

Cornell University
School of Civil and
Environmental Engineering

UPDATE

Spring 2007



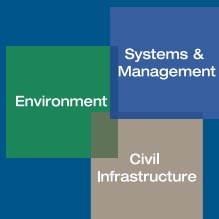
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FROM THE Director



James M. Gossett



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Spring 2007

I'm pleased to present to you this latest edition of *Update*.

I trust you'll find it interesting and informative reading. If it has any common theme, it's that CEE is becoming more diverse than ever, in terms of the problems to which we apply our skills. Our field has always been diverse—spanning (no pun intended!) topics from structural engineering to public health. But CEE researchers and practitioners are increasingly finding important roles in less traditional applications such as space exploration, medicine, nanotechnology, sustainable energy, and the defense against terrorism. Old-timers will, I am sure, be quick to point out that it has always been so: For example, Professors Emeriti Bill McGuire and the late Don Belcher were instrumental in the locating and designing Cornell's Arecibo radio-telescope. But the scope of our studies has changed since then. CEEs now practice and research on many levels—from the nano-, to the micro-, to the macro-, to the mega-scale.

The diversity of CEE is represented by the articles in this edition of *Update* that profile the contributions of Professors Linda Nozick and Mark Turnquist to the global war on terror; and the multiscale research of our newest hire, Associate Professor Christopher Earls. Chris represents the new breed of CEE faculty members—he sits with practitioners on professional-society "code" committees, but also applies his considerable skills in structural analysis to biomechanics and nano-mechanical devices, in addition to steel structures. He epitomizes the multiple missions we have at a major research university; to educate undergraduates and MEng candidates for professional practice, while also carrying out internationally recognized programs of cutting-edge research. Diversity of application has also characterized the distinguished career of alumnus Howard Simpson, profiled in this issue.

We in Cornell's School of Civil and Environmental Engineering have been heavily engaged in strategic planning for our future. From demographics alone, we can anticipate a substantial turnover of faculty over the next five to ten years, and it is imperative that we make strategic decisions about where to invest our resources. The process began early last fall when we convened a workshop on campus to discuss "The Future of CEE." Nearly all of our faculty members participated, along with nearly all the members of our external Advisory Council, plus some special guests. It was an invigorating exercise, as we tried to identify the great challenges that will face society over the next 30 to 50 years, and our profession's potential role in addressing them. Among the weighty questions we are considering is this: In a present (and likely future) where CEEs apply their skills to problems beyond our traditional realm of "public works," what defines CEE and distinguishes it from other fields of engineering?

We'd love to hear from you. In the meantime, enjoy this issue of *Update*!

Investing in Security:

CEE Researchers Linda Nozick and Mark Turnquist Take Decision-Making “Games” to the Next Level

In a time of heightened security at airports—and frequent delays when would-be passengers stare out the windows at departure gates and wonder, “What are all those people fussing around the airplanes really doing there?”—Linda Nozick gets paid to think the thoughts most passengers dare not verbalize: “What’s the chance, for example, of a bad guy with a fake ID getting on the tarmac and sneaking a bomb aboard my airplane?”

Nozick, a professor of civil and environmental engineering and a specialist in network analysis for transportation systems, gets paid to think about terrorists, airplanes, and bombs because such scenarios are in the national interest. She reports her conclusions, together with those of colleagues at Cornell and at Sandia National Laboratories, to the federal Department of Homeland Security in reports with titles like “Physical Security and Vulnerability Modeling for Infrastructure Facilities.”

The so-called “intruder models” that Nozick develops—and then analyzes with a mathematical framework called Markov modeling—are much more specific than the titles of her official reports might suggest. Here’s one, for instance:

Suppose that an intruder carrying an explosive device knows that three areas of vulnerability—for an aircraft being serviced on the apron—are the open doors of the cargo hold, the landing gear that will fold into the wings, and the catering supplies for the airplane’s galley.

Then suppose that the intruder’s stolen ID badge indicates that he or she works for a catering company. That badge and impersonation might get the intruder through security and onto the apron. But a purported caterer hanging around the landing gear would attract attention. Luckily (for the intruder), he or she thought to bring a second badge and other trappings of an aircraft mechanic. Or

the identity of a baggage handler, if a bomb in the cargo hold is part of “Plan B.”

Even if the intruder succeeds in placing a bomb, he or she must get away without being detected. Otherwise, the aircraft will be thoroughly searched and the attempted attack will be foiled.

What are the chances the intruder will reach the apron in the first place? Will the intruder get the opportunity to place the bomb . . . and exit, undetected?

Once the results of Nozick’s modeling exercises reach the right people in Homeland Security, policy-makers will have the information to know where to invest in improved security and reduced vulnerability.

Such is the power of Nozick’s approach to transportation security: to combine network representations of systems—in this case, the security provisions around passenger planes—with Markov models of intruders’ strategies and actions. “We start the model running by assuming the worst about our intruders, that they are both rational and well informed,” Nozick explains. By rational, she means that the adversaries follow a strategy to maximize the probability that their attack will be successful. And well-informed adversaries know the probability of succeeding in the plan (and of not being detected) at every step, so they can effectively optimize their attacks.

