IN THE MIDST OF A
FRACKING FIRESTORM

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IN THE MIDST OF A FRACKING FIRESTORM

Nicholas Researchers Lay Groundwork to Better Understand the Environmental Effects of Controversial Natural Gas Extraction Process

BY TIM LUCAS

Photos of Jackson (top) and Vengosh by Les Todd, Duke Photography
Whatever your stance, one thing is certain: few energy issues today are as divisive as shale gas drilling and hydrofracturing, a process in which large volumes of water, sand and chemicals are pumped deep underground into gas wells at high pressure to crack open hydrocarbon-rich shale and extract its embedded natural gas.

Shale gas comprises about 15 percent of natural gas produced in the United States today. The federal Energy Information Administration estimates it will make up almost half of the nation’s gas production by 2035 as “fracking,” as one step in the process is commonly called, makes more and more deposits of shale gas accessible.

Supporters tout the process as a way to tap a plentiful domestic resource and bring jobs, prosperity and energy security to America at a time when we desperately need them.

Opponents paint it as an environmental travesty. They say it makes a lucky few rich but at the cost of polluted groundwater supplies and fractured communities, and possible risks to human health.

“You hear all kinds of claims, few of which are based on science,” says Avner Vengosh, professor of geochemistry and water quality at the Nicholas School of the Environment. “It’s become such a charged issue that it literally is tearing communities and families apart.”

In May, Vengosh and three colleagues at the Nicholas School landed squarely in the middle of the firestorm when they published the first peer-reviewed study documenting contamination of drinking water supplies near shale-gas drilling and fracking sites in the Marcellus Shale region of northeastern Pennsylvania and New York.

Their study, published in the Proceedings of the National Academy of Sciences, found high levels of leaked methane in well water near the drilling and fracking sites. The team analyzed water samples from 68 private shallow groundwater wells across five counties in the two states.

Fears about well-water contamination from methane, wastewater and fracking fluids have risen sharply in many communities overlying the Marcellus Shale formation as the pace of drilling and fracking accelerates there in recent years. Fracking fluids contain a proprietary mix of toxic and non-toxic chemicals that most companies did not disclose in the past but more are voluntarily disclosing now.

Some homeowners claim they can’t drink their well water any longer and say it wasn’t that way before the fracking began.

Proving anecdotal claims about tainted water—and assessing blame—can be tricky, says Robert B. Jackson, Nicholas Professor of Global Environmental Change and director of the Center on Global Change, “but at least some of the homeowners who claim that their wells were contaminated by shale-gas extraction appear to be right.”

The team’s study detected measurable amounts of methane in 85 percent of the collected samples, and levels were 17 times higher on average in wells located within a kilometer of active hydrofracking sites, says geologist Stephen Osborn, a former postdoctoral research associate with Jackson and Vengosh at the Nicholas School and Duke’s Center on Global Change, who was lead author of the study. (Osborn joined the faculty at California Polytechnic State University this summer.)
Tests showed that the methane collected from water wells within a kilometer of active sites had a chemical fingerprint similar to thermogenic methane, which is formed at high temperatures deep underground and is captured in gas wells.

No evidence, however, was found to support two of the most widespread public fears about fracking. Water samples showed no sign of contamination from chemical-laden fracking fluids, community leaders cited the findings—sometimes with considerable poetic license—at public meetings, marches and rallies. Media coverage was all over the map, literally and ideologically. There seemed to be no middle ground. One local newspaper compared the study to a Rohrschach test because people from all sides saw what they wanted in it.

The atmosphere of entrenched denial and distrust shook the scientists but strengthened their resolve to dig deeper.

“We had no preconceived notions of what we’d find going into this research, so we felt we had an opportunity and responsibility to work with people on all sides to find answers,” says Vengosh.

“No one likes having a bulls-eye on your back,” Osborn adds, “but when your work generates a reaction this divided—and when you see how anxious homeowners are for straight answers—it underscores the urgency of bringing science to bear on the issue.”

**FRACKING 101**

To understand how much is at stake in the fracking debate, you first have to understand a bit about the process itself.

The Energy Information Administration estimates the United States has 2,119 trillion cubic feet of recoverable natural gas, about 60 percent of which is “unconventional gas.” This means it’s trapped in low-permeable formations such as shale, coal beds or other geologic strata that hold the gas too tightly for conventional extraction processes to bring it to the surface cost-effectively without special stimulation.

Scientists and energy companies have long known these reserves exist. But it wasn’t until the last decade that advancements in hydraulic fracturing and horizontal drilling technologies finally made large-scale production economically viable.

To frack a well, millions of gallons of fluid are pumped down its shaft at high pressure to create cracks in hydrocarbon-rich formations deep underground, allowing trapped gas to flow out and be extracted. The fluid contains “proping agents” such as sand to keep the fractures open, as well as friction reducers, surfactants, gelling agents, scale inhibitors, acids, corrosion inhibitors, antibacterial agents, clay stabilizers and other chemicals. The composition and proportions of these chemicals is not always public knowledge.

Fracking can substantially boost a well’s productivity, especially horizontally drilled wells that extend for up to two miles underground from the well pad.

In some cases, the output of a fracked horizontal well can more than triple that of a conventional vertical well.

Because it delivers so much bang for the buck, fracking is now used to stimulate production in 90 percent of domestic oil and gas wells, according to the Interstate Oil and Gas Compact Commission. Its use in unconventional shale extraction is one of the fastest growing trends in American on-shore oil and gas production.

Supporters point to many environmental benefits. Natural gas, they note, contains more energy per pound than coal, and when burned it produces almost no mercury, sulfur dioxide and particulates. A horizontal well has a much smaller footprint on the surface of the Earth than multiple vertical wells would, and doesn’t require mountain-top removal or other destructive mining methods. Nor does it require disposal of coal ash residue, an emerging environmental concern.

“As a cleaner source of energy than coal, shale gas has a lot to recommend it,” Jackson agrees. “Our goal is to make it as clean and safe as possible.”

Despite precautions by industry, contamination of nearby shallow groundwater can occur through corroded well
casing, spilled fracking fluids, leaked or improperly disposed wastewater, or, more controversially, the direct movement of methane gas or water from deep underground.

Shale gas is typically comprised of more than 90 percent methane, a tasteless, odorless gas that is flammable, poses a risk of explosion and, in very high concentrations, can cause asphyxiation.

At some locations near active fracking sites, methane levels in groundwater are so high that homeowners can light their tap water on fire. It’s a scene replayed over and over again in recent years in televised news reports, many of which have focused on a cluster of homes along Carter Road in Dimock, Penn., one of the communities included in the Nicholas School study.

Less attention has been paid to the possible health effects of drinking methane-contaminated water. Methane isn’t known to affect water’s potability, so it isn’t regulated under the U.S. Environmental Protection Agency’s National Primary Drinking Water Regulations. (The Duke team has called for an independent medical review to evaluate the effects of exposure to chronic low levels of methane in drinking water. Their recommendation is included in a white paper they’ve issued with a colleague from Duke’s Nicholas Institute for Environmental Policy Solutions.)

Some safety standards do exist, however. The U.S. Department of the Interior recommends removing nearby ignition sources, warning nearby occupants and taking steps to reduce the buildup when dissolved methane concentrations in water exceed 10 milligrams per liter. Immediate ventilation of the well head is recommended when levels exceed 28 milligrams per liter.

Average methane concentrations in the water samples collected within a kilometer of active gas wells in the Nicholas School study were about 22 milligrams per liter.

**POINT, COUNTERPOINT**

Industry advocates have said the study’s average 22-millgram-per-liter figure is distorted because it includes methane levels in the well water of homes along Carter Road, which, they contend, are a localized anomaly.

Not true, counters Osborn. “Our analysis shows that methane concentrations were 17 times higher on average in well water collected within a kilometer of active drilling sites across the study area, not just in known trouble spots like Dimock, although contamination was primarily observed in two counties,” he says.

The average methane concentrations for the study’s dataset were actually about five milligrams per liter higher when samples from Dimock were excluded, Warner notes. The highest levels found in the initial study—64.4 milligrams per liter—weren’t even from samples collected in Dimock; they came from sites in a different county altogether. Samples collected more recently from another site had methane concentrations above 100 milligrams per liter.

Evidence from the team’s other tests also points to a more generalized cause of the contamination.

Using carbon and hydrogen tracers, the scientists found that methane from samples within a kilometer of active sites had an isotopic fingerprint similar to deep-gas thermogenic methane. Samples collected outside a kilometer contained a mixed fingerprint of both thermogenic and biogenic methane, which forms at shallower depths and lower temperatures and is not associated with shale gas.

To confirm these findings, the scientists compared the dissolved gas chemistry of the water samples to the gas chemistry profiles of shale-gas wells in the region, using data from the Pennsylvania Department of Environmental

Field photos by Rob Jackson
Protection. Deep gas has a distinctive chemical signature.

“When we compared the dissolved gas chemistry in well water to methane from local gas wells,” Jackson says, “the signatures matched.

“The fact that we found similar patterns across the five counties, not just in Dimock, raises the question of how general the contamination is from shale gas wells in the region, and highlights the need for more research,” he says.

As the scope of the research expands, one issue that looms large is the question of wastewater.

Warner is now using state-of-the-art isotope technology to identify the geochemical fingerprints of produced water and fracking fluids so the team can track them in the environment and test for possible contamination of drinking water.

An active well can produce a million or more gallons of wastewater a month, Vengosh notes. The water is 10 to 20 times more saline than seawater. It’s naturally radioactive. And it can contain metals such as surfactants in concentrations far above those considered safe for drinking water or for release into the environment.

“Fracking fluid is injected into the well in one shot, but the extraction of produced wastewater continues over the well’s lifetime,” he says. “How do you treat and dispose of this large volume of radioactive brine that is continually generated?”

Companies used to dispose the wastewater in local waterways or send it to treatment plants, he says. In some cases, this led to problems in downstream communities, including Pittsburgh, where elevated levels of bromide in the treated wastewater generated toxic compounds known as trihalomethanes in chlorinated drinking water supplies.

Earlier this year, the state of Pennsylvania requested a “voluntary” stop to the practice. Many companies have since sent their produced water to Ohio for recharge into deep aquifers there. Now, Ohio is saying it can no longer handle the volume.

“This is a huge issue, especially when you multiply it by the number of wells that are, or soon will be, producing wastewater,” Vengosh says.

Jackson’s group is following up on a different angle.

Graduate student Adrian Down and research scientist Jon Karr are trying to answer the question of how much methane reaches the atmosphere from shale gas drilling and from natural gas pipelines. Methane can interact with other gases in the atmosphere to form ozone, a pollutant, and is a much more potent greenhouse gas than carbon dioxide, Jackson explains. His group has recently deployed a new instrument that allows them to measure airborne methane concentrations and isotopic values in real time.

