Forefront

COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA, BERKELEY

fall 2003

Smart Helmets on the Horizon

Fall on campus is a time of new beginnings. We extend a warm welcome to incoming UC President Robert Dynes, knowing that although he will be facing many challenges—from budget woes to affirmative action issues—under his leadership the University will continue its tradition of excellence.

Times may be tough, but we are still building new buildings (like the new Stanley Center), and our gifted engineers are always finding ways to make this world a better place for us all. You will read about many exciting projects in these pages, from the construction of the largest building on campus in two decades to our development of the smallest ever sensor motes, a primary focus of our researchers at CITRIS, the Center for Information Technology Research in the Interest of Society.

We are installing motes in fire helmets, attaching them to treetops, and placing motes in birds' nests and in weather stations. These tiny wireless sensors hold the power to make inanimate objects smart, to help us better understand our world and each other, and even to help save lives. These are not merely new gadgets, but a new technology family that holds immense promise for improving the quality of our lives.

We hope you like *Forefront's* new look and that you'll help us with the magazine's ongoing evolution. Future plans include the addition of letters to the editor, so please send us your letters, your class notes, and your ideas. We are intent on making *Forefront* your magazine. Our contact information is summarized to the right of this column. Whether you are near or far, a recent graduate or have been around a while, working in an engineering field or not, we'd very much like to hear from you.

— A. RICHARD NEWTON
Dean, College of Engineering
Roy W. Carlson Professor of Engineering

Forefront takes you into the labs, classrooms, and lives of professors, students, and alumni for an intimate look at the innovative research, teaching, and campus life that define the College of Engineering at the University of California, Berkeley.

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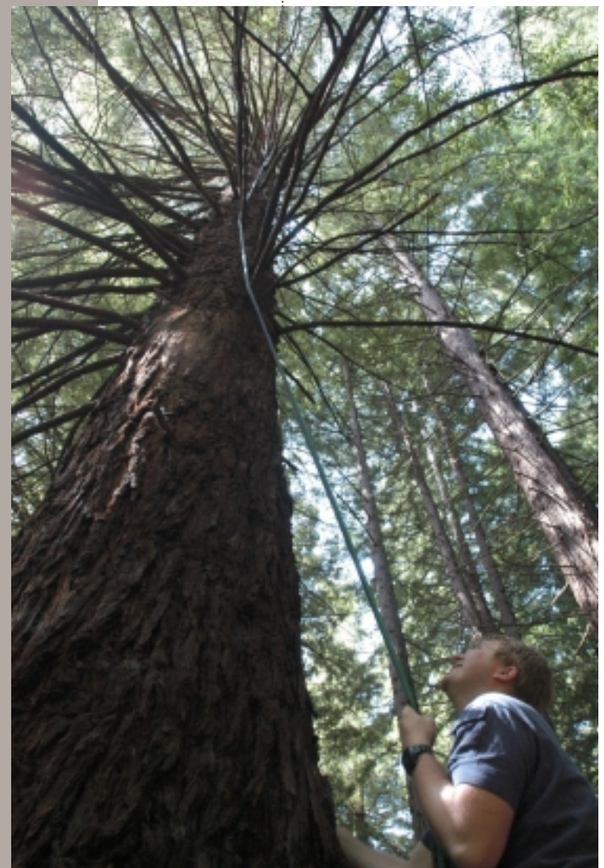
On the cover
Under way in mechanical engineering professor Paul Wright's Ford Prototypting Lab is budding technology that, in the face of events as monumental as 9/11 or as local as an apartment building fire, will make it possible for the first time for firefighters to remain oriented and within the secure control of their commanders. "Combined with wireless sensor networks already in existence," says Wright, "our smart helmet technology could become core for homeland security applications."
Read the story on page 8
COVER PHOTOS BY BART NAGEL



Forefront

COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA, BERKELEY *fall 2003*

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New bioscience center takes shape on Stanley site

PEG SKORINSKI PHOTO

California Gov. Gray Davis joined Chancellor Robert Berdahl (left) and outgoing UC President Richard Atkinson (right) as they broke ground at the site for the new Stanley Center.

A high-tech center will rise from the rubble of old Stanley Hall, tripling the former building's capacity and providing state-of-the-art laboratories for collaborative research that unites engineering with the physical and biological sciences.

The Stanley Biosciences and Bioengineering Facility is the largest construction undertaking on campus in 20 years. It will be home to the California Institute for Quantitative Biomedical Research (QB3) and the College's Department of Bioengineering and will provide laboratory space for the Center for Information Technology Research in the Interest of Society (CITRIS).

Gov. Gray Davis was on hand at groundbreaking ceremonies in May to launch construction where old Stanley Hall—half a century old, scientifically outmoded, and seismically unsafe—was demolