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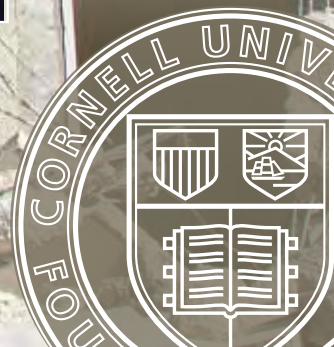
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UPDATE

SPRING 2010



**CEE Professors' Research Helps
to Mitigate Natural Disasters**



FROM THE Director



Phil Liu

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Spring 2010

On cover: Earthquake damage in Port-au-Prince, Haiti. Photograph taken ten days after the earthquake. Photo by Ken Hover.

On cover pictured left to right: Mark Turnquist, Linda Nozick, Ken Hover, Philip Liu, Thomas O'Rourke

Dear alumni and friends,

I came back from my one-year sabbatical leave in Taiwan and Germany and took over the directorship of the School last July. It has been a challenging and busy nine months. Budgetary constraints were imposed on all units across the campus last year and this year. While the university is making plans to adopt a new budget model and modify the administrative structure (to learn more, visit www.cornell.edu/reimagining/), we are fully committed to maintaining and strengthening the quality of our education and research programs.

Last year, we underwent an evaluation (including a site visit) by the Accreditation Board for Engineering and Technology (ABET) for our new B.S. in Environmental Engineering degree program, which is jointly offered by our School and the Department of Biological and Environmental Engineering. We received high marks and were accredited for three years so that the degree program will be in phase with the reaccreditation process of our B.S.C.E. degree. While I am on the topic of academics, I should note that *US News and World Report* ranked the Cornell Civil Engineering undergraduate program as the eighth-best (ninth last year) undergraduate engineering program in the nation, while the Cornell Environmental Engineering undergraduate program was ranked tenth (ninth last year).

I am happy to report that we have started a new faculty search in the area of Sustainable Systems Engineering: Energy, Transportation, and the Environment. This search is a joint effort between the School and the Energy Institute in the Cornell Center for a Sustainable Future. Energy and the environment are two key issues on the agenda of most, if not all, governments in the world. I believe that our School can play a major role in educating professionals and conducting research leading to better utilization of precious resources.

In the last nine months, several large earthquakes have struck different parts of the world and have caused devastating damage (e.g., September 29, 2009, M8.3 Samoa earthquake; January 12, 2010, M7.0 Haiti earthquake; February 27, 2010, M8.8 Chile earthquake). Some of them also generated large local tsunamis. In this issue, professors Ken Hover, Tom O'Rourke, and I talk about our own research in understanding the basic science of earthquakes and tsunamis and our experiences conducting post-disaster surveys. To mitigate any natural disasters it is essential to have a well-implemented emergency response plan, which includes the scheduling and routing of traffic for an evacuation and implementation of funds and supplies. Professor Linda Nozick describes her research in investment planning for evacuation and shelters, while professor Mark Turnquist investigates how to pre-position supplies after a disaster hits.

One of my goals during my tenure as director is to communicate as much as possible with CEE alumni. On a recent trip to the West Coast and to Houston, Texas, I managed to meet with a total of 12 alumni in four days. It was a pleasure to meet these folks and I plan to continue to meet a lot more alumni. We would, of course, always like to hear from you about what you are doing. Please send us your news and feel free to write me an email any time with your thoughts about your School. The address is located in this *UPDATE*.

Don't forget to join us at our annual Alumni Breakfast during reunion weekend, see the date and time on the back page. I look forward to meeting you.

Sincerely,

Director

ENGINEERING a Better Response to DISASTERS

When a natural disaster strikes somewhere in the world, it's a safe bet that before long a CEE faculty member will field an urgent request for assistance, advice, or comment.

The person on the other end could be a government official, a reporter, an international post-disaster team leader, or . . . the president of Cornell University. This was indeed the case at 9:30 P.M. on January 17, 2010, when professor **Ken Hover** returned home from a trip only days after a devastating earthquake hit Haiti.

"Is this a joke?" Hover thought to himself as the caller said "this is David Skorton" and then cut to the chase: Would Hover go to Haiti to assess damage to the Cornell-affiliated GHESKIO health clinics in Port-au-Prince? Given that virtually everything in Haiti was built with concrete, including all of the medical buildings in question, experience such as Hover's in the design and construction of concrete and masonry was needed.

The **GHESKIO** (Groupe Haitien d'Etude du Sarcome de Kaposi et des Infections Opportunistes) clinic is a nongovernmental organization dedicated to training, research, and the provision of HIV/AIDS and tuberculosis care. It has collaborated with Cornell Weill Medical School for 25 years. The two clinics, one downtown and one near the airport, provide free care and treatment for AIDS and TB patients—more than 100,000 a year. After the earthquake, GHESKIO had been providing care outside under tents, unsure about the structural safety of the buildings and wary of the numerous aftershocks. However, the medical staff still managed to provide humanitarian assistance to 6,000 refugees and emergency care to thousands affected by the disaster. Clearly, assessing damage to the buildings was urgent.



Concrete buildings damaged by earthquake in Port-au-Prince, Haiti.



Hover is quick to point out that, unlike some of his colleagues who embrace the actual nature of natural hazards, he is a general purpose structural engineer who teaches structural design courses and conducts research in concrete and masonry. "It was not so much that I am a disaster recovery person," said Hover. "They needed somebody who had an idea of how these buildings go together so they could look at them and decide whether they could continue operations."

While his assignment from President Skorton only pertained to Cornell facilities, Hover felt compelled to carefully document everything he encountered in Port-au-Prince, not just flattened buildings. He

recalls being encouraged by simple signs of human dignity among the refugees' daily struggles in sprawling tent cities and being dismayed by the poor concrete construction that caused buildings to crumble like sand castles. Since his return, he has held over a dozen talks or seminars to share his experiences and show some of the more than 2,000 photographs he took.

"There are things I saw down there that are just unbelievable," Hover offers. From a completely collapsed school building that contained 400 children to people standing patiently for hours in mile-long lines for food and water, Hover saw up-close both the desperation and despair of the Haitian people, but also their resilience and pride.



Main lobby of W.C. Johnson Research facility of the GHESKIO clinic.

The current situation, he says, can be summed up with a common Haitian saying: “There are mountains after mountains.” While Haitians may be accustomed to hard times, Hover insists that “they can not recover without our help.”

Although Hover had previously investigated major structural collapses, this was his first foray into natural disaster assessment. A number of his CEE colleagues are leading experts in various aspects of natural disaster engineering and mitigation, however. Their cutting-edge research involves tsunamis, hurricanes, mud slides, earthquakes, and more. Certain faculty, such as professor Thomas O’Rourke and CEE director Philip Liu, have extensive real-world experience at disaster sites. As a whole, the School has the subject pretty well covered, from geotechnical to structural to systems engineering. However, four members of the School stand out for their contributions to specific areas of research.

Professor **Linda Nozick’s** pathbreaking work applies math modeling and systems engineering to solve the complex problems of how to effectively evacuate and shelter those who are in the path of a hurricane or other disaster.

Professor **Phil Liu**, an internationally known expert on tsunamis, utilizes wave tanks and field studies to help understand tsunamis and improve tsunami forecasting and warning systems.

Professor **Mark Turnquist** is a leader of the nascent subdiscipline of “pre-positioning,” essentially the logistics of providing emergency supplies after a disaster.

Professor **Tom O’Rourke** pioneered the study of earthquakes and lifelines, buried infrastructure such as water and electricity.

“There is an important aspect of breadth here that may not occur in very many other places,” said Turnquist, who was one of the first people Hover turned to for advice before leaving for Haiti.

“Before I even went down there, Mark was saying to me, ‘This is all going to boil down to logistics,’” says Hover. “And it was absolutely true.” Four hours into an arduous 12-hour bus ride from Santo Domingo, Dominican Republic, to Port-au-Prince, Hover realized that the lack of any centralized control or plan was indeed slowing the pace of recovery and the distribution of aid.

Hover’s experience preparing for the Haiti trip illustrates neatly the complementary backgrounds that CEE faculty have in natural disaster engineering and mitigation. In the two days before his trip, he was able to reach out to all the resident experts in the School.

“I really felt like here within this School and campus, given 48 hours,” Hover said, “I got myself pretty well prepared.”

He recalls not being able to sleep or eat after Skorton called. But then, by Monday

night, he was feeling much better after amassing the proper gear and getting advice and assurances of help from his colleagues.

“I really went down there thinking I was the reconnaissance person who was then going to be able to funnel information back to the main campus,” Hover said. “By the time I actually left I was calm and ready to go. The night before I left I had a full night’s sleep.”

The first person Hover sought out for advice was **Phil Liu**; first, because he is director of the School, and second, because of his in-depth experience performing post-tsunami field studies. In October 2009, Liu was part of an NSF-funded reconnaissance team that traveled to Samoa to document the impacts of tsunamis that occurred on September 29. They examined flow depths, run-up heights, inundation distances, sediment depositions, and damage patterns at various scales. The collected field data is helping to validate numerical tsunami models used for forecasting and warning.

In 2005, Liu led a team of scientists and engineers to Sri Lanka to better understand the Indian Ocean Tsunami of December 26, 2004, one of the deadliest natural disasters in recorded history. From January 10–20 his team, composed of scientists from NSF’s Tsunami Research Group and the U.S. Geological Survey, studied wave heights, evidence from sediment deposits, and structural damage. The trip received a great deal of attention as reporters from the *Seattle Post Intelligencer* and *Nature* were “embedded” with the team as it made observations at the southern end of Sri Lanka and on the east and northeast coasts.

At first, tsunamis were just one of many research interests for Liu, but his first field survey in 1992 in Indonesia was an eye-opening moment. This was the “first time I really saw the impact on human lives,” he recalls. Since then, he has steadily increased his focus on the subject, with the Indian Ocean Tsunami reinforcing his passion.

For his research, Liu employs a wave tank equipped with a long-stroke wave maker, which he uses to mimic the long waves of tsunamis. As he explains, a typical ocean wave may have a period of only 3 to 10 seconds, while a tsunami wave period is on the order of 15 to 30 minutes. Using the state-of-the-art wave maker in the wave tank of the DeFrees Hydraulics Lab, Liu and his team are



New wave maker for studying tsunami waves.

able to compare laboratory results with field data to determine the accuracy of tsunami prediction models.

What Liu and his colleagues have learned is that the models are quite accurate, provided some key details are known.

"The big 'if,' Liu said, "is where the epicenter of the earthquake was and what the sea floor displacements were." If that information can be pinpointed, he explains, the numerical models can tell us the direction, amplitude, and time period—where and when the waves will hit. Thankfully, the deployment of deep ocean sensors in recent years has greatly improved the ability to detect tsunamis.

Even when there is time for evacuation, Liu points out, there is a great deal of uncertainty about how the giant waves will behave when they reach coastal regions. To solve this problem, his research team created COMCOT (Cornell Multi-grid Coupled Tsunami Model), a tsunami modeling package capable of simulating the entire lifespan of a tsunami, from its generation and propagation to its runup/run-down in coastal regions. Using

the model, Liu and his team are developing inundation maps for especially vulnerable coastal areas such as cities on the south coast of Sri Lanka.

An area that Liu is especially concerned about is the South China Sea, which until only very recently had no early warning system despite being in a high-potential subduction zone. For three years, he has been convening meetings in this part of the world to discuss the potential tsunami hazard and the need for a warning system for this relatively small area. Perhaps prompted by these meetings, the Chinese government will soon be deploying two sensor buoys in the region.

Down the hall and around the corner from Liu's second floor office in Hollister Hall is where the School's preeminent earthquake expert resides—at least some of the time. **Tom O'Rourke** can be hard to track down in person, with his rigorous teaching, research, and travel schedule. Fortunately, Ken Hover was able to contact O'Rourke by phone in Canada when he needed advice on assessing post-earthquake damage.

As Hover recalls, the single most

Generating Tsunamis with a New Wave Maker

In 2007 Spansion, Inc. provided a gift to the School to design and construct a new wave maker for studying tsunami waves. This contribution was part of a larger financial commitment Spansion made in 2005 for relief following the tsunami that devastated parts of Southeast Asia. This gift was facilitated by Mr. Richard Weigand B.S. '74, MEng '75, who was the VP for Risk Management and Real Estate in Spansion at the time.

The new wave maker is driven hydraulically and has a 4m stroke. The wave-maker is attached to a wave flume, which is 40 m long, 0.6 m wide, and 0.9 m deep. The wave maker is programmable and can generate very long transient waves, which can be used to study tsunami propagation and runup on beaches.

important piece of information that O'Rourke shared was where to find a little green handbook called the *Applied Technology Council-20* report, which would prove invaluable. The report describes how to properly assess a building that has been damaged by an earthquake and determine if it can be reoccupied. Using the handbook's methodology, Hover was able to determine that some of the buildings the medical staff had thought were safe, had actually sustained heavy damage.

O'Rourke is well acquainted with the ATC-20 having inspected and evaluated damaged buildings multiple times at far-flung disaster sites. Starting in the late-1980s, he began participating in earthquake reconnaissance missions—a decision that had a huge effect on his career. His first mission took him to Ecuador in 1987, where an earthquake had decimated a swath of rural jungle, wiping away villages and

“The big ‘if’ is where the epicenter of the earthquake was and what the sea floor displacements were.” philipliu

damaging the oil industry.

“It was a real wake-up call,” he said of his first post-disaster visit. That mission had elements of adventure, including rough Jeep rides through the jungle and a helicopter-aided visit to the side of an active volcano. The very next year, however, he was part of a team that surveyed the harrowing earthquake devastation in Armenia. With a special invitation from the Soviet Academy of Sciences, they were the first to go over after the rescue teams.

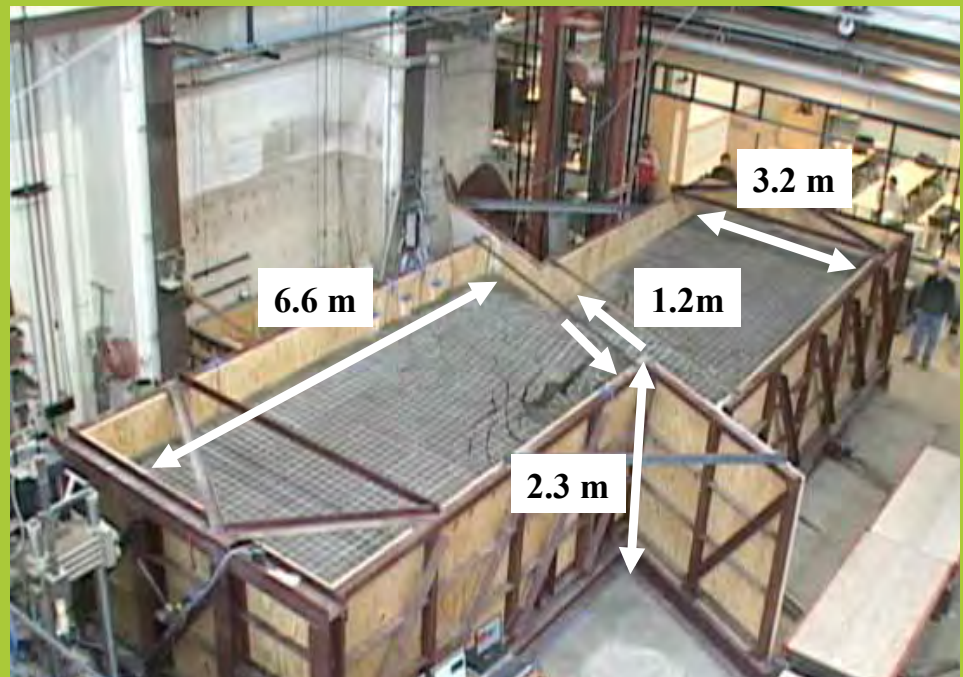
Prior to these missions, O'Rourke recalls that his research felt somewhat detached from actual events. While he knew his work was for a good cause and that it helped people, it was hard to fathom its possible impact.

“You can read a statistic about 40,000 people being killed, or in the case of Haiti over 200,000, O'Rourke said. “It doesn't really mean a lot, but when you go down there and actually see all the destruction and you see bodies and all the coffins, it's real immediate. It's real serious.”

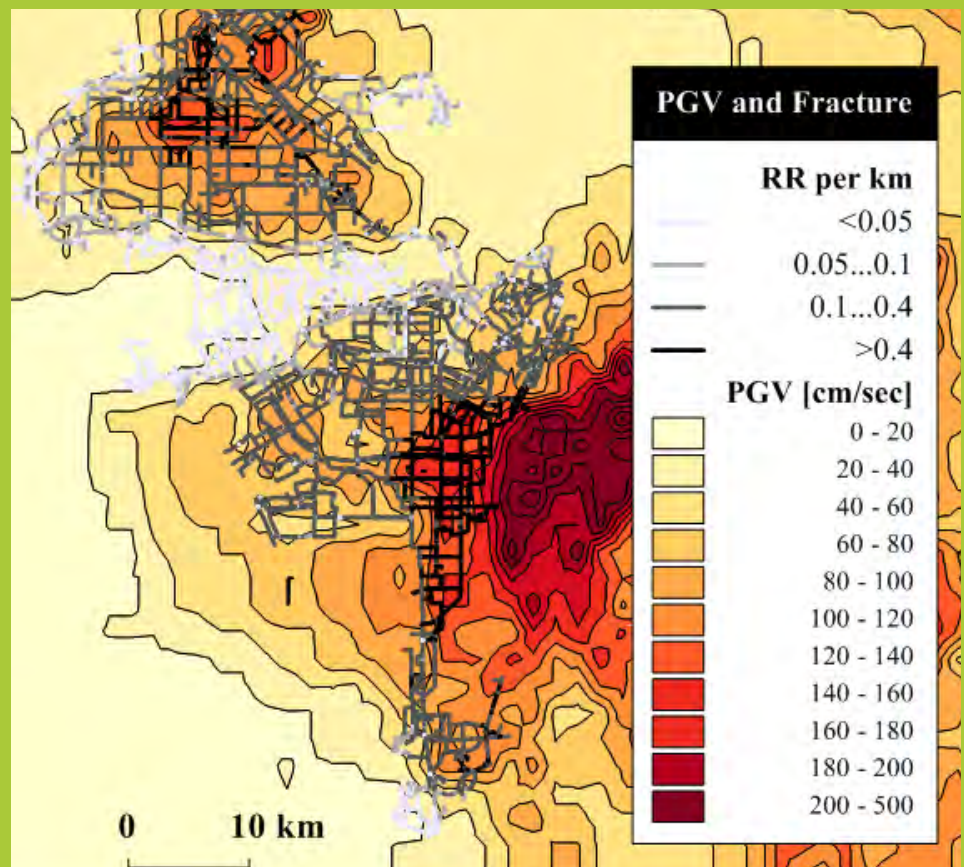
The Armenia earthquake mission was O'Rourke's “first big break,” he says. “I never dreamed I would be asked to go on that mission.” But it was the following year, when the Loma Prieta earthquake struck San Francisco that his career really took off.

A few years prior to that 1989 quake, O'Rourke and his team had created a model of the water supply in San Francisco and had predicted that it would not perform well in the event of another earthquake. After the results were presented to Diane Feinstein, who was the mayor at the time, she pushed through a bond issue to finance improvements to the system. After the earthquake, resources available from the bond issue were used to put out the fire in the Marina District.

From these early models of lifeline infrastructure, O'Rourke's research has grown to encompass much larger and more complex problems of systems engineering. For many years, he and his team have worked with the Los Angeles Department of Water and Power to create a computer simulation of their system, which includes 12,000 km of pipeline and virtually all related water facilities. The “next generation model” that the team is currently working on is



NEES testing facility in Bovay Laboratory Complex.



Damage to Trunk Line pipes is estimated using previous correlations between pipes breakage and PGV. Correlations vary for different materials.

“No one had ever bothered to look at all the utilities that are between the buildings and the construction.”

thomaso’rourke



FEMA/Mike Moore

Products bound for Haiti waiting in turn on the tarmac for military air transport. In support of its federal partners, FEMA is assisting with the logistics needed to move the tons of life-sustaining products to the earthquake stricken country.

designed to allow researchers and water supply operators to visualize the ramifications of improved component design on the overall performance of the system.

With the ability to run 59 earthquake scenarios, O’Rourke says “Our models are sophisticated enough and capture enough of the true complexity of system behavior that by working with them . . . the people who are responsible for the water supply can develop the important characteristic of improvisation.” By running multiple scenarios, with and without modifications of the system, operators can identify recurrent patterns of response and develop an overview of potential performance, helping them plan for many eventualities and improving their ability to improvise and innovate in the event of a real earthquake.

O’Rourke and his team have used the model to evaluate post-earthquake performance of the entire water system with and without certain reservoirs that are typically not opened due to water quality concerns. Their simulations showed that when the system is damaged by a serious earthquake, opening the reservoirs immediately afterward improves water flow to the point that it can be used effectively for

fighting fires.

Although much of O’Rourke’s research involves complex systems engineering, his colleagues are also heavily involved in testing the behavior of individual components and how they react to earthquakes, or some other extreme event, in terms of soil-structure interaction. When they need to test the performance of a specific type of pipe, for example, they head next door to the Bovay Laboratory Complex which houses the NSF-funded Cornell Large-Scale Lifelines Testing Facility, part of the George E. Brown Jr., Network for Earthquake Engineering Simulation. This behemoth of a machine simulates a fault rupture and will move 100 metric tons of soil at a time or 55–60 cubic meters of soil.

The facility was recently used by O’Rourke’s research team to perform tests for the San Francisco Public Utilities Commission to support the design of a new water pipeline that crosses the Hayward Fault. The tests showed that the design, which utilizes a segmented concrete enclosure, would allow the pipeline to survive over 6.5 ft of fault rupture.

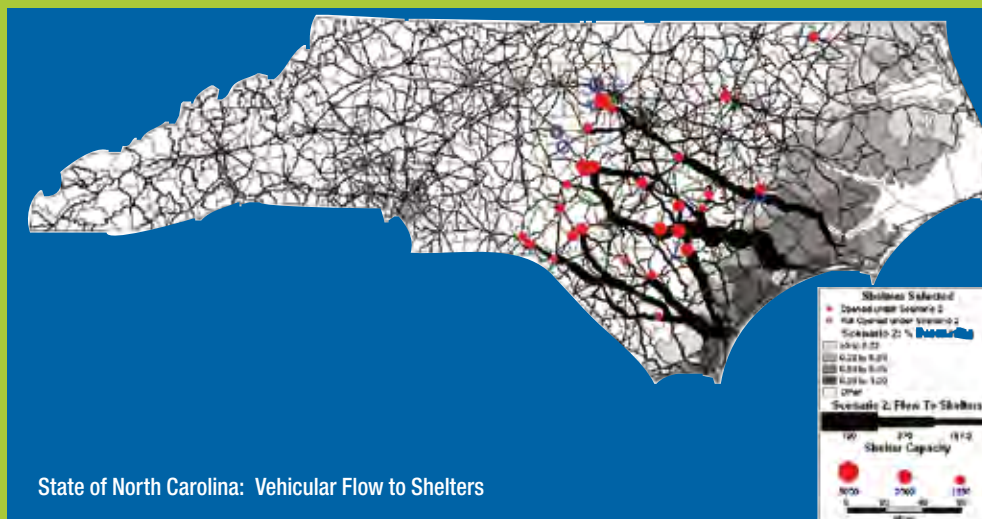
O’Rourke’s interest in earthquakes has its roots at the Gallery Place Metro stop in

Washington, DC. It was here that he spent two years monitoring the effects of the tunnel’s construction on nearby utilities. His research results formed the basis of his Ph.D. thesis.

“No one had ever bothered to look at all the utilities that are between the buildings and the construction,” he said. “So, I started to put measurement points on the utilities and started to gather data about how the utilities responded to the ground deformation.”

On another part of the spectrum that is natural disaster engineering is the work of **Linda Nozick** and Mark Turnquist. As Ken Hover sees it, their research “is right at the border of the most technical side of systems engineering and of social science too.” Both are leading experts in math modeling of complex problems involving how to properly prepare and respond to natural disasters. And while neither one has ever gone on a post-disaster field study, both say that Hurricane Katrina was an important moment in their careers.

Nozick recalls thinking “Wow. We need to do more work on hurricanes.” Up to that point, she and her colleague had spent a lot of time working on earthquakes. After



State of North Carolina: Vehicular Flow to Shelters

Katrina, they started thinking about how to apply their models to hurricanes. The utter failure of the relief effort in New Orleans reaffirmed Nozick's decision to focus on natural disasters. "It's clear there is lots of room to make a difference. That opportunity has not dwindled much over the years."

One of the main ways that Nozick has been making a difference is by answering the question: If you have a certain amount of money for natural disaster mitigation methods, how should you spend that money over a wide area that is affected by hurricanes or earthquakes? In particular, she explores investment planning for evacuation and shelter in response to disasters.

Nozick and her team are focused on an NSF project for which they have built a regional optimization model to determine the best locations for shelters in North Carolina and how those decisions impact evacuation. Their model explicitly considers a range of hurricane events that matches the hurricane hazard in North Carolina when recommending these locations and evacuation plans. And while the model can't capture every event, Nozick says it is sufficiently broad to allow officials to clearly determine the best routes for evacuation or which subset of shelters to use. "This is not easy" Nozick offers. Determining who is going to choose to stay or flee involves multiple factors related to income, storm severity, car ownership, and cultural issues among others.

Hurricanes are also the main focus of **Mark Turnquist**, who puts his amazingly complex research into simple language: "We want to have emergency supplies

near the general location of the disaster right afterwards, but you don't know where the disaster is going to be or when. If you happen to locate supplies right where it occurs, you probably will lose them anyway. You want them close, but not too close and, under all this uncertainty, you want to make some reasonable planning decisions about how and where to pre-position items and then be in a position to move them quickly into an area after a disaster."

Turnquist and his Ph.D. students began investigating the idea of pre-positioning emergency supplies for disaster response right before Hurricane Katrina slammed into New Orleans. The fallout from that disaster has heightened interest in their work.

"You see something like that and the whole idea of being better prepared for events of that nature just becomes so much more real," says Turnquist.

So far, Turnquist and his students have focused on the Southeastern United States, where most hurricanes strike. Their models include 51 storm scenarios, including hurricanes that hit one after the other, that are based upon historical storm data. Among the myriad considerations in the pre-positioning equation are facility locations and sizes, inventory demands, possible damage to supplies, and the condition of transportation networks. Despite the complexity of their stochastic programming model, Turnquist and his students have shown it to be an effective way of addressing location-inventory problems. Although his research is offering real answers, Turnquist knows that implementation of such an analytical approach to the problem by

government agencies such as FEMA is difficult. This is hardly reason for pessimism though, he insists. "From a research standpoint, what we are doing is building tools so that when these organizations are more ready, the tools are there."

Looking Forward

The CEE faculty who specialize in natural hazards engineering see a bright future for the field and many opportunities for young engineers and those just beginning their education. As they describe it, the broadening of the field has coincided with a number of natural disasters that have forced people to think more about how society should respond.

"Perhaps it is a bit cynical, but there is nothing like a couple of these big events to make people more aware and more interested in trying to deal with them," says Turnquist. "If there is a good side to Katrina, it was that it raised awareness. It got people to say 'We can do better than that.'"

The next generation of natural-hazards engineers has plenty of big unanswered questions awaiting them according to Tom O'Rourke. "One of the biggest challenges," he says, "is to better understand the interdependence of the complex infrastructure systems that lie beneath every major city in the world."

"We know some things about how water supply depends on electricity, how control systems depend upon telecommunications, how transportation is interactive with all of the above, but we really don't understand fully all the ways in which interdependencies affect us."

Recently, Turnquist has noted more interest in his emerging subdiscipline. He notes that in one of his professional organizations, a new specialty group has formed focusing specifically on building and using models for better response to disasters.

Nozick sees great potential for those natural hazards graduate students who can combine knowledge in structural and geotechnical engineering with an understanding of systems. "Now, we are seeing programs like ours where students really can see both sides of the equation, and I think that's wonderful."

Chris Brouwer

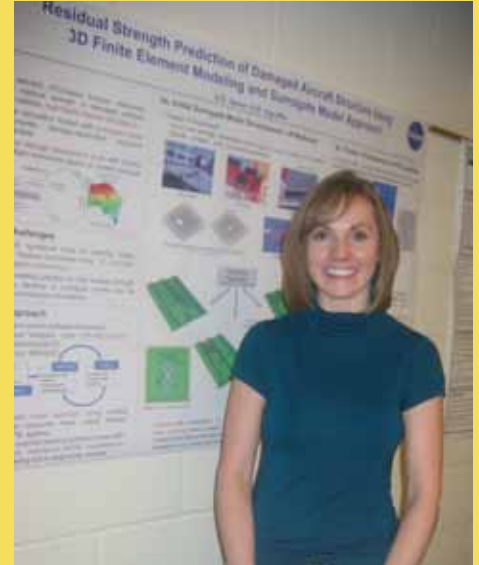
Second Annual CEE Graduate Research Symposium

Under the theme “The Power of Versatility,” the CEE Graduate Student Association held its 2nd annual Graduate Research Symposium on February 12, 2010 in Hollister Hall. Twenty-one graduate students participated in the event, which featured oral presentations in McManus Lounge and a poster competition session in the graduate student lounge.

The symposium began with an opening address by CEE Professor Thomas O’Rourke and was followed by 13 oral presentations held in 4 sessions. This year, students from Systems Engineering and Applied Engineering Physics participated as presenters.

Faculty judges awarded Blair Johnson (fluid mechanics) the first-place prize for her talk on “Sediment Resuspension and Ripple Dynamics in Highly Turbulent Flows.” The second-place prize was awarded to Jim Warner (structures) for his talk entitled “Learning Solutions to Multiscale Elliptic Problems with Gaussian Process Models” and third-place went to Rafael Tinoco-Lopez (fluid mechanics) for his talk on “An Experimental Investigation of Aquatic Vegetation-Flow Interactions.”

After a keynote address by CEE Professor and Director Phil Liu, posters were viewed and judged by all attendees. First-place was awarded to Ashley Spear (structures) for her poster “Predicting Residual Strength of Damaged Aircraft Structure Using 3D-Finite Element Modeling,” while the second-place prize went to Jai Jung (geotechnical) for his poster “Behavior of Pipe in Dry Sand Under Lateral Loading,” and third-place was awarded to Josh Woodbury (environmental and water resources systems) for his poster “Modeling Variable Source Area Hydrology with a SWAT model for the Cannonsville Watershed.”



Ashley Spear



Jim Warner



Blair Johnson



Josh Woodbury

JOYE **THALLER**, CEE Class of 1998, Masters of Engineering in 1999

INSTILLING CONFIDENCE THROUGH EDUCATION

Joye Thaller never envisioned herself as a teacher. As she worked toward her Master's in Environmental Engineering at Cornell, she was preparing for a future as a practicing engineer: "I did co-op my junior year, I participated in ASCE, and I was vice president of Chi Epsilon. I never really considered teaching as a potential career path though."

However, Thaller can point to one particular Cornell course that may have planted the seed for her current job as a high school teacher at The Engineering School in Boston: it was ENGRG 470, an engineering teaching class. Thaller says she had developed an interest in education and volunteer work in high school and found she had room in her schedule to give the course a try. Students participated in lectures during the fall, and then served as teaching assistants for Physics 112 during the spring. "I really enjoyed this class, as it allowed me to pursue my interests in engineering," she says, "but also my passion for teaching and helping others."

Now in her fifth year of teaching, Thaller sounds very satisfied with her career choice, although her path there was a bit circuitous. After graduating in 1999, she got a job at an environmental consulting firm. She recalls not being completely satisfied with the work and when the economy slowed in 2002, she was laid off and was unable to find another job. With her free time, Thaller pursued several volunteer activities, including tutoring one night a week at an after-school program and serving as outreach coordinator (and later as chair) of the Boston Society of Civil Engineers Section Younger Members' Group.

"I had the feeling that engineering consulting wasn't for me since I enjoyed my volunteer work far more than I had ever enjoyed my career," she says. "When I saw a new graduate degree program offered at Tufts University, I decided to go back to school full time." She applied and was accepted to the master's program in Math, Science, Technology, and Engineering Education, a degree geared towards research and curriculum development in those fields at the K-12 levels.

Coincidentally, at the same time Thaller was graduating from that program in 2005, a new high school was opening up in Boston called The Engineering School. One of three small "themed" high schools created from a larger school through money from the Bill and Melinda Gates Foundation, the school is free and open to all, meaning no entrance exam is required. Thaller was first hired as the pre-engineering teacher, and later as a math teacher at the school, which serves an underprivileged segment of the population.

"We get students who otherwise may not have had any exposure to engineering," Thaller explains. "I was fortunate to have a father who was an engineer, so I knew what engineers did and knew that was a path open to me. Not everyone has those kinds of resources. Most of our students' parents have not gone to college."


She adds that "While not everyone in the school wants to be an engineer (and we certainly don't force them to) we do expose them to



what the different types of engineers do and we make sure they have all the prerequisites needed, should they decide to apply to engineering schools." For this reason, every student takes pre-engineering during 9th grade, and every student is expected to take calculus.

"We try to give them the confidence to believe they can become engineers if they want to," she says.

In addition to her teaching duties, Thaller also runs a Robotics Club for students after school, teaches a computer literacy class for adults one night a week and, for the past two summers, has taught an Engineering Design class for science teachers at Northeastern University.

For right now, Thaller is enjoying her educational and career choices. "I do know that getting an engineering degree at Cornell has helped me to succeed at any career I choose and also gave me the courage to go back to school and change careers when the outcome was uncertain." 



Thaller, students, and fellow mentors gather around the robot they built for the FIRST Robotics competition.

Professor *K* Retires

During his 40-year academic career, Professor Kulhawy taught a wide range of courses over the field of geotechnical engineering, including engineering geology. His courses emphasized basics, but they always were oriented toward design and professional practice.



Fred H. Kulhawy grew up in New Jersey, within the New York Metropolitan area. From grade-school days on, he was always fascinated with the beautiful bridges, tunnels, high rise buildings (including the Empire State Building—then the tallest in the world!), and other engineering features of the area. This fascination led him to study civil engineering. He received his B.S.C.E. in 1964 from New Jersey Institute of Technology. Over

the next two years, he was a part-time instructor and researcher at NJIT, part-time MS student in the evening, and part- to full-time project engineer with a local geotechnical engineering consultant. He completed his M.S.C.E. at NJIT in 1966.

In September 1966, he and his wife of two days, Gloria, headed off to California to further their education. At the University of California at Berkeley, he focused on geotechnical engineering and geology, from pure to applied to geomechanics. There was excitement at Berkeley in the late 1960s, which added much to the education. He finished his Ph.D. in 1969.

In 1969, the Kulhawys moved to Syracuse, N.Y., where he began as an assistant professor at Syracuse University. He also was a part-time associate in a local geotechnical consulting firm (until 1972). In 1976, he came to Cornell as an associate professor. Thirty-three years later, he retired as professor emeritus.

During his 40-year academic career, Professor Kulhawy taught a wide range of courses over the field of geotechnical engineering, including engineering geology. His courses emphasized basics, but they always were oriented toward design and professional practice. He stressed professionalism at all times. He is registered as a professional, civil, and geotechnical engineer (first in 1970)

and is certified as a Diplomate in Geotechnical Engineering. During sabbaticals, he had the privilege of being visiting professor at universities in England, Australia, Hong Kong, Singapore, and China.