SEEKING SOLUTIONS

Industry is expected to drill as many as 10,000 new wells in the next few years. That timeline, the scientists say, adds urgency to their efforts to build consensus and find solutions.

In addition to their peer-reviewed study—which was funded by the Nicholas School and Center on Global Change, and started with help from Dean William L. Chameides—the researchers have worked with Brooks Rainey Pearson, policy counsel at Duke’s Nicholas Institute, to issue a white paper on hydrofracking (online at nicholas.duke.edu/cgc). It includes practical recommendations for monitoring and addressing potential environmental and human health risks.

They’re organizing an international...
symposium at Duke in coming months on the environmental impacts of shale gas drilling. The symposium has been funded by a $46,000 grant from the National Science Foundation.

They’ve returned to northeast Pennsylvania and New York several times in 2011 for weeklong trips to collect more samples, especially of baseline water quality from natural methane seeps and from water wells near sites slated for future drilling and fracking.

Offers to collaborate with industry on the research have been ignored.

“Given the chance of litigation, I can understand why industry is so defensive,” says Jackson. “We’re not saying don’t frack. We’re saying let’s be smart: Acknowledge the problem, do the due diligence, and put additional safeguards in place.”

Some people seem to be listening. A commission created by Pennsylvania’s governor is now urging beefed-up environmental protections, including the expansion of the presumptive liability zone around gas wells from 1,000 feet to 2,500 feet—a recommendation consistent with one made by the Duke team. Lawmakers crafting legislation in North Carolina have sought out the team’s expertise. The EPA has announced plans for its own study of fracking’s impact on water. The U.S. Department of Energy is soliciting a new round of expert advice on the issue. Increasing numbers of homeowners nationwide and from Canada are coming forward and asking to have their water tested by the Nicholas School scientists. Other universities, including Penn State, Texas and Temple, have unveiled plans to start testing wells, too.

It’s too early to claim a growing consensus on the divisive issue, says Vengosh with guarded optimism, “but we’re a lot further along than we were six months ago.”

Tim Lucas is the Nicholas School’s national media relations and marketing specialist.
The Nicholas School sponsored a new award in 2011 to recognize the best environmentally themed film at Duke’s Center for Documentary Studies’ Full Frame Documentary Film Festival. It is an annual international event held in the spring and dedicated to the theatrical exhibition of nonfiction cinema.

The Nicholas School of the Environment Film Award carries a $5,000 cash prize.

This year’s award was given to “Pit No. 8,” a portrait of parents and teenagers trying to earn a living in the abandoned coal pits of the Ukraine. It was released in 2010 and directed by Marianna Kaat.

**VIEW THE FILM TRAILER AT nicholas.duke.edu/news/fullframeaward**

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**NICHOLAS SCHOOL’S ART AND THE ENVIRONMENT INITIATIVE**

**AMERICAN AUTHOR barbara kingsolver RECEIVES 2011 DUKE LEAF AWARD**

In a ceremony before a full and cheering crowd in Duke’s Page Auditorium, critically acclaimed author Barbara Kingsolver received the 2011 Duke LEAF Award for Lifetime Environmental Achievement in the Fine Arts earlier this spring. Her bestsellers include The Lacuna and The Poisonwood Bible.

In accepting the award, she gave a thoughtful talk about her history as a scientific artist, which is available online at nicholas.duke.edu/leaf/kingsolver or by scanning the QR code with this article.

The award has been given annually since 2009 to honor artists whose works have lifted the human spirit by conveying our profound spiritual and material connection to the Earth, thereby inspiring others to help forge a more sustainable life for all. Actor Robert Redford was the first recipient.

**SPECIAL AWARDS**

**THE DEAN’S AWARD FOR OUTSTANDING RESEARCH PAPER FOR 2011**
Given annually since 2008 to recognize outstanding research and writing done by a current PhD candidate who has a manuscript accepted or published in a peer-reviewed journal.

**MEREDITH BARRETT** of Portola Valley, Calif., Environmental Sciences and Policy (First Prize) “Modeling the Effects of Illicit Rosewood Logging in Madagascar: A Call for CITES Designation,” Science, Vol 328 PhD, Ecology, Duke University, May 2011

**BA, Earth & Environmental Sciences, Wesleyan University**
Meredith is a Robert Wood Johnson Health & Society Scholars Fellow in San Francisco.


**PhD candidate (presently)**

**VIRLIS L. FISCHER AWARD**
Goes to the graduating professional degree student with the highest academic achievement. Given by Bernice Fischer in memory of her husband.

**EMILY SCHIEFFER** of Austin, Texas MEM, Ecosystem Science and Conservation

**SARA LABOSKEY AWARD**
Given in recognition of personal integrity and academic excellence.

**SARAH ELIZABETH SAFLEY** of Wake Forest, N.C.
BA, Environmental Sciences and Policy; Certificate, Children in Contemporary Society

**THOMAS V. LASKA MEMORIAL AWARD**
Given by the Earth and Ocean Sciences faculty to the most outstanding senior major.

**NORA KATHERINE DOUGLAS** of Statesville, N.C.
BS, Earth and Ocean Sciences, and BS, Environmental Sciences
A new mobile app developed at Duke University lets students—or anyone using an iPad tablet device—access a vast virtual library of videos, photos, maps, audio and descriptive text about some of the sea’s most charismatic creatures.

With a touch of the screen, users can watch a humpback whale being tagged off the coast of Maine or listen to the trumpet-like calls of gentoo penguins in Antarctica.

Scientists at the Duke Marine Lab created the app for use in Biology 127, a popular undergraduate biology course on marine megafauna, but anyone with an iPad can download the app’s public content for free from the iTunes store.

“The idea is to leverage the charisma of these amazing animals to drive home lessons about marine science and conservation,” says Dave Johnston, a research scientist at the Marine Lab.

The app’s encyclopedic front end is organized by species. It includes profiles of many of the sea’s biggest A-list celebrities, including whales, penguins, dolphins, sharks, seabirds, sea turtles and giant squids. A new species profile will be released every week.

Course content, provided specifically to students in Biology 127, will offer more detailed information organized by lessons, and gives students access to additional scholarly articles and scientific datasets. Instructors load class notes, assigned readings, videos, audio and other multimedia files into the app. Students can highlight or take notes on them right in the application.

The Marine Lab is part of Duke’s Nicholas School. Funding from the school is covering the cost of providing loaner iPads to students in the marine megafauna course, and to underwrite future content development.

The app is the first of its kind at Duke. Johnston was inspired to create it by good, old-fashioned necessity. “There’s no textbook for the megafauna course,” he says. Powerpoints, handouts and assigned readings from scientific literature have been used in the past to augment class lectures, but they lack the portability, interactive nature and mass appeal of a mobile app.

“Students use mobile apps to check in with the world all the time,” Johnston says. “By creating one for the course, we effectively put all the information they need at their fingertips 24 hours a day.”

Using a 2010 seed grant from Duke’s Center for Instructional Technology, Johnston engaged with a class of undergraduate computer science students to handle the technical challenge of creating the iPad app framework so it could easily be adapted for use in other classes at the Marine Lab or across Duke’s campus.

Fellow Marine Lab faculty members Ari Friedlaender, Doug Nowacek, Andy Read and Cindy Van Dover helped guide the app’s development and contribute to its content.

The Marine Lab is a year-round teaching and research campus located on the North Carolina coast, three hours east of Durham in the historic town of Beaufort. Biology 127 is taught by Marine Lab faculty every fall on Duke’s main campus in Durham.

“Because of our distance from main campus, many undergraduates are unaware of the opportunities available to them at the Lab,” Johnston says. “The marine megafauna course and the new mobile app are great ways to bring the coast to campus and the world, and show people what we’re all about.”
NEW TELEPRESENCE TECHNOLOGY
Gives Students High-Definition, Life-Size Global Access

Susan Gerbeth-Jones, assistant dean of information technology, and Jeffrey Priddy, manager of information systems at the Duke University Marine Lab, played key roles in a project that brings state-of-the-art Cisco TelePresence technology to the Nicholas School.

The new system provides students with global access to guest lecturers and professors and extends the in-person classroom environment across campuses.

Completion of the nearly yearlong endeavor was celebrated in April as faculty and staff in the Telecom Building in Durham connected with peers in the Bookhout Building at the Duke Marine Lab in Beaufort, some 200 miles away.

TelePresence combines high-definition life-size video, 3-D spatial audio and sophisticated room design to create an “in-person” experience so participants from different locations feel as if they’re in the same space. The kick-off culminated the group efforts of Duke’s Office of Information Technology and Facilities Management and several third-party contractors.

“Moving forward with TelePresence technology is in line with the Nicholas School’s goals to eliminate barriers of distant collaboration, easily share academic expertise and reduce travel,” says Gerbeth-Jones. The school can now expand the unique educational experience internationally to areas such as China and India.

You can view a short video of the unveiling event at: today.duke.edu/2011/04/connecting-duke-and-world#video or by scanning the QR code with your cell phone. —Donna Sell, communications assistant

It’s not every day that a new island is discovered, let alone 657 of them. But that’s the gist of a fascinating paper published this spring by Orrin Pilkey, James B. Duke Professor Emeritus of Geology at the Nicholas School, and PhD graduate Matthew Stutz, who is now assistant professor of geosciences at Meredith College.

Pilkey and Stutz identified a total of 2,149 barrier islands worldwide using satellite images, topographical maps and navigational charts. That’s a significantly higher total than the 1,492 islands identified in a 2001 survey conducted without satellite imagery.

Barrier islands form a line of defense for low-lying coasts and can be vital wildlife habitats, but they face increasing threats from development, sea-level rise and climate change.

The newly identified islands—found in all oceans and along all continents except Antarctica, and in all climates and wave-tide combinations—didn’t miraculously appear in the last decade, of course; they’ve long existed but were overlooked or misclassified as a result of outdated theories about where and how barrier islands develop and evolve.

Pilkey and Stutz’s geospatial sleuthing pulls the sand out beneath these antiquated assumptions and underscores the need for a new way to classify and study barrier islands, one that takes into account the complex interplay of local, regional and global variables that shape where the islands form and how they evolve.

“It prompts the question: Why are barrier islands not found in certain places, like the extreme northeastern Gulf of Mexico around Florida’s Apalachee Bay?” Stutz says. “Are there clues there to predict which of today’s islands might be in danger of disappearing in the near future?”

The potential for significant climate and sea level change this century “underscores the need to improve our understanding of the fundamental roles these factors have played historically in island evolution, in order to help us better predict future impacts,” Pilkey says.

A Nicholas School-led team of scientists has observed a “super-aggregation” of more than 300 humpback whales gorging on the largest swarm of Antarctic krill seen in more than 20 years in bays along the Western Antarctic Peninsula.

The spectacular find, made in waters still largely ice-free deep into austral autumn, suggest the previously little-studied bays are important late-season foraging grounds for the endangered whales. But it also highlights how rapid climate change is affecting the region.

