

IE PROFESSOR RACHEL NOBLE BALANCES RESEARCH AND STUDENT ENRICHMENT

Contaminated coastal waters can make people sick, especially children.

Diarrhea, upset stomach, nausea, and upper respiratory tract infections are just a few of the possible implications of contaminated waters for human health. In spite of these health risks, the currently used tests for water quality problems require a day or more for results. This delay in notification also increases the total amount of time necessary to re-open recreational waters after contamination has passed. These delays adversely impact tourism, recreation, and the economy of coastal areas, and places people at risk for illness.



Rachel Noble

In recent years, advances have been made in water quality testing. Rachel Noble, professor of marine sciences at UNC-Chapel Hill's Institute of Marine Sciences and director of IE's Morehead City Field Site, developed a technique using molecular tools to test for water quality rapidly reducing the total time to notification to less than three hours rather than 18 or more. Noble began using molecular tools to study developmental biology as an undergraduate at Carnegie Mellon University in Pittsburgh, Pennsylvania. As a graduate student, she applied some of the molecular tools that she learned as an undergraduate to answer questions in marine microbiology. For nearly a decade, Noble has been working with UNC Institute of Marine Sciences Research Analyst Denene Blackwood to develop and test these methods for use in rapid water quality testing in a wide range of environments. "We can now notify the public of beach contamination in hours instead of days", Noble said. "In my lifetime, I hope to see notification in a period of minutes — that would be truly revolutionary."

This advancement in water quality testing isn't the only way that Noble's work has real impact on people's lives. As director of the IE's Morehead City Field Site, Noble teaches and advises groups of undergraduates each fall that return to Chapel Hill with unparalleled classroom, field and research experience. The site is minutes from the Duke University Marine Laboratory, NC State University's Center for Marine Sciences and Technology, a National Oceanic and Atmospheric Administration research facility, and a leading coastal conservation non-profit (the North Carolina Coastal Federation). Each fall, Noble welcomes students for seminars, field trips, interaction with faculty and access to facilities unparalleled on the east coast. Noble's

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INSTITUTE DIRECTOR LEADS NATIONAL WATER MODELING INITIATIVE

In the United States, 22 federal agencies have major roles related to water. To a great extent, each agency has concentrated on its own mission, using computer models designed to make specific management and regulatory decisions. For example, the National Weather Service may concentrate on models to forecast rainfall and potential flood events; the U.S. Army Corps of Engineers develops models that can be used to manage rivers for transportation and flood control; and the Environmental Protection Agency develops and uses models to manage water pollution. Each model is separately developed and supported by its agency.

Increasingly, however, it is recognized that the existing models must be updated to take advantage of improved information technology, that they have common elements and that today's water problems often cut across all these issues—suggesting that a collaborative model incorporating elements from various agencies is critical for the future of water management.

Developing the next generation of water models will require strong collaboration, both among federal agencies and with scientists who have the expertise to help. This past spring, UNC Institute for the Environment Director Larry Band hosted a meeting in Chapel Hill to take the first step towards a collaborative approach. To do so, Band called upon representatives of several federal

Participants of the 2012 workshop of the National Water Model Initiative at the North Carolina Botanical Garden in Chapel Hill.



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National Water Model, continued from page 1

agencies and scientists to launch a community approach to develop common modeling tools. Band is a leading hydrologist and a recent chair of the Board of Directors of the Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI), an organization representing more than 130 U.S. universities and international water science organizations.

With colleagues at CUAHSI, the National Weather Service, the U.S. Geological Survey and the U.S. Army Corps of Engineers, Band is designing the National Water Model Initiative. The initiative kicked off in April with that three-day workshop in Chapel Hill, which brought together roughly 50 scientists from five federal agencies (including NASA and EPA) and several universities. Together, the group identified three science and management drivers that will be the focus of the first community-built models:

1. *Improved forecasting and management of hypoxia (low oxygen levels in water bodies) and water pollution;*
2. *Better forecasting, planning and management of hydrologic extremes (flooding and droughts) to reduce their impact; and*
3. *Ensuring water security, including adequate water supplies and quality for drinking, industry and agriculture, and safe infrastructure for water*

“Obviously these three areas intersect,” Band noted. “For instance, drought causes challenges with regard to having adequate, reliable water. But, to date, each of these issues were addressed separately by different agencies, each using its own models. Through the National Water Model Initiative, we want to develop a basic core of state-of-the-science community modeling tools using common data, testing facilities and training that can be used by all of the agencies and scientists for research and management.”