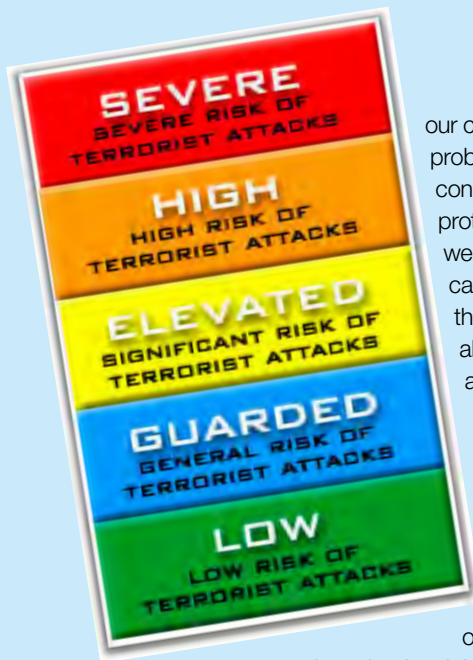
“We need to assume the adversary is better than he or she might actually be, because that assumption gives



istockphoto.com, carole gomez



Professor Linda Nozick



our calculations an 'upper bound' on probability of success. We want to be conservative in estimating how well-protected the system should be. While we recognize that a less-able adversary can sometimes get lucky, by assuming the worst we can make sure the probabilities of their success are as small as possible."

Nozick believes Markov modeling (and a refinement called "hidden Markov modeling," or HMM) are useful tools for analyzing decision-making of adversaries in transportation security applications. HMM works well in situations for which outcomes are partly random (an

actual mechanic might see a purported caterer meddling with the landing gear) and partly under the control of the decision maker (the intruder thought to bring a second fake ID badge).

And the approach she's testing with aircraft security, Nozick believes, should work equally well for most of the other 12 sectors of American society in which the Homeland Security Office perceives vulnerability to "intruders": agriculture, food processing, water, public health, government, emergency services, banking and finance, telecommunications, energy, the chemical industry, postal and shipping services, and the defense-related industrial base.

While an intruder to the banking sector might wield a self-replicating computer virus—instead of a bomb in a box of airline pretzel snacks—the process is similar: Compute the probability of a successful attack, model possible strategies to reduce vulnerability, and advise policy makers on optimal investments to improve security.

In fact—because virtually all parts of modern society's infrastructure (from the electric power grid to government administration) rely on information technology and the Internet—a well-placed virus could be just as disruptive as a bomb, observes Mark Turnquist, another CEE professor who works on transportation-security problems. Having said that, Turnquist explains his particular piece of the security-analysis task. It is a problem that will seem relevant to anyone who ever is puzzled over those hazardous-materials icons on the sides of semi-trailer trucks.

Again, this is one of those unthinkable thoughts, albeit one that passengers in private automobiles can verbalize without attracting attention:

What's to keep a terrorist from learning the route and schedule of that chlorine tanker, then planting a bomb when it goes through a populated area like, for instance, my town?

Chlorine is far from the nastiest substance that Turnquist ponders when he does his transportation-security and vulnerability-reduction modeling. But a cloud of chlorine gas from a ruptured container, spreading at ground level and attacking human lungs, is a realistic example—considering that thousands of big chlorine tankers are crisscrossing America at any given time.

"At one time, a shipper of chlorine used to choose one route—usually the cheapest and fastest," Turnquist notes. "A single, predictable route made sense, in terms of keeping

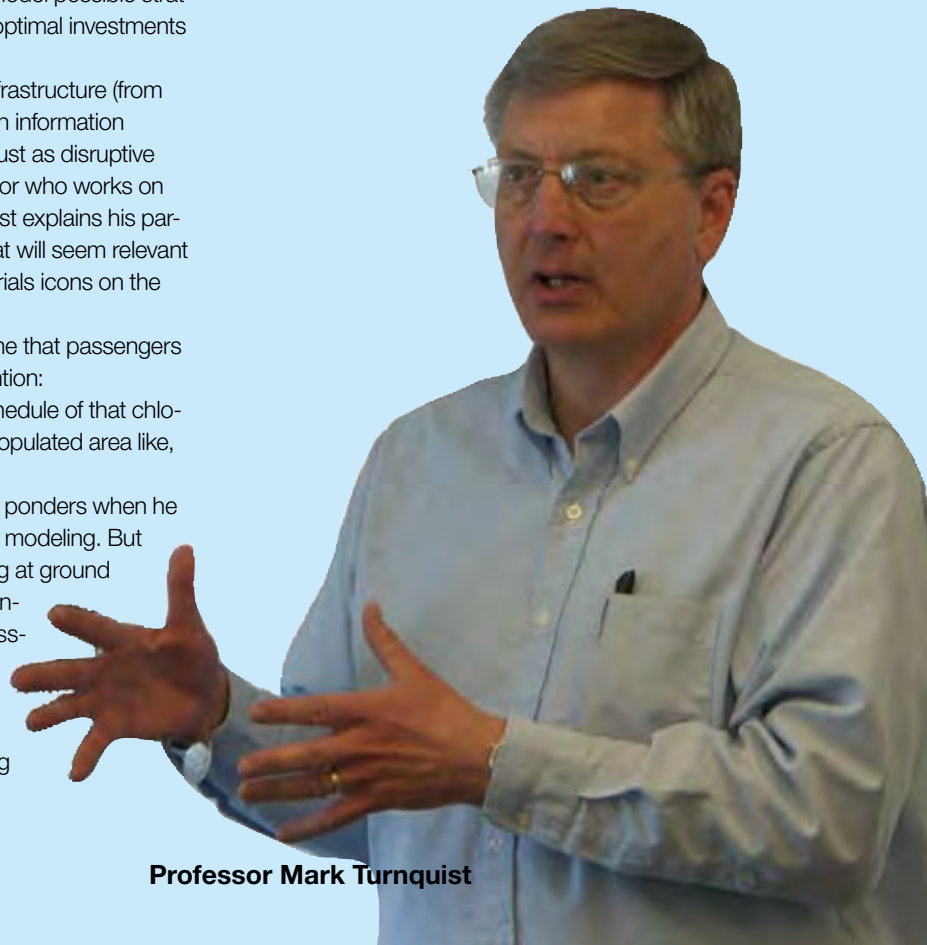
the customers satisfied, when cheap was all that mattered. We have had mathematical models to help shippers choose cheap routes for a long time."

But the threat of terrorism adds another level of complexity to the problem, according to Turnquist. "An adversary can know where your trucks will be if you use a single, predictable route and schedule. Transportation security would be better if the shipper used game theory—to make it less likely that an adversary will be successful." A shipper's strategy might change, based on the Department of Homeland Security Threat Advisory Level, for example.

Like Nozick's modeling of aircraft security, results of Turnquist's work on hazardous-materials transportation goes through Sandia National Laboratories and on to Homeland Security.

That all-encompassing agency, which came under public scrutiny in the less-than-optimal federal response to Hurricane Katrina, could also benefit from another version of Cornell's vulnerability-reduction modeling—determining where to pre-position emergency relief supplies for natural disasters before they strike.

Again, predictability and probability are parts of the equation, Turnquist observes: "If you pre-position your medical kits, prepackaged food, water, and ice in the exact location where the storm strikes, you could lose everything. But if you pre-position too far away, you could



Professor Mark Turnquist

have trouble transporting supplies to where the need is greatest.”

Turnquist and Nozick’s work is actually performed for the National Infrastructure Simulation and Analysis Center (NISAC), which is jointly operated by Sandia and Los Alamos national laboratories. The mission of NISAC is to provide analytic support and modeling capabilities to the Department of Homeland Security for a broad spectrum of infrastructures, from electric power, banking, and food to transportation. NISAC subcontracts some projects to nongovernmental labs with special expertise, which in the case of Cornell is transportation security. CEE PhD students Yashoda Dadkar and Carmen Rawls are important participants in this research.

Because of the classified nature of national security, some details of Turnquist and Nozick’s work are not “publishable” in the general scientific literature. But a surprising amount is, and that’s a good thing, according to Turnquist. “The core question—if we are going to invest resources to change operations and make systems less vulnerable—is this: ‘Where should we invest and what should we do?’”



(left to right) Yashoda Dadkar and Carmen Rawls



“Core questions about strategic investment are vitally important to national security,” Nozick adds, “and we hope the tools we develop will be useful to the nation. But every enterprise, whether public or private, has vulnerability and investment issues. We think our tools are too valuable and too broadly relevant not to share.”

Research insights by Nozick and Turnquist show up almost immediately in Cornell classrooms—minus sensitive national-security details, of course—in classes like **CEE 593: Engineering Management Methods: Data, Information, and Modeling**, which is taught by Turnquist. Nozick’s newly developed course, **CEE 406/606: Civil Infrastructure Systems**, teaches systems-engineering tools such as optimization, life-cycle cost analysis, decision analysis, simulation, Markov modeling, and risk analysis.

Cornell students learn to do modeling for all kinds of systems—not just the ones of interest to Homeland Security—and they get a bonus: Some new “games” to play while waiting to board flights to the next job interview.

—Roger Segelken

New Faculty Profile: Chris Earls Answers the “What if?” Questions



Riding along on family trips to Brooklyn from his boyhood home in Washington, D.C., young Chris Earls crossed some interesting bridges.

Maryland offered the Francis Scott Key (a continuous truss bridge over the Patapsco River) and the Millard E. Tydings Memorial (over the Susquehanna, with its ominous warnings on dangerous crosswinds). Then it was the Delaware Memorial (another suspension bridge, across the Delaware river to the New Jersey Turnpike), the Goethals Bridge (named for the Panama Canal engineer, and crossing the murky Arthur Kill to Staten Island), and finally the Verrazano Narrows (once the longest suspension bridge in the world). A special treat was a stroll across the wood-planked pedestrian walkway of the Brooklyn Bridge, which was near Earls's grandparents' home.

As the sheer joy—of vaulting wide, high spaces with man-made creations of concrete and steel—matured to curiosity, he wondered: Why are bridge designs so different? Which is better? And for what purpose? Inevitably, the questions became the “What if?” kind: Suppose a tugboat hauling barges hit the bridge? What if some of the cable strands rusted away? How many heavy trucks would be too many? Or how much wind could the bridge withstand?

Kids in cars tend to ask those questions. So do structural engineers.

Still, the boy who would become the newly appointed associate professor of structural engineering, Christopher J. Earls, didn't go directly



U.S.S. Cole being transported aboard the MV Blue Marlin semi-submersible heavy-lift ship

there. He started college with astrophysics in mind, and greatly admired Carl Sagan. But partway through Virginia Polytechnic Institute and State University, Earls figured that some of the same mathematics and physics that Sagan (1934–1996) was using to fathom the cosmos might also help build better structures on this planet. After a 1990 bachelor's and 1992 master's degree in civil engineering at VPI, Earls completed a PhD in structural engineering at University of Minnesota (1995). Moving to West Point, he won the United States Military Academy's 1998 Outstanding Teacher Award. At University of Pittsburgh, where Earls rose to become chairman of the Department of Civil

and Environmental Engineering, he was given the 2001 Outstanding Professor of the Year Award by the Pittsburgh section of the American Society of Civil Engineers.

Earls's knack for teaching caught the attention of Cornell's School of Civil and Environmental Engineering, which hired him in 2006. Here he teaches **CEE 474: Design of Steel Structures** and **CEE 779: Advanced Behavior of Metal Structures**. Earls also is the faculty leader for the MEng (two-semester professional master's degree) in structural engineering, where a recent project involved designing a new bridge to take Interstate 74 across the Mississippi River.

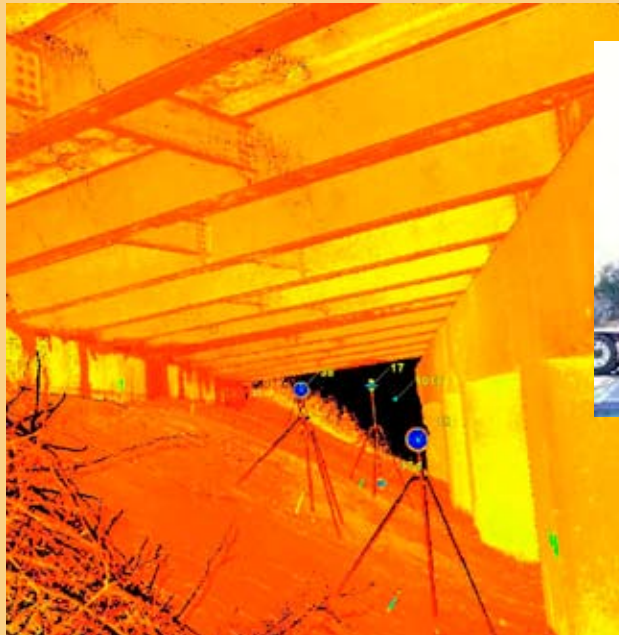
Earls's students came up with a single cable-stayed bridge that addresses a civil-engineering challenge: to bring a bottleneck (the existing Iowa-Illinois Memorial Bridge on I-74 that aggravates 65,000 late-for-work drivers a day) up to current Interstate standards—with what will be the widest bridge in the world.

In addition to multiple lanes for vehicular traffic, the next I-74 bridge will feature a pedestrian crossing between Moline, Illinois and Bettendorf, Iowa. And a pedestrian lane on a bridge these days, the MEng students learned, must be wide and strong enough to accommodate not only walkers, runners, and bicyclists but a truck-size ambulance, as well. When engineers at the firm with the government contract for the new I-74 bridge saw the Cornell students' design, they praised the innovative solutions to some difficult problems.

Earls's knowledge
of steel structures
of buildings like
the World Trade
Center towers
made him a book
reviewer . . .

Earls's own research in computational mechanics stretches from the large and real to the infinitesimally small and hypothetical. In one project sponsored by the Office of Naval Research, he is trying to determine if in situ instrumentation throughout a ship's structure could inform the captain of the vessel's structural integrity. That kind of instrumentation would have been helpful, according to Earls, when terrorists approached the *U.S.S. Cole* in a small boat in the Yemeni port of Aden on October 12, 2000, and killed 17 American sailors by blasting a 35- by 36-foot hole in the guided missile destroyer's port side. Instead of sending divers to perform a prolonged (and qualitative) inspection of the ship's hull, a skipper under orders to leave the port immediately could monitor the damage with the instrument array and compute the likelihood that the vessel could move out of harm's way without sinking.

Eleven orders of magnitude smaller than a naval warship, in the 250-nanometer range, are the electromechanical oscillators that biosecurity policy-makers hope someday soon will measure masses of airborne pathogens, such as viruses, with attogram sensitivity—and differentiate one kind of virus from another. An attogram is one-thousandth of femtogram,



Terrestrial laser scanner-derived image of a damaged bridge

which is one-thousandth of a picogram, which is one-thousandth of a nanogram, which is one-billionth of a gram. Across the Engineering Quad from Earls's Hollister Hall office, nanobiotechnology researchers in Duffield Hall are fabricating oscillating cantilevers for devices that can tell the difference between 6 attograms and 60. Earls wants to determine the dynamic stability of the oscillating cantilevers—and whether the same laws of physics apply to structures at the scales of the atom, the I-74 bridge, and the cosmos.

Dynamic instability is one of the factors that determine whether bad things happen to good structures, or so the youthful bridge-crosser who became a nationally recognized expert on structural integrity came to understand. For example, when attachment bolts failed and dropped a 12-ton ceiling panel on a car in Boston's "Big Dig" tunnel last year, the NPR radio show, "Science Friday," and host Ira Flatow asked Earls to explain, and to answer "What if?" questions from concerned callers to the popular show.

When the publishers of *Popular Mechanics* magazine debuted the book, *Debunking 9/11 Myths: Why Conspiracy Theories Can't Stand Up to Facts*, Earls's knowledge of steel structures of buildings like the World Trade Center towers made him a book reviewer, among other nationally known experts. In retrospect, he thinks that only buildings fortified to the standards of nuclear-plant containment vessels can



Damaged bridge

Courtesy of Bob Dexter, Univ. of Minnesota

withstand a hit from a fully fueled airliner flying at full throttle. The best defense against 9/11-type strikes, he says, is to keep big planes away from tall buildings.

While Earls claims no mystical powers of prescience—when it comes to terrorists, airplanes, and towering structures—he came eerily close on September 5, 2000. That is the date on a structural-engineering analysis exercise he handed to his students at University of Pittsburgh, a year and six days before 9/11. The hand-drawn diagram on the exercise shows a plane the size of a 747 hitting the top of a 100-story building.

It was another one of those "What if?" questions. Would the building fall? The uncomplicated answer that Earls hoped Pitt students would come up with is this: A building that is properly designed to withstand sustained high winds should not fail from the impact of an airplane.

But devastating fire that results from the ignition of the thousands of gallons of fuel contained in a speeding plane is another matter, he notes. Ever since a B-25 bomber blundered through fog into the 79th floor of the Empire State Building in 1945, structural engineers have assumed that accidental strikes would come from relatively slow-moving planes. And they have designed for that kind of scenario, Earls explains, as he returns the loose-leaf binder of exercises to his office bookshelf.