Lead researchers Doug Nowacek, Repass-Rodgers University Associate Professor of Conservation Technology, and assistant research scientist Ari Friedlaender reported the team’s discovery in the peer-reviewed journal *PLoS ONE* this spring.

They warn that reduced ice cover in the Antarctic bays may be good news for the hungry whales in the short term, but in the long run it’s bad news for them, the krill, and other species in the Southern Ocean that rely on the pinky-sized, protein-rich crustaceans for food.

“If there are more areas with large aggregations of krill hanging out in waters where sea ice has diminished, you could see a big decrease in the standing krill stock, especially if we have a few years of back-to-back bad ice and the krill can’t replenish themselves,” Friedlaender says.

Scientists already have documented drops in krill abundance over the last 50 years related to reduced sea ice cover. Further drops could have far-reaching consequences. Seals and penguins have a relatively small foraging range, and some can’t eat any prey other than krill or hunt without the presence of sea ice. Whales can migrate longer distances and might be able to find food elsewhere, but may be affected in other ways.

The Duke team tracked the super-aggregation of krill and whales during a six-week expedition to Wilhelmina Bay and surrounding waters in May 2009.

Co-authors on the study were Patrick Halpin, David Johnston and Andrew Read of Duke; Elliott Hazen of the NOAA/University of Hawaii Joint Institute for Marine and Atmospheric Research; Boris Espinasse of the Université de la Méditerranée; and Meng Zhou and Yiwu Zhu of the University of Massachusetts.
A year ago many people had never heard the words “shale gas” or “hydraulic fracturing.” Today, who hasn’t? The U.S. Energy Information Administration projects that by 2035 shale gas will account for half of natural gas production in the United States. That’s not bad for an energy source that was untapped a decade ago.

Natural gas has many advantages for generating energy compared with other sources such as coal. It contains more energy per pound and, when burned, produces little of the mercury, sulfur and particulate pollution that coal produces. As a cleaner source of energy and a bridge to a renewable future, natural gas is here to stay.

The energy boom is only half of the conversation about shale gas and hydraulic fracturing, though. People are worried about its effects on drinking water, streams and air quality. As one resident I spoke with in Pennsylvania said, “People used to take their water for granted. Not anymore.”

Working with Avner Vengosh’s team, my research group recently published the first peer-reviewed study on the effects of shale gas extraction on drinking water quality. We asked a simple question. If you lived near a gas well, was your drinking water any different than if you lived farther away? We worked in the Marcellus formation of Pennsylvania, one of the fastest growing areas of shale gas extraction today.

There was a lot that we didn’t find. We didn’t, for instance, find evidence of one of people’s greatest concerns—that the chemicals in hydraulic fracturing fluids would appear in their water. That was good news. We did find that people living within a kilometer of a gas well were far more likely to have high concentrations of methane and other gases associated with gas drilling. In some cases the levels were dangerously high, posing a possible risk of fire or explosions.

When we published our paper in May in the Proceedings of the National Academy of Sciences, it ignited a firestorm. Responses ranged from personal attacks to legitimate scientific questions to tearful thanks. We tried to make it clear that we weren’t trying to stop shale gas extraction. Instead, we wanted to understand which homeowner concerns might be real, and to help fix the problems that were legitimate.

We worked hard to make our data useful in a positive way. Along with the paper, we released research and policy recommendations that included a call for the medical community to look at the health effects of chronic, lower-level exposure to methane and other gases. If you look through the peer-reviewed literature, you won’t find a single study examining these potential health effects. There may not be any other health effects, because methane is a fairly stable molecule, but the medical community should confirm this.

Another recommendation dealt with Pennsylvania’s “presumptive liability” rule that protects homeowners around drilling sites. If a house within 1,000 feet of a gas well has a problem with its well water after drilling starts, the driller is held liable unless he can show otherwise. The strength of this rule is that it leads industry and homeowners to take baseline data before drilling starts. As a result, homeowners are better protected, and companies are both more careful when they drill and protected from false claims of damage.

Based on our research, we recommended that the presumptive liability distance be extended to 3,000 feet—the distance out to which we saw higher methane concentrations in people’s water. Pennsylvania’s Department of Environmental Protection has since proposed strengthening the state’s Oil and Gas Act and expanding the presumptive liability distance to 2,500 feet, consistent with our suggestions.

Here in North Carolina we also have tried to engage with policymakers and industry in a positive way. I wrote an op-ed with postdoctoral associate Stephen Osborn that ran in the Raleigh News & Observer and the Charlotte Observer, titled “How Pigs and Drilling Rigs are Alike.” We used the history of hog farming as an analogy for thinking about shale gas expansion in the state.

Our state, we noted, had 10 million pigs on the ground before people realized that the farms might affect air and water quality. Improved farming practices and state regulations, such as 1995’s Swine Farm Siting Act and 1997’s Clean...
CEHI’S TAMI TUCK RECEIVES PRESIDENTIAL AWARD

Tami Tuck, administrative assistant for the Children’s Environmental Health Initiative in the Nicholas School, was named one of the winners of the Presidential Award for outstanding service in 2010. The awards were announced this spring.

The awards, which are among the most prestigious honors given to Duke University staff and faculty, recognize employees’ distinctive contributions to Duke University & Health System over the past year.

This year’s honorees included five Presidential Award winners and 18 Meritorious Award winners. Presidential Award winners received a Presidential Medallion and $1,000 check. Meritorious Award winners received a plaque and $100.

Tuck, who received the award in the clerical/office support category, was cited as being the person who makes the lives of staff, students, post-docs and collaborators at the Children’s Environmental Health Initiative easier.

Pamela Maxson, director of human resources for CEHI, says Tuck is instrumental in making new employees and collaborators feel welcome and comfortable. “She is a source of strength, information and support for all employees, from the new recruit to CEHI’s director,” Maxson said.

Marie Lynn Miranda, director of CEHI who is now dean of the School of Natural Resources at the University of Michigan, made special note of Tuck’s professionalism and diplomacy in her letter of nomination.

“Tami is organized, persistent, meticulous, levelheaded, creative, efficient, and a team player,” Miranda wrote. “She is truly motivated by the mission of the organization. [Her] many contributions make the CEHI and the university more highly functioning and more humane, which I find to be an extraordinary combination.”

Water Responsibility Act, have made what was, in places, a bad situation much better.

For shale gas, we suggested that safeguards should be in place before any extraction starts in North Carolina. This includes collecting baseline data on water and air quality, using zoning and setbacks to protect property owners, planning for large water withdrawals and wastewater disposal, and requiring full disclosure of the chemicals used in hydraulic fracturing fluids.

We made these and other suggestions “neither to promote nor to prevent” shale gas extraction in our state, but to make extraction and hydraulic fracturing safer if it does start. When policymakers read the op-ed, they asked us to put our recommendations in a letter, and then scheduled the first of several meetings to discuss our findings with industry and other groups.

How science is used is vitally important in the polarized world of today’s politics. In my view, the difference between researchers in an advocacy group compared to those at a university such as Duke is the goal of their work. People working for an advocacy group do research to support a point of view—they assemble data to bolster their case.

In a university our responsibility is different. We’re trying to separate perceived problems from real ones—and to offer solutions for the latter. It’s just as important for us to say when we don’t find problems, such as a lack of contamination from fracturing fluids in people’s water, as when we do.

Shale gas has a spotlight on it now that is both good and unfair. It’s good, because people are finally taking a hard look at it. It’s also somewhat unfair because people aren’t giving the same attention to other forms of energy. In the eastern United States, mountaintop removal is a common way to mine coal. If we said “no” to shale gas and, as a result, lopped off the tops of more mountains for our power needs, I think that would be a bad choice environmentally. We need to increase our use of renewable energy and make every technology safer, fossil fuel or otherwise.

In the end, our experience with shale gas has made me think harder about my philosophy of research. Here’s how I might characterize that philosophy. First, do your best to be objective. Next, separate perceived problems from real ones. Third, step outside academia to offer solutions, making sure you listen to people working in the real world. And, lastly, make the world a better place. We can’t ask for more than that.

Robert B. “Rob” Jackson is Nicholas Professor of Global Environmental Change and director of the Center on Global Change.

Experience in Pennsylvania Led Rob Jackson to Take a New Look at How He Approaches Science

FRACKING and the Philosophy of Research
TERMINOLOGY

dinner on the table each night and get to the office on time. But having too heavy a focus on short-term tomorrow is unlikely to lead to a rewarding or meaningful life. In fact, I would go as far as to say the exact opposite is true. Consider Macbeth. When we first meet him, he’s got a bright to-morrow, slated for promotion you might say. But he (and his wife) get seduced by ambition and go for short-term rewards. Macbeth’s path leads upwards for a time, but ultimately ends in despair—his life becomes a tale told by an idiot, signifying nothing.

Now, I am fairly confident that few view Macbeth as a role model. Nevertheless, the world is full of Macbeths. Time and again people—often those we expect more of—choose to take shortcuts, betray our trust and act for personal gain. Perhaps without even realizing it, these people come to use short-term tomorrow as their guidepost. It’s a cautionary tale.

A far more rewarding path embraces the long-term tomorrow, a tomorrow that takes a longer view, considers how one’s actions impact the world today and in the future. It’s a path that compels one to become engaged with the great issues of one’s time and to take responsibility for the consequences of one’s actions.

This is easier said than done, of course. When one looks at the world today—the environment, the economy, poverty, wars—the future can be bleak. It is easy to despair, give up and cash in. The problem, of course, is that we all can’t do that. In about 40 years, there will be some nine billion people on Earth.

Where will the resources come from to provide for these people? How will we maintain the ecosystems and natural resources upon which we all depend? What will happen to our children and grandchildren? What will happen to all of us?

In truth, I have no idea. But I do have hope.

I recently read a fascinating book called The Beginning of Infinity by David Deutsch, an Oxford University quantum physicist. Deutsch’s essential argument is that humans—as intelligent beings who have learned to harness the power of the scientific method of inquiry, conjecture, and testing—have unlimited possibilities. We are capable of sparking infinite progress. At some point he predicts, if we are successful we will become unencumbered by planet Earth, no longer dependent upon nature for food, water, fiber and energy.

Who knows? Deutsch may prove to be right, in some very distant tomorrow. And maybe our efforts today might be moving us in the direction of that unlimited progress. In the meantime we have long-term tomorrow to worry about.

In the end it’s a juggling act with all three tomorrows. You have got to have short-term tomorrow in the mix, but keep it moving. Hold tighter to long-term tomorrow. And when things get tough, when it seems like there’s no way to keep all the balls in the air, get some perspective by considering very, very long-term tomorrow.

At the end of the Broadway play called “Master Class,” the great opera diva Maria Callas says, reflecting on her life: “I am certain that what we do matters.”

I, too, am certain.

