Inside the Earth Institute

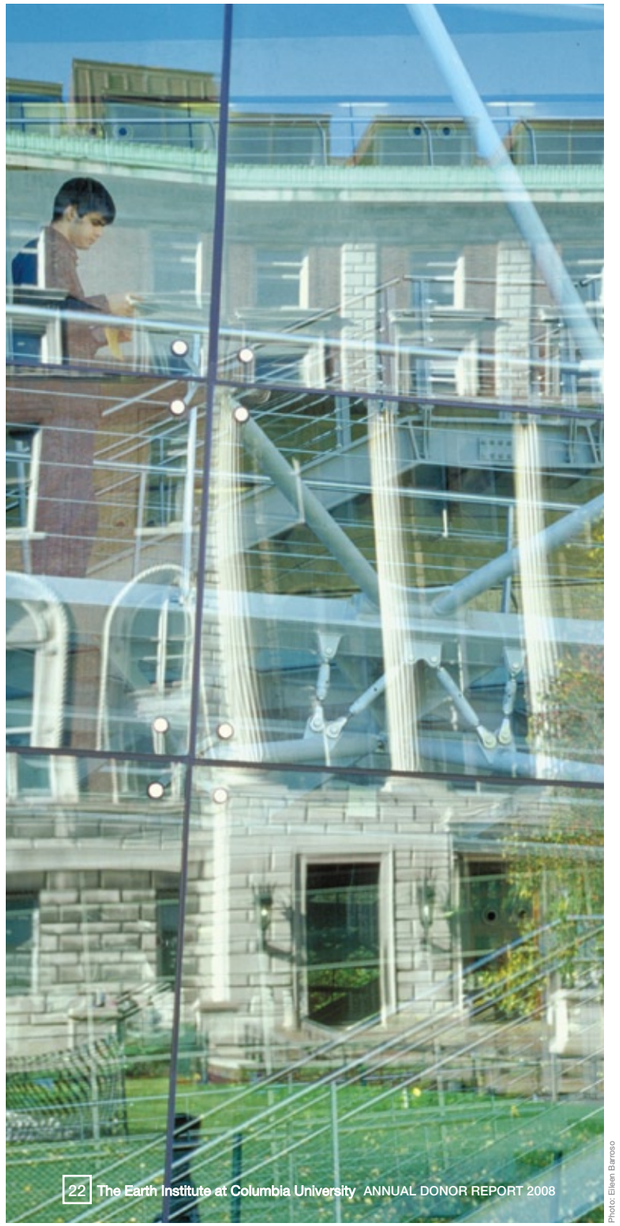


Photo: Eileen Barroso

Photo: Bob Handelman

Photo: David Wentworth

Photo: Eileen Barroso

RESEARCH CENTERS AND PROGRAMS

The Earth Institute's overarching goal is to help achieve sustainable development through scientific research, education and the practical application of knowledge to solving real-world challenges. The Institute is composed of 32 research centers and programs that house over 850 scientists, postdoctoral fellows and students.

Research Centers

- Lamont-Doherty Earth Observatory (LDEO)
- Columbia Climate Center
- Columbia Water Center
- Center for Rivers and Estuaries
- Center for Climate Systems Research (CCSR)
- Center for Environmental Research and Conservation (CERC)
- The Earth Engineering Center (EEC)
- Lenfest Center for Sustainable Energy (LCSE)
- The Center for Global Health and Economic Development (CGHED)
- The Center for National Health Development in Ethiopia (CNHDE)
- The Center on Globalization and Sustainable Development (CGSD)
- The Center for the Study of Science and Religion (CSSR)
- The Center for Sustainable Urban Development (CSUD)
- Center for International Earth Science Information Network (CIESIN)
- International Research Institute for Climate and Society (IRI)
- The Center for Hazards and Risk Research (CHRR)

Partnership Institutions

- The Black Rock Forest Consortium
- Center for Research on Environmental Decisions (CRED)
- Cooperative Institute for Climate Applications and Research (CICAR)
- NASA Goddard Institute for Space Studies (GISS)
- Laboratory of Populations

Earth Institute Programs

- The ADVANCE Program
- The Earth Clinic
- The Cross-Cutting Initiative (CCI)
- Urban Design Lab (UDL)
- The Program on Science, Technology, and Global Development
- The Global Roundtable on Climate Change (GROCC)
- Tropical Agriculture and Rural Environment Program
- Master of Public Administration in Environmental Science and Policy
- Master of Arts Program in Climate and Society
- Ph.D. in Sustainable Development