—Roger Segelken

ALUMNI PROFILE

Howard Simpson BCE '42: Expanding the Horizons of Structural Engineering

Swing-wing fighter-bombers and moon rockets, acts of terrorism and atom smashers, radio telescopes and the Statue of Liberty: When Howard Simpson says he had “no idea, no concept of the variety of areas that the civil engineering discipline could become involved in” when he graduated with a bachelor’s degree in civil engineering in 1942, don’t blame him for a lack of vision . . . or the faculty of the old School of Civil Engineering for a lack of preparation.

In 1942, civil engineers didn’t do all the things Simpson has done in his six-decade career.

One of three founding partners of the Massachusetts-based design and consulting engineering firm, Simpson Gumpertz & Heger Inc. (SGH), Howard Simpson recalls always wanting to apply his knack for mathematics to the practical problems of civil engineering. He credits the in-depth Cornell training in math, the physical sciences, and related engineering disciplines for keeping him flexible, broadly knowledgeable, and always ready to apply the tools at an engineer’s disposal in a changing world.

Simpson spent World War II in service to his country (first as a field engineer based at Clinton Engineering Works, as the Manhattan Project’s Oak Ridge National Laboratory was originally known, then two years as a U.S. Navy line officer aboard an attack-transport in the South Pacific) before heading to MIT for a master’s degree (1947) in building engineering and construction. He taught for 12 years at MIT, earning a ScD degree in civil engineering, and leaving, as an associate professor, when the little firm he started in 1956 (with fellow faculty members Werner Gumpertz and Frank Heger) got busy and challenging enough to be a full-time job.

At 85, Simpson still shows up regularly at the Waltham, Massachusetts, corporate office to help guide SGH into becoming an international leader in its field. SGH now has regional offices in Los Angeles, New York City, San Francisco, and Washington, D.C., and more than 300 employees. Lately, Simpson’s been thinking about some of the memorable projects in his 50 years with SGH, and lessons learned along the way.

SGH’s work for NASA on the Vehicle Assembly Building at Kennedy Space Center, for example, helped that cavernous structure (525 feet tall and 129,428,000 cubic feet of unobstructed interior volume) weather hurricane hits and changes in the NASA mission.

Simpson’s reputation for precision engineering design was honed, in part, by his work on the supporting structures for big radio-radar telescopes and optical telescopes. The parabolic reflector at MIT’s Haystack Observatory, a device the size of a 12-story building, must keep its exact shape—give or take a hundredth of an inch, Simpson notes—while it is panned across the sky. Simpson and SGH brought the same passion for precision to structures that house physicists’ particle accelerators, colliders (atom smashers), and exquisitely delicate subatomic particle detectors.

Time and again, Simpson and SGH helped clients avert disasters. The environmental chambers that tested Saturn rockets in the simulated near-vacuum of space—at ground level—would have collapsed from exterior air pressure if SGH hadn’t solved structural design problems. The refurbished Statue of the Liberty is safe to climb through and the Brooklyn Bridge still stands proud—albeit with re-configured main cables—thanks, in both cases, to SGH engineers.

SGH is also called in when structures suffer catastrophic failure—the 1981 collapse, for example, of skywalks at the Kansas City Hyatt Regency, where 114 people died—and the answers that Simpson’s firm provides become part of industry standards and college textbooks.



Courtesy of Simpson, Gumpertz & Heger Inc.

The investigation into an even more tragic disaster—the 9/11 collapse of the World Trade Center towers—illustrates one thing Simpson says he’s learned in life: Be the best at what you do best and respect other specialists for their expertise.

In the case of the World Trade Center investigation, SGH experts in structural analysis and structural steel worked respectfully with other kinds of specialists—such as experts in how fire spreads—to reach one conclusion: The towers’ steel was exposed to unbearable heat because of damage to its protective fire-proofing; impact damage to the structure alone was not sufficient to cause the collapse.

Simpson notes that another Cornell civil engineer (Donald O. Dusenberry ’73, MEng ’74) led the SGH team’s investigation at the Pentagon after 9/11, and that the firm employs about a dozen Cornell-trained engineers.

One of Simpson’s favorite “little projects” at SGH showed how engineers should always consider the “human element” in designs. Experiments in handrail graspability, performed for the Stairway Manufacturer’s Association, had volunteers from 10 to 83 years of age trying to keep a grip on rails of various shapes. The videotaped study proved that elderly people with arthritic hands aren’t the only ones who need easily graspable handrails. And that architects’ designs can be both stylish and functional in everyday life, Simpson notes.

“Be the best at what you do best and respect other specialists for their expertise.”

He emphasizes that dealing with unconventional buildings can require special attention. His firm is renowned for its expertise in building technology, a practical area that combines an in-depth understanding of the building envelope, HVAC systems, and construction materials and methods. Simpson reports that the demand for SGH’s building-technology services is especially great from clients with new or unique designs.

Told that the section of Cornell’s campus where he studied in the 1940s (when civil engineering was in Lincoln Hall) is about to gain a stylish new structure (Milstein Hall, for the College of Architecture, Art, and Planning), Simpson professed respect for architect Rem Koolhaas and his specialty.

Then he advised Cornell to make sure that specialists in building technology are part of the design team.

The Milstein Hall plans feature a “living roofscape” with native grasses, plants, and shrubs. All that soil on the roof will hold a lot of water, especially in notoriously rainy Ithaca, Simpson predicts.

“Yes, you’ll want a top-notch building technologist involved in that one.”