If we turn our energies to engagement with the great issues of our day, to making the world a better place, we will likely find ourselves immersed in an extraordinarily rewarding life. A life that may very well be filled with sound and fury, but also with meaning.

William L. Chameides is dean of the Nicholas School and Nicholas Professor of the Environment.
AMAZON GOLD FEVER COMES WITH A HIGH ENVIRONMENTAL COST

Inspired by a Student’s Newspaper Clippings Jennifer Swenson Investigates Links Between Gold Prices and Peruvian Deforestation with Surprising Results

BY TIM LUCAS

With gold prices soaring to all-time highs—up more than 400 percent in the last decade, to more than $1,900 an ounce in recent months—market watchers worry where it will end and what the long-term effect will be.

Jennifer Swenson worries, too. But she’s not an economist.

Over the last two years, Swenson and a team of students and colleagues at the Nicholas School of the Environment have worked to document how gold’s stratospheric upward spike is affecting environmental and human health in the resource-rich Amazon lowlands of Madre de Dios, Peru, one of the most biologically diverse regions on Earth.

Miners have eked out meager incomes by digging and dredging for alluvial deposits of gold in Madre de Dios’s river channels and floodplains since Incan times. But the pace of activity has shifted into hyperdrive in the last decade as international gold prices hit new records and newly completed sections of the Peru-to-Brazil Interoceanic Highway opened the region to development.


Photos of Jennifer Swenson by Les Todd, Duke Photography
In April, Swenson’s team published a paper in the online journal *PLoS ONE* showing that deforestation in parts of Madre de Dios has increased exponentially as miners blast and clear more of the region’s once-pristine rainforest.

The study also found that imports of mercury, used to extract the gold, have risen sharply over the same period. Exposure to the toxic metal, which can escape into the air, soil or water, poses grave environmental and human health risks.

“Today’s record gold prices can carry high environmental costs,” says Swenson, assistant professor of the practice of geospatial analysis. “Unfortunately, some of the world’s poorest people and most threatened ecosystems often end up shouldering a disproportionate share of the damage.”

**IMAGES OF DESTRUCTION**

Using NASA satellite imagery spanning six years, coupled with economic analyses of gold prices and Peruvian mercury imports, Swenson and her team calculate that at least 15.2 thousand acres—the equivalent of more than 12,000 football fields—of forest and wetlands have been cleared and converted into bare, mud-streaked swaths of holding ponds and rubble piles at three large mining sites between 2003 and 2009. The areas are plainly visible from space, even with lower-resolution satellite images.

Land cleared for mining has a unique spectral signature on satellite images, Swenson explains, allowing researchers to distinguish it from deforestation caused by farming, road-building or other settlement-related activities.

At two sites, mining deforestation has substantially outpaced deforestation caused by nearby human settlement. Forests disappeared at a rate of 10 football fields a day during 2006-2009, when gold prices rose especially fast.

“In addition to these two large sites, there are many scattered, small but expanding areas of mining activity across Madre de Dios that are more difficult to monitor but could develop just as rapidly,” Swenson says.

Until now, scientists have focused mostly on road building, oil drilling, logging and agriculture as the chief culprits in forest loss, but “this study clearly shows that demand for gold and gold pricing might be another driver—a major driver—of deforestation,” says William Pan, formerly at the John Hopkins Bloomberg School of Public Health and, since fall 2011, assistant professor of global environmental health at the Nicholas School and Duke Global Health Institute.

Most of the deforestation showing up in satellite images is caused by unregulated artisanal miners who are among the most marginalized members of their society.

“There’s no multinational ‘Goliath’ mining company to blame,” Swenson says. “These are poor, small-time miners who do this because they feel they have no alternative. It’s dangerous, back-breaking work, and very few ever get rich.”

These “artisanal” miners often work 12-hour shifts, usually in small groups, for six days at a time. A typical yield is about one gram—or 0.04 ounces—of gold for every 24 hours of work. The take-home pay: About 10 percent of the yield’s actual market value, split among the group.

Most of the miners lack access to...
modern technology and have limited knowledge of mining’s environmental or human health effects. They rarely have safeguards to limit the release of mercury into the air, soil or water, or to reduce their own exposure to the toxic metal, which is used to bind loose flakes and bits of gold ore into hard chunks that can be more easily extracted, and then burned off with blowtorches once the chunks are in hand.

“The mercury contaminates local water and soil, and ravages the nervous system of miners and their families, but the risks extend far beyond the local area,” Swenson says.

Small-scale gold mining is the second-biggest source of mercury pollution in the world, second only to the burning of fossil fuels. Mercury from artisanal mines can travel long distances in the atmosphere or in downstream surface waters—eventually settling in sediments and moving up the food chain into fish, fish-eating wildlife and humans.

“Virtually all mercury imported to Peru is used for artisanal gold mining. Our study shows that imports have risen exponentially since 2003, mirroring the rise in gold prices,” Swenson says.

“Given the rate of recent increases, we project by the end of 2012 mercury imports could increase by more than five times the amount imported in 2009.”

Solutions aren’t easy to come by. The vast size and remote nature of the terrain and the secretive nature of mining has made it difficult for Peru’s government to monitor and control all artisanal mining within its borders.

“Another approach, which could complement monitoring efforts by government and regional environmental NGOs, may be to limit mercury imports to those who have received environmental training,” Swenson says. “Given the harm mercury causes and the fact that we can monitor its entry into Peru, it would at least be a good first step.”

‘WHAT A CONCEPT’

Though Swenson grew up in suburban Sacramento, only an hour or so from the historic California goldfields, and has twice worked for NGOs doing geospatial analysis of land use change and its impacts on biodiversity in South America, she didn’t begin to investigate the environmental costs of gold fever until Cesar Delgado MEM ’08, a former student of hers, sent her newspaper clippings about the Madre de Dios mining deforestation in 2009.

“Cesar said that Peruvians were not expecting this marked increase in gold mining,” Swenson recalls. “I was stunned by how huge it was. And when I searched through the scientific literature, there were no studies documenting the recent deforestation.”

The more she looked into the issue, the more she realized something had to be done. Located in the western Amazon, Madre de Dios is thought to host some of the highest numbers of mammal, bird and amphibian species in the world, and is home to some of the Amazon’s largest remaining swaths of virgin rainforest. Animal and plant life there is so diverse that Peruvian law proclaims it to be the world’s “Capital of Biodiversity.”

Swenson enlisted Catherine Carter, an MEM student in her remote sensing class, to help unearth data and images of what was happening in Madre de Dios. (Carter graduated in 2010 and now works at Tetra Tech Inc. in Research Triangle Park.) As the project
grew, Swenson also enlisted the help of her husband Jean-Christophe Domec, a research associate in forestry at the Nicholas School.

“We had no funding. We did the research mostly on weekends. And our topic was about as far off most policymakers’ radar screens as the part of Peru we were studying,” Swenson says. “I wasn’t sure anyone outside a small circle of conservationists would even be interested.”

While on sabbatical in spring 2011, Swenson submitted the paper to *PLoS One*, the Public Library of Science’s online peer-reviewed journal, and crossed her fingers. “I had no expectations,” she says. It wasn’t until after the study’s publication, when reporters and conservationists on four continents began contacting her, that Swenson realized her team’s “little paper” might have struck gold. Friends called to say they heard her on NPR, saw the story on MSNBC, or read about it on science and conservation websites from India to Indianapolis. Domec, who was in France at the time, sent her updates on how it was playing in the European press. Delgado reported on the reaction in South America.

“It’s the first time in my career this has happened, and it was a little overwhelming at first,” Swenson says with a grin. “But it finally got to a point where I sat back, took a deep breath and realized, ‘Wow, we might actually influence policy. What a concept.’”

Like her team’s paper, Swenson’s career has, at times, progressed along a somewhat nonlinear trajectory. Growing up in a family where there were more hiking boots than high heels, she developed a love of the outdoors early, but it wasn’t until high school that she began to think of the environment as a possible career field.

“I had this wonderful environmental studies teacher who was dynamic, creative and kind of wacky,” Swenson recalls. “She planted the seed and inspired me to enroll at the University of California-Santa Barbara to study geography and international relations.”

Shortly before graduating from Santa Barbara, Swenson took her first geospatial analysis class and saw her first satellite image. “It was like a new window opened on the world,” she says. Unfortunately, she knew one class wouldn’t be enough to open job doors. Determined to learn more, she volunteered after graduation at the National Park Service’s regional GIS center in Colorado and made ends meet working a variety of seasonal jobs, from being a bike tour guide in summer, to waiting tables and driving a UPS truck in winter.

Swenson enjoyed the practical focus on her duties at the park service, but it soon became clear that to achieve what she really wanted—“to immerse myself entirely in ecology and geospatial analysis”—she had to return to school. She enrolled in the geography program at San Diego State University and graduated with a master’s degree in 1995. This time, she had the skills to land a great job.

“Immediately after turning in my master’s thesis, I got on a plane for South America for a job doing tropical land-use-change analysis as a geospatial lab manager at EcoCiencia, an Ecuadorian NGO,” she says. “We looked at issues such as the conversion of primary forest into agriculture and the impacts of oil drilling in the Amazon and colonization around new roads.”

The work was all Swenson had hoped.
for, but the more she learned about the issues threatening ecosystems and communities in South America, the more she realized “I needed to know more about the underlying ecology and science.”

After three years, she returned to the States to get a PhD in forestry ecology from Oregon State University. She finished her dissertation in 2004 and—once again—found herself pondering her career path.

“I was a bit torn,” she says. On one hand, a career in academia would offer a chance to do meaningful research and teaching; on the other hand, working at an NGO would provide the practical, real-world focus she found so satisfying. “The all-too-frequent disconnect between academia and on-the-ground environmental problems has always been disconcerting to me,” she explains.

After testing the waters at the U.S. Forest Service and the conservation NGO NatureServe in Washington, D.C., Swenson realized there was a third path open to her, too. In late 2006, she accepted a post as assistant professor of the practice in geospatial analysis at the Nicholas School.

“Assistant professor of the practice,” she says. “I liked the sound of that.”

STRIKING GOLD

Five years later, Swenson remains confident she made the right choice. “This position is the perfect platform for me—it links the applied environmental interests of our fantastic master’s students and the research from our outstanding academics,” she says.

This fall, she’s teaching two graduate-level classes, supervising multiple masters projects, advising dozens of MEM (Master of Environmental Management) students —there’s nearly always a line waiting outside her office door —and has taken on new responsibilities as the school’s director of professional studies. Over summer, she co-directed a Duke Engage undergraduate outreach project in Ecuador with fellow assistant professor of the practice Elizabeth Shapiro. On the research front, Swenson’s applying her geospatial expertise to a wide range of real-world issues, from endemic species and ecosystem mapping in the Peruvian and Bolivian Amazon, to forest change in the southern United States. She has a PhD student, Mariano Gonzalez-Roglich, who is conducting NASA- and NSF-funded research on the effects of broad-scale shrub encroachment in Argentina. And she hopes to collaborate other faculty members on further remote sensing studies in the tropics, including a follow-up to her PLoS ONE paper.

