Even though freshwater concentrations of mercury are far greater than those found in seawater, it’s the saltwater fish like tuna, mackerel and shark that end up posing a more serious health threat to humans who eat them. The answer, according to Duke University researchers, is in the seawater itself.
As we start a new academic year, I would like to extend a warm welcome to all our undergraduates, our new and returning graduate students, my faculty colleagues, the staff, and to our most recent additions to the CEE faculty: Assistant Professor Desirée Plata and Professor Marco Marani.

Plata is an environmental geochemist whose career has focused on man's chemical interaction with the Earth System. She comes to Duke University from the Massachusetts Institute of Technology, where she was a Visiting Professor in the Department of Civil and Environmental Engineering and the Department of Aeronautics and Astronautics. She was recently honored by the National Academy of Sciences with an invitation to the 2011 Kavli Frontiers of Science Symposium for promising young scientists. Professor Plata holds an undergraduate degree in Chemistry with minors in Biology and Mathematics from Union College in Schenectady, NY, and a Ph.D. in Chemical Oceanography and Environmental Chemistry from the Massachusetts Institute of Technology and the Woods Hole Oceanographic Institution. Professor Marani has a joint appointment in the Nicholas School of the Environment. He was previously the Director of the International Center of Hydrology at the University of Padova, Italy. His research interests encompass hydrometeorology, remote sensing applications to hydrology and tidal morphology, fluvial geomorphology and climatology. He holds a Ph.D. in hydrodynamics from the University of Padova.

Our faculty members continue to receive national and international recognition. The Director of the Office of Economic Policy and Summit Coordination, U.S. State Department, Western Hemisphere Affairs Bureau, has appointed Professor Ana Barros as a Senior Fellow under the Energy and Climate Partnership of the Americas (ECPA). ECPA is a regional partnership to promote clean energy, advance energy security, fight energy poverty, reduce greenhouse gas emissions and build capacity for climate change adaptation. Professor Mark Wiesner recently won the Clarke Prize from the National Water Research Institute, and has also been named the President-Elect of the Association of Environmental Engineering and Science Professors. Professor Heileen Hsu-Kim was selected out of a pool of 1,150 applicants to receive a five-year, $760,000 Early Career Research Award from the Department of Energy. Prabhakar Shrestha, a graduate student of Professor Ana Barros, received an award for his presentation on how aerosols affect local climatology at the Atmospheric Chemistry Conference of the American Meteorological Society. Prabhakar completed his Ph.D. in 2011 and he is now doing postdoctoral work at Bonn University in Germany. And, fourth year graduate student Kaoru Ikuma has won the 2011 Dean's Award for Excellence in Mentoring from the Duke Graduate School. She was selected in recognition of her consistent record of good mentoring practices. Kaoru is studying under the supervision of Professor Claudia Gunsch.

Lupita Temiquel-McMillian, Student Services Coordinator in the Dean’s Office, will now be serving as academic dean for all our civil and environmental engineering undergraduates, as well as the mechanical engineering undergraduates. I have worked with Lupita before, and I know our students will be very pleased that she has taken on this new role. At the same time, we also salute Connie Simmons for her great dedication to our students over the years: she is finally getting some relief from an advising responsibility that had grown too large.

Our warmest congratualations to all our recent graduates: they are an important component of Duke’s academic and professional reputation. A special message goes out to all our alumni: keep in touch. There is nothing that gives us more satisfaction than to hear about your well-deserved honors and successes.

Marc Deshusses. Thomas is working to remove invasive species through gene silencing in microalgea cultivation for biodiesel, under the supervision of Professor Claudia Gunsch. Hydrology and Fluid Dynamics graduate student Julien Brun won a NASA Earth and Space Science Fellowship to characterize the role of tropical cyclones in the eco-hydrology of the southeastern United States, under the supervision of Professor Ana Barros. Environmental engineering graduate student Lauren Barton has won a Chateaubriand Fellowship from the Office for Science and Technology in the Embassy of France in the United States. Lauren will be working at CEREGE—the Centre Européen de Recherche et d’Enseignement des Géosciences de l’Environnement—at the University of Aix-Marseille with international collaborator Jean-Yves Bottero, the director of CEREGE. The focus of her doctoral research is comprehensive risk forecasting of emerging contaminants, specifically nanomaterials, under the supervision of Professor Mark Wiesner. Prabhakar Shrestha, a graduate student of Professor Ana Barros, received an award for his presentation on how aerosols affect local climatology at the Atmospheric Chemistry Conference of the American Meteorological Society. Prabhakar completed his Ph.D. in 2011 and he is now doing postdoctoral work at Bonn University in Germany. And, fourth year graduate student Kaoru Ikuma has won the 2011 Dean’s Award for Excellence in Mentoring from the Duke Graduate School. She was selected in recognition of her consistent record of good mentoring practices. Kaoru is studying under the supervision of Professor Claudia Gunsch.

Miguel A. Medina, Jr.
Professor and Interim Chair
The potentially harmful version of mercury – known as methylmercury — latches onto dissolved organic matter in freshwater while it tends to latch onto chloride — the salt — in seawater, according to new a study by Heileen Hsu-Kim, assistant professor of civil and environmental engineering at Duke’s Pratt School of Engineering.

“The most common ways nature turns methylmercury into a less toxic form is through sunlight,” Hsu-Kim said. “When it is attached to dissolved organic matter, like decayed plants or animal matter, sunlight more readily breaks down the methylmercury. However, in seawater, the methylmercury remains tightly bonded to the chloride, where sunlight does not degrade it as easily. In this form, methylmercury can then be ingested by marine animals.”

Methylmercury is a potent neurotoxin that can lead to kidney dysfunctions, neurological disorders and even death. In particular, fetuses exposed to methylmercury can suffer from these same disorders as well as impaired learning abilities. Because fish and shellfish have a natural tendency to store methylmercury in their organs, they are the leading source of mercury ingestion for humans. “The exposure rate of mercury in the U.S. is quite high,” Hsu-Kim said. “A recent epidemiological survey found that up to 8 percent of women had mercury levels higher than national guidelines. Since humans are on the top of the food chain, any mercury in our food accumulates in our body.”

The results of Hsu-Kim’s experiments, which have been published in the journal *Nature Geoscience* (3:473, July 2010), suggest that scientists and policymakers should focus their efforts on the effects of mercury in the oceans, rather than freshwater. Her research is supported by the National Institute of Environmental Health Science.

In the past, most of the scientific studies of effects of mercury in the environment have focused on freshwater, because the technology had not advanced to the point where scientists could accurately measure the smaller concentrations of mercury found in seawater. Though the concentrations may be smaller in seawater, mercury accumulates more readily in the tissues of organisms that consume it. “Because sunlight does not break it down in seawater, the lifetime of methylmercury is much longer in the marine environment,” Hsu-Kim said. “However, the Food and Drug Administration and the Environmental Protection Agency do not distinguish between freshwater and seawater.”

Mercury enters the environment through many routes, but the primary sources are coal combustion, the refinement of gold and other non-ferrous metals, and volcanic eruptions. The air-borne mercury from these sources eventually lands on lakes or oceans and can remain in the water or sediments.

The key to the sun’s ability to break down methylmercury is a class of chemicals known as reactive oxygen species. These forms of oxygen are the biochemical equivalent of the bull in the china shop because of the way they break chemical bonds. One way these reactive oxygens are formed is by sunlight acting on dissolved organic matter. The light-activated organics transfer their energy to oxygen molecules in the water. “These reactive forms of oxygen are much more efficient in breaking the bonds within the methylmercury molecule,” Hsu-Kim said. “And if the methylmercury is bonded to organic matter instead of chloride, then the break down reaction is much faster.”

Tong Zhang, a Ph.D. candidate in Hsu-Kim’s laboratory, was first author on the paper.
New International Nano-Safety Initiative

The cleanliness of our water faces pressures from many directions. More factories mean more discharges, a growing population leads to more wastewater, and more runoff from lawns and farms carries pollutants into waterways. While there are many elements in water that may be harmful to people and the environment, one of the newest constituents are particles too tiny to see — yet they are drawing the heightened attention of environmental engineers.

Nanoparticles — so-called because they are about 1/10,000 the diameter of a human hair — are finding their way into industrial processes, common consumer products and fertilizers. Their use is becoming increasingly common because their miniscule size gives them special properties that their normal sized counterparts don’t have.

Since they came into broader use in the past decade, these nanoparticles have not been as rigorously researched as other agents; scientists are only now starting to figure out which nanoparticles are the most dangerous to human health, as well as animal and plant life.

In the latest step toward better understanding the true nature of the problem, a new international consortium, funded by a four-year, $4 million grant from the U.S. Environmental Protection Agency (EPA) and the United Kingdom’s Environmental Nanoscience Initiative, has been formed to determine the environmental behavior, bioavailability and effects of manufactured nanomaterials in ecosystems on land.

Known as the Transatlantic Initiative for Nanotechnology and the Environment, the consortium will be directed by scientists at the Center for the Environmental Implications of NanoTechnology (CEINT) which is based at Duke University. The new consortium is made up of scientists from the UK, Carnegie Mellon University, the University of Kentucky and Duke. Kentucky’s Paul Bertisch is the consortium’s project leader.

“One area in CEINT that will grow as a consequence of this initiative is research on the potential impacts of nanomaterials on agricultural lands,” said CEINT director Mark Wiesner, James L. Meriam Professor of Civil and Environmental Engineering at Duke's Pratt School of Engineering. Wiesner specializes in nanoparticle movement and transformation in the environment.

“Our risk assessment work to date has shown that many nanomaterials in consumer products are likely to make their way into wastewater sludges that are in turn applied to land as fertilizer,” Wiesner continued. “This new effort bolsters CEINT’s research efforts by adding top soil scientists and prominent new collaborators in the United Kingdom.”

It is estimated that approximately 60 percent of the eight million tons of biosolids produced each year in the US and the UK are applied to agricultural lands. Biosolids are what remains after wastewater and sewage have been treated. After additional treatment to remove toxins and pathogens, these biosolids are often used on farmlands.

However, it is not known whether these treatments are effective in removing nanoparticles, and if they aren’t, what effects these nanoparticles could have on the environment.

Research has shown more than 90 percent of certain nanomaterials, such as nanosilver, end up in biosolids. Thus, land-applied biosolids can become an important source of nanomaterials in soil where they can be taken up by microorganisms, earthworms or plants, with the potential for transfer up the food chain to animals and humans. Runoff and erosion from agricultural lands receiving biosolid applications can also introduce nanomaterials directly into streams and rivers.

“Accumulating evidence suggests that sewage sludge or biosolids generated from wastewater treatment will be a major source of manufactured nanomaterials to terrestrial ecosystems,” Bertisch said. “Our consortium has assembled some of the world’s top scientists working on the fate, transport, bioavailability and toxicity of nanomaterials in terrestrial systems, as well as those working in the area of assessing the risks associated with the release of nanomaterials to the environment.”

The consortium will conduct research to quantify the amount of nanomaterials added to soil via biosolids, examine how nanomaterials introduced into the waste stream are modified in the waste treatment process and in soil, and how this influences their transport or uptake by plants, animals and other organisms, as well as assess the relative risks to ecosceptors and humans.

Duke professor of chemistry, Jie Liu, joins Wiesner as the consortium’s other Duke scientist.

CEINT is a participant in two of the three recently funded EPA-UK initiatives. The second involves CEINT’s Rich Di Giulio, professor in Duke’s Nicholas School, who will collaborate in nanomaterial ecotoxicology work with researchers at Rutgers University.

CEINT was created two years ago with a $14.4 million grant from the National Science Foundation and the EPA.
New Faculty

Desirée L. Plata, formerly a visiting assistant professor of chemistry at Mount Holyoke College and visiting assistant professor of civil and environmental engineering and aeronautics and astronautics at MIT, is joining the department effective July 1, 2011. Plata specializes in the environmental impacts of nanomaterials and aims to develop environmentally benign nanomaterial manufacturing processes. She earned a doctorate in chemical oceanography and environmental chemistry from MIT and the Woods Hole Oceanographic Institution. She holds a Bachelor of Science in chemistry with minors in biology and mathematics from Union College in Schenectady, NY.

Marc Deshusses, professor, specializes in the design, analysis and optimization of processes for the bioremediation of contaminated air, water and soils. Specific areas of research include bioreactors for air pollution control and biotreatment of contaminated soils, sediments and water. One current project is concerned with the evaluation and optimization of an innovative waste management to energy system at a local pig farm. A two million gallon digester was installed to convert pig manure to biogas, which is burned in a microturbine for energy generation. The resulting wastewater is further treated and recycled to flush the barns. With this system, methane and other greenhouse gas emissions are greatly reduced, while generating renewable energy. In another project, Deshusses is collaborating with Assistant Professor Heileen Hsu-Kim to understand the factors that affect the bioavailability of mercury to methylating bacteria. In 2010, Deshusses co-organized with Professor Revah of Mexico City, the Duke-UAM Conference on Biofiltration for Air Pollution Control. The event was held in Washington, DC and attracted close to 100 international participants. Deshusses is a co-editor for the Chemical Engineering Journal, and an associate editor for Biotechnology & Bioengineering; both are top ranked journals in the field. Deshusses is also spearheading development of a new undergraduate major in energy engineering at Duke, working in concert with Josiah Knight of the Department of Mechanical Engineering and Materials Science.

John Albertson, the W. H. Gardner, Jr. Department Chair, specializes in environmental fluid dynamics surface; hydrology and boundary layer meteorology; dynamic coupling of energy, water and carbon cycles, and vegetation dynamics in semi-arid ecosystems. Albertson is leading a series of international summer schools in Venice, Italy titled “Biogeodynamics and Earth Systems Sciences.” He will be on sabbatical for the 2011-2012 academic year, conducting research and teaching in Italy. Projects will include modeling the interaction between water cycle, vegetation and climate in Alpine environments, and monitoring and modeling the Flumendosa basin water.

Ana Barros, professor, specializes in environmental physics, hydrometeorology, remote sensing, climate change and engineering infrastructure. She was recently awarded a three-year $550,000 grant from NASA to characterize and define orographic precipitation in mid-latitude mountainous regions. She serves as the chief editor of the American Meteorological Society’s Journal of Hydrometeorology; as scientific editor of the journal Meteorology and Hydrology published by the European Geophysical Society’s Natural Hazards and Earth System Sciences section; and as associate editor for the Journal of Hydrology, published by Elsevier.

Fred Boadu, associate professor, specializes in applied geophysics, with a focus on applications for petrophysics, engineering and environmental geophysics. A recent publication in the journal Geophysics (vol. 75(3), 2010), focused on the influence of petrophysical and geotechnical engineering properties on the electrical response of unconsolidated earth materials. In addition to his research, Boadu is committed to improving education and awareness of the dangers of nitrate contaminations in groundwater in rural Ghana. And he is investigating the role of geological, geo-environmental and geophysical properties of the earth materials surrounding aquatic habitats that foster mosquito populations and malaria outbreaks.
John Dolbow was named the Yoh Family Professor in the past year. He specializes in the development of numerical methods for problems where evolving interfaces such as material defects or fluid-structure interaction play a crucial role. Dolbow serves as the co-editor of the journal *Finite Elements in Analysis and Design*, and serves on the editorial board of *Computer Methods in Applied Mechanics and Engineering*. He is also the department’s Director of Graduate Studies, and leads graduate student recruitment efforts.

Lee Ferguson, associate professor, specializes in the application of high-performance mass spectrometry techniques to problems in environmental toxicology and chemistry. Active areas of investigation include development of methods for broadband qualitative and quantitative analysis of polar organic contaminants in the environment, as well as the use of proteome analysis techniques for investigating mechanisms and biomarkers of chemical stress in aquatic organisms. Ferguson holds a joint appointment with Duke’s Nicholas School for the Environment. He recently published research on how advanced oxidation processes for biofilm control may result in unintended quorum sensing responses by microbial communities in the journal *Environmental Science & Technology* 44:19, Oct. 2010.

Henri Gavin, associate professor and licensed professional engineer, specializes in structural dynamics and earthquake engineering with a focus on seismic hazard analysis and parametric or semi-active control system. His research focuses on the protection of equipment and other building contents from earthquake hazards and encompasses methodologies such as devices to control damping, seismic hazard calibrations models, and assessing equipment isolation systems. Gavin co-authored a book chapter with Assistant Professor Jeff Scruggs titled “Earthquake Response for Civil Structures,” published in The Controls Handbook textbook 2nd edition, CRC Press, 2010. He recently spent a sabbatical visit at the University of Canterbury in New Zealand and contributed to the post-earthquake evaluation and assessment of engineered structures such as a hospital, churches and concrete reinforced structures. He has published several articles on the 2010 Darfield earthquake in Christchurch, New Zealand, in the *Bulletin of the New Zealand Society for Earthquake Engineering*.

Claudia Gunsch, assistant professor, specializes in environmental molecular biotechnology. Her research efforts focus broadly on studying the ecological impacts of emerging contaminants in natural and engineered systems as well as elucidating factors controlling horizontal gene transfer events for the development of genetic bioaugmentation based in situ bioremediation technologies. She recently published research titled “Effect of Carbon Source Addition on Toluene Biodegradation by *Escherichia coli* DH5a Transconjugants Harboring the TOL Plasmid,” in the journal *Biotechnology and Bioengineering*, 2010, 107(2):269-277 and “Effects of Selected Pharmacologically Active Compounds on Treatment Performance in Sequencing Batch Reactors Mimicking Wastewater Treatment Plant Operations” in the journal *Water Research*, 2011, 45(11):3398-3406. Gunsch is a National Science Foundation Early CAREER award winner, and serves as Associate Editor for the journal *Biodegradation*. She is also a co-founder of a Sommerville, MA-based startup company called 349Q that aims to use gene silencing to control the growth of invasive microorganisms in municipal and industrial settings as well as help people in developing countries gain access to safe drinking water.

Heileen Hsu-Kim, assistant professor, specializes in environmental engineering, environmental chemistry and geochemistry.

Hsu-Kim also served as a guest editor for a special topics issue of *Environmental Science & Technology* on “Nanoscale Metal-Organic Matter Interactions,” 2011, 45 (8), pp 3194–3195. Her research on the ongoing environmental implications of coal ash spill in Tennessee was covered by *Chemical & Engineering News* in December 2010.

Tomasz Hueckel, professor, specializes in the mechanics of materials with an emphasis on geomechanics. He focuses on the mechanical behavior of materials in variable physical, chemical and thermal environments. He recently obtained a $200K grant from ENI, Italian oil company, for research on subsidence prediction. He delivered an invited lecture on Mechanisms of Chemo-mechanical Coupling at ALERT-Geomaterials 2010 Annual Meeting of European Geomechanics Laboratories. He was a Visiting Professor at the University of Montpellier-2, France. He co-authored a book chapter on cracking of drying soils in “Mechanics of Unsaturated Soils,” published by J. Wiley, London, p 55-86, 2010. He recently published research results focused on temperature dependent internal friction of clay in a cylindrical heat source problem in *Geotechnique* 61, no. 9, 1-14, 2011.
Hsu-Kim 2011 DOE Early CAREER Award 2011

Heileen Hsu-Kim would like to like know exactly what happens when naturally-occurring or man-made mercury first reaches the sediments on the bottom of rivers or lakes and then gets taken in by a microbe. For her, this is the key step in a process that ultimately finds the microbe being eaten by a larger organism, and then another, all the way up the food chain – with the mercury accumulating each step of way.

“We all know that certain forms of mercury are toxic and what they can do living things,” said Hsu-Kim, assistant professor of civil and environmental engineering. “But we don’t totally understand the processes within the sediments that create dangerous forms of mercury. Before we can develop effective remediation strategies for mercury, we really need to understand what is happening at the nano-scale.”

Her approach to gaining insights into this crucial first-step is now being supported by a five-year, $760,000 Early Career Research Award from the Department of Energy (DOE). Out of the pool of about 1,150 university- and national laboratory-based applicants, 69 were selected this year for funding.

Hsu-Kim plans to spend the next five years teasing out all the subtle biochemical reactions and microbial influences that occur within the sediments to cause the formation of methylmercury, a form that is readily taken in by living things.

“This information will ultimately be used to establish a new geochemical framework for predicting mercury methylation potential in contaminated sediments,” she said, ushering in a new field she terms nano-geochemistry.

Her award comes from the Office of Biological and Environmental Research, one of the six offices supporting young investigators who focus on research areas that are a high priority for the DOE. She will also be working with researchers in Duke’s Center for the Environmental Impacts of Nanotechnology (CEINT) on this project.

Hsu-Kim has been on the Duke faculty since 2005, after completing a postdoctoral fellowship at the University of Delaware and graduate degrees from the University of California, Berkley.

Zbigniew Kabala, associate professor, specializes in deterministic and stochastic modeling of water flow and contaminant transport in saturated and unsaturated heterogeneous porous media, and the theory of related measurements.

Miguel Medina, professor, specializes in hydrologic and water quality modeling, contaminant transport, and surface and subsurface interactions. He has been appointed interim chair for the 2010/2011 academic year. From 2009-2010 he served as President of the American Institute of Hydrology. He was recently appointed to the Boren Fellowships Review Panel, a program supported by the National Security Education Program (NSEP), which focuses on geographic areas, languages, and fields of study deemed critical to U.S. national security.

Joseph Nadeau, associate professor of the practice, licensed professional engineer, and Director of Undergraduate Studies, received the 2010 Klein Family Distinguished Teaching Award for his outstanding efforts in teaching, mentoring and performing research at the Pratt School of Engineering during the annual Founder’s event. His primary research focus is in the areas of deterministic and stochastic groundwater modeling, contaminant transport, and subsurface interactions. He has been appointed interim chair for the 2010/2011 academic year.

Jeff Peirce, associate professor, specializes in environmental and systems optimization engineering, with a focus on large-scale engineering analysis networks for environmental research, and microbial transformation of gas phase contaminants in soil. He is a member of the National Science Foundation’s Science Committee on Collaborative Large-Scale Engineering Analysis Networks for Environmental Research (CLEANER-WATers).

Amilcare Porporato, professor, specializes in ecohydrology, soil and water resources, sustainability and stochastic processes in geophysics. He was recently awarded a $375,000 grant from the National Science Foundation’s Chemical, Bioengineering, Environmental and Transport Systems section for a project titled “Ecohydrology and Sustainability in Seasonally Dry Ecosystems.” He published 15 peer reviewed research articles in 2010 ranging from the journals Water Resources Research to Geophysical Research Letters to Bioscience. And he organized an international workshop titled Ecohydrology and Sustainability in Seasonally Dry Ecosystems, June 13-14, 2011, at Duke University.

David Schaad, associate professor of the practice and associate chair, specializes in sustainable engineering and development and environmental systems design for a range of applications such as water, wastewater, storm water and hazardous waste treatment. He also conducts work in wetland and stream restoration design; disaster planning, mitigation and response; and energy sustainability. He teaches the department’s practical methods in civil engineering (CE100) course and is a licensed professional engineer in 21 states. He also teaches Duke-wide courses in sustainable design, rebuilding after natural disasters and the science and policy of natural disasters. Schaad spent five weeks onsite in Las Mercedes, Honduras leading a student group through the design and fabrication of a 4,800 square foot infant and maternal health clinic. The team worked with the local community and Heifer International to complete the project, and equipped the facility with running water, solar power and a septic leach field.

Mark Wiesner, the James L. Meriam Professor of Civil and Environmental, won the 2011 Athalie Richardson Irvine Clarke Prize from the National Water Research Institute. He was cited for his efforts and leadership in improving water quality through advancements in membrane and nanotechnology research and received a gold medallion and $50,000. Wiesner specializes in water treatment, environmental nanotechnology, membrane separation, risk assessment and surface science. He is the director of the National Science Foundation/Environmental Protection Agency’s Center for the Environmental Implications of Nanotechnology (CEINT) based at Duke.

Wiesner was named President Elect of the Association of Environmental Engineering and Science Professors in July, 2010.

New Faculty

Marco Marani joined Duke in September 2011 as a professor in the Department of Civil and Environmental Engineering with a joint appointment in the Nicholas School for the Environment. He was previously the Director of the International Center of Hydrology at the University of Padova, Italy. His research encompasses hydrometeorology, remote sensing applications to hydrology and tidal morphology, fluvial geomorphology and climatology. Marani holds a Ph.D. in hydrodynamics from the University of Padova.
The Rev. Paul Gerritson, pastor of the Mount Moriah Baptist Church, faced a troubling dilemma. The church has been located on the same plot of rural Orange County land for more than 100 years. Since then, more than 400 church members had been buried in the cemetery behind the church.

Over time, many of the headstones have crumbled or their inscriptions have eroded. Some graves have been marked only with stones at the head and feet. Some don’t have any markers at all. And like most small churches, burial records, if they exist, are not always the most reliable. Especially the older ones.

“This is a problem common to small rural churches across North Carolina, many of which are even older than ours,” the Rev. Gerritson said. “Between the encroachment of nature around us and the lack of documentation – especially for the older graves – it can be difficult to get an exact handle on who is buried where and their exact locations. It becomes a challenge when we have to dig a new grave.”

When an unmarked grave was almost breached while a new one was being dug, the pastor decided that something needed to be done. So he contacted Duke’s Pratt School of Engineering and the University of North Carolina at Chapel Hill to see if they could help.

David Schaad, Pratt associate professor of the practice and associate chair of civil and environmental engineering, jumped at the chance to not only help the Rev. Gerritson, but to provide a unique hands-on learning experience for students in his CE100 – Practical Methods in Civil Engineering class.

“Typically, students learning surveying techniques practice at locations across campus,” Schaad said. “I thought this would be a great opportunity for them to learn these same skills in a new and more real-world setting.”

Students participating in this project were divided into eight groups, each one
known headstones and markers, and where possible, the name of the person buried there.

Schaad is considering continuing the project using ground-penetrating radar to further identify gravesites. The space where a coffin is located will have a different density than the earth surrounding it, a difference that can be picked up by the equipment.

The church was organized in 1823 and has occupied the current site since 1903. For the Rev. Gerritson, pastor for the past several years, cemeteries serve important spiritual needs of a church’s parishioners — past, present and future.

“Not only does it represent the final resting place of the departed, but it also is a special place for the living to visit friends and loved ones,” he said. “It’s a place for quiet thought and reflection.

“To plan for future burials, it’s so important that we have a better handle on who is buried in our cemetery,” he continued. “The results of this project should be of great help to us.”

Team Competes in Sustainable Design Competition

A Duke civil engineering student team earned an Honorable Mention in the Water, Pollution Prevention/Sustainable Development category at the Environmental Protection Agency’s People, Prosperity and the Planet (P3) competition in Washington, DC.

Their project, entitled “Watershed Management at the Basin Scale at Duke University,” focuses on the restoration of a stream and local storm water management system on Duke’s campus. The overarching goal is to create a basin-wide learning laboratory where students from different disciplines can work with practicing professionals to develop stream restoration, wetland mitigation and storm water management measures that are more effective than current management practices.

Faculty advisers included civil and environmental engineering faculty members David Schaad, Marc Deshusses, Zbigniew Kabala and Miguel Medina; Emily Bernhardt of the biology department; Duke Energy Manager Steve Palumbo; Nicholas School for the Environment Professor Curtis Richardson, and Jim Halley of the Durham-based firm EcoEngineering.

The student team included civil and environmental engineer graduate student Ashley Thomson, sophomore Grace Cambareri, juniors Ming Jiu Li, Annelise Mesler, and Lauren Shwisberg; biomedical engineering/civil engineering senior Richard Veerman; biomedical engineers Angie Luong, a junior, and Hyun Koo Chung, a freshman; freshman electrical and computer engineer Harris Osserman; and junior Nari Sohn, majoring in environmental studies.
Over fall break I traveled to El Salvador on a site assessment trip for a pedestrian bridge. It was my seventh trip to El Salvador, but my first visiting in the role of an engineer. The past six summers I’ve worked in an orphanage right outside of El Salvador’s capital city, San Salvador.

On my most recent trip in May of 2010, one of my Salvadoran friends who graduated from the orphanage and works as a teacher in a rural farming community told me about a problem her students have getting to class. Most of her students have to cross a river that rises up to two meters after heavy rainfall, at which point they cannot cross at all or must put themselves in danger attempting to cross and often arrive at school soaking wet. I brought this problem back to Duke and with the support of Duke Engineers for International Development (DEID) and David Schaad, faculty advisor of DEID and associate professor of the practice in civil and environmental engineering, I coordinated an assessment trip to address the need for a pedestrian bridge in this rural Salvadoran community. I recruited sophomore electrical engineer and Spanish minor Jack Jamieson and freshman engineering major Mauricio Villa to accompany me to El Salvador to visit some potential sites, meet with the community, and collect surveying data to map topographical features of the land.

On each day of our assessment trip in October 2010, we went out to see different sites with Mike Jenkins, the founder of a local NGO that works on community-driven development projects in San Jose Villanueva. Mike was very excited to have us “engineers” in his community and constantly alluded to different problems he expected us to be able to explain or fix, ranging from groundwater contamination to poor road conditions to the broken fan in his laptop. This was a bit nerve-racking as I looked around at the three of us – one only a month and a half into his first year of college, one a sophomore electrical engineering major, and me, who had only completed two courses in the civil engineering department before the beginning of my junior year.

Traveling around with Mike, we witnessed the incredible need for pedestrian bridges in this region of El Salvador, as the seasonal flooding leaves most river crossings impassible for days at a time and repeatedly wipes out the pasarelas (steel footbridges) that are constructed every year at some sites. We visited five different sites with each having unique issues, from roads that had been completely washed away, to crossings with existing bridges that are completely submerged and impassible after a heavy rain.

As the trip progressed, I was continuously surprised by our ability to actually answer some of Mike’s questions. At one
site there was a bridge with deep lateral cracks in the concrete deck and I was able to speculate based on what I learned in a Mechanics of Solids class that the cracks existed because the slab was under-reinforced. Without any rebar, which adds tensile strength, the concrete cracked in the direction perpendicular to the tensile loading.

At another site that had a pasarela, I was able to compare the scoured foundation to another bridge project I worked on in Bolivia with similar river flooding conditions. For the Bolivia bridge, rather than the shallow foundations resting on soil we saw for the pasarela, the foundations were over a meter and a half deep and were situated on solid bedrock. We surveyed two of the more promising crossings, and, based on interviews with the communities, chose the site where a pedestrian bridge would have the largest impact. On our last day, we even had the chance to take apart Mike’s computer and fix his fan.

A team of 20 Duke undergraduates is now in the process of designing the pedestrian bridge and preparing for an eight week implementation trip in the summer of 2011 during which the bridge will be constructed in partnership with Bridges to Prosperity.

Gibbs is a civil engineering major who plans to earn a graduate degree in structural design followed by a career in international development.
Summer: a time for students to relax and unwind from the rigors of yet another school year of challenging academic and social activities. Yet, for a group of passionate and dedicated Pratt engineering students, summer is the perfect time to apply the skills learned in Duke classrooms to real-life situations and settings.

Last summer, two groups of Duke engineering undergraduates did just that. Traveling to remote villages in Uganda with the Duke chapter of Engineers Without Borders (EWB) and Bolivia as part of Duke Engineers for International Development (DEID), the students gained hands-on experience in engineering solutions to issues facing developing nations, and came to have a greater understanding of the political and economic implications of development projects.

Duke students have been active in Nkokonjeru, Uganda, since 2006, working with the Rural Agency for...
Sustainable Development (RASD), a local nongovernmental organization that assists the residents of Nkokonjeru in assessing their health and water usage needs. Among the major concerns identified was the need for access to clean, potable water, as well as efficient water fill stations, to combat malaria and improve quality of life. Starting in 2009, Andrew Mang, a junior mechanical engineering and economics double major at Duke, became the lead coordinator for this project.

Mang notes the personal and scientific aspects of the project as follows: “I was involved in interviewing farmers, village chiefs, town business leaders, and leaders of local schools to assess their wants and needs. I also collected various technical data at each water source, including GPS coordinates, flow rate, observations about usage patterns, and any special geography that set the water source apart from others.”

After analyzing data and statistics collected, the Duke Uganda team, led by Mang, designed a water collection tank and fill station for the rural town’s spring boxes. “We plan to visit in summer 2011 to install four fill stations in the most heavily used tanks,” Mang said.

Fundraising efforts to finance this follow-up trip is going to be the team’s primary focus once the design work is complete.

Ben Gagne, a senior mechanical engineering major, served as project leader of a bridge construction project in Bolivia during the summer of 2009. Over the course of this visit, he and Phillip Danser, a senior civil engineering and public policy major, learned of the local need for improved irrigation during the yearly dry season. This would improve the financial stability of the local village of Obrajes and help keep the adolescent population from leaving their family farms in search of work in the nearby cities.

In an assessment trip the following autumn, the team began exploring four possible irrigation methods: alternative energy (including wind and solar), ground water, irrigation channels, and a retention pond. Working closely with a nongovernmental agency called Water Transport in Obrajes, Danser contributed his expertise from a structural engineering perspective and performed a cost-benefit analysis.

“We determined wind would not be strong enough to power a pump, and solar had low potential to work,” Danser said. “We left knowing there were three areas, 40 hectares each, that could work. In the end, we chose an area of undeveloped land to place a 60 to 80 meter-long pipe into an underground well.”

Much like the Uganda project, the primary focus of the Bolivia irrigation project this academic year has been fundraising for building materials and travel expenses. Duke’s sister chapter of EWB, called Duke Engineers for International Development (DEID), has received some assistance, in the form of a grant from the Kenan-Biddle Partnership, for collaboration with engineers from the University of North Carolina, Chapel Hill. The Bolivia team hopes to utilize these funds to return to Bolivia again this summer to drill their well, install the pump, and assist locals in establishing and managing electrical power to the pump.

The lessons learned and experiences gained from these two projects have gone far beyond technical expertise. As these trips coincided with the 2010 FIFA World Cup, the villagers shared their enthusiasm for the sport of soccer and, consequently, converted many of the Duke students into enthusiastic soccer fans. Through daily collaboration on matters such as sustainability and sports, students formed long-lasting relationships with the residents of their host villages.

As Gagne said, “The relationship we have with the community of Obrajes is not one I would soon give up.” Thus, through hard work and skill, team work and dedication, the Pratt students exceeded their goals, and provided a record of success that will be certain to inspire future Duke engineers to pursue even greater achievements in years to come.
In the summer of 2010, a DukeEngage team led by associate professor of the practice David Schaad, completed the construction of an Infant and Maternal Health clinic in Las Mercedes, Honduras. The project was originally conceptualized and facilitated by Duke Global Health Institute (DGHI) Senior Advisor and Duke Pediatrician Dennis Clements who leads the “Exploring Medicine” program connected to the medical, nursing, and physical therapy schools. Clements, who has been taking teams for an annual itinerant clinic in the area since 2000, identified a need for a permanent health care facility in the community. Working in collaboration with Honduran partners Heifer International, COMPRINIL and the Honduran Ministry of Health, student engineers designed the entire 4,800 square foot maternal-infant health clinic, complete with running water and electricity as part of CE185: Engineering Sustainable Design and Construction (taught by Schaad). Over the past two summers as part of DukeEngage experiences, students have worked in collaboration with the local community to construct the clinic.
Amy Allen

**MAJOR:** Civil Engineering; Certificate in Architectural Engineering  
**ADVISER:** Jeffrey Scruggs  
**PROJECT:** Dynamics and Control of Offshore Wind Turbines

This project aims to analyze and model the structural dynamics of floating turbines stabilized by various anchoring methods. Allen is studying the interactions between waves, wind, and the power generated by the turbine. Currently, most wind turbines are restricted to shallow ocean depths because concrete piles must be able to reach down to the ocean floor. If anchoring methods are developed that allow the turbines to be moved farther offshore, then more wind energy could be harvested in a more efficient manner and the turbines would have a smaller impact on the shoreline aesthetics.

The plan consists of a cylindrical buoy floating in the water at a variable depth and tilted at an angle. She has derived equations for the center of mass of the buoy and the water displaced by the buoy. These equations are then used to model the moment arm of the buoyant force and to determine whether it causes the buoy to capsize or return to static equilibrium. Stiffness and mass matrices were derived to determine the structural stability of the system. Moving forward, she will enhance the system to represent more complicated structures that include anchors and a turbine on top of the cylinder. Computer codes will also be created to model the more complicated systems and to easily study the effects of changes in design.

William Greer Mackebee

**MAJOR:** Civil and Environmental Engineering and Grand Challenge Scholar  
**ADVISER:** Helen Hsu-Kim  
**PROJECT:** Selenium Geochemistry of Coal Combustion Byproducts

Research into the fate of metal, metalloid, and radionuclide pollutants associated with coal combustion products during their disposal or accidental release into the environment becomes more important every year as the burning of coal for electricity and subsequent production of coal ash wastes increase. The importance of coal ash research is demonstrated by the December 2008 accident near Kingston, Tennessee, in which approximately 1.1 billion gallons of coal ash slurry were spilled over 300 acres of adjacent land and into the nearby Emory and Clinch Rivers. As with most coal combustion products, the spilled coal ash was enriched with certain contaminants, including selenium. This fact is troubling considering that the dangers of selenium, a toxic element that can bio-accumulate in the food chain and impart health risks to animals and humans, are well documented.

The objective of the project is to determine the speciation and biochemical cycling of selenium from sediments and water samples taken from aqueous environments proximal to the Kingston coal ash spill. Using high performance liquid chromatography coupled with inductively coupled plasma mass spectrometry, the project will incorporate initial research into the optimal conditions for selenium leaching. Previous results indicate that high alkalinity increases the capacity for selenium to leach from some coal ash samples, but these results must be upheld for the Kingston plant’s unique coal ash varieties. From these results, subsequent tests will be conducted to assess the overall speciation and relative danger of selenium still present in the environment.
Tyler Rohr

**MAJOR:** Civil Environmental Engineering  
**MINOR:** Math  
**ADVISER:** Amilcare Porporato  
**PROJECT:** Sustainable use of Water and Soils in Seasonally-dry regions: Exploring the Continuum Between Natural and Intensively Managed Ecosystems

The primary mission of this project is to explore water and soil interactions in seasonally dry ecosystems, particularly the northeastern portion of Brazil known as the caatinga. Computer code has been written to analyze carbon concentrations in the litter, hummus and biomass, as well as soil moisture, ammonia, and nitrate concentrations based on various parameters and data collected. Once the code and equations have been suitably modified to work with actual data collected from Brazil, the ultimate goal is to use the information to compare natural and intensively managed ecosystems, and finally derive an optimal, in terms of sustainability, practicality and financial necessity, method of agriculture for seasonally dry ecosystems.

Currently he is rewriting the code to work with actual data. Research progress to date has replaced Poisson distributed rainfall with actual collected values as well as created a seasonally periodic function to input actual litter values. As the work progresses, he will continue to adjust the code to make it more precise to the area. Then the research will move from adjusting inputs to analyzing outputs. This is where the heart of the project lies, in discovering how various methods of agriculture effect the soil-water interactions and eventually deriving an optimum solution.
The Duke chapter of the American Society of Civil Engineers gave amazing performances at the 2011 Carolina's Conference in Raleigh, NC, hosted by our neighbor, North Carolina State University. Our teams took first place wins in the quiz bowl, service project, and the Mead Paper competitions. Duke took second place in the tee shirt design contest and 3rd place overall for the concrete canoe.

Senior Spotlight

**Trisha Kathryn Lowe, '10**
Duke National Academy of Engineering Grand Challenge Scholar

**Winner:**
- Pratt School of Engineering Student Service Award
- William Brewster Snow
  Environmental Engineering Award
- ASCE Outstanding Senior Prize

For her Duke NAE Grand Challenge Scholars thesis project, Lowe focused on a project titled “Registering Carbon Offsets Available from Innovative Aerobic Swine Waste Management System.”

Her work on the project originated from a course (CE185: Engineering Sustainable Design) that she took from associate professor of the practice David Schaad. One of the topics that caught her attention was capturing methane emitted from livestock and converting that into energy. North Carolina is the second largest pork producing state in the nation and has a high density of hog farms in particular.

During Summer 2010 she researched and evaluated mass-balance calculations for various forms of swine waste management technologies to allow for a useful comparison. In particular, she looked at how effective different technologies are at managing the nitrogen cycle, how effective they are at keeping contaminants and wastewater out of water supplies, and how much energy and water they consume.

As a result of her efforts, Lowe was asked to contribute to the Duke Carbon Offset Initiative. She began the process to register carbon offsets available from a Clinton, NC farm already utilizing an innovative swine waste management technology. This encompassed completing the calculations necessary for registering the carbon offsets from the B&B Tyndall farm under the American Carbon Registry (ACR) and to complete the application required by ACR.

**Carolina’s Conference**

The Duke chapter of the American Society of Civil Engineers gave amazing performances at the 2011 Carolina's Conference in Raleigh, NC, hosted by our neighbor, North Carolina State University. Our teams took first place wins in the quiz bowl, service project, and the Mead Paper competitions. Duke took second place in the tee shirt design contest and 3rd place overall for the concrete canoe.

**Acara Challenge**

This year, a Duke team was one of four teams to win The Acara Challenge with a project focused on improving water usage in rural India. The Acara Challenge is a unique way for a university to get their students involved in entrepreneurship and sustainable design for social change. The competition purpose is to engage students in a multi-disci-
Acara Challenge... cont.

The competition purpose is to engage students in a multidiscipline, multi-country collaboration to develop sustainable solutions and business models to challenging global social issues as well as incubate and implement the winning plans into successful sustainable social businesses.

The winning team from Duke, the Ankur Initiative, included team members Anamika Goyal, Neha Limaye, Brendon Pierson and Ross Taggart. Their goal was to combat water stress in parts of rural India by selling affordable polytunnels—lightweight plastic miniature greenhouses—to subsistence farmers in order to reduce water loss and increase crop yields.

As part of the competition, the team developed a business plans for a sustainable business that addresses the subject of food and water security in the developing world. The first phase of the challenge was incorporated as a part of two courses: CE185: Engineering Sustainable Design and Construction, taught by David Schaad, associate professor of the practice, and ENV171: Food and Energy, taught by Charlotte Clark, visiting professor and associate director for education and training in the Nicholas School of the Environment. Between these two courses, five teams were formed and paired with industry mentors and a companion team from IIT-Roorkee to help in developing the concepts and business plans for the challenge. At the end of the semester, each team presented their concept to “venture capital-like” panel. From this initial judging, one team from Duke was selected to be one of the eight teams competing in the finals hosted at the University of Minnesota. The team from Duke was selected as one of four finalists which received funding to launch their business venture.

New Master’s Programs

The Department is now offering two new graduate degree opportunities: a Master of Engineering (M. Eng.) in either environmental engineering or civil engineering. The goal of the program is to offer an alternative to the traditional, research-focused Master of Science curriculum and give students a competitive edge in their careers. Ideal candidates for a master of engineering are early career professionals or recent B.S. graduates who know they want to go into practicing engineering positions in industry and are interested in product development, engineering support and technology innovation.

The non-thesis M. Eng. curriculum takes between 18 to 24 months to complete, and exposes students to a core of preparatory business courses and either an internship or applied research experience. So students gain business acumen to help them navigate corporate environments and better prepare for project management and also gain real world, practical research skills. The technical engineering courses reflect the research strength of the department and there is a high degree of flexibility to customize course selection.

“The MEng degree was started because there is an increased interest in masters level engineering education. The American Society for Engineering Education reports a 38% increase in the number of masters degrees awarded over the past 10 years,” said Brad Fox, associate dean for professional master’s programs. “Additionally, industry has placed significant emphasis on the need for innovation in order to be competitive. By innovation, companies are not just referring to invention but also implementation of that invention into practice. We crafted the MEng degree to address both aspects of the innovation equation.”

The Environmental Engineering M. Eng. curriculum gives students a choice to study in one of four areas: environmental nanotechnology, ecohydrology and environmental fluid dynamics, environmental engineering and public policy. And it draws on faculty from both the Pratt School of Engineering and the Nicholas School of the Environment.

The Civil Engineering M. Eng. curriculum allows students to gain greater technical depth in the areas of computational engineering, systems engineering and optimization, or geo-systems.

For more information about our new programs, visit http://www.cee.duke.edu/cee_meng
**Morse wins EPA STAR Fellowship**

Environmental engineering graduate student **Thomas Morse** won an EPA STAR Fellowship that will provide $42,000 per year for three years. Thomas Morse is working to remove invasive species through gene silencing in microalgal cultivation for biodiesel. Working with his adviser, Assistant Professor Claudia Gunsch, Thomas is looking at emerging genetic technologies such as antisense gene silencing and bacteriophage biocontrol to inhibit invasive species growth in the large scale cultivation of microalgae. If successful this technology has the potential to greatly reduce the cost of algae sourced biofuels and reduce biofouling in engineered systems.

**Strickland wins EPA STAR Fellowship**

Graduate Student **Matt Strickland** won an EPA STAR Fellowship that will provide $42,000 per year for three years. Matt is studying biofiltration of waste gasses containing dilute concentrations of methane by utilizing a biphasic reactor. A biphasic reactor contains bacteria growing in a mineral salts medium and a non-miscible second phase such as silicone oil. Synthetic waste gas containing methane is bubbled through the biphasic liquid emulsion and the presence of the oil facilitates transfer of methane gas into the liquid phase, where it is bioavailable. One secondary goal of this project is to engineer a method for biologically converting methane into methanol which could be collected and sold as a useful commodity. Matt is a student of Professor Marc Deshusses.

**Barton Wins Chateaubriand Fellowship**

Environmental engineering graduate student **Lauren Barton** has won a Chateaubriand Fellowship from the Office for Science and Technology in the Embassy of France in the United States. Every year, it allows doctorate students enrolled in American universities to conduct research in France for up to 10 months. Lauren will be working at CEREGE—the Centre Européen de Recherche et d’Enseignement des Géosciences de l’Environnement—at the University of Aix-Marseille with international collaborator Jean-Yves Bottero, the director of CEREGE. The focus of her doctoral research is comprehensive risk forecasting of emerging contaminants specifically nanomaterials. She is working on developing a comprehensive model to predict the exposure of nanomaterials that are transported through wastewater treatment plants (WWTP). The model will incorporate the key processes in WWT as well as fate and transport through land application of biosolids. The objective will be to design a comprehensive exposure assessment of nanomaterials in the environment that can be combined with toxicological data to produce and understand the risk associated with the materials. While in France, Lauren intends to work specifically on improving her model and decreasing the inherent uncertainty through laboratory experimentation to more accurately determine various model parameters. Chateaubriand Fellowship recipients receive a stipend, a round trip ticket to France and health insurance. Her adviser is Professor Mark Wiesner.

**Shrestha wins Award from American Meteorological Society**

**Prabhakar Shrestha**, a graduate student of Professor Ana Barros, received an award for his presentation on how aerosols affect local climatology at the Atmospheric Chemistry Conference of the American Meteorological Society. Prabhakar completed his Ph.D. in 2011 and he is now doing postdoctoral work at Bonn University in Germany.

**Ikuma wins 2011 Dean’s Award for Excellence in Mentoring**

Fourth year graduate student **Kaoru Ikuma** has won the 2011 Dean’s Award for Excellence in Mentoring from the Duke Graduate School. She was selected by a committee of graduate deans, faculty, and graduate students from a highly competitive pool of nominees in recognition of her consistent record of good mentoring practices. Kaoru is studying with Assistant Professor Claudia Gunsch, and her research focuses on the genetic evolution of bacteria following their exposure to environmental contaminants for the development of novel remediation technologies.

**Brun wins NASA Earth and Space Science Fellowship**

**Julien Brun**, a 3rd year doctoral student in civil and environmental engineering, won a NASA Earth and Space Science Fellowship for his research titled “Using Satellite Data to Characterize the Role of Tropical Cyclones in the Eco-hydrology of the Southeast United State.” Brun is studying under Professor Ana Barros.
Expanding Hong Kong Rail
For most of his life, Danal Blessis was rooted to the East Coast of the U.S. He lived in North Carolina since the sixth grade, graduating from Duke in 1982 with a civil engineering degree in 1982, followed by 13 more years in his first career stop.

Back then, the School of Engineering had not yet been named for Edmund Pratt, and during an introduction to a computer course, Blessis created computer programs by punching out holes on a sheet.

A lot has changed since then, especially Blessis' unexpected road to working in Hong Kong.

He is now the manager of knowledge management at MTR Corporation, a public transportation railway. Blessis is involved with planning all the company's future railway projects and expansion work. He helps manage the construction and expansion plans so that they go smoothly.

There is great importance for railway transportation in Hong Kong, since the mountainous terrain limits the amount of roads that can be constructed, Blessis said. Also, railways provide a much more sustainable and environmentally friendly alternative to the area. Currently, he is working on a 60-kilometer expansion of the railway that will connect Hong Kong to the high-speed network in China.

Blessis credits Duke for providing him with a very broad education, which helped him find his future career.

"The most important skill I gained was working with people. I learned how to better work in groups and how to plan ahead. Those are the sorts of things that become most important once you get out into the work field."

After college, Blessis worked for 13 years and moved up through the ranks at Carolina Power and Light, until he and his wife decided to move to Hong Kong. The big change in location came down to three deciding factors — "to have a chance to gain an international experience, continue to pursue our careers and save money, and to be able to travel."

Even though Blessis is halfway across the world, he is now more involved with the Duke community than ever before. He remains connected with the university by working with the Alumni Academic Admissions Council chair and by serving as president of the Duke Club of Hong Kong, where he interviews prospective students. Blessis said he's benefited a lot through his involvement with Duke.

"I've gained a lot of friends and a lot of meaningful personal relationships. Seeing such smart high school seniors applying to Duke, and being able to stay in touch with them is really rewarding."

Although Blessis' career is rooted in new technology, he believes that face-to-face interaction will always be the best method of communicating. Although technologies like smart phones, e-mail and social media sites help keep everyone connected from a distance; in-person communication will always be the best way to maintain meaningful relationships.

"People are getting sick of sitting at a computer; it doesn't replace the face-to-face communication. It is important for schools to continue to teach valuable people skills."

-Blessis

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People are getting sick of sitting at a computer; it doesn’t replace the face-to-face communication. It is important for schools to continue to teach valuable people skills.

-Danal Blessis
Undergraduates

Awards at Graduation

Left to right: Anna Katherine Sleeter, Andrew Joseph Harris, Andrew Joseph Wood, Matthew Marsh Wander

ASCE Outstanding Senior Prize – Trisha Kathryn Lowe and Anna Katherine Sleeter

William Brewster Snow Environmental Engineering Award – Trisha Kathryn Lowe and Andrew Joseph Wood

Aubrey E. Palmer Award – Andrew Joseph Wood

Eric I. Pas Award – Andrew Joseph Harris and Matthew Marsh Wander

Pratt School of Engineering Student Service Award – Trisha Kathryn Lowe

Graduation with Distinction – Andrew Joseph Harris, Matthew Marsh Wander

2010-2011 Graduates

December 2010

Do Hyuk Kang - PhD
Dissertation: Snow Hydrology: Measurement to Modeling of Snow Physical Properties
Adviser: Ana Barros

Christine Ogilvie Hendren - PhD
Dissertation: Framing and Assessing the Environmental Risks of Nanomaterials
Adviser: Mark Wiesner

Rawad Saleh - PhD
Adviser: Andrey Khlystov

Jessica Duvall Sanders - PhD
Dissertation: Stable Embedded Grid Techniques in Computational Mechanics
Adviser: Tod Laursen

May 2011

Steven Michael Lattanzio - MS
Thesis: Optimal Power Generation of a Wave Energy Converter in a Stochastic Environment
Adviser: Jeff Scruggs

Shihong Lin - MS
Thesis: Deposition of Silver Nanoparticles in Geochemically Heterogeneous Porous Media: Predicting Particle Mobility from Surface Composition Analysis
Adviser: Mark Wiesner

Prabhakar Shrestha - PhD
Dissertation: Characterization of Pre-Monsoon Aerosol and Aerosol-Cloud-Rainfall Interactions in Central Nepal
Adviser: Ana Barros

Frederick Owusu-Nimo - PhD
Dissertation: Investigating Linkages Between Engineering and Petrophysical Properties of Unconsolidated Geomaterials and their Geoelectrical Parameters
Adviser: Fred Boadu

David Murray Kahler - PhD
Dissertation: Pulsed Pumping Scheme for Improved Pump-and-Treat Groundwater Remediation
Adviser: Zbigniew Kabala

Amrika Deonarine - PhD
Dissertation: Sources and Biogeochemical Transformation of Mercury in Aquatic Systems
Adviser: Heileen Hsu-Kim