Members of the National Water Model Initiative are connecting through biweekly teleconferences and quarterly face-to-face meetings. Their second

“We have been treating water problems as separate, sectoral issues for too long. We need a common, community approach.” —Larry Band

meeting was held in July in concert with the CUAHSI meeting in Colorado.

This will be a long-term project, Band acknowledged. Developing and distributing a complete new generation of hydrologic models will take five or ten years.

Once developed, the new community modeling tools will prove valuable for North Carolina, said Band, an expert who develops models that integrate water, carbon and nutrient cycling and has carried out major reviews of models developed for national water quality issues in the Chesapeake Bay, the Everglades and Cape Cod, as well as North Carolina projects focusing on the Neuse River Basin, Jordan Lake and other watersheds. “Our state’s population continues to grow rapidly, which means greater demand for water, but at the same time we have had unprecedented droughts. North Carolina is becoming increasingly water-challenged, and we have yet to put together the type of infrastructure – freshwater supply, distribution and management – that we need to meet this growing demand.”

Band’s involvement will also yield opportunities for other UNC faculty and students to be involved in this modeling work, and the three targeted areas resonate with UNC’s new “Water in our World” two-year, campus-wide academic theme.

BUILDING A BRIDGE FROM COLLEGE TO CAREER: IE’S DEVELOPING ENERGY LEADERS THROUGH ACTION (DELTA) PROGRAM

STUDENTS DISCUSS THE IMPACT THAT INTERNSHIPS THROUGH IE HAVE HAD ON THEIR EDUCATION AND CAREERS.



ERIN HIATT

Under mentors David McNelis and Gerald Cecil, Hiatt, who worked on developing the DELTA internship program initially, used her internship to develop a Carolina Students Taking Academic Responsibility Through Teaching (C-START) program about smart grid and the future of energy. Hiatt recruited 12 guest speakers from small business, non-profit, and utility interests to speak about smart grid and critical energy issues, and registered 15 undergraduates for the course. She also held an internship at Progress Energy (now a subsidiary of Duke Energy), where she worked for over a year as a change management intern. During her internship, Erin branded “EnergyWise” (a program that works across communities to lower energy usage during occasional periods when demand is unusually high), and continued her spring 2011 internship into the fall, when her responsibilities expanded to include business processes. “My time as a DELTA intern in Progress Energy’s smart grid department, and the other smart grid research I was able to do as a result, played a crucial role in helping me land a rewarding sustainability position after graduating,” Hiatt said.



CHRIS WERNER

Chris received his Masters of Science in Environmental Engineering at Carolina in May 2012. While he was seeking an internship that would connect his experience to the real world, he heard about the DELTA program through a listserv. DELTA, he said, was about “placing students with entities that have real world issues to deal with.” His internship was with the Town of Morrisville (North Carolina), where he evaluated and analyzed energy efficiency in town buildings and researched financing options and types of systems to provide background for the town’s plans to retrofit some buildings with solar energy capability. He completed his internship earlier this year and is still working on both of these projects for the town, which hired him as a temporary employee to see his projects through.

INSTITUTE HELPS PLAN STATEWIDE PROGRAM TO ADDRESS ENVIRONMENTAL HEALTH ISSUES IN N.C. HOMES

The IE's Environmental Resource Program (ERP) is helping North Carolina state and local agencies develop a statewide plan to address environmental hazards in homes that can cause serious children's health problems such as lead poisoning or asthma.

Last year, ERP staff helped the N.C. Division of Public Health's Children's Environmental Health Program secure a multi-year grant from the Centers for Disease Control and Prevention (CDC) to launch a statewide Healthy Homes initiative to assess and address environmental triggers in homes that could cause harmful health impacts to children. Earlier this year, unfortunately, federal budget cuts forced the CDC to cut the grant to one year.

"We've had to reorganize the project, working closely with local health departments and other state organizations to better leverage existing programs," said ERP Environmental Health Educator Amy MacDonald. "We are now focused on developing a strategy for addressing the need for education and outreach on environmental health, while being realistic about achieving these goals with limited budget for implementation."

Strategic planning is being led by the Healthy Homes Outreach Task Force, convened by ERP. The task force brings together representatives from several branches of the N.C. Department of Health & Human Services, other state agencies, several county health departments, nonprofit organizations, IE and other programs at UNC and North Carolina State University.

Healthy Homes grew out of a CDC-funded program that focused on lead poisoning prevention in the state. ERP was involved in outreach and education for this program for the past five years. As awareness grew and incidence of childhood lead poisoning lessened, the program was expanded to cover asthma, pests and pesticides, and other environmental health issues in the home.

Leveraging existing resources

One of the ways the task force plans to advance the program is by weaving aspects of Healthy Homes into related, grant-supported programs where appropriate. For instance, ERP administers the Community Outreach and Engagement Core (COEC) of the UNC Center for Environmental Health and Susceptibility, which has several projects where Healthy Homes concepts are a natural fit.

"Without funding, local health departments have limited to no capacity to



do this work," said ERP Director Kathleen Gray. "Fortunately, our staff's efforts with the COEC and community-based organizations (CBOs) in Durham and Lenoir counties are helping build capacity to address these needs in several different ways, such as training the CBOs to conduct home assessments."

ERP has also helped develop the nhealthyhomes.com website, which is hosted by the Guilford County Health Department, in partnership with several state agencies. The site includes valuable information and educational resources, including fact sheets such as Five Steps to a Healthy Home.

Ed Norman, program manager for the Children's Environmental Health Program in the N.C. Division of Public Health, has worked closely with ERP for several years. "UNC-ERP has brought a breadth of technical and organizing skills to the table, which have combined to move the strategic planning process toward a successful conclusion. The ERP staff is adept at interpreting technical information from diverse professions – including the housing industry, environmental protection and public health – and translating this information to facilitate discussion among stakeholders whose expertise may be of a narrower scope."

Noble, continued from page 1

leadership at the site has inspired and transformed the career trajectories of students who study there.

Students live in Beaufort while studying at the field site. Located at the convergence of numerous, large-scale estuaries and two major oceanic inlets along the North Carolina Outer Banks, the field site is adjacent to the Gulf Stream and boasts a wealth of wetlands, marshes, estuarine and river ecosystems, oyster reefs, mud flats, and beach environments. Noble doesn't undervalue these assets when it comes to the student experience. "Students coming to our field site often make a connection here that makes a strong impact on their career outcomes," she said.

Noble's time when students are at the site is mostly focused on making sure their experience is a fulfilling one. "When the students are in town, I end up wanting to watch over them and guide them through their experience," she said. While she concedes that teaching students in the classroom is a great way to start the process, it is the site's offerings in the field and out in the community that really make it a one-of-a-kind opportunity. The students, she says, affect the entire marine science community, bringing enthusiasm and new ideas to her research. "In my laboratory, the undergraduate students bring a fire and desire that cannot be matched. They often renew my own resolve to be a better environmental steward," Noble said.

In addition to stimulating seminars, access to some of the world's best marine science research scientists and facilities, and unparalleled hands-on field experiences, students at Noble's field site also work as a team on a research project. "They investigate and work to solve or better understand a marine science problem," Noble says. At the Morehead City Field Site, these "cap-

stone projects," a component of all of IE's field site curricula, have included investigating wind energy potential for coastal North Carolina, stormwater runoff, oyster populations and restoration, and beach nourishment—topics that Noble says are relevant to national, state, and local government.

As though her water quality work and field site program weren't keeping her busy enough, Noble also conducts research on marine microbial food webs—specifically, viruses and bacteria. Bacteria in seawater are part of a critical cycle of carbon in our oceans that affect phytoplankton, which remove carbon dioxide from the atmosphere as they grow. Like her research in water quality testing, Noble brings novel molecular methods to study these processes, which are critical for accurately quantifying the ocean's role in managing the level of greenhouse gases in the atmosphere, among many other things.

IE director Larry Band recognizes in Noble an outstanding balance of critical environmental research, teaching, and leadership that make her a great asset to the Institute and to Carolina as a whole.

"Rachel's work is a wonderful example of the development and translation of cutting-edge science to products that have immediate impact on the management and protection of our environment," he said.

"In my laboratory, the undergraduate students bring a fire and desire that cannot be matched." —Rachel Noble

GIFTS &
GRANTS

NEW FUNDING SUPPORTS IE PROJECTS

The UNC Institute for the Environment is grateful for a number of recent gifts, grants, contracts and subcontracts that help our faculty, staff and students continue to pursue important research, education and outreach programs.

The National Science Foundation provided a grant in support of an IE Center for Sustainable Energy, Environment and Economic Development effort to establish collaborative projects with the Northern Arctic Federal University in Arkhangelsk and the Higher School of Economics in Moscow. Center Director David N. McNelis led a group of five UNC researchers to Russia to preplan collaborative research in energy efficiency, biomass applications and methane releases. IE's Christian Chan-Gilbert and Glenn Schweitzer, Bob Pinschmidt from the UNC Institute for Advanced Materials, Nanoscience and Technology, and Professor of Environmental Sciences and Engineering Stephen Whalen also participated in the visits of the two universities.

The Wallace Genetic Foundation provided a second grant of \$10,000 in support of Senior Associate Director Tony Reevy's Capacity Building for the UNC Institute for the Environment Program. This program also involves Director for Development-Environment David Greer. The Foundation also provided a \$75,000 grant in support of the Environmental Resource Program's (ERP) Promoting Watershed Stewardship Across North Carolina project, which also involves Associate Director for Outreach and Public Service Kathleen Gray and ERP Project Coordinator Michele Drostin.

The North Carolina Department of Environment and Natural Resources provided \$12,000 supporting the Environmental Resource Program's (ERP) teacher professional development institute, Environment and Health: Making Connections through Water Quality Investigations. Project leaders were Associate Director for Outreach and Public Service Kathleen Gray and Environmental Education Coordinator Sarah Yelton.

Under a Cooperative Agreement with the **National Park Service** through the **Piedmont-South Atlantic Coast Cooperative Ecosystems Studies Unit**, Research Associate Zac Adelman received \$220,000 to participate in the Three State Air Quality Study (3SAQS). The 3SAQS is focused on understanding the local and regional air quality impacts of oil and gas development in the states of Colorado, Utah, and Wyoming. IE will coordinate the collection and assessment of air pollutant emissions inventories from oil and gas development projects, conduct regional air quality modeling to quantify the regional impacts of oil and gas development, and train stakeholders on how to best engage in the 3SAQS. The project also involves other IE faculty and staff, including Mohammad Omary, Uma Shankar, and Limei Ran.

Environ International Corporation provided two contracts totaling \$116,388 funding Research Associate Zac Adelman's work in support of the West Jump Air Quality Modeling Study (AQMS). The West Jump AQMS is developing air quality modeling data, tools, and analyses in support of regional and local

air quality goals for the states and tribes in the western United States. The project also involves other IE faculty and staff, including Alejandro Valencia Arias, Jeanne Eichinger, Susan Fratazzi, Dawn Morgan, Mohammed Omary, Uma Shankar and Dongmei Yang.

The United States Department of Homeland Security, through the UNC Coastal Hazards Center of Excellence led by Gavin Smith, provided an additional \$203,165 for the hazard and disaster planning work of IE's Deputy Director and Center for Sustainable Community Design Director Phil Berke and his colleagues. To date, this grant has provided nearly \$750,000 in support of this research.

The Environmental Law Institute received \$15,000 in support from the **McKnight Foundation** for IE's Center for Sustainable Community Design Deputy Director David Salvesen to conduct the McKnight Wetlands, Wildlife Habitat, and Flood Hazards Workshop. The workshop was held in Cedar Falls, Iowa on May 16, 2012, at the University of Northern Iowa's Center for Energy and Environmental Education.

Under a NASA project, the **University of Alabama at Huntsville** provided a grant of \$139,000 to IE Center for Environmental Modeling for Policy Development Director Adel Hanna's Incorporating Space-borne Measurements to Improve Air Quality Decision Support Systems project. The project also involves other Institute's faculty and staff, including Aijun Xiu, Limei Ran, and Zac Adelman.

Under a sub-award from the National Aeronautics and Space Administration, **Wyle Laboratories, Inc.** provided \$224,354 to IE Research Associate Professor Sarav Arunachalam to develop near real-time and predictive models of ozone and particulate matter production due to aircraft operations for further use in assessing the environmental impact of predicted aircraft operations to support NASA's surface movement scheduling research. This project also involves other IE faculty and staff, including Alejandro Valencia Arias, Elizabeth Adams, B.H. Baek, Jared Bowden, Mohammad Omary and Aijun Xiu.

The Mid-Atlantic Regional Air Management Association (MARAMA) provided \$58,605 in support of IE Research Associate B. H. Baek's work on MARAMA's emissions inventory development for 2012. Also involved in the project with IE staff Zac Adelman, Darin Del Vecchio, Jeanne Eichinger, Jizhen Zhao, and Mohammed Omary.

The Federal Aviation Administration provided grants totaling \$309,986 renewing the Agency's support for IE Research Associate Professor Sarav Arunachalam's work on modeling impacts of aircraft emissions. This year's work will focus on developing a modeling system for aviation air quality performance analyses in support of FAA's goals under Destination 2025. The project also involves other IE faculty and staff, including B. H. Baek, Jared Bowden and Mohammad Omary.

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CONGRATULATIONS! IE CELEBRATES UNC'S CURRICULUM FOR THE ENVIRONMENT AND ECOLOGY'S 2012 GRADUATES



New graduates toss their hats in the NC Botanical Garden.

Brianna Steele enjoys the NC Botanical Garden with her mother.



IE Associate Director for Education Greg Gangi celebrates with new graduate Sarah Rhodes and her family.



Graduate Sean Murphy celebrates his years of hard work at Carolina with his family.



Curriculum for the Environment Director Jaye Cable welcomes students to the ceremony."



Graduate Ovik Banerjee is congratulated by IE Director Larry Band (center) and Associate Director for Education Greg Gangi (right.)

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FATHER-DAUGHTER GIFT PROVIDES ENVIRONMENTAL FIELD STUDY OPPORTUNITIES FOR UNC STUDENTS



Four generations of Pates have attended Carolina. The latest to carry on the family's Tar Heel tradition is Jessica Pate, who earned her undergraduate degree in environmental science in 2007.

At Carolina, Jessica took advantage of several field study opportunities, assisting in marine conservation research in Mexico, exploring how elephants affect woodlands in Kenya, and studying coral reef ecology in the Virgin Islands with her academic advisor, IE Associate Director for Education Greg Gangi. The experiences ignited Jessica's passion for marine biology and led her to study sea turtles in Costa Rica, Africa and Florida after graduation.

So when Jessica's father, Tim Pate, retired to Chapel Hill last year and was looking for a way to give back to the University, the 1980 graduate (business administration) was encouraged by his daughter to do something for UNC's environmental programs.

“Once Greg told us that there were students who wanted to participate in the field studies programs but couldn't afford to, the thought of helping them really appealed to us.” —Tim Pate

“Dr. Gangi was always encouraging me and other students to take field classes and to study abroad. Those programs made a huge impact on my life: they led me to the career I've chosen,” said Jessica, who is now pursuing a master's degree in marine biology at Florida Atlantic University. “Participating in those programs can be expensive, and we wanted to help students who might not otherwise be able to afford it to have that experience.”

After talking with Gangi and IE Development Director David Greer, Tim and Jessica decided to establish a scholarship fund to provide support for UNC students to participate in field learning and research at the IE's field sites in Thailand, the Galapagos Islands, the United Kingdom, and in several regions of North Carolina.

“Once Greg told us that there were students who wanted to participate in the field studies programs but couldn't afford to, the thought of helping them really appealed to us,” Tim said.

He also saw this gift as an opportunity to start his daughter on a course of philanthropy at an early age. “As a father, I felt this was a way to teach my child to start thinking about what she wanted to support, and who it was going to help.”

The Pates' generosity will definitely help many Carolina students, said Gangi, who will lead a committee that will award these scholarships, focusing first on need, then merit. “We are grateful to the Pates for providing this generous gift. It is tremendously affirming to know that Jessica and Tim found so much value in Jessica's environmental education at Carolina that they want to make similar experiences possible for other students who may not have the financial means to participate

otherwise. We are committed to ensuring that students have access to experiential education, because those experiences have such a positive impact on their personal development and career opportunities.”

PEOPLE NEWS

Dr. Andy Keeler has joined the Outer Banks Field Site (formerly named the Albemarle Ecological Field Site) as Co-Director. Keeler will take the helm as director in January 2013, when the field site will shift focus to incorporate more environmental policy.

Dr. Karen Kandl has joined the Highlands Field Site as Associate Director. Kandl is an instructor in the department of biology at Western Carolina University.

Dr. Thomas H. Martin is the Interim Director of the Highlands Field Site while Director James T. Costa is on research leave. Martin is an associate professor in Western Carolina University's department of biology.

Dr. Michael Emch has joined IE's Faculty Advisory Committee. Emch is a professor of geography at UNC.

Dr. Conghe Song has joined IE's Faculty Advisory Committee. Song is an associate professor in UNC's department of geography.

Dr. Rachel Noble, director of IE's Morehead City Field Site, is now a full professor and continues to conduct her research at the UNC Institute of Marine Sciences in Morehead City.

Dr. Jeffrey McDonnell is a world-renowned isotope hydrology specialist at Canada's University of Saskatchewan and will visit the UNC and Duke University next spring as the 2013 Keohane Professor.

On the Board

William E. Hollan, Jr. has joined the Institute's Board of Visitors. Hollan lives in Winston-Salem, N.C. and is the recently retired CEO of Turnpike Properties of Winston Salem. Throughout his career he was involved in working for Tanglewood Park Foundation, Inc., the N.C. Chapter of The Nature Conservancy, the N.C. Clean Water Management Trust Fund, Roanoke Island Commission, Sci-Works, The Environmental Science Museum of Forsyth Co., and the Arts & Sciences Foundation, Inc. He is a 1968 graduate of UNC-Chapel Hill and was a Morehead-Cain Scholar.

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RECENT EVENTS

CMAS Conference: The 12th annual Community Modeling & Analysis System Conference was held at the William and Ida Friday Center in Chapel Hill from October 15-18, 2012. Each year, the CMAS Conference allows the model user and development communities to share their experiences with air quality models, modeling, and model development.

Water and Health: The 2012 Water and Health Conference was held from October 29-November 2nd at the William and Ida Friday Center in Chapel Hill. This year's conference focused on science, policy, and innovation and was organized by The Water Institute at UNC. The first and second annual Water and Health Conferences were organized by the UNC Institute for the Environment and The Water Institute. The event continues to address critical water issues related to both natural and anthropogenic stressors.

Environment and the Arts: IE welcomed author William deBuys and photographer Alex Harris for a lecture and book signing on October 23rd on UNC's campus in Chapel Hill. Their widely acclaimed book, *River of Traps*, was a Pulitzer Prize finalist and is hailed for its intimate look at life and nature in the American southwest.

C. Boyden Gray Seminar: Ambassador C. Boyden Gray spoke to students, faculty, and staff on October 4th about market-based solutions to the management of air pollutants in the United States. Gray served as U.S. Ambassador to the European Union from 2006-2008, and previously was the U.S. Special Envoy to the European Union and served as counsel to President George H.W. Bush. He pioneered efforts to reduce pollutants that contribute to acid rain through market-based management.

Birdsall-Dreiss Lecture with Dr. Jay Famiglietti: Dr. Jay Famiglietti, professor of hydrology at the University of California, Irvine, spoke about NASA's GRACE (Gravity Recovery and Climate Experiment)—including the implications of the data collected for the future of water availability and sustainable water resources management. Famiglietti teaches in the earth system and civil engineering departments, and was featured as an expert in the recently released film, "Last Call at the Oasis." The Birdsall-Dreiss Lectureship is sponsored by the Geological Society of America.