“I’m busy—but good busy,” Swenson says. “As an assistant professor of the practice, my primary responsibilities are teaching and advising, which I love. But I definitely want to continue carving out time for research. It’s the balance I’ve been looking for: science, applications, and students.”

Tim Lucas is the Nicholas School’s national media relations and marketing specialist.
In mid-July, before going to help with a community dinner Bayou Grace was holding for the Smithridge families, Heidi and Sarah sat down in the nonprofits’ office and had a conversation about their experience in Louisiana. Here is what they had to say:

**HEIDI:** When I started my first year at the Nicholas School I wasn’t sure what I wanted to study. I knew that I loved the Gulf coast and I wanted to contribute back to this area of the country. During my orientation week I attended a lecture by the dean in which he spoke about his trip here to see the Gulf oil spill in summer 2010 ([nicholas.duke.edu/oilspill](http://nicholas.duke.edu/oilspill)). It really affected me and I felt then that I wanted to come to Louisiana and find my place and where I could help out. Luckily a client-based masters project was advertised and I applied. Through that I found this internship (with Bayou Grace Community Services), and I’m incredibly grateful for this experience.

**SARAH:** Originally we thought we were going to be doing a community garden with the Smithridge community. When we got down here we realized that wasn’t necessarily what the community wanted. What we’ve learned is that you can’t tell a community what they want and you can’t do something for them, you have to work with them.

**HEIDI:** Through our internship, we’ve been working with the Smithridge community and through that process we’ve learned that environmental management is much more than the science and the policy, it’s getting out and meeting the communities and understanding their needs.
We’ve really learned to listen a lot and not assume that we know everything about the community or what is going on down here.

SARAH: We had two different experiences during the summer, the first half we did coastal restoration. We worked with BTNEP (Barataria-Terrebonne National Estuary Program – www.btnep.org). They do a lot of good work down here… marsh planting, sand fencing. We helped build an irrigation system and grow plants so they can continue to try to rebuild the wetlands. And we talked to a lot of the organizations that are seeking to rebuild the wetlands down here. We’re seeing how big of a challenge it is. If you put something in one year, there is no guarantee it’s going to be there next year after the hurricanes come. … The second half of the summer we spent with the Smithridge community getting to know them—interviewing some of the community members to find out who they are and what their needs are—and becoming a part of their community for the summer.

HEIDI: … In addition we’ve attended several community forums and discussion groups mainly focused on the 2012 Coastal Master Plan for Louisiana, which has been very informative, and we’ve heard a lot of different voices and perspectives about the land loss and what’s going on on Louisiana’s coast. It’s been a good learning experience—especially working with the communities and seeing what they are dealing with day-to-day throughout their lives.

SARAH: I think one of the biggest challenges of this summer has been really immersing ourselves in a community but not being seen as affluent Duke students who are coming in to make a change without asking them what they want.

… I’ve also learned about all the challenges with coastal restoration and what to do when people have to start moving. That’s going to be important when sea level rise or global warming starts happening and people in other big cities around the country—Washington, D.C., San Francisco—this is going to start happening in those cities too. It’s just happening here now. Everything we’ve learned in New Orleans is going to be applied to the rest of the country, the rest of the world.

HEIDI: One of the most amazing things I’ve heard this summer was from Reggie Dupre, who is the levee board director here in Terrebonne Parish, and he said that manmade problems require manmade solutions. And for this environmental problem here it’s a very dynamic issue and the solutions also have to be very dynamic. It’s going to require a lot of collaborative effort and a lot of voices and thoughts and ideas. It’s a very unique and difficult issue to address and it is going to set the framework for future problems for land loss and sea level rise and how our communities adjust to these changes. That’s the root of it: our communities are vulnerable and we need to come together and collaborate and find these dynamic solutions to address these problems we are creating in our environment.

Scottee Cantrell, assistant dean for marketing and communications, returned to Louisiana this summer to visit Heidi and Sarah and renew contacts with the Bayou Grace Community Services family.
Gulf Update 2011

Oyster Restoration off of Grand Isle
In April 2010, The Nature Conservancy (TNC) and its partners began putting latticed, waist-high triangles made of steel in waters off of Grand Isle, La., as part of their efforts to restore oyster reefs. Fitted with bags of cleaned oyster shells, the frames created the infrastructure that oyster larvae known as spat are attracted. Two days later, the Deepwater Horizon blowout occurred, and by the time TNC’s Cindy Brown MEM’93 took a group from the Nicholas School out to the site in July 2010, the project had been put on hold.

The project resumed in April 2011 and when TNC’s Seth Blitch boated Duke Engage and MEM students out to the site this July, the students could get out of the boat and touch the cages. A TNC study in 2008-2009 showed an 85 percent loss of oyster reefs globally. In a Dukenvironment article (Fall 2010) Brown said, “What we also found from that study is that the northern Gulf of Mexico is pretty much the only place left in the world where we can restore this ecosystem in a timely way. ...”

Air Cannons Replace Booms in Bay Jimmy
A few days after BP capped a runaway geyser of oil from the Deepwater Horizon blowout off the Louisiana coast in 2010, a team from the Nicholas School boated out from Myrtle Grove Marina in Plaquemines Parish. They passed a blue sign proclaiming Boomtown behind which sheltered hundreds of booms. Dean William L. Chameides dipped his hand in oil near St. Mary’s Point in Bayou Wilkinson and visited Bay Jimmy where oily orange and yellow booms ringed the shore and dirty brown, dying marsh grass sat in oil.

This summer boat Captain Todd Eppley returned to Bay Jimmy, one of the worst hit areas, with another Nicholas team. The booms and sign were gone from Myrtle Grove and there was no oil on the surface of the water near St. Mary’s Point. But workers were still clearing oil from the marshes in Bay Jimmy and air cannons, ringing the bay shore, regularly sounded off to scare away birds from the remaining oil.

Nicholas School’s Gulf Project Receives National Award
The Council for Advancement and Support of Education (CASE) selected the Nicholas School’s coverage of the 2010 BP Deepwater Horizon Oil Spill Response for a Grand Gold Award in their 2011 Circle of Excellence Program.

The school received the award in the Individual Public Relations and Community Relations category. Thirty-three entries were judged in this competition. In addition to the grand gold, which is presented only for exceptional entries, the judges awarded one gold, one silver and one bronze award.

The school’s entry, titled “On the Frontier of a Disaster: Nicholas School Responds to the Gulf Oil Spill” documented a multi-tiered communications and education plan involving websites, blogs, YouTube submissions, Facebook, Twitter, magazine features, news items, and a four-day fact-finding trip, as well as on-going DukeEngage and student projects.

The entry was displayed in the Awards Gallery during the CASE Summit in Chicago in July.

Involved in the project were the Nicholas School Marketing and Communications office, including Scottee Cantrell, Tim Lucas, Nancy Kelly, Erica Rowell, Stephanie Thir olive, Amy Chapman-Braun, Donna Sell and Brian Johnson; Dean William L. Chameides; faculty members Curt Richardson and Charlotte Clark; board members Lynn Gorguze and Tom McMurray; Alum Cindy Brown with The Nature Conservancy; Duke photographer Chris Hildreth; Duke Engage’s Elaine Madison; and Caroline Smith Griffith with the Duke Global Health Institute.

CASE is an international professional association serving educational institutions and the advancement professional who work in alumni relations, communications, development, marketing and allied areas.
Engaging in the Gulf

Led by Nicholas School faculty member Charlotte Clark and MEM Alicia Bihler, a group of seven Duke undergraduates ventured into the marshes of Louisiana this summer to volunteer with Bayou Grace Community Services as part of a new Duke Engage program. While there they helped with wetlands restoration and engaged with the children of the Smithridge community by teaching environmental education in a summer camp run by neighborhood grandmothers. They also received a real taste of being part of the community as seen here where they learned how to make the Louisiana creole dish jambalaya from shrimper and Chauvin resident Thaddeus “Mike” Pellegrin, father of Rebecca Templeton, Bayou Grace’s executive director. Crucial to their learning experience was Diane Huhn, environmental outreach volunteer coordinator for Bayou Grace, who served as their main contact for the summer.

Here are excerpts from the undergrads’ blog “I’ll stand bayou” at sites.duke.edu/bayoublog.

Summer Camp: Finding What Works
June 29, 2011

Becca Bayham of St. Louis, Mo., Rising Senior, Environmental Science and Earth and Ocean Sciences


It’s not your average summer camp fare. But the kids in our community needed something to tide their brains over during the summer ... hence the summer enrichment program, started by area grandparents. The program provides all the fun of summer camp, with a little learning sprinkled in.”

New Experiences
June 15, 2011

Tuana Phillips, Rising Junior, Environmental Science

“Hammers, screws, nails, etc., have always, for the most part, been foreign objects to me...until now. After working on some projects with Bayou Grace Community Services and BTNEP (Barataria-Terrebonne National Estuary Program), the carpenter within me has surfaced, if you will. Projects included the construction of a shade house that now provides shade and water to relatively salt-tolerant plants. We also helped build tables to support the plants under the shade house and plant pots that will serve as decoration items for the community!”

Duke Engage students learning to make jambalaya with Thaddeus “Mike” Pelegrin, building plant tables with Diane Huhn, boating off of Grand Isle and working with Smithridge children. Photos by Scottee Cantrell.
NICHOLAS SCHOOL ALUMS ENERGIZE U.S. DOE

They’re not quite an army but they’re definitely a growing force at the U.S. Energy Department (DOE). This year some 13 graduates of the Nicholas School have joined the ranks of DOE workers leading the charge toward a sustainable future of clean energy, renewable fuels and forward-thinking on the energy front. Meet four of them below.

DAVID ANDERSON

Technology Development Manager, Vehicle Technologies Program, Office of Energy Efficiency and Renewable Energy

“I actually have in my office the notebook from one of the required energy and environment classes,” says David Anderson Mem’09, who manages a portfolio of energy department projects aimed at reducing petroleum consumption in the transportation sector. “I refer to it as engineering for dummies.”

Years ago, Anderson was an engineer by trade. After receiving his bachelor of science from Clemson University in 1994 he worked as a semiconductor design engineer at several companies, including Nvidia Corp. In 2007 he entered the Nicholas School with a career change in mind. He just wasn’t sure what that change would be.

“I wanted to do something automotive-related,” he says, “so I tried to take classes, do whatever I could for things automotive-related. For example, one of the first classes I took was Transportation and Energy, which delves into energy use in all modes of transportation. Second year I took the undergraduate engineering class Electric Vehicle Projects.”

