



environmental engineering alumni newsletter

Sustainability: Beyond the Buzzword

“The trouble with the global warming debate is that it has become a moral crusade when it’s really an engineering problem. The inconvenient truth is that if we don’t solve the engineering problem, we’re helpless.”

—Robert J. Samuelson, *The Washington Post*, July 5, 2006

Building on its century-old roots in sanitary engineering, the field of environmental engineering has addressed such problems as the provision of safe drinking water, the treatment of hazardous wastes, and the control of air and water pollution. While those issues continue to require attention, many environmental engineers are beginning to take a broader view of their role in creating and improving systems for managing human impact on the Earth.

A variety of issues, such as the pressures of increasing population and industrialization in the developing world, factor into what is becoming a crescendo of interest in sustainability.

One issue in particular is forcing itself to the forefront: climate change. A cacophony of grim predictions crowds the news media. Global warming is undeniably occurring, according to the Intergovernmental Panel on Climate Change (IPCC). The first volume of the IPCC’s new assessment report, released in February 2007, predicts that increased atmospheric carbon dioxide, methane, and nitrous oxide levels, very likely caused by human activity, could lead to contraction of snow cover, shrinkage of polar sea ice, increase in frequency of heat waves and heavy precipitation events, and increase in intensity of tropical cyclones.

UC Berkeley’s Environmental Engineering (ENV) Program is evolving to respond to these new challenges. A subtle but significant shift in focus is evident in the research of many faculty, and in additions and revisions to the curriculum.

Bill Nazaroff, ENV professor and chair of the Energy & Resources Group, says, “As the debate shifts from ‘Is climate change happening?’ to ‘What should we do about it?’ we will

see a large role for engineers to contribute to progress toward a solution.” He sees environmental engineers as particularly well equipped to develop “solution strategies” encompassing a variety of components.

And beyond climate change, Nazaroff frames the challenge facing environmental engineers as, “Can we apply the methods of engineering to develop information and approaches that will help put society on a path towards sustainability?”

Nazaroff’s research centers on the development and application of exposure science and the chemistry and physics of pollutants in indoor environments, including such common products as air fresheners and household cleaners. “I’m much more conscious and attentive now than before to the sustainability dimensions of these areas of work,” he says. With about 30% to 40% of all primary energy use in the United States occurring in buildings—for heating and cooling, lighting, powering appliances, and other purposes—the potential is high for reducing the environmental footprint of the built environment through more efficient functioning. And the work of Nazaroff’s group and other researchers on “intake fractions” could dramatically improve the assessment of environmental health hazards, helping to focus resources on the problems that matter most.

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Letter from the ENV Group Leader

Dear Alumni,

Do you remember what first got you interested in environmental engineering? Are you an alumnus from the 1970s who was energized by Earth Day and the birth of the environmental movement? Or are you a graduate from the 1980s who wanted to help clean up all of those Superfund hazardous waste sites? Or maybe you are a graduate from the 1990s, worried about how we are going to protect habitat from urban sprawl and rapid growth of our state. Whenever you graduated and whatever your motivation for coming to Berkeley, you undoubtedly share with your fellow alums a common goal of wanting to make the world a better place.

I hope we gave you some of the tools you needed to achieve your goals. In particular, I hope that you learned more than formulae and equations; I hope that we taught you how to learn. The Environmental Engineering Program at UC Berkeley has never been about vocational training. We aim to challenge, motivate and inform. (And when that doesn't work, we pile on a few more assignments for good measure.) In the end, we hope that our graduates are prepared to adapt to changing conditions throughout their professional lives.

For the past ten years, the field of environmental engineering has been changing. Perhaps the rate of change hasn't been as fast as in the tech sector, where computer software and hardware become obsolete almost as soon as they've been produced. Still, new technology and globalization have affected us, and now it seems like the rate of change is accelerating.

The types of problems that we address are expanding from local issues like treatment plants and dams to regional and global issues. On topics like sustainability, we're worrying about future generations rather than the people in the next town over, and using skills from beyond Civil & Environmental Engineering (CEE) to solve complex societal problems. In areas like nanotechnology, water resource planning, and wetland restoration, we're also trying to be proactive and anticipate the next generation of environmental problems instead of waiting to read about them in the news. And all the while we maintain our core competency in the practice of environmental engineering.

Can we keep up with the rapid pace of change? We don't have a choice. We all have to continue to learn and grow in new areas. Hopefully, your training at Berkeley has prepared you for some of these changes. The department also has to grow in new directions. Sometimes we accomplish this by hiring bright, young assistant professors like Tina Chow and Kara Nelson. We're currently in the midst of another faculty search in the area of ecological and water resources engineering.