—Roger Segelken

Other Notable Projects by SGH under Howard Simpson’s Lead

- Epcot Center, Florida (design of Spaceship Earth)
- F-111 Fighter/Bomber (design consultation and stress analysis for the wing hinge and support structure)
- Grand Central Station (rehabilitation)
- Hultman Aqueduct (analysis of failure risk in the conduit that provides most of greater Boston’s water)
- John Hancock Tower, Boston (investigation of glass failures)
- Multiple Mirror Telescope, Arizona (design of a structure that maintains the precise coordinated alignment of six mirrors)
- New York State Capitol Building (comprehensive rehabilitation of the building envelope)
- Seismic Mitigation Program, Worldwide (investigation of seismic risk, retrofit design for Procter & Gamble)
- Walter C. Murrow Floating Bridge, Seattle (failure investigation of a highway bridge across the Hood Canal)

For more details, see www.sgh.com.



Water management, SGH-style: Speaking of rainwater, Orlando’s precipitation passes straight through the 11,324-piece outer skin of Spaceship Earth, which Howard Simpson’s firm engineered, to a concealed collection system that diverts water to Epcot Center’s World Showcase lagoon.

Courtesy of Simpson, Gumpertz & Heger Inc.



Howard Simpson at the Statue of Liberty

Jill Dattel

Campaign Update:

Bovay Lab Complex Officially Dedicated

For civil engineering alumni, Saturday, October 14, 2006 was not just another Cornell homecoming . . . it was a day for celebration. The Harry E. Bovay Jr. '36 Laboratory Complex was officially dedicated, marking the completion of Phase 1 of a \$7 million laboratory renovation project. Located not in Hollister Hall, the "home" of the school since the late 1950s, but rather in the neighboring Thurston Hall, attendees saw but perhaps couldn't fully appreciate the transformation of the 50-year-old complex into modern, technically-sophisticated, and infinitely more useful labs that are certain to become hubs of activity for classes, labs, and research testing. The labs are uniquely equipped to construct and perform large-scale experiments—the National Science Foundation has funded earthquake engineering research there.

Alumni, friends, faculty, and staff donned hard hats to get into the proper spirit to view the transformed 12,500 square-foot space. The complex includes five distinct work spaces named for the lead benefactors to the fund-raising campaign: the Kenneth E. Arnold, Class of 1963, and Ruth Arnold Fabrication and Testing Laboratory; the Joseph D. Dreyfuss II '61 Control Center; the Reed L. McJunkin '32 Electronics Laboratory; the Leone-Perkins Materials Technology Laboratory; and the Civil Engineering Class of 1949 Curing Room, along with two spaces named to honor former professors, George Winter and Dick White. Other gifts from many alumni and friends were instrumental in this team effort.

Speaking of teams, there was actually another reason to celebrate the day. The Big Red football team defeated long-standing rival Colgate, 38–14. Go Big Red!



Harry E. Bovay Jr. '36



Missed the Dedication? Coming to campus? Let us know. We'd be happy to provide a tour. Contact Carol Eichler, Alumni Affairs and Development, cme24@cornell.edu or call 607 255-7757. To make a gift to Phase 2 renovations at the Environmental Fluids Teaching Laboratory, contact James Gossett, CEE professor and director, at jmg18@cornell.edu or 607 255-3690.

Student Activities

2006 was a lively year for Cornell's student chapter of the American Society of Civil Engineers (ASCE). The group benefited from increased participation and focused on building community within the School of Civil and Environmental Engineering. As usual, a pig roast at Myers Park marked the end of the 2005–06 school year, and the beginning of the terms for the chapter offices. Students and staff and faculty members braved windy conditions to chat, play volleyball, and chow down. The fall semester began with a welcome picnic—a chance for continuing students and professors to reconnect while greeting recent affiliates.

Last fall, students expressed interest in cultivating more personal relationships with faculty members. This led to the first “Pizza with Professors” event, which took place at The Nines in November. Over deep dish pizzas, professors and students shared stories, gossip, and good-natured complaints. Since then, the gathering has become a monthly social occurrence. Hopefully it will lead to a more cohesive CEE community. The general meetings provide opportunities to meet and hear about the interests of several faculty members and other professional issues. In February, ASCE reached out to the surrounding community by participating in Engineering Day at the local Pyramid Mall. Our toy roller coaster was a hit with the under-ten crowd.

The spring semester is dominated by the regional conference in April, which was held at Cornell this year. The chapter played host to 12 schools from upstate New York and Canada as they competed in the steel bridge and concrete canoe competitions. What better place for the competitions than among the gorges, bridges, and lakes of Ithaca? While some ASCE members booked venues, found judges, and raised funds, Cornell's own competition teams put their designs into action. Steel bridge participants were excited about using a plasma cutter to shape sheet steel into webbing for girder members, and the concrete canoe team looked forward to casting the canoe with a new type of reinforcement. Cornell ASCE anticipated showing off both top-notch engineering skills and our striking campus to the visiting students.



Steel bridge team members reassemble bridge for the judges.



Pizza with the professors.



Cornell ASCE concrete canoe team admiring their handiwork.



CEE Launches Exchange Program with the Universidad de Cantabria

Responding to the evolving global marketplace and the many opportunities to practice engineering in the Spanish-speaking world, Cornell's School of Civil and Environmental Engineering has developed an exchange program with the Universidad de Cantabria in Santander, Spain.

"Foreign students have long sought higher education in the United States, but we have not pursued the reciprocal value of sending our students abroad to study," said Associate Professor Edwin A. Cowen, who has taken the lead in creating the program. "This program will allow our students to enhance their education while preparing themselves to perform in a world market."

The program has been developed around the school's junior-year core course requirements. Up to 20 selected students will be exchanged between Cantabria and Cornell each academic year. The program is open to students in other majors within the College of Engineering who can meet their degree requirements within the exchange program's framework.