He hadn’t been gunning for a career in the federal government, he says—cars were his thing. But when he graduated in 2009, “there wasn’t really an auto industry.” So he wound up at DOE primarily working on vehicle electrification projects and has been there happily ever since.
FUNDING, INTEGRATING, COMMUNICATING

A large portion of Anderson’s job is funding research both in the auto industry and at the country’s national labs—primarily Argonne, Oak Ridge and the National Renewable Energy Lab.

“For example,” he says, “my team manages $360 million in Recovery Act funds through the Transportation Electrification Initiative—which is actively deploying more than 20,000 electric vehicle (EV) charging stations in coordination with 13,000 vehicles nationwide.”

To determine what gets funding, Anderson, who is fluent in the nitty-gritty details of the different vehicle technologies, integrates the work of four research and development teams—the hybrid electric systems team that deals with batteries, electronics, motors; the advanced combustion team that looks for efficiency gains in engines, which are still in all hybrid electric vehicles; the advanced materials team that develops cost-effective lightweight materials such as carbon composites and magnesium alloys for reducing vehicle mass; and the fuels and lubricants team that looks at various biofuels and ethanol blends and their effects from fuel-economy and emissions perspectives.

“You can design a really high-energy battery but it has to be considered in relation to the whole vehicle,” he says.

MEETING THE CHALLENGES OF BRINGING EVS TO MARKET

Performance-wise, except for their range, EVs are competitive with gas-powered cars and in some ways even better, says Anderson, ticking off the examples of acceleration, simplicity and less maintenance needed. The cost barrier, however, he says, boils down to one thing: the battery. But that’s where the government comes in.

Energy Department researchers are working to reduce the costs for batteries, along with the power electronics and other drivetrain components, so that EVs can compete on a cost basis with their traditional counterparts.

“A lot of the research is on the battery itself—its chemistry, the materials—to increase the usable capacity and extend its life,” says Anderson.

Stimulus money to the tune of $2 billion also is aiding the effort, spurring the establishment of manufacturing plants for batteries and electric drive components. Such help will provide the boost that these technologies and parts need to overcome the mass-production hurdle.

And what about overcoming Anderson’s own personal hurdle? His yen to work directly in an industry that’s experiencing a huge transformation? For now, the self-described automotive guy says, there’s no need to apply the brakes to his current work.

“I told my boss recently that when I got out of grad school, I’d wanted to work for an auto company. But now I get to work with all the auto companies and see the new technologies that are coming out even before the public knows about them,” says Anderson, almost giddily. “Just being a car guy and having longstanding interest in the auto industry, it’s cool and exciting being in D.C. right now—being part of a big change in our transportation shift to electric vehicles.”

MEET THE DOE GROUP:

David Anderson MEM’09 (Energy and Environment), Technology Development Manager, Vehicle Technologies Program, Energy Efficiency and Renewable Energy Office, EERE

Hayes (Neely) Jones T’06, MEM’08 (Coastal Environmental Management), Analyst and Communications Specialist

Parker Crowe MEM’10 (Energy and Environment), Associate, ICF International (contractor for DOE’s State Energy Program)

Carla Frisch MEM’08 (Environmental Economics and Policy), Senior Advisor, EERE

Jennifer Krajewski MEM’08 (Environmental Economics and Policy), Program Analyst, Office of Vehicle Technologies, Clean Cities program, EERE

Mike Leff MEM’08 (Energy and Environment), Analyst, Energy Information Administration’s Energy Analysis division

Jason Levinn MEM’10 (Energy and Environment), Consultant, Booz Allen Hamilton (Energy Market)

Anna Shpitsberg MEM’11 (Environmental Economics and Policy), Presidential Management Fellow

Patrick O’Connor MEM’10 (Energy and Environment), Technical Research Analyst, BCS (support contractor for DOE’s EERE Hydro Power Program)

Brent Wanner MEM’09 (Energy and Environment), Economist, Office of Policy and International Affairs

Andres Potes T’06, MEM’08 (Energy and Environment), Senior Consultant, Booz Allen Hamilton

John Wyne MEM’09 (Energy and Environment), Energy Analyst, Energetics (support contractor for DOE)

Sarah Zaleski MEM/MPP’07 (Environmental Economics and Policy), Project Officer, Energy Efficiency and Conservation Block Grant program

Photos on pg 26: From left (back) Jason Wynne, Jason Levinn, David Anderson, Parker Crowe, (front) Carla Frisch, Hayes Jones
ASK HER ABOUT HER PASSIONS AND CARLA FRISCH MEM’08 MINCES NO WORDS. SHE’S ALL ABOUT STEPPING UP THE DEPLOYMENT OF ENERGY EFFICIENCY.

Currently the senior advisor to Assistant Secretary Henry Kelly, Frisch started out at DOE in the fall of 2008 as a Presidential Management Fellow. Working for a short stint as special assistant to the Under Secretary for Science, Frisch project managed the development of the agency’s strategic plan.

“Carla was part of the crack-team,” says Richard Newell, the Gendell Associate Professor of Energy and Environmental Economics at the Nicholas School of the Environment and a former professor of Carla’s, “that helped get out the massive Recovery Act spending.”

Frisch is quick to note that her Nicholas School education was a big asset in this mammoth task.

“Program Evaluation was invaluable,” she says, referring to a core course in the Environmental Economics and Policy concentration that helped prepare her to deal with a budget that suddenly grew eight times its size. In 2009, thanks to the Recovery Act, the office’s normal yearly budget of $2 billion shot up to $16.8 billion.

“Because of my training at Duke, I was ready to come up with a plan to evaluate our progress—and to figure out how much impact the recovery money really had,” Frisch says.

CURRENT WORK: MANAGING A CROSS-CUTTING ANALYSIS TEAM

These days her bread and butter is analysis.

Working for the assistant secretary in charge of investing in efficiency and renewables, Frisch explores questions the answers to which help determine which projects get funded, when and by how much.

Her work with deployment provides an example of her approach. Frisch’s team has been tasked with supporting the president’s goal of reaching 80 percent clean energy by 2035. To do that, renewable energy will have to be cheaper than a lot of fossil fuels are now.

The first step in meeting the president’s challenge is to pose a big-picture question around which a constellation of small questions and their answers will help figure out the omnibus question. “How can we drive down technology costs?” is one of those overarching questions.

Once that is established, Frisch and her team come up with smaller plans to answer that, for example, by determining realistic technology-specific goals.

To work in real numbers to their calculations, Frisch’s team works closely with companies, finding out details about their costs, their decision-making processes, which technologies are seen as areas of growth and their plans for turning a profit.

Once these variables become known, they can be factored into the Energy Department’s funding equations. For instance, says Frisch, if a company sees potential profits in deploying a particular technology, they should go ahead and do that and DOE will pursue a different funding avenue—maybe focus on the early stage R&D or interaction between different technologies.

And that’s the ultimate end point: finding the best investment for federal dollars to save the most amount of energy and reduce greenhouse gases over time.

FINDING THE RIGHT PATH FOR MORE EFFICIENCY AND WIDER DEPLOYMENT OF RENEWABLES

Frisch’s group covers the full suite of renewable energy sources—sources currently accounting for a tiny fraction of America’s energy mix—and efficiency.

Says Frisch: “One thing we can deploy now is efficiency. You set up a program and get it going.”

Networking with state and local governments—through the State and Local Energy Efficiency Action or SEE Action Network for short—Frisch’s team helps get energy efficiency projects off the ground, helping sort out such problems as building codes and varying standards for measuring efficiency and verifying savings.

If the short-term goal is ramping up deployment of efficiency and renewable energy, the longer-term goal is shaping the future mix of energy sources.

One of the areas she is looking at now is what tools utilities use to make decisions about deploying energy sources for electricity. With that info in hand, Frisch and her DOE colleagues can better analyze the gateways and hurdles to getting more renewable energy sources online.

“What if,” Frisch asks, “renewables made up a larger percentage?” This is the question a recent study conducted by her team set out to answer. “What changes would be needed to make that happen? How would those changes affect the grid, electric utilities?”

The results of this extensive study produced some good news.

“We found out that with the technologies we have now, it’s possible to get a good percentage of our electricity mix from renewables,” she says. “Not as far as we ultimately need to go but a good start.”

So what’s the hold-up? She’s working on that answer now.
WHAT ENERGY SOURCES WILL POWER THE WORLD IN 2035?

Seeking answers to that question is Brent Wanner MEM’09, who is researching fuel subsidies and analyzing the outlook for global power structures. It’s all part of his contribution to the 2011 World Energy Outlook, the annual report on the state of global energy produced by the International Energy Agency (IEA)—a must-read for energy wonks.

Wanner is in the middle of a six-month stint at the IEA as part of a Presidential Management Fellowship at the Energy Department. Working out of Paris, Wanner has been adjusting to life in the 11th Arrondissement, learning “restaurant French” and poring over economic models, energy statistics and country databases daily.

Though he cannot talk details about the report before its November publication, he provides a hint about one part of what’s coming: the worldwide support that is in the works for renewable energy.

STRATEGIC THINKING

Prior to his rotation at the IEA, Wanner worked for DOE out of Washington, D.C., on a broad range of analyses. He looked into energy-related subjects from oil markets and offshore drilling regulations to clean-energy standards and critical minerals needed for clean energy. But it was his contributions to a cost-benefit analysis about adding refined petroleum products to the nation’s strategic petroleum reserves (requested in the wakes of Hurricanes Katrina, Rita and Gustav) that could be considered an extension of the work he’d done in Richard Newell’s Energy Economics class at the Nicholas School of the Environment.

“In that class, we did an analysis of the strategic petroleum reserve including what was its optimum size,” says Wanner. “I used that as a springboard to understand the function of the reserve and how to think about the way those reserves can provide benefits for the market and how it operates.”

Combining model predictions, a government database of storms from the past 150 years, and a number of scientific papers forecasting hurricanes, Wanner researched the probabilities—on a 35-year horizon—of hurricanes hitting specific Gulf Coast regions that would affect refineries. This ultimately contributed to an analysis of how adding refined petroleum products to the strategic reserves could help alleviate gasoline and diesel supply crunches following gulf hurricane events.

BEFORE DOE: FROM THE LINKS TO THE BOOKS

Before focusing his energies on energy, Wanner spent a lot of time on the road playing competitive golf and crisscrossing “just about every highway and byway in the eastern United States,” he says. But this life of regional and national tournaments—a lot like being a musician on tour or a traveling salesman—left him unsatisfied.

“Day in and day out it was about my performance,” he says. “It was very individually focused and I found that pretty unfulfilling.”

He says he realized the environment was the answer if he wanted to do something more than just for himself. Extremely interested in energy, he soon began satiating his curiosity by reading books about energy and the environmental challenges arising from our energy use. This, he found, was his new calling.

“I literally had it in my hand when I had the epiphany,” says Wanner, referring to Lester Brown’s Plan B: Rescuing a Planet under Stress and a Civilization in Trouble.

