were no prospects of fracking, and SU showed up and asked to test the water, I would have jumped at the chance,” she says.

Drilling and fracking are separate and distinct functions and each carries certain risks. Aquifers, lakes, streams, and bedrock tend to have naturally occurring levels of metals, salts, methane, and radioisotopes, often (as testing of the Joneses’ and other water showed) in concentrations that are negligible and harmless. Drilling can create conduits for non-potable elements to travel from gas-bearing zones and layers below the aquifer, where they are concentrated. These risks are mitigated by cement and steel casings that seal the well bore from the aquifer. These are effective but not infallible. Pollution can also come from aboveground mishaps, spills of chemicals or diesel fuel. And when problems do occasionally crop up, it’s hard to prove what is—and what is not—caused by industry without a comprehensive and reliable baseline to set a water sample in a given spot in the context of its broader natural history.

The picture gets cloudier because fracking recipes are
The anti-fracking movement keeps pressure on New York State lawmakers, seeking a ban on the controversial practice of high-volume hydraulic fracturing for shale gas in the state. Concerns about the environment and public health swirl around the fracking industry.

considered proprietary. Drilling and fracking are exempt from the federal Safe Drinking Water Act and hazardous waste laws. That makes it hard to track both chemicals used and waste produced at a given site. The complexity is compounded by the changing dynamics of watersheds, the geographical expanse they tend to cover, and the fact that drilling and fracking operations are itinerant.

Due to these concerns, New York State put a moratorium on shale gas development in 2008 pending the results of a broad review (incomplete at the time of this writing) of its consequences. With shale gas development on hold, the SWIFT team capitalized on a window to collect this critical "before" picture as a baseline to gauge changes after the industry arrives. Funded by $50,000 from the National Science Foundation and $15,000 from the College of Arts and Sciences and Office of the Provost, the program is analyzing samples from well water and surface water in 60 wells and 20 streams distributed uniformly across a grid in Tioga, Chemung, Steuben, and Broome counties.

On an overcast day last summer, Earth sciences graduate students Egan Waggoner and Sunshyne Hummel pulled up next to the red barn at the Joneses’ home. Mary Beth Jones greeted them warmly as they unpacked their kit—clipboard, hoses, bottles, filters, gloves, and syringes. They answered questions as they went about their work, using the hose to connect to the Joneses’ plumbing at a point before the water traveled through internal systems. They collected samples in small canisters, which they labeled and packed in a cooler, and soon they were on their way to the next stop. After a day in the field, they brought the samples to a lab run by Professor Zunli Lu in the Heroy Geology building. They removed their shoes and donned disposable slippers and gowns as a safeguard against tracking salt or any hitchhiking contaminants into the clean room.

Here, Professor Laura Lautz later explained how forensics chemistry will help determine where manmade sources of contamination—industry, road salt, fertilizer, manure—may preexist. SWIFT is also fingerprinting unique characteristics of drilling waste—flow-back—the chemical solution injected into a well that mixes with natural elements from deep formations that flow back out. Flow-back may bring halogen composition unique to fracking to the surface. It’s a telltale marker, along with certain kinds of salts. “We’re finding out what is in the range of normal and what is outside the range,” Lautz says. “If there is a question about whether a well was contaminated with a product of hydraulic fracturing, or as a result of drilling, or from something else, we should be able to tease out those identifiers.”

Lautz and fellow faculty member Gregory Hoke have no public views on the merits of shale gas development. Professor Don Siegel, on the other hand, is very public in sharing his belief that fracking is critical to the viability of regional economies, poses negligible risks to water, and “by any measurement, the environmental impact of gas is lighter than coal,” he says. Yet he also acknowledges concerns from fracking opposition. “There is not as much information in the public domain as there should be,” he says. “Overall, the concern about fossil fuel dependency is real. Disruptive climate change is moving faster than the worse case models have predicted, and I’m very worried about that.”

Siegel explains he is under contract with Chesapeake Energy to analyze pre-drilling water quality data in Pennsylvania. The project is technically and administratively unrelated...
At various stages, operations on a well pad include a rig to drill the well bore (right); a pipe to flare excessive pressure from the well after it’s fracked and before gas is connected to pipelines (below); and tanks to store brine and other waste pulled up with gas over time (left).
to SWIFT, but it could eventually contribute to the same body of knowledge regarding impacts of drilling on groundwater. Siegel also brings up his Chesapeake contract in the interest of disclosure. Although it’s not unusual for faculty researchers to collaborate on industry projects, he acknowledges that transparency issues are a sensitive part of the fracking debate.

Siegel’s pro-fracking views fall on one side of an academic divide over the subject. Cornell engineering professor Tony Ingraffea, who is president of an anti-fracking group called Physicians, Scientists & Engineers for Healthy Energy, has provided a high-profile counterweight to Siegel. Ingraffea—an expert on mechanical fractures and, like Siegel, an industry authority—has co-authored a paper that concludes cumulative impacts of shale gas production are worse than coal. Siegel and Ingraffea have debated the issue in public forums, and contributions by both men are widely seen as serving the public interest in advancing the discussion.