Partnership Programs

- Vale Columbia Center on Sustainable International Investment (CPII)

Photo: Office of University Publications

FURTHER INSIDE THE EARTH INSTITUTE

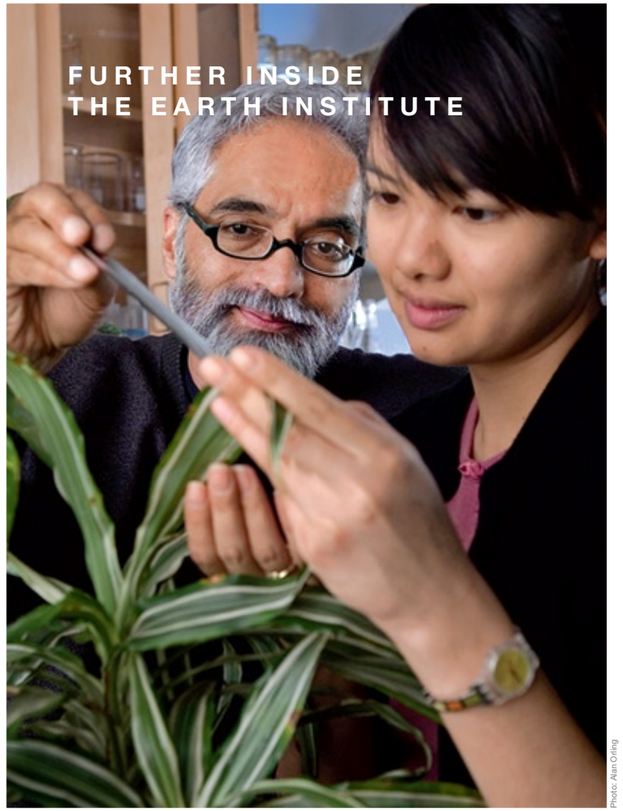


Photo: Alan Orling

In many ways, the Earth Institute is a lens to the world and the many issues that challenge humanity. From here in New York City, to countless international locations, we are conducting extensive and far-reaching work on many issues of sustainable development and our world's environment.

Nine cross-cutting themes—water; climate and society; energy; urbanization; hazards and risk; global health; poverty; ecosystems health and monitoring; and food, ecology and nutrition—run through the work of the hundreds of researchers, postdoctoral fellows and students at the Earth Institute.

Here are a few more highlights of the innovative projects we have conducted over the last year.

As our exciting work continues to move forward in the area of sustainable development, we remain committed to solving the world's most pressing needs.
— Jeffrey D. Sachs

Sustainable Development in Practice

As the main practice arm of the Earth Institute, the **Earth Clinic** supports projects designed to help developing countries and poor communities worldwide overcome economic and environmental problems. With generous support from donors such as Joe and Barbara Ellis, the Earth Clinic offers science-based assistance to address urgent issues of economic development, public health, energy systems, water management, agriculture and infrastructure.

One of last year's Earth Clinic projects included the Pilot Cook Stove Project, which aims to reduce human exposure to smoke from cooking fires in Ghana by providing clean-burning engineered cook stoves. This effort is designed to illuminate key uncertainties regarding the adoption of new cooking technologies and show the feasibility for larger-scale cook stove programs.

Season Smart, a project that received funding from donors such as the Countess Moira Charitable Foundation, aims to protect children throughout Africa by teaching community health workers to incorporate an understanding of how climate and seasons affect health and the spread of disease in their public health programs. A pilot program in Mali is teaching community health workers to advise families about how and when to focus on prevention of infectious disease transmission, in particular acute respiratory illness, diarrhea and malaria.

Mapping Emerging Disease Hotspots

By mapping global hotspots of emerging diseases, the **Center for International Earth Science Information Network** (CIESIN) and an international team of researchers found that the frequency of these ailments is increasing rapidly around the world. Some emerging diseases, known as *zoonoses*, pass from animals to humans and are becoming more common as human populations rise and wildlife is crowded into increasingly smaller areas. Risks are highest in East Asia, but hotspots can be found on every continent except Antarctica.

An Increasingly Urban World

With more than half the world's population now living in urban areas and the rapid shift to urban living expected to continue, the **Center for Sustainable Urban Development** (CSUD) is working on the ground in Nairobi, Kenya and New York City to address the challenges of urbanization. In July 2007, CSUD worked with the Rockefeller Foundation on a month-long conference to address the many challenges of urbanization—drinking water, sanitation, shelter, climate change preparedness and development—that face low- and middle-income countries where urban growth will be the most pronounced.