The goal of this program is to maximize interest among Cornell engineering undergraduates in spending their junior year abroad—specifically in a Spanish-speaking program. Because lack of foreign language skills is often a significant hurdle to achieving this goal, the program combines Cornell-equivalent engineering courses taught in English with liberal distribution courses, including Spanish language, taught in Spanish.

To prepare for the program, participating Cornell students who aren't already near fluent in Spanish will arrive in Santander about a month before

the start of the fall semester and take an appropriate level immersion course in Spanish language. To complement their intensive language study during this immersion experience, students will live with local Spanish families. During the academic year, students will be housed in a university residence hall on campus, only about 1 km from the famed beaches of Santander.

Eight members of the Class of 2009 are finalizing their plans to officially launch this program in late summer of 2007 as they head to Santander for the year. Current freshmen (Class of 2010) interested in such an experience are encouraged to visit the program web site (ceeserver.cee.cornell.edu/eac20/spain/) to learn more and to complete a brief online form that includes their contact information and interests. Additional questions may be directed to Professor Cowen in CEE.

Project To Build Water Treatment Plants in Honduras Wins National Award for Engineering Students and Their Instructors



Group picture at opening ceremonies of the Ojojona water treatment plant

Adapted from stories in *The Cornell Chronicle* by Anne Ju

Engineers for a Sustainable World (ESW), a 30-chapter national organization founded five years ago at Cornell, has given the Cornell-based AguaClara its Best Project Award. The project, which competed against sustainability programs from across the nation, received the award at the ESW conference in Iowa City, September 27–30, 2006.

AguaClara—Spanish for clear water—involves engineering students who research and design the technologies and then train Hondurans to build and operate the water treatment plants. Coordinated by Cornell civil and environmental engineering senior lecturer Monroe Weber-Shirk, the multiyear effort has focused on rural Honduran communities where clean drinking water is not currently available.

In the program, student teams research and develop technologies that meet the challenges of developing communities throughout the world. The constraints they face include the need to produce clean water without using electrical power and to build the facilities at a cost of less than \$10 per person, using locally available materials.

“One of the big goals for this project is to transfer knowledge,” Weber-Shirk said. “And not just a particular design, but to transfer knowledge so Hondurans can go on building these plants.” For this reason, AguaClara is partnered with the Honduras organization Agua Para el Pueblo—“water for people.” Agua Para el Pueblo is now a few weeks away from finishing a water plant in the Honduran town of Ojojona, Weber-Shirk said.

Ken Brown, who holds a degree in mechanical engineering from Cornell, provided most of the funding for the water plant in Ojojona. “This is so important, and so close to the realities of the world today,” Brown said. “They are doing good engineering work, but in the context of what really matters.”

“Ken’s contributions have created new opportunities to engage in the significant engineering challenge of providing clean drinking water to the billions who lack it,” Weber-Shirk said. “Working to meet this millennium development goal inspires many students who want to use engineering to do something that really matters.”

Involvement with AguaClara affects students even after they have left campus. Cornell students previously designed a water plant for the Honduran village of La 34, a project that was completed in 2005. Perla Lastra, one of the students who worked on that project, recently wrote, “This was by far the most rewarding and fun project that I ever participated in, and I’d love to contribute again.”



Hondurans celebrate the opening of a water plant in their village of Ojojona. Cornell students led by civil and environmental engineering senior lecturer Monroe Weber-Shirk helped design the plant.

ASCE News

Tim Bond was selected to receive the ASCE 2006 Faculty Advisor Certificate of Commendation. He was chosen based on his outstanding work and dedication as faculty advisor to the chapter.

Cornell's ASCE Student Chapter received a 2006 Letter of Honorable Mention for its outstanding activities, as recorded in the 2005 chapter annual report.

ESW News

AguaClara, the Honduras water project of the Cornell chapter of Engineers for a Sustainable World (ESW), won the ESW national organization's 'Project of the Year' award!

Students

Stephanie Arbelovsky, currently a PhD student, won a Fulbright Fellowship to Turkey.

Alumni

David Darwin '67, MS '68, was installed as president of the American Concrete Institute, for a one-year term beginning in April, at the institute's spring convention in Atlanta. Darwin is the Deane E. Ackers Distinguished Professor of Civil, Environmental, and Architectural Engineering and director of the structural engineering and materials laboratory at the University of Kansas.

Veronica Davis MEng '03 writes that 2006 was a "year of transformation" for her. She "changed jobs, started a PhD program in civil and environmental engineering at the University of Maryland, and started "Veronica-O!" Veronica also published her first book, *Images in the Mirror: My Life Through Poetry*. Veronica is a project engineer with Malcolm Pirnie Inc. in their Washington, D.C. office.

James H. Hanson '91, MEng '96, PhD '00, assistant professor of civil engineering at the Rose-Hulman Institute of Technology, is a recipient of the 2006 American Concrete Institute Young Member Award for Professional Achievement.

Eduardo Savio Martins PhD '01 has recently been appointed by the governor of the state of Ceará, Brazil, to head the Research Institute for Meteorology and Water Resources,

Fundação Cearense de Meteorologia e Recursos Hídricos (FUNCEME). The institute was created in 1972 and has conducted scientific and technological research in water resources and meteorology to support water resource-management decision-making, environmental protection, and agricultural development.

Robert A. Rubin '60 has joined the law firm of Seyfarth Shaw LLP as counsel and partner in the New York office. Bob is a member of the firm's national construction practice. The firm's additional practice areas of real estate, corporate, environmental, labor and employment, employee benefits, intellectual property, and government contracts will allow him to expand his current construction litigation practices in New York and on a national basis. Bob previously was with the firm of Postner & Rubin.