He also has been a prolific researcher throughout his academic career, with sponsors ranging from various government agencies to public and private companies. Also, many Ph.D. students and post-docs have come to work with him with their own support. He has supervised 54 M.S. and Ph.D. theses to date. Prof. K (or Dr. K), as he has been affectionately known by his graduate students, always worked closely with his students and developed strong bonds with them. When they graduate, they continue regular communication with him. The research done by him and his students has influenced geotechnical practice widely, and he has authored/co-authored more than 350 publications to date. These works have led to many awards. To cite a few, he was elected Distinguished Member of ASCE, which is the highest accolade of ASCE for acknowledged eminence in engineering; he was awarded the Norman Medal, which is the oldest and most prestigious technical award of ASCE; and he was selected for the Karl Terzaghi Award, which is the ASCE Geo-Institute career accolade for eminence in geotechnical engineering.

Dr. Kulhawy has been an active professional geotechnical engineering consultant throughout his career, bringing his specialized knowledge to help improve or solve various geotechnical engineering problems. To date, he has completed over 430 assignments on six continents. He is still waiting for a project on Antarctica!

Retirement brings a special opportunity to re-structure your life. Professor Kulhawy will continue some research on topics of interest, give some short courses and lectures in the United States and abroad, and keep an active, but selective, consulting geotechnical practice. But he also will spend much more time with his other interests, including opera, philately, gardening, photography, and other enjoyable topics. He and Gloria intend to remain in Ithaca. 🌿



RICHARD N. WHITE

JAMES A. FRIEND FAMILY
DISTINGUISHED PROFESSOR OF
ENGINEERING EMERITUS

DECEMBER 21, 1933–OCTOBER 3, 2009

Richard “Dick” N. White, died October 3, 2009, at the age of 75. He was born December 21, 1933 in Chetek, Wisconsin, and grew up on several different dairy farms in Wisconsin. He and his wife, Margaret C. Howell, were married in December 1957.

Dick received his civil engineering education at the University of Wisconsin, Madison, earning a B.S. in 1956 and an M.S. in 1957. He then was called to six-months of active duty in the U.S. Army Corps of Engineers, after which he returned to Madison to work as a structural designer for a firm of consulting engineers. He continued this work part time when he re-enrolled at UW-Madison for study leading to his Ph.D. in structures, awarded in 1961. While still a graduate student, he began to develop his famously effective teaching skills by serving as an instructor with full responsibility for several undergraduate courses.

He joined the CEE faculty in 1961 and rapidly developed a versatile research program to complement his teaching of undergraduate and graduate courses, some of which he initiated. Although his research interests spanned all the traditional areas of structural engineering—experimental, analytical, and computer approaches to concrete, steel, and timber structures—he held a special love for topics in concrete and for structural model studies. In support of the latter, he led the creation and use of a structural models lab for instruction and research that was one of the finest in the nation. Among his many publications, he was the senior author (with Peter Gergely and Robert Sexsmith) of a remarkably successful set of textbooks, *Structural Engineering*, a three-volume series that integrated aspects of mechanics, analysis, behavior, materials, and design. These textbooks also disseminated widely the essence of the Cornell CEE undergraduate curriculum in structures.

Among his numerous appointments and positions at Cornell, he most notably served as director of the School of Civil and Environmental Engineering (1978–1984). Among his proudest accomplishments as director were the fundraising, planning, construction, and dedication for a 5,000-square-foot addition to Hollister Hall to house the Joseph H. DeFrees Hydraulics Laboratory. He served the college as associate dean for undergraduate programs (1987–1990) and he was named the James A. Friend Family Distinguished Professor of Engineering in 1988. Dick retired from Cornell in 1999, but remained active in the school until illness overtook him in 2005. Thanks to the financial support of alumni and friends, the Richard N. White Instructional Laboratory was dedicated in 2004 within the newly refurbished Bovay Laboratory Complex.

Throughout his 39 years at Cornell, Dick also maintained a part-time consulting practice for dozens of clients, including leading

companies, national laboratories, government agencies, publishers, and universities. This consulting involved structural analysis, design, and development work; structural investigations, reviews, and evaluations; structural research and development oversight; preparation of design aids; and editorial development work.

During the course of his career, he received two teaching awards from Cornell’s College of Engineering (1965 and 1996), three “Professor of the Year” honors from Chi Epsilon (1972, 1987, and 1996), the University of Wisconsin Distinguished Service Citation (1993), and the Collingwood Prize of the American Society of Civil Engineers (ASCE) in 1967. He was elected to the National Academy of Engineers in 1992 and was also named an Honorary Member of the ASCE in 2001.

An American Concrete Institute (ACI) member since the late 1950s, Dick was elected ACI vice president in 1995, served as ACI president from 1997 to 1998, and was chair of the Standards Board from 2002 to 2005. He was a member of the Technical Activities Committee for eight years and served as its chair from 1991 to 1994. He also served a three-year term on the ACI Board of Direction. Dick was a member of numerous ACI committees; and he was the first chair of ACI Committees 335: Composite and Hybrid Structures, and 444: Experimental Analysis for Concrete Structures. White received the ACI Joe W. Kelly Award in 1992 and was the co-recipient of the ACI Wason Medal for Most Meritorious Paper and the ACI Structural Research Award in 1993 and 1994, respectively. He was named an ACI Fellow in 1974 and was elevated to ACI Honorary Membership in 2006.

During his sabbatical leaves from Cornell, he was a staff associate at Gulf General Atomic (1967–1968) and a visiting professor at the University of California at Berkeley (1974–75), the University of Puerto Rico at Mayaguez (1982), Southwestern Jiaotong University in China (1982), and Durham University in England (1990).

Through his mentoring of many international graduate students and his duties as ACI president, he was able to travel to a great many places in the world: Egypt, Saudi Arabia, the United Arab Emirates, Qatar, Puerto Rico, Costa Rica, Colombia, Chile, and Brazil, to name a few. He also lectured in many places, including an extended stint in China in the early 1980s that included Beijing, Hong Kong, Shanghai, Wuhan, Xian, and Chendu. Of course, he always carried his favorite camera, recording his trips, the scenery, the people, the foods, and life wherever he was.

Photography was a major pastime for Dick. He enjoyed taking pictures of people, birds, animals, flowers, and all the things around him. He later entered many photographic exhibitions, and had numerous one-man shows of his various works, both locally in Ithaca and a major show in eastern Massachusetts. He also recorded the growing years of his daughter, Barbara, and son, David.

Dick was very proud of his years at Cornell University and of the colleagues and students who were an integral part of his career and life. He enjoyed his many friends and neighbors through his Ithaca years, as well as his beloved schnauzers. He is survived by his wife, Margaret, one daughter and one son and their spouses, a sister, and several grandchildren, nieces, and nephews. 🌿

Richard N. White Instructional Laboratory Fund



In honor of Dick's retirement from CEE in 1998, a fund drive was launched to create the **Richard N. White Instructional Laboratory**. Thanks to the financial support of alumni and friends, this outstanding lab was dedicated in 2004 (see photo above) within the newly refurbished Bovay Laboratory Complex of CEE. Since its dedication, the White Lab has been of great value to the Cornell Engineering

community for courses, section meetings, projects, and presentations, and hundreds of students have benefitted.