This issue of the newsletter highlights ways in which some of the new hires—and old-timers—are responding to changes associated with the topic of sustainability. It's just one of the many areas in which our faculty members are addressing the new challenges in the environmental engineering field.

Other notable new developments are highlighted below.

Tina Chow, our newest faculty member, is off to a running start. Last spring she introduced a new graduate fluid mechanics course in which students learned how to simulate environmental flows and explored the similarities and differences in fluid flows in air, water, and soil. She also took a team of students to participate in the spring 2006 Terrain-induced Rotor Experiment (T-REX) in California's Owens Valley, where they got to launch lots of weather balloons to measure winds and gravity waves in the atmosphere.



Prof. David Sedlak,
ENV Group Leader

Lisa Alvarez-Cohen was elected chair of the Faculty of the College of Engineering (this means that she gets to run graduation and wear a floppy hat). She is also serving as Vice Chair for Instruction for the CEE Department (no floppy hat/lots of extra work). In between these activities, she and her students have been developing and testing new tools for exploring microbial communities.

"Emeritus" Professor John Dracup continues to teach, advise students in our program, and receive kudos for his research accomplishments. This year the Universidad Católica San Antonio in Guadalupe, Spain, named him a "Profesor Honorífico," and its home city of Murcia gave him an award for his research on water management in the Murcia Region.

Rob Harley was on sabbatical last fall, which gave him a chance to explore research areas related to regional- and global-scale air pollution issues. He also has made plans to return to his favorite research site in the Caldecott Tunnel. (Remember to honk at him as you drive by!)

Slav Hermanowicz has been exploring both the engineering and moral issues associated with sustainability in his research and teaching. He is also continuing his research on membrane bioreactors and their use in municipal wastewater treatment systems.

Jim Hunt is transitioning back to his research roots in the areas of hydrology and water resources engineering. This fall he used the opportunity for teaching the introductory hydrology course to reconnect with the field, and he's starting on a watershed-scale research effort through the Berkeley Water Center. He spends about half his time trying to assist the campus in its operation outside of the department. (In other words, he's becoming an administrator.)

Bill Nazaroff was on sabbatical last fall at the Technical University of Denmark, near Copenhagen. He experienced the long days of northern summer, the persistent Danish cloud cover, and some time to guide his research program in new directions. He worked with a close colleague (C.J. Weschler) on a state-of-knowledge review and assessment of semi-volatile organic compounds in indoor environments.

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Sustainability

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One challenge of addressing questions of sustainability is the lack of a clear, practical definition of the term. “Sustainability is a commonly used term, but quite vague,” says Associate Professor Slav Hermanowicz. He thinks it is essential for engineers and others to discuss and define the philosophical and ethical dimensions of sustainability and “sustainable development” before significant progress can be made on related engineering problems.

Hermanowicz’s research focuses on engineered processes in water quality. Recently his group has been studying membrane filtration in depth, and also linking the technical solutions to physical sustainability, an approach that draws on other sciences, such as thermodynamics and system theory.

It is engineers’ responsibility, Hermanowicz says, to learn from misguided actions of the past in designing solutions for the future, and to see beyond the narrowly defined scope of each individual problem. “A prime example of such actions, perhaps well-intended but with severe consequences, is a recent push toward biofuels,” he notes. “As a result of encouraging the production of biodiesel from palm oil in Europe (Netherlands mostly), huge areas of Indonesia have been turned into palm plantations by slashing and burning.”

Hermanowicz sees a logical progression from environmental engineering’s focus on protection of public health and of the environment to protection of the whole Earth for the long term. “This progression requires new tools and methods,” he says, “not only on the scientific and technical side but even more so on the public policy side”—a realm that engineers have often avoided.

Others echo these sentiments, adding that environmental engineers are starting to shift from reactive to proactive problem solving—from treatment to prevention. Nazaroff charges students and practitioners with the goal of “being able to anticipate environmental problems before they happen, and help society avoid mistakes.”

By all accounts, work towards sustainability necessitates big-picture thinking and a more interdisciplinary approach to problems. Assistant Professor Kara Nelson says, “We tend to feel like environmental engineering is inherently about sustainability.” But sustainability involves more, she says, than the traditional sets of problems and solutions. “It’s not just thinking about wastewater or drinking water, but the implications to the whole water system, and the energy use of the system.”

Associate Professor Arpad Horvath studies just that. A faculty member in the Civil & Environmental Engineering (CEE)

Department’s Engineering and Project Management Program, Horvath uses methods such as life-cycle assessment to study the environmental implications of various industries. His research has included looking at the energy use and greenhouse gas emissions of water infrastructure projects in California, from extraction of raw materials to decommissioning. “Decisions should include all factors,” Horvath says, “such as economics, and equity and social issues. Whereas we previously viewed problems through a single lens, now we view them through multiple lenses.”

Horvath has joined Nelson and Professor Rob Harley in teaching E11, “Engineered Systems and Sustainability.” This sophomore-level course was previously aimed at introducing students to the environmental engineering major. In recent



years, the course’s focus has been shifted and expanded to focus on the environmental impacts of buildings, transportation, water, and energy systems, and critical evaluation of engineering approaches to sustainability, including coverage of climate change and life-cycle assessment.

Harley says the course now takes a more “macroscopic” approach. “The revised course is more about trying to instill awareness of environmental and sustainability issues that all engineers should know about and try to address in their professional careers,” he says. That message appears to be a popular one: students from throughout the College of Engineering and beyond are flocking to the course.

David Sedlak, ENV Group Leader, says that student interest in new problems, such as energy issues and climate change, is partly responsible for driving the ENV Group’s focus toward sustainability. The CEE Department offers several upper-level courses to meet this interest, including CE 107, “Climate Change Mitigation,” taught by Nazaroff, and CE/ER 293A, “Technology and Sustainability,” taught by Nazaroff, Horvath, and Ashok Gadgil, an adjunct professor in the Energy & Resources Group.

This student interest in attacking some of the world’s most challenging problems gives hope that current and future generations may be able to alter humanity’s course for the better, with a powerful vision of a sustainable future. As for climate change, Nazaroff says, “Given sufficient political and public will, I believe we have the potential to address the problem so that the effects are much smaller than they would be under ‘business as usual.’”

“Environmental engineers will play a big role in transforming that vision into a reality.”

Alumni Updates

Rachel Peletz

B.S. '05 (Environmental Engineering Science)

After graduating from Berkeley, Rachel got a masters in civil and environmental engineering at MIT (2006). She is currently working as an International Technical Advisor for the Centre for Affordable Water and Sanitation Technology (CAWST) in Calgary, Alberta, Canada.

Source of Inspiration

“I wouldn’t be doing what I am doing today if it wasn’t for Kara Nelson. I remember her putting up photos of latrines in Mexico in CE 92 when I first heard her speak—that talk inspired me to pursue environmental engineering, particularly water and sanitation in developing countries. I took E11 and also CE 210A (Water Pathogens) with Kara. And I worked with Kara on the UV tube project (disinfecting drinking water using ultraviolet light) in the laboratory and spent a summer in Haiti with one of her graduate students. My experience in Haiti made me realize that my passion is working in water and sanitation in developing countries.”

Funny memory from undergrad

“In Water Chemistry, I remember David Sedlak saying that you titrate the night’s alcohol with coffee the next morning.”

Recent travel

“Right after graduation, I spent the summer backpacking in Europe with friends and family. Then during my graduate studies at MIT, I went to Ghana for a month for my thesis research on ceramic drinking water filters, and to India for the summer to work on ecological sanitation. In a couple of weeks, I am off to Indonesia for a month to lead training workshops on drinking water filters. After that, I may be going to Bangladesh and the Philippines later this year.”



Terry Burton

M.S. '01

Terry is a senior scientist for the U.S. Environmental Protection Agency (EPA), working on hazardous waste issues for the Office of Research and Development in Dallas, Texas.

Newsworthy work

“From late August 2005 until August 2006, I was part of the government’s response to the hurricanes in southern Louisiana. For four months of that time, I was either the Situation Unit Leader or the Planning Section Chief of all U.S. environmental activities in the Louisiana region.”

Career Path

“After Berkeley, I worked at the Lawrence Berkeley National Laboratory for a year doing software validation on the Yucca Mountain repository project. When my planned sub-project did not receive funding, I moved on to EPA’s office in San Francisco. As Remedial Project Manager, I was responsible for all aspects of four to five small Superfund sites. After two years, my current position was created in Dallas, and I was encouraged to go for it.”

Thoughts on the ENV Program

“There is no question, the ability to apply learned principles to different scenarios [helped me succeed after graduation]. I clearly

remember that my first work assignment could easily have been a comp exam question. When I sketched out the probable solution off of the top of my head, my boss thought I was a genius.”

Extracurricular activities

“I’ve done some professional dancing with a traditional Turkish dance troupe. I’m currently learning ‘hip-hop’ dance as well. In late summer, I went to Paris and re-taught my tongue the French language.”

Advice for recent grads

“By interviewing carefully, one can avoid pushing stacks of paper for a living.”



Ruth Richardson

M.S. '95, Ph.D. '01

Ruth is an assistant professor of civil and environmental engineering at Cornell University in Ithaca, New York. Her research on bioremediation centers on the use of genomics, transcriptomics, and proteomics to study activities of microbial communities. She teaches such courses as “Biodegradation & Biocatalysis” and “Microbiology for Environmental Engineering.”