Sustainable Urban Communities

With support from the Ford Foundation, the **Urban Design Lab** teamed up with the Center for Sustainable Urban Development and the community-based organization WE ACT for Environmental Justice to examine the potential impacts of PlaNYC 2030's proposed congestion pricing plan, which would discourage traffic from entering southern Manhattan. The team studied ways to mitigate the effects of an increased pollution and congestion load on Harlem and other parts of the city, such as designing "green" bus depots and distributing them equitably across more than one neighborhood and developing a sustainable bus system that would help reduce noise and air pollution.

Ecology and Environmental Education, Columbia Grads, and Low-Income City Schools

This year scientists and graduate students from the Earth Institute are working in New York City public schools and a school in the Dominican Republic to bring hands-on science to the classroom and get teachers and students into the field. Funded by a $3.1 million grant from the National Science Foundation, the Learning through Ecology and Environmental Field Studies (LEEFS) program supports Columbia graduate students who work in middle and high school classes in low-income city schools where they present their research, assist with inquiry-based teaching, tutor students and lead field trips. The program builds on existing relationships between NYC schools, the **Center for Environmental Research and Conservation** and the **Lamont-Doherty Earth Observatory**.

Issues of Global Health

Recognizing that improvements in public health and quality of life cannot occur in isolation, the Earth Institute works through the **Center for Global Health and Economic Development** on scaling up access to health care for the poor. Support from donors like the Bill & Melinda Gates Foundation, the John D. and Catherine T. MacArthur Foundation, the Packard Foundation, and the Glaser Project Foundation, among many others, is critical to this work.

Among many ongoing health projects, several stand out. The Millennium Villages project has continued to provide basic health interventions to rural communities in sub-Saharan Africa. The Center for National Health Development in Ethiopia is helping create a new community health workers program and is advising 11 governments on scaling up the control of malaria and other tropical diseases. The Access project in Rwanda is applying business and management skills to public health systems to increase access to life-saving drugs and critical health services.

Photo: Bruce Gilbert

Left and right: In New York City and around the world, the Earth Institute is addressing global issues and teaching the next generation of leaders.

Photo: Bruce Gilbert

The sustainable management and distribution of water resources has emerged as a global challenge in the 21st century. Regions of every continent now experience periodic water stress in one form or another. The Columbia Water Center, a new initiative of the Earth Institute at Columbia University, was established in 2007 to lead intellectual inquiry into the assessment, prediction and solution of the emerging global water crisis.

Researchers at the Water Center are investigating and evaluating original solutions to water scarcity in some of the most challenging settings in the world, working with local partners to understand their unique needs and craft viable solutions. The Water Center also sponsors regular seminars on water issues and is developing water-related courses.

Upmanu Lall *Director, Columbia Water Center*

Photo: Bruce Gilbert

"Water scarcity is emerging as a global problem, with ramifications for food security, energy production and needs, and biodiversity. Strategies for managing risks due to changing climate, changing water use demographics and depleting groundwater resources are urgently needed," says Upmanu Lall.

"The Columbia Water Center is working on theoretical and field developments to meet this challenge. Improving water use efficiency in agriculture while improving rural economic returns is a major goal of our science and policy research."

Lall is Alan and Carol Silberstein Professor of Engineering in the Department of Earth and Environmental Engineering and the Department of Civil Engineering and Engineering Mechanics and is a senior research scientist at the International Research Institute for Climate and Society (IRI).

"Strategies for managing risks due to changing climate, changing water use demographics and depleting groundwater resources are urgently needed."

Tanya Heikkila *Associate Director, Columbia Water Center*

"In the face of climate change, rapid population growth and growing economies around the world," says Tanya Heikkila, "we face tremendous uncertainty over how best to use and allocate freshwater resources.

Photo: David Wentworth

"At the Columbia Water Center, we will conduct interdisciplinary research to understand how to manage water supplies locally, nationally and globally, as well as to devise institutions that will be adaptable to changing water supply and demand conditions."

Heikkila is an assistant professor in the School of International and Public Affairs who does research on collaborative and transboundary institutions for managing water resources.

Support for Water Initiatives

The Earth Institute has received significant donor support from individuals like Ceil and Michael Pulitzer and others like JM Eagle and the PepsiCo Foundation for our work on global water issues.

PepsiCo Foundation

A $6 million lead gift from the PepsiCo Foundation is supporting crucial work on water-related issues at the Earth Institute. The grant is an example of how private companies can be part of efforts to find globally relevant solutions to the growing challenge of water scarcity. The PepsiCo gift will fund water projects in critical settings like India, Brazil, China and Mali.

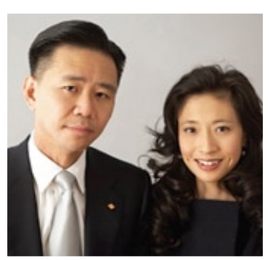
The PepsiCo Foundation's wish is to reverse the worldwide water crisis. "Without clean water, none of the other fundamentals leading to a healthy and prosperous life are possible," says Indra Nooyi, PepsiCo chairman, CEO and PepsiCo Foundation chairman. "We believe that the world water crisis is one of the most pressing challenges of our age. As a global food and beverage company, our success depends on being responsible stewards of this limited resource."

JM Eagle

JM Eagle, the world's largest manufacturer of plastic pipe, partnered with the Earth Institute to develop a sustainable system for transporting potable water throughout the Millennium Village cluster in Potou, Senegal, and in future sites in Ghana, Uganda, Mali and Rwanda. The water supply network in Potou, which features over 110 kilometers of high-strength PVC pressure pipe in various sizes, will provide drinking water to individual villages and improve public health.

Prior to JM Eagle's involvement, three tube wells in the region were used to supply four water towers in a 400-square-kilometer area that is home to 35,000 people. However, because that system only reached about one-third of the individual communities, most residents did not have direct access to water due to the lack of a functioning distribution infrastructure.

Walter and Shirley Wang, owners of JM Eagle, see their involvement in this project as a responsibility as well as an opportunity to have a hands-on role in helping solve the water scarcity crisis in the region. They are also pleased that the products they produce will play an important part in improving lives.



Many communities in the developing world lack sufficient infrastructure to transport water and suffer as a result. JM Eagle hopes to change this.

INSIDE THE COLUMBIA CLIMATE CENTER

Photo: Bruce Gilbert

The case has been successfully made that anthropogenic climate change is real and society is now asking, not for proof, but for solutions. The climate science community thus faces a new challenge: to provide strategies to minimize the negative impacts of ongoing and future change.

This requires advancing our knowledge of the impacts of climate change at many scales, understanding the institutions that will be responsible for implementing strategies of adaptation and mitigation, identifying the capacity to implement the technological and policy changes to carry out an array of solutions, and improving the scientific community's ability to communicate impacts and solutions to decision makers and to society at large.

To meet these challenges, the Earth Institute formed the Columbia Climate Center in 2007. The center integrates the many climate-related activities and research efforts throughout Columbia University, bringing together studies in the natural and physical sciences, in engineering, and in social and political science to improve humankind's capacity to understand, predict and respond to climate variability and change.

Peter Schlosser *Director, Columbia Climate Center*

Photo: Bruce Gilbert

"Climate research has always been a strong part of Columbia and can be traced all the way back to the early work of the Lamont-Doherty Earth Observatory. The Columbia Climate Center builds on these contributions to move toward a solution-oriented approach to a problem that is so multidimensional," says Schlosser.

Peter Schlosser is associate director and director of research at the Earth Institute, Vinton Professor at the School of Engineering and Applied Science, and a professor in the Department of Earth and Environmental Sciences.

"Climate research has always been a strong part of Columbia and can be traced all the way back to the early work of the Lamont-Doherty Earth Observatory."

Mary-Elena Carr *Associate Director, Columbia Climate Center*

Photo: Mark A. Inglis

"At the Columbia Climate Center we aim to improve the pathways of communication so that the results of our research reach both decision makers and society at large."

Oceanographer Mary-Elena Carr comes to Columbia after a research career at CalTech's Jet Propulsion Laboratory and two years at the National Science Foundation.

Centers, Departments and Programs Active in the Columbia Climate Center Include:

Lamont-Doherty Earth Observatory (LDEO) and the Department of Earth and Environmental Science (DEES) Climate-related research in oceanography, geochemistry and biology at LDEO and DEES focuses on the basic science and processes that determine climate conditions of the past, present and future.

International Research Institute for Climate and Society (IRI) IRI works to improve climate science and the delivery of climate information to decision makers, and to develop climate risk management strategies with the goal of enhancing the ability of developing nations to manage climate-related impacts.

Cooperative Institute for Climate Applications and Research (CICAR) A partnership between Columbia and the National Oceanic and Atmospheric Administration (NOAA), CICAR combines modern and paleoclimate data with Earth system models to study and predict climate variability and change.

NASA Goddard Institute for Space Studies (GISS) and Center for Climate Systems Research (CCSR) GISS and CCSR combine comprehensive global data sets, obtained mainly from spacecraft, with global models of the atmosphere, land and ocean to predict climate changes in the 21st century and to quantify climate sensitivity.

Center for Environmental Research and Conservation (CERC) A consortium that includes Columbia University, the American Museum of Natural History, the New York Botanical Garden, Wildlife Conservation Society and Wildlife Trust, CERC aims to build environmental leadership, stem the loss of biodiversity, and achieve environmental sustainability through research and education.

Lenfest Center for Sustainable Energy (LCSE) and Department of Earth and Environmental Engineering (DEEE) LCSE and DEEE seek to develop technologies and institutions to meet global needs for sustainable energy while reducing emissions of atmospheric greenhouse gases.

Mailman School of Public Health Climate-related research at Mailman examines the impacts of climate change on public health in urban and rural settings, including heat-related mortality and the spread of infectious diseases.

Center for Research on Environmental Decisions (CRED) CRED performs research in decision making by individuals and groups under climate uncertainty with the goal of improving decision-making processes and communication.

Global Roundtable on Climate Change (GROCC) GROCC brings together stakeholders from the private sector and international governmental and nongovernmental organizations to explore the scientific, technological and economic issues critical to shaping public policies on climate change.

Center for International Earth Science Information Network (CIESIN) At the intersection of the social, natural and information sciences, CIESIN applies its expertise in data management, spatial data integration and training, and interdisciplinary research to improve access to information and to serve the needs of scientists and decision makers.

Environmental Law Clinic The Environmental Law Clinic brings students together with local, regional and national organizations to solve critical environmental challenges facing the metropolitan region.

Master of Arts Program in Climate and Society The 12-month M.A. Program in Climate and Society trains professionals and academics to understand and manage the impacts of climate variability and change on society by taking an interdisciplinary problem-solving approach.

Timeline of Climate Research at Columbia University

1950s LDEO starts deep-sea sediment core collection for paleoclimate work.

1960s Paleoclimate research confirms the magnitude of past climate changes.

1970s CLIMAP program headquartered at LDEO campus produces maps of past ocean temperatures.

1980s
- Mark Cane and Steve Zebiak make first El Niño predictions.
- Wallace Broecker proposes conveyor belt concept that links ocean currents to climate change and suggests abrupt climate change is possible.
- James Hansen testifies on global warming in front of U.S. Senate.

1990s
- Columbia University founds the Earth Institute where climate is an important focus of sustainable development work.
- IRI founded to enhance society's ability to respond to the impacts of climate variability.
- CIESIN brings its capabilities in socioeconomic and environmental information to the Earth Institute.

2000s
- Links between climate and public health and ecology become active areas of research.
- LCSE founded to develop technologies and institutions for sustainable energy and carbon management.
- CRED founded to study decision making under climate uncertainty.
- GROCC founded to develop consensus regarding climate change among corporate and political stakeholders.
- Columbia Climate Center founded to integrate and coordinate climate research at Columbia University.

EDUCATIONAL PROGRAMS

Photo: Kevin Krajick

The Earth Institute fosters a wide range of innovative undergraduate, master's and doctoral educational programs that are housed across multiple schools and departments at Columbia University. Currently, there are over 28 academic programs in environmental studies and sustainable development associated with the Earth Institute.

We are committed to training a new generation of professionals and academics in the field of sustainable development, giving them the intellectual and practical foundations to address many of the world's challenges such as climate change, global water, natural disasters and other critical issues.

"The Sustainable Development Ph.D. program has tremendously impacted my vision of the world. It's a place that gathers enthusiastic people who dream to make a difference in every corner of the globe."
— Aly Sanoh

Interdisciplinary Ph.D. in Sustainable Development

The interdisciplinary Ph.D. in Sustainable Development is offered by the Graduate School of Arts and Sciences in collaboration with the Earth Institute and is housed in the School of International and Public Affairs. The program welcomed its first class of six students—selected from a pool of 190 applicants—in 2004.

Marta Vicarelli, a current Ph.D. candidate, shared in the 2007 Nobel Peace Prize with the Intergovernmental Panel on Climate Change (IPCC) and Al Gore. Ph.D. candidate Aly Sanoh spent his first year working to help develop a costing model for national electrification schemes to meet the Millennium Development Goals in Senegal and Kenya. "The Sustainable Development Ph.D. program has tremendously impacted my vision of the world," says Aly. "It's a place that gathers enthusiastic people who dream to make a difference in every corner of the globe."