To perpetuate the memory of Dick's many significant contributions to CEE, the School would like to create a discretionary endowment to support future operations of the White Lab, to upgrade School equipment, and provide support for other instructional and operational needs of the School. We are off to a good start, raising almost half of the necessary \$100,000 to reach our goal.

The present and former directors of the School, all of whom served during Dick's affiliation with CEE, invite you to join them in reaching this objective. 🌿

To make a gift to this fund in memory of Professor White, visit:

www.giving.cornell.edu/give/
or a check made payable to Cornell University, may be mailed to:

Cornell University
Box 223623
Pittsburgh PA 15251-2623

When making a gift, please note the following on your check or in the space provided online, **White Fund #064125**

For questions, please contact
607.255.3690.

In Memoriam

Professor Emeritus **Floyd Slate** died on August 18, 2008 in Florida at the age of 88. He was a professor of structural engineering in Civil and Environmental Engineering from 1949 until his retirement in 1987.



Born in Indiana, Slate attended Purdue University where he majored in chemistry, receiving a bachelors of science in 1941, a master of science in 1942, and a Ph.D. in 1944.

In 1946–1949 he was an assistant professor at Purdue. During this time, he worked on the Joint Highway Research Project as chief chemist and on the Manhattan Project as chemical supervisor.

He joined Cornell University in 1949 as an associate professor, receiving full professor status in 1973. He specialized in engineering materials, particularly concrete and masonry, and studied the relationship between internal structure and engineering properties.

Some alumni may recall the courses he taught: Engineering Materials, Differential Equations for Engineering, Strength of Materials, Structure and Properties of Materials, and Advanced Plain Concrete, to name a few. He was known to create innovative courses that had never been offered before to civil engineers, one of them being a course on "Low-Cost Housing." Floyd travelled extensively to study indigenous

construction methods and materials around the world, and he compiled the publication, *Low-Cost Housing for Developing Countries, an Annotated Bibliography 1950–1972*.

Professor Slate supervised many graduate students who majored in structural engineering and in transportation engineering. He wrote numerous publications, was a consultant for industry, and traveled to many foreign countries lecturing and consulting on concrete, masonry, and corrosion.

On projects and papers, he worked closely with many of his CEE colleagues such as George Winter and Art Nilson, and with Henry Richardson in City & Regional Planning. He also interacted with colleagues at other universities, particularly in the Mideast and South Pacific.

He was a member of the American Institute of Chemists, American Concrete Institute, American Society of Testing Materials, and American Society of Civil Engineers. He also served on several professional committees.

Slate won the ACI Wason Research Medal twice, once in 1956 for the "best research work in fields of cement and concrete," and then again in 1963. Within CEE, he won the award "for outstanding and consistent contributions to bettering faculty-student relations" and received top teaching recognition from Tau Beta Pi in 1984.

Professor Slate is survived by his children, two daughters and one son. His beloved wife, Margaret, known to many as "Midge," died on August 16, 2004. 🌿

Gerhard H. Jirka

died on February 14, 2010 of a heart attack. Jirka came to Cornell in 1977 and was a CEE professor in environmental fluid mechanics and hydrology until 1995. He had recently retired from his post as professor and director of Institut für Hydromechanik at Universität Karlsruhe in Germany.



While at CEE, Jirka essentially designed the DeFrees Laboratory that is located in the basement of Hollister Hall. His main research interests were in the areas of fluid mechanics and energy, focusing on transport phenomena in water quality, stratified flow, turbulence, experimental techniques and environmental effects of energy facilities, heat disposal, fluid mechanical aspects of alternative energy systems, ocean thermals, and energy conversion.

Born in Kasten, Austria, in 1944, he grew up and went to school at Hochschule für Bodenkultur, Vienna, Austria where he earned his Dipl. Ing. with honors in 1969. He received a Fulbright travel grant and came to the United States to attend the Massachusetts Institute of Technology where he earned an M.S. and Ph.D. in 1971 and 1973, respectively.

Jirka will be missed by several CEE faculty with whom he stayed in touch with over the years. He had visited Ithaca as recently as December 2009. He is survived by one daughter, one son, and a grandchild. 🌿

AguaClara

The AguaClara team (AguaClara.cee.cornell.edu) continues to research and design sustainable, municipal water treatment facilities for resource-poor cities and towns. The fifth AguaClara plant in Honduras is nearing completion in the community of Agalteca. It will serve a population of 2,160 residents and is the first plant to be largely designed using the team's web-based automated design tool. The inauguration of the Agalteca plant is scheduled for June 2010. With the Agalteca plant, the number of people served by the Cornell AguaClara technology will exceed 15,000. Preliminary designs are being drafted for other Honduran cities and towns. Monroe Weber-Shirk took a team of 21 students to Honduras during the winter recess. The students had the opportunity to see four of the AguaClara facilities, visit conventional water treatment plants, and stay with host families in Agalteca.

ASCE



In November 2009, the student chapter and the Ithaca section of ASCE hosted a dinner featuring a lecture by Frank Lombardi, P.E., chief engineer of the Port Authority of New York and New Jersey. In his talk, Lombardi described upcoming projects and obstacles facing the Port Authority, including subway tunnel construction in dense, urban areas, and the current work with the Twin Towers Memorial Site.

In addition to its community service events such as Adopt-A-Highway, the student ASCE Chapter is involved in two community service projects this year. Students are working on a design for a pedestrian bridge at Myers Point Park in Lansing, using a proposal from CEE student Jay Jeon '10. Students are also working with Cornell staff on a design for a set of telescoping stairs for the Tang Stairs at the base of Beebe Lake. The students continue to hold monthly Pizza, Professors, and (P)socializing events at which students and faculty meet and talk.

This year's ASCE Regional Conference will be hosted by Rensselaer Polytechnic Institute on April 9–10. ASCE members plan to compete in both the Concrete Canoe and Steel Bridge competitions. Go teams!

Chi Epsilon

The 41st Chi Epsilon National Conclave was held March 11–14, 2010 at the University of Alabama in Tuscaloosa. Dianne Kamfonik, Cornell's chapter president, traveled to Tuscaloosa to represent Cornell. The Conclave is held every two years and is attended by delegates from all active Chi Epsilon chapters across the country. Kamfonik and the other delegates had the opportunity to discuss and vote on potential bylaw and policy changes. One important change was made when Chi Epsilon unanimously decided to allow ABET accredited schools outside of the United States to apply for membership, thus officially changing it from a national honor society to an international honor society.

Back at Cornell, the members of Chi Epsilon have been hosting office hours twice weekly for BEE 5330: Engineering Professionalism. The purpose of the class is to help prepare fellow engineering students for the upcoming Fundamentals of Engineering Exam in April.

ESW

Engineers for a **S**ustainable **W**orld students are applying their knowledge from CEE 4920 to design a high-performance solar cooker. The goal is to create a simpler design that will be less expensive for people in developing nations. The team entered its idea into the "Big Idea" competition sponsored by Entrepreneurship@Cornell; it is currently a finalist in the social enterprise category (entrepreneurship.cornell.edu/BigIdea/finalists2010.php).

The team's idea is to create a design that uses only two-dimensional geometries as opposed to complex three-dimensional paraboloids. A prototype of the initial concept has already been made and work on the second design concept is underway. The team will travel to Nicaragua to build solar box ovens and introduce the new cooker.