So he traded in his clubs for textbooks and turned to the Nicholas School, attracted by its fledgling energy track and interdisciplinary focus.

Wanner says that today that study of energy from all sides—from the technologies to the policies to the challenges—are paying off.

“Lincoln Pratson’s Energy and Environment class provided a useful broad base to understanding the world of energy,” says Wanner. “Richard Newell’s Energy Economics course and Dalia Patino Echeverri’s Energy Modeling course provided the analytical tools I use on a daily basis."

And then there are Simon Rich’s memorable lectures on renewables.

“Here was a guy,” says Wanner, “trying to bring renewables to the forefront in the energy world and to have that sort of passion about it and be willing to share the real-world challenges and opportunities was really exciting. Seeing that there was a future for renewables in America and elsewhere was very encouraging.”
would have more money in hand, meaning lower operating costs, borrowers can borrow at a lower rate. Why? Since energy efficiency projects—those that leverage government funds to fund renewable energy projects—are recipients of federal recovery grants managed by Sarah Zaleski MEM/MPP’07.

In all, Zaleski, a project officer at the Energy Department, is in charge of 40 grants worth roughly $150 million. New York, the most populous grantee, and Tanana, the smallest, represent opposite ends of the size spectrum. But regardless of size, the pressure is on. These projects were designed to spur economic growth, and the funds must be spent in three years.

“It’s a big experiment,” says Zaleski, “to see what would happen if you gave seed money directly to local programs for clean-energy projects—give them autonomy to figure out how best to use those resources in their communities.”

The clean-energy “experiments” Zaleski helps oversee run the gamut from a $2 million hydrogen fueling station to high-stakes financing instruments.

Not surprisingly, NYC is spearheading the financial piece. Its main aim, says Zaleski, is to leverage government funds and reduce barriers to financing energy efficiency. One way being explored is through lower mortgages for investors of energy-efficient buildings.

“Say a real estate mogul is looking for a loan to purchase an expensive but really energy-efficient building,” Zaleski explains. “We’re suggesting that the lender in such cases provide a lower borrowing rate. Why? Since energy efficiencies lower operating costs, borrowers would have more money in hand, meaning they’d be better able to repay the loan, thus lowering the risk of default.”

Throughout the year, Zaleski has been tracking in on her projects, traveling northbound to cities scattered across the Northeast, westward to a handful of Midwestern locales and way northwest to Alaska.

“Tracking these projects,” says Zaleski, “involves ensuring that the grants’ terms and conditions are being met. These include seeing that appropriate labor rates are being paid, ensuring manufactured products are made in the USA, ensuring no environmental damage is being done.”

Then there are program details.

“We troubleshoot problems, see how energy use is measured, check to see what kind of retrofits are being implemented,” says Zaleski, “and share best practices, common pitfalls and the latest technologies.”

PUTTING BIOMASS ON THE ALASKAN MAP

Tanana isn’t just rural; it’s remote. Located in central Alaska about 130 air miles from Fairbanks and accessible only by air or river, the city’s 15.6 square miles of land and water lie just below where the Tanana and Yukon Rivers meet.

It’s a largely subsistence-based lifestyle. Smokehouses are common. There’s a school, a senior center, a firehouse, a tribal building and city offices. There’s one bed and breakfast, one general store and 38 traffic lights (22 of which will soon be LEDs, thanks to different federal grant money).

Tanana is far too small for a formula grant (the bulk of the stimulus funding), but what it lacks in size, it makes up for in need and its potential for capacity-building—thus, it landed a roughly $1.5 million competitive grant.

While those federal dollars will fund a number of energy efficiency measures including much-needed weatherization, says Zaleski, “it’s going primarily to woody biomass boilers to displace diesel boilers and provide heat.”

Heating is a challenge in a place where temperatures dip to -48 degrees Fahrenheit. So the lion’s share of the grant will fund refrigerator-sized biomass boilers for residences and large biomass furnaces for public buildings. And though a forest management plan is in the works to ensure sustainably harvested wood, most of the burners’ feedstock will come from the acres of driftwood that float naturally toward the city on the Yukon, says Bear Ketzler, Tanana’s city manager.

One final key objective: making Tanana a demonstration project, an idea that’s already taking root.

“We’ve now noticed from school districts and other communities,” says Ketzler, “that they’re approaching the state legislature seeking support for implementing biomass systems in their communities as well.”

Building sustainable communities is how Zaleski launched her career. Before DOE, she helped establish Baltimore’s sustainability office. And before that she laid the groundwork for both jobs during her time at Duke.

“The coursework and extracurricular activities I was involved with there, such as my Nicholas Institute fellowship and work with the Duke University Greening Initiative, gave me a fundamental, comprehensive understanding of energy and environmental issues and how they relate to the economy, policy and law,” says Zaleski.
At a 2005 environmental summit held at the Nicholas School, Simon Rich, a former energy executive and then chair of the school’s board of visitors, spoke of the urgent need for an “authorizing focus” from government.

“Free markets are great in certain aspects,” he told the crowd assembled at the symposium, “but without an authorizing focus companies don’t know where to go or how to operate”—or what the rules are, he went on to say.

Today some 13 Nicholas School alumni are helping to sharpen that authorizing focus, bringing their talents to bear on the U.S. Energy Department.

**ENERGY PROGRAM**
**CATALYST FOR DEVELOPING TOMORROW’S ENERGY LEADERS**

A FORWARD-THINKING IDEA TAKES OFF

Less than four years after its official launch, the Nicholas School’s energy track is paying big dividends: Incoming students are flocking to it, making it the school’s biggest concentration, and alumni are entering industry, the NGO world and government, approaching energy with the environment in mind.

That was the idea for the program all along, from its genesis as a topic of lunchtime conversation in the fall of 2002 between then-dean William H. Schlesinger and Paul Risher, a private investor in energy industry, to its fruition as a full-fledged concentration in 2007.

“Paul Risher was the first to suggest an energy program,” says Schlesinger. “Paul recognized that a number of Duke alumni...had risen to reasonably high places in the energy industry and I think he realized that environment and energy were on an unhealthy collision course.”

Schlesinger was interested and thought the Nicholas School should somehow capture Duke’s expertise in the industry and couple that to the new generation of environmental types to help make them realistic about what they were up against. How? Enter Simon Rich.

Rich became a driving force in establishing the program. The effort began with the Energy and the Environment class Rich and Schlesinger co-taught in the spring of 2003.

The natural gas executive and the dean mixed lectures from various energy perspectives with guest lectures from industry heavyweights, including other board members. Earth Sciences professor Ron Perkins returned from retirement to teach a class on petroleum geology, one highlight of which was his in-class demonstration of forming petroleum in a test tube during class time, no geologic time needed.

In absence of a formal curriculum, says Schlesinger, Rich launched a series of student field trips to Houston to see first-hand where oil is found in
and extracted from the ground, loaded into trucks and then hauled off to gas stations.

ENERGIZING A TRANSFORMATION FROM CERTIFICATE TO TRACK
The atmosphere of the Nicholas School was electric—charged by the hot topic of energy.

In the spring of 2004 Rich spearheaded a leadership forum that brought together leaders from business, politics, environmental nonprofits, and academia under the banner of “Creating a Sustainable Energy Future.” Key to this effort were Schlesinger, Perkins and Lincoln Pratson on the academic front, and a number of movers and shakers from the business world, including Art Smith, Joe Stanislaw and Jeff Gendell, who all played pivotal roles in growing these early seeds for an energy program into an MEM track.

Building on these early successes and strong student interest from the likes of Mandy Schmitt, Lena Hanson, and Julian Wong, Pratson, now the faculty director of the Nicholas School’s Energy and Environment program, organized an energy task force. Through the collective brainpower of Rich, Chris Holmes, Jeff Gendell, and several other members of the board, the curriculum was formed and in short order the full-blown concentration was structured.

“It was Jeff Gendell who was very supportive of what we were doing in this area,” said Pratson. “He was willing to supply support to hire faculty. He gave the first of two gifts to hire a senior and junior faculty member in energy and environment in the spring 2005.”

In the fall of 2006 the education committee felt the program had enough established courses and experience through the certificate that it could be offered as a concentration. In 2007 it became an official track.

First order of business was hiring Richard Newell, Gendell Associate Professor of Energy and Environmental Economics (who has just returned to the Nicholas School after taking leave to serve in the federal Energy Information Administration). Then, says Pratson, the concentration was launched with nine students. Dalia Patino Echeverri was hired next as Gendell Assistant Professor of Energy Systems and Public Policy. And the program has been building steam ever since.

“Right now we have 109 students,” Pratson says. “We’re now one of the two largest concentrations.”
by Jennifer Weiss MEM’12  

Once upon a time, I was a banker. And I loved it.  
I worked in a large regional bank’s eCommerce group helping launch new online banking products. As a senior vice president, I managed 25 tremendously talented people, worked 12 hours a day and loved every minute of it. Then suddenly, I didn’t love it anymore. I started to dread coming to work and the endless meetings and the long days. I no longer was having fun.  

In retrospect, I should have seen it coming. My husband and I, proud parents of a beautiful baby girl, had a second daughter on her way. While I always thought that I would juggle work and children effortlessly as a working mom, I was finding I couldn’t give the 110 percent that each deserved. So I made the difficult choice to trade in a career that I loved to be with my children full time. Absolutely no regrets—I made the right decision for me.  

Fast forward five years. With one child in school and another preparing for kindergarten, I had the burning desire to re-enter the work force. But, I had no idea where to start. I certainly couldn’t go back to banking after five years away from the fast-paced online world—and to be honest, I didn’t want to. I needed to reinvent myself. I started thinking about what I found exciting and how I could turn it into a career. Then a light bulb—probably an LED—flashed inside my head; I could work in the energy efficiency field. It was something I felt very passionate about and loved to do at home.  

To my surprise, I found one of the top environmental schools right in my backyard. I had lived in Raleigh for five years and wasn’t aware that Duke offered a terrific Master of Environmental Management program just 20 miles down the road. I scheduled a tour of the school, which included a meeting with Glenda Lee in the Nicholas School’s Career Services office. Before I had even applied to the Nicholas School, Glenda offered me sage advice that would help change my career path choice:  

♥ VOLUNTEER TO GAIN VALUABLE EXPERIENCE—Since I had absolutely no experience in the field, Glenda recommended that I touch base with the executive director of a local environmental not-for-profit before I started school. The director not only took me under her wing, she wrote one of my recommendations to the Nicholas School.  

♥ USE YOUR EXISTING SKILLS TO HELP YOU IN YOUR NEW FIELD—In the environmental arena, where skills tend to be science and research based, my business and financial background comes in handy and allows me to get involved in projects quickly and add value to the team.  