The political, financial, and ecological stakes are high. Since high-volume hydraulic fracturing and horizontal drilling were pioneered in Texas, the United States has become a global leader in shale gas development. The technology is now being used to explore or produce oil and gas in more than two dozen formations in the lower 48 states, increasing natural gas supplies for heating and manufacturing, lowering prices, and putting the country in the unanticipated position of becoming an exporter of natural gas in coming years. Two of the largest formations, the Utica and the Marcellus, collectively underlie parts of Pennsylvania, Ohio, West Virginia, and upstate New York.

Land Rights: Boom or Bust?
Water is a big issue. But the controversy is also rooted in the land itself and, specifically, who controls it. Gas companies need rights to private land to extract the minerals beneath it, and for this, they use leases. Technically, standard leases grant rights to extract what’s in the ground, but they also allow great latitude for company operations on the surface. How the lease is worded has everything to do with the extent of disruption operators are allowed—roads and pipelines, waste disposal, storage of materials or product, and well placement.

Elmira attorney Chris Denton was among the first in the Southern Tier legal community to recognize the potential for the wholesale leasing of mineral rights on private land to shape the fate of its inhabitants—for better or worse in the advent of a shale gas boom. Denton has been on the front line of the upstate New York gas picture since long before the Marcellus formation became a national story five years ago. His interest in mineral leasing began in the early 1990s.

At the time, the price of natural gas was rising, and plans were under way for a large pipeline—the Millennium—to run through New York’s Southern Tier, carrying gas to New York City and other lucrative metropolitan markets. Operators, encouraged by rising prices, burgeoning infrastructure, and promising geology, began developing conventional formations in Chemung County, where Denton lives. Many landowners, attracted by what looked to them like money for nothing, rushed to sign leases without legal counsel.

By 2008, as shale gas development began across New York’s border with Pennsylvania, the price of natural gas was hitting record highs, and lease offers were increasing proportionately, from $25 an acre, to $250 an acre, to $2,500
to $5,000 an acre. It was unlike anything local farmers had seen. By signing a piece of paper, they would get a check—money they could use to pay back taxes, get a new pick-up, or support retirement—seemingly with no strings attached. Of course it was too good to be true, and Denton teamed up with leaders of the New York State Farm Bureau to give talks at town halls and school auditoriums to educate landowners. He explained a lease as “a complex legal transaction masquerading as a lottery ticket.” Denton helped organize these meetings “so that everybody could take a deep breath,” he says. “At every sale there is a moment when the salesperson gets everybody stampeding toward the product—in this case, the salesperson was the landman and the product was the lease. It became an emotional response.”

Meanwhile, people began waking up to realities of shale gas development as it began playing out in Pennsylvania, where some uninformed residents had signed industry leases without realizing the value and potential of the resource under their feet. Unexpected problems soon followed. In the rural Pennsylvania border town of Dimock, there were cases where spills and lax disposal practices contaminated water sheds, and methane leaked along faulty well bores into the water table, according to records from the Pennsylvania Department of Environmental Protection, causing the water well of one resident to explode.

With growing awareness of the stakes, Denton adopted a model of strength in numbers that had proven successful in other regions. It is derived from the fact that operators need large contiguous tracts to effectively develop a shale gas resource. Consequently, landowners have more leverage to command favorable terms and environmental safeguards if they hold out and collectively craft a lease that suits their interests. When gas prices spiked in 2008, a coalition of landowners in and around Deposit, New York, landed a deal to lease 50,000 acres to an international company for $110 million plus royalties. Denton was a candidate to represent the group, but leaders of the coalition feared the level of environmental safeguards he insisted on building into the lease might discourage prospects, so they opted for other representation. Denton now represents four other coalitions in the Southern Tier that control 240,000 acres, the largest of which is a group in Tioga County with 140,000 acres.

The land play has since slowed. The price of gas has dropped to less than a third of what it was in 2008, and operators looking to tap into New York’s shale gas riches face several hurdles, including a market glut that has discouraged aggressive new exploration, regulatory uncertainty based on open questions about impacts on public health and the environment, and related legal challenges from the anti-fracking movement. Denton, who works for coalitions on contingency, has been at it for more than four years without a coalition-related payday. After cutting back staff in 2009, he is now making headway using the coalition approach to negotiate pipeline easements for infrastructure being developed to transport Pennsylvania gas to New York markets. Denton is given to military references in describing the camaraderie and values shared by the coalitions facing tough times. “To be an effective leader, you have to be at the front,” he says about his stake in the outcome, which goes unrewarded in the absence of results. “That means you eat the same beans and polish your own boots, and spend time in the same foxhole.”

The Southern Tier is where the legal work of Denton and the fieldwork of SWIFT come together. Although many of their Tioga County neighbors belong to a coalition represented by Denton, the Joneses do not. As a newspaper publisher, Mary Beth Jones is well versed in the political and scientific forces that have divided the community. The Joneses’ situation is also complicated because their land is already under lease from a company that developed a conventional formation decades ago, and the empty well has been incorporated into part of a gas storage facility. How future shale gas development will affect their lease and their property is another worry for the Jones family.

The outcome of the story will be years in the making. In the meantime, members of the SWIFT team will again be in the field to collect water from the Joneses’ property and many others as they build their pre-shale gas data set. And Chris Denton will continue to ready his troops for a time when the science can better inform regulatory decisions, and the land play advances over the rich deposits under New York. <<


https://surface.syr.edu/sumagazine/vol30/iss1/9