Alumni



Harry E. Bovay Jr. '36, a member of the Boy Scouts of America for 83 years, was honored at the "nation's largest" 100th anniversary celebration of the Boy Scouts, held on February 18, 2010 at

the Minute Maid Park in Houston, Texas. Bovay was thanked for his dedication to the Boy Scouts; first as a Scout, and then as a Scout Leader, which includes dedication of time as well as financial support. Bovay believes that the Boy Scouts are vitally important to the future development of America's youth by instilling the core values and beliefs of the Boy Scouts in every young Scouter.

The Sam Houston Area Council Boy Scouts 100th Anniversary celebration drew scouts and supporters from all around Houston, including elected officials, astronauts, and Distinguished Eagle Scouts. On this occasion, it was announced that Bovay, through the Harry E. Bovay Jr. Foundation, hopes to name the Sam Houston Area Council Boy Scouts of America as a key beneficiary of future funds from the Foundation.

Walter Buydens Ph.D. '92 recently moved from ERM to Royal Haskoning, an international engineering consultancy, to become the corporate director for the environment division. In this position, he is responsible for 500+ consultants around the world. Buydens received his Ph.D. in 1992 in the Environmental and Water Resource Systems concentration in CEE under the supervision of Prof. Christine Shoemaker.

Alexander Cheng Ph.D. '81 was named dean of the School of Engineering at the University of Mississippi.

David Darwin B.S. '67, M.S. '68 won the 2010 ACI Certification award "for foresight and dedication in promoting ACI certification to civil engineering students through its incorporation in the University of Kansas civil engineering curriculum."

Perry DeFelice M.S. '96 was hired by 1010data as director of business development for capital markets in October

2009. In his new role, Perry will develop analytical solutions for clients including investors, servicers, originators, insurers, rating agencies, and regulatory entities.

Steve Dentel M.S. '80, Ph.D. '84, a professor in the University of Delaware's Department of Civil and Environmental Engineering, has been elected to a three-year term on the board of directors of the Association of Environmental Engineering and Science Professors (AEESP). Few professional fields have an organization made up primarily of professors, Dentel says. The AEESP provides the fields of environmental engineering and science with dynamic leadership in both education and research so that environmental problems will be met, and solved, with the very best technical expertise.

Walter Gerstle M.S. '82, Ph.D. '86 is now chair of ACI Committee 446 "Fracture Mechanics." Dr. Gerstle is a professor in the Department of Civil Engineering at the University of New Mexico.

Benjamin Hobbs Ph.D. '83, a professor of Geography and Environmental Engineering at The Johns Hopkins University, was installed as the inaugural recipient of the Theodore M. and Kay W. Schad Professorship in Environmental Management.

Thomas T. C. Hsu M.S. '60, Ph.D. '62 was recognized for his "life-long contribution to the field of structural engineering" at a symposium and dinner held in his honor on November 8–10, 2009 at the ACI convention in New Orleans.

Clark C. K. Liu Ph.D. '76 has been named the 2009 Engineer of Distinction by the University of Mississippi. Liu a 1969 master's graduate of UM's engineering program, recently completed two federally sponsored research projects: an NSF project to develop an engineering system for open-ocean mariculture using nutrient-rich deep ocean water, and a U.S. Bureau of Reclamation project to develop a wind-powered reverse osmosis system for water desalination and treatment. For the past 29 years, Liu has been a professor at the University of Hawaii.

Daniel Medina M.S. '87, Ph.D. '89 in hydraulics and hydrology, has joined PBS&J

as a senior group manager in the water service sector. In his role, Medina will be leading a team of water resource engineers, GIS analysts, and scientists who conduct floodplain and risk assessment studies nationwide. He will also participate as a senior technical expert for water resources projects.

Bernard L. Meyers Ph.D. '67 was awarded 50-year membership in ACI.

Jeanine Plummer B.S. '93 was named 2009 Professor of the Year for Massachusetts by the Council for the Advancement and Support of Education. She is an associate professor of civil and environmental engineering at Worcester Polytechnic Institute where she was installed as the first David M. Schwaber Professor of Environmental Engineering.

Surendra P. Shah Ph.D. '65 was awarded ACI honorary membership "for his outstanding contributions as a researcher, teacher, and mentor in the field of concrete materials, and as the founder and director of the Center for Advanced Cement-Based Materials."

Robert Topping M.S. '57, owner of Topping Engineers, has received the Golden Knight Award from his alma mater, Clarkson University. Topping received his bachelor of science degree in civil engineering from Clarkson in 1954 and a master of science degree in civil engineering from Cornell in 1957. In 1972, he started his own consulting company. Today, Topping Engineers has over 52 years experience in consulting engineering. Robert is directly involved with all aspects of his firm's projects, including engineering and design, contract preparation and administration, and construction supervision.

Paul Wawrzynek M.S. '87, Ph.D. '91 is chief technology officer of Fracture Analysis Consultants, Inc. located in Ithaca, N.Y.

Faculty

John Abel, professor emeritus, has been

elected for a second three-year term as president of the International Association for Shell and Spatial Structures (IASS). The election was held at the October 28, 2009, meeting of the IASS Executive Committee during the 50th Anniversary Symposium of the Association that took place in Valencia, Spain.

Wilkins Aquino was recently promoted to associate professor with indefinite tenure.

Jim Bisogni is a recipient of the 2009 College of Engineering's Daniel M. Lazar '29 Excellence in Teaching Award.

Peter Diamessis has received an NSF Career award for his project titled "Career: Shoaling of Non-Linear Internal Waves over Gentle Slopes: Wave-Scale Interactions and Dissipative Processes."

Jim Gossett was a 2009 distinguished lecturer at Georgia Tech.

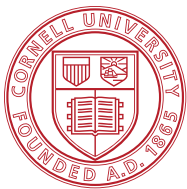
Tony Ingraffea was accepted into the Class of 2009 International Congress on Fracture Fellows. He is recognized for his pioneering contributions to the advanced computational simulation of fatigue and fracture processes leading to improved understanding for practical applications to integrity assessment of engineering structures.

Jim Jenkins, Walter S. Carpenter Jr. Professor of Engineering, has joined the School of Civil and Environmental Engineering.

Jery Stedinger was selected as the 2008–2009 Cornell Chi Epsilon Professor of the Year.

Derek Warner is a recipient of a 2009 Presidential Early Career Award, as a scientist and engineer who embodies "the greatest promise for strengthening America's leadership in science and technology." In addition, Warner is the 2009 recipient of the College of Engineering James M. and Marsha D. McCormick Advising Award.

Contact us with your news:
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Upcoming Events –

Reunion 2010:

June 10–13

Saturday, June 12

Alumni breakfast buffet: Plan to attend this year's CEE alumni breakfast—especially if it's your reunion year. The breakfast will be held from 7:30 to 9:30 a.m. in McManus Conference Center, 166 Hollister Hall. All alumni(ae) and their families are invited. Please let us know if you are planning to attend the breakfast at civil_env_eng@cornell.edu or by phone at 255.3690.

Homecoming 2010:

September 24–26

Cornell vs Yale



College of Engineering's Phoenix flying out to meet the dragon from the College of Architecture, Art, and Planning on March 19, 2010.