Master of Public Administration in Environmental Science and Policy

The Master of Public Administration in Environmental Science and Policy, housed in the School of International and Public Affairs, has more science courses than any other M.P.A. program currently offered in the United States. It trains students to be sophisticated public managers and policy-makers who can apply innovative, systems-based thinking to understanding and maintaining the health of Earth's interconnected ecological, institutional, economic and social systems. For each of the three semesters, students work collaboratively in hands-on workshop courses where they apply their course work to real-world case studies. The increasingly popular program welcomed its first class in 2002 and has already graduated over 300 students.

Master of Arts Program in Climate and Society

The Master of Arts Program in Climate and Society, housed in Columbia University's Department of Earth and Environmental Sciences, is a unique 12-month interdisciplinary master's program that offers its students the opportunity to learn about climate issues from both the physical and social science perspectives. A summer internship program gives students the opportunity to gain practical experience. The program has graduated 76 students from all over the world. Graduates go on to pursue careers in nonprofit, public and private organizations.

New Undergraduate Special Concentration in Sustainable Development

A new undergraduate special concentration in sustainable development, housed in Columbia College and the School of General Studies, was launched in the fall of 2007. Within the curriculum are two new courses offered exclusively to students enrolled in the special concentration. The first of these courses, "Science of Sustainable Development," is designed to cover the elements of natural sciences necessary for students to gain an appreciation for the field of sustainable development and prepare them for more in-depth science courses. The second course, a client-based sustainable development workshop, focuses on methods of applied policy analysis.

Global Classroom Project

The Global Classroom project, launched in the spring of 2008, gives students around the world the opportunity to participate in interactive discussions with the top thinkers in the field of sustainable development without ever having to leave their classrooms. Through a combination of taped lectures and live, Web-based discussions, the inaugural, semester-long graduate course was taught at a dozen universities around the world, including the United States, Europe, Africa, South America, South Asia and East Asia.

An early initiative of the International Commission on Education for Sustainable Development Practice, the Global Classroom project is directed by the Earth Institute at Columbia University and supported by the John D. and Catherine T. MacArthur Foundation to help change the course of development education and create bold new leaders who can work to achieve a sustainable world.

Outside the Classroom

To supplement its academic offerings, the Earth Institute coordinates internships, research assistantships and travel grants for Columbia students to help them pursue practical work and research outside the classroom. From the laboratories and research sites of the Columbia campus to the Millennium Villages in Africa, students can enhance their understanding of the world through research and hands-on experience with a range of topics ranging from asteroid impacts to global health.

In addition, transportation grants for faculty make it possible to incorporate field trips into course curricula to get students out of the classroom and into the field where they can learn about the natural world in ways they cannot in Columbia's sophisticated urban setting.

▶ *Support from our many donors—such as the MSST Foundation and the Rockefeller Brothers Fund—is a critical part of our efforts to provide strong educational programs in sustainable development.*

Photo: Eileen Barroso

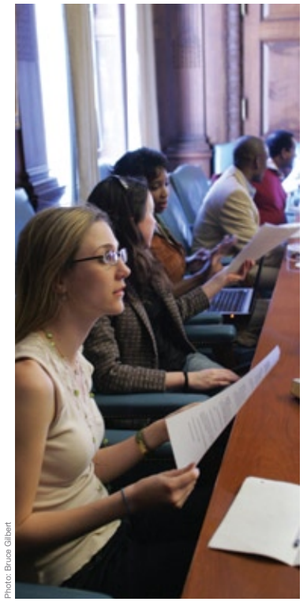


Photo: Bruce Gilbert

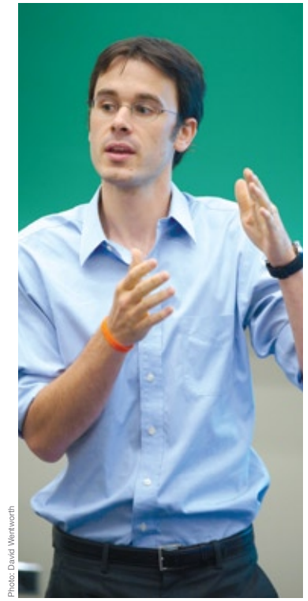


Photo: David Wentworth

Photo: Peter Freed

Photo: Alisa Frohman

Left and right: Students in the classroom and the field.