♥ LEARN NEW “TRICKS”—Although I am the oldest member of the Nicholas School class of 2012, Glenda assured me that being a “non-traditional” student could be a blessing. Throughout my first year, I focused on learning new skills and enhancing my existing ones.  

♥ NETWORK, NETWORK, NETWORK— I write down every name that Glenda and the Career Services team shares with me. Each time I have been in touch with a contact, it has paid off in huge ways both personally and professionally. This summer, I investigated HVAC systems, lighting and office equipment at Shaw University in downtown Raleigh as part of the Environmental Defense Fund’s Climate Corps Public Sector Fellowship program. I uncovered hidden energy efficiency treasures, saving Shaw money and helping to establish Shaw’s own Green Team of energy efficiency ambassadors. At the same time I was learning and teaching, I met great contacts and established myself as an expert in my new field. Yes, I am loving it.

Jennifer Weiss MEM’12, who is in the Energy and Environment track with a focus on corporate and small business sustainability, is a member of the Nicholas School’s “From the Trenches” blogger team. You can follow her blogs at nicholas.duke.edu/insider/trenches/jennifer-weiss.
The Duke Marine Lab’s new Marine Science and Conservation Genetics Center has taken a major step closer to reality with the announcement of two major gifts for the $6.75 million project.

The Duke University Board of Trustees approved the plans for the state-of-the-art, sustainably designed facility in May. Groundbreaking is scheduled for summer 2012, with an anticipated opening in fall 2013.

Oak Foundation, an international organization that commits its resources to address issues of global social and environmental concern, including global climate change and the conservation of marine resources, has provided a $4.5 million challenge gift to support construction of the new building.

The first leadership contribution to take advantage of Oak Foundation’s challenge has been given by Philip “Flip” and Kathy Froelich, who made a $1.5 million gift by establishing a charitable remainder unitrust to benefit the new facility. They plan to continue to build the fund over time.

“These generous gifts will enable students and faculty at the Duke Marine Lab to pursue promising developments in marine sciences,” said Duke University President Richard H. Brodhead. “We are grateful for this commitment by Oak Foundation and Kathy and Flip Froelich, which will strengthen the Duke Marine Lab’s capacity to address critical problems in the marine environment.”

This will be the first building in a planned multi-phase, “green” renovation and expansion of the Marine Lab’s Pivers Island campus in Beaufort.

Kristian Parker, chair of Oak Foundation’s Board of Trustees, earned his PhD in environmental sciences at Duke in 2000 and studied at the Marine Lab. He was instrumental in making the foundation’s gift possible.

“This opportunity came together from three different directions: my experience as a Duke graduate; the fact that Oak Foundation has a strong interest in marine conservation; and the Duke Marine Lab’s desire to renew their research laboratories,” Parker says.

Parker, a marine biologist who oversees his family foundation’s environment program and is a founding member on the board of directors of Oceana, an international organization working to protect the world’s oceans, is pleased the foundation’s gift will help make the new Marine Science and Conservation Genetics Center a reality. “The result,” he says, “will be better trained students, important research developments in the field of marine conservation, and a stronger Marine Lab.”

For Flip Froelich, T’68, a chemical oceanographer, the decision to support the new building “was easy.”

“My ‘foundings’ as a marine environmental chemist began as a Duke senior, when I took marine geology classes with Orrin Pilkey at the Marine Lab and joined his group at sea twice. I went with him on sabbatical to Puerto Rico the next year, where I ended up getting a master’s degree in marine sciences before pursuing my PhD at the University of Rhode Island.

“This is our way of regifting back to Duke and to the Marine Lab the opportunities that were given to me when I was a student there. It’s an investment in the future of marine sciences at Duke, where I got my start as an oceanographer. Plus the faculty at the Marine Lab are terrific.”

Froelich says he and his wife believe that “conservation is the answer to most of the environmental issues we and our children and grandchildren face.”

The Froelichs worked closely with Duke staff to establish the charitable remainder unitrust.

“Kathy and I are both university professors and are not wealthy, but my parents left us a small inheritance that we wanted to do something significant with, and the timing worked out well. We were able to help secure the matching funds from Oak Foundation for the new building, and still earn a lifetime income from the trust.” Flip Froelich, who graduated from Duke with a bachelor of science in chemistry, is a member of the board of visitors of the Nicholas School of the Environment, of which the Marine Lab is a part.

“Inspiration and leadership by Oak Foundation and by Kathy and Flip Froelich make the new center possible,” says Marine Lab Director Cindy Lee Van Dover. “Their investment in this research infrastructure comes at a time when marine research is no longer a luxury but an imperative.

“The Marine Lab has not seen a new research building constructed since the 1970s,” Van Dover notes. “The new center will be home to faculty research groups that use the latest molecular tools to understand the ecology of our oceans and coasts, and will give Duke and the Nicholas School much-needed room to expand our marine research programs and provide our faculty scientists and their students with state-of-the-art and environmentally sensitive research spaces.”

The Nicholas School is still seeking funds toward construction of, and operating costs for, the Marine Science and Conservation Genetics Center in order to meet Oak Foundation’s challenge. For information about naming opportunities within the new center, contact Celeste Brogdon, interim director of external affairs, at 919-613-8035 or celeste.brogdon@duke.edu.

Laura Ertel is a freelance writer based in Durham, N.C.
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<th>Contact</th>
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<td>Nov. 10</td>
<td>DUKE FOREST ANNUAL GATHERING</td>
<td>New Hope Improvement Association Center Chapel Hill, N.C.</td>
<td>Office of the Duke Forest 919-613-8013 or <a href="mailto:dukeforest@duke.edu">dukeforest@duke.edu</a></td>
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<td>Dec. 5</td>
<td>WINTER MASTERS PROJECT SYMPOSIUM</td>
<td>MEM and MF candidates masters project presentations Von Canon Hall, Bryan Center</td>
<td>Academic and Enrollment Services 919-613-8070 or <a href="mailto:admissions@nicholas.duke.edu">admissions@nicholas.duke.edu</a></td>
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<td>Jan. 10</td>
<td>PROSPECTIVE EMPLOYER CAREER CONFERENCE</td>
<td>Levine Science Research Center</td>
<td>Saskia Clay-Rooks 919-613-4442 or <a href="mailto:saskia.clay-rooks@duke.edu">saskia.clay-rooks@duke.edu</a></td>
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<td>Jan. 27</td>
<td>PROSPECTIVE STUDENTS VISITATION DAY</td>
<td>Bryan Center Von Canon C and LSRC</td>
<td>Academic and Enrollment Services 919-613-8070 or <a href="mailto:admissions@nicholas.duke.edu">admissions@nicholas.duke.edu</a></td>
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<td>Feb. 3</td>
<td>17TH ANNUAL DUKE/YALE ENVIRONMENTAL RECRUITING FAIR</td>
<td>Gallaudet University Washington, D.C.</td>
<td>Thelma Jernigan 919-613-8102 or <a href="mailto:tejernigan@duke.edu">tejernigan@duke.edu</a></td>
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<tr>
<td>Feb. 24</td>
<td>STANBACK FELLOWSHIP INTERVIEW DAY</td>
<td>Bryan Center, Von Canon Rooms, Duke Campus</td>
<td>Glenda S. Lee 919-613-8079 or <a href="mailto:gslee@duke.edu">gslee@duke.edu</a></td>
</tr>
<tr>
<td>March</td>
<td>SPRING MEETING OF NICHOLAS SCHOOL ALUMNI COUNCIL</td>
<td>Location TBD</td>
<td>Celeste Brogdon 919-613-8035 or <a href="mailto:celeste.brogdon@duke.edu">celeste.brogdon@duke.edu</a></td>
</tr>
<tr>
<td>March 30-31</td>
<td>ADMITTED STUDENTS VISITATION WEEKEND</td>
<td>Duke West Campus, Levine Science Research Center</td>
<td>Academic and Enrollment Services 919-613-8070 or <a href="mailto:admissions@nicholas.duke.edu">admissions@nicholas.duke.edu</a></td>
</tr>
<tr>
<td>April 5-6</td>
<td>MASTERS PROJECT SYMPOSIUM</td>
<td>MEM and MF candidates’ masters project presentations Von Canon Rooms, Bryan Center</td>
<td>Academic and Enrollment Services 919-613-8070 or <a href="mailto:admissions@nicholas.duke.edu">admissions@nicholas.duke.edu</a></td>
</tr>
<tr>
<td>April</td>
<td>SPRING BANQUET AND SILENT AUCTION (TENTATIVE)</td>
<td>Location TBD</td>
<td>Nancy Kelly 919-613-8090 or <a href="mailto:nkelly@duke.edu">nkelly@duke.edu</a></td>
</tr>
<tr>
<td>April 19-20</td>
<td>NICHOLAS SCHOOL BOARD OF VISITORS, SPRING MEETING</td>
<td>Hug Commons, LSRC</td>
<td>Celeste Brogdon 919-613-8035 or <a href="mailto:celeste.brogdon@duke.edu">celeste.brogdon@duke.edu</a></td>
</tr>
<tr>
<td>April 21</td>
<td>DUKE LEAF™ AWARD</td>
<td>Location TBD</td>
<td>Celeste Brogdon 919-613-8035 or <a href="mailto:celeste.brogdon@duke.edu">celeste.brogdon@duke.edu</a></td>
</tr>
<tr>
<td>May 3-4</td>
<td>BEAUFORT MASTERS PROJECT SYMPONIU (COASTAL ENVIRONMENTAL MANAGEMENT STUDENTS) Repass Center, Duke Marine Lab, Beaufort, NC</td>
<td>Contact: Lauren Stulgis 252-504-7531 or <a href="mailto:lauren.stulgis@duke.edu">lauren.stulgis@duke.edu</a></td>
<td></td>
</tr>
<tr>
<td>May 11</td>
<td>DEL-MASTERS PROJECT SYMPOSIUM</td>
<td>Levine Science Research Center, A158</td>
<td>Contact: The DEL Program 919-613-8082 or <a href="mailto:del@nicholas.duke.edu">del@nicholas.duke.edu</a></td>
</tr>
<tr>
<td>May 12</td>
<td>NICHOLAS SCHOOL RECOGNITION CEREMONY (GRADUATE AND PROFESSIONAL DEGREE CANDIDATES) LSRC, Great Lawn Duke University West Campus</td>
<td>Contact: Nancy Kelly 919-613-8090 or <a href="mailto:nkelly@duke.edu">nkelly@duke.edu</a></td>
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<tr>
<td>May 13</td>
<td>UNIVERSITY COMMENCEMENT EXERCISE</td>
<td>Wallace Wade Stadium, West Campus</td>
<td>Contact: Academic and Enrollment Services 919-613-8070 or <a href="mailto:admissions@nicholas.duke.edu">admissions@nicholas.duke.edu</a></td>
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Mark your calendar for the following dates and monitor our website at nicholas.duke.edu for additional events.

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**our environmental commitment**

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