Thoughts on the ENV Program

“Two key features [of the program] I think have helped me immensely. First is the breadth of the course material within the Environmental Engineering Program itself. It was not until I got to the other side of the lecturn that I realized the diversity of courses available [at UCB]—in air, water, and applied chemistry and biology—is not the norm. Most programs focus on one or two niches or specialties. A second was the opportunities for interdisciplinary interaction with other departments. In my time at UCB I interfaced with faculty and students in microbiology, mechanical engineering, and public health. These interactions

paved the way for what will be a lifetime of cross-discipline cooperation and collaboration.”

Extracurricular activities

“As a lifelong team athlete, I continued playing soccer after landing in Ithaca. However, a newer passion of ultimate Frisbee has taken hold of my free time. That, and tap-dancing (I say sheepishly).”



Recent travel

“Traveling to warmer climates in winter helps me get through the Northeastern winters, most recently roughing it on a Belizean isle and a two-week trip to small communities around Honduras with our Engineers for a Sustainable World student group.”

Denny Parker

B.S. '65 (Civil Engineering), M.S. '66, Ph.D. '70

Denny Parker is the Director of Technology at Brown and Caldwell, working at the firm's Walnut Creek headquarters.

“I am always on the lookout for new technologies, particularly in my principal area of focus, wastewater. Another focus is on finding key technology staff, both experienced people as well as young professionals just starting out. I also take the time to liaise with universities on research projects that can advance our state of knowledge about the application of specific new processes.

“My other focus is on assuring quality process engineering is done at BC, both in a QA/QC role as well as ‘keeping the knives sharp’ by acting as the assigned project engineer for process engineering on selected projects. I have kept my hand in process innovation throughout my career and have either invented and applied new processes, or adapted and improved existing processes. Many of those applications are now widely used in industry, even by competitive firms. That is the highest form of compliment, even if they don't acknowledge the source!”

Source of Inspiration

“I had Gerry Orlob, then a professor at Cal Berkeley in water resources, in a undergraduate course at Berkeley and he got me interested in water as an undergrad. He gave me a summer job at his engineering firm and assigned me to the only wastewater process work his firm had. In the summer before entering Cal for my M.S., I switched from ‘hydraulics’ to ‘sanitary engineering,’ which were what the two separate departments were called in those days.”

Thoughts on the ENV Program

“Going on for a Ph.D. at Berkeley was great preparation for my role today—the scope of environmental engineering required breadth

in the ‘minors’ courses I had to take. Good advising by my profs led to a sound educational foundation.”

Advice for recent grads

“My answer is oriented to folks in consulting engineering, but is translatable to other jobs. I was mentored by some great engineers with lots of experience. Find a firm like that with engineers like that who will organize your growth in all the areas necessary to be a good consultant. If you aren't at a firm like that, it is not too late to make a career move. If your firm is like that, think long and hard before you move. A little more money is important, but it certainly is not everything.

“Look for balance in everything (career, family, sleep, recreation etc.). Don't go through life looking for your endpoints, as the process (of life) is almost everything!”

Extracurricular activities

“Skiing, reading, gardening, cinematography, and grandparent heaven.”



Letter from the ENV Group Leader

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Kara Nelson is adding new dimensions to our teaching and research program, with an emphasis on the detection and removal of pathogens in water. She is currently leading a multidisciplinary team of researchers working on safe water and sanitation issues in developing countries, with support from the Blum Center for Developing Economies. The program will include a strong component of undergraduate participation in education and field research.

Yoram Rubin continues to lead the Berkeley Water Center, which has expanded its research portfolio to include issues such as the use of advanced computing methods for water resource predictions, planning for California's water future, and addressing water and sanitation in developing countries.

Garrison Sposito was honored in a four-day symposium held during the 2006 American Chemical Society meeting in San Francisco. The symposium, entitled "Physical Chemistry of Soil and Aquifer Systems," included more than 60 scientific papers presented by geochemists from around the world on the theme of applying rigorous methods in physical chemistry to understand complex processes in environmental systems, which has been one of the major thrusts of Professor Sposito's scientific career. Later in 2007,

a special issue of the journal *Geochimica et Cosmochimica Acta* will be published in honor of his research accomplishments.

Mark Stacey is on sabbatical during the spring semester of 2007. He's using the time to try to solve some of the many problems facing San Francisco Bay and the Sacramento-San Joaquin Delta.

And as for me, when I'm not busy writing newsletters and tracking down alumni, I keep busy with new research projects looking at subjects such as endocrine-disrupting compounds in California's Central Valley, the use of engineered nanoparticles for contaminant remediation, and water quality issues related to seawater desalination.

In this issue we have expanded our coverage of alumni beyond recent graduates. You, our alumni, reflect well on our program and we are proud of all of you. If you have suggestions of alumni to profile in future issues, please do not hesitate to contact me.

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