Kevin Saunders '96, MEng '00 is a lead game designer at Obsidian Entertainment (www.obsidianent.com). He recently shipped a PC game called *Neverwinter Nights 2*, and coauthored a book, *Game Development Essentials: Game Interface Design*, published by Thomson/Del Mar. Kevin writes that he remembers fondly his years at Cornell and in CEE and though he does not directly utilize much of what he learned, "the problem-solving skills have doubtless aided me in my career." He will never forget the many great professors, and gives special thanks to Professor Dick.

Surendra P. Shah PhD '65, Walter P. Murphy Professor of Civil and Environmental Engineering at Northwestern University, is the 2006 recipient of the Robert E. Philleo Award presented by the American Concrete Institute's Concrete Research Council "for pioneering developments in high-performance concrete and fiber-reinforced cement-based materials, and for leadership in the conduct of interdisciplinary research."

Faculty

John Abel, Professor Emeritus of Civil and Environmental Engineering, was elected President of the International Association for Shell and Spatial Structures (IASS) at the annual meeting of the association, held in Beijing in mid-October. The IASS is a worldwide group of structural engineers, architects, builders, and academics with an interest in lightweight and long-span structural systems such as lattice, tension, membrane, and shell structures. Abel,

who begins a three-year term in the presidency, has been one of the four vice presidents of IASS and also serves as editor-in-chief of the *Journal of the IASS*. In addition, he is chair of the organizing committee for IASS-IACM 2008, the Sixth International Conference on Computation of Shell and Spatial Structures, "Spanning Nano to Mega," to be held at Cornell, May 28–31, 2008.

Wilkins Aquino has been selected for a Faculty Early Career Development (CAREER) grant from the National Science Foundation. The title of his project is "A Simulation Environment for Studying Aging and Degradation of Structures and Materials."

NSF established the CAREER awards to emphasize the importance the foundation places on the early development of academic careers dedicated to stimulating discovery process, in which the excitement of research is enhanced by inspired teaching and enthusiastic learning.

Leslie Banks-Sills adjunct professor in civil and environmental engineering and a professor of solid mechanics, materials, and systems at Tel Aviv University, has been awarded the Diane and Arthur Belfer Chair of Mechanics and Biomechanics at Tel Aviv University.

Edwin "Todd" Cowen is the recipient of the 2005–06 College of Engineering's Daniel M. Lazar '29 Excellence in Teaching Award.

Doug Haith was named by the College of Engineering as recipient of the Douglas Whitney '61 Teaching Award.

Ken Hover participated in the University of Texas at Austin, Department of Civil, Architectural, and Environmental Engineering's Distinguished Lecture Series, presenting on "Texas Concrete Meets Texas Weather—(Complicated Enough Even Before Global Warming!)" in October.

Tony Ingrassia is the recipient of the George R. Irwin Medal of the American Society for Testing and Materials. This award was given in recognition of his pioneering and outstanding contributions to the advanced computational simulation of fatigue and fracture processes and the resulting improved understanding necessary for practical applications of fracture mechanics to the assessment of integrity in engineering structures. This award is largely the result of collaboration with Wash Wawrzyniek and Bruce Carter, research associates in the Cornell Fracture Group.

Fred Kulhawy has been named the Southern Tier NYSSPE 2007 Engineer of the Year by the New York State Society of Professional Engineers; the award was presented at the Engineer's Week Dinner in Binghamton on February 22, 2007.

Phil Liu has been honored with the Kwoh-Ting Li Chair Professorship at the National Central University, Taiwan. This endowed chair is the highest-level professorship in the university. Phil will be helping the university to establish a joint graduate program (or institute) with the Academia Sinica in the field of ocean sciences.

Arnim Meyburg was awarded the status of ASCE Life Member, "with appreciation for a lifetime of dedication and service to the profession of civil engineering."

Petru Petrina was named by the College of Engineering as recipient of the Fiona Ip Li '78 and Donald Li '75 Teaching Award.

Christine Shoemaker was elected an honorary member of ASCE, for her "pioneering research on modeling and algorithms, identification of cost-effective, robust solutions for environmental engineering problems, and her professional and educational leadership."

Shoemaker also was named the Goldman Lecturer for the Department of Applied Mathematics and Statistics at Johns Hopkins University.

Monroe Weber-Shirk is a recipient of the 2006 Kaplan Family Distinguished Faculty Fellows in Service-Learning Award, in recognition of his proposed service learning project and course development entitled, "Honduras Water Supply Project," and his experiential learning efforts and sustained partnership with the APP community in Honduras.

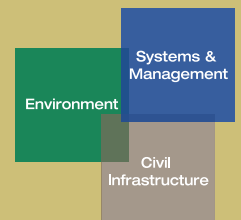
Dick White, Professor Emeritus and the James A. Friend Professor of Engineering, has received the highest honor given by American Concrete Institute, Honorary Membership. This award is "for his lifetime dedication to promoting innovative teaching methods, experimental research, and developing knowledge in concrete and for his dedication and friendship to thousands of students and colleagues at Cornell University and the American Concrete Institute."



CONTACT CEE WITH YOUR NEWS

We would like to hear from you about your accomplishments, awards, and activities so we can tell faculty, students, and other alumni.

Please send your news to
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www.cee.cornell.edu

Reunion 2007: June 7–10

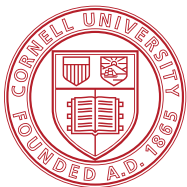
Saturday, June 9

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 7:30–9:30 a.m. in McManus Conference Center, Hollister Hall. A tour of the Bovay Laboratory Complex will be given immediately following the breakfast.

Homecoming 2007: October 12–14

Saturday, October 13

Big Red vs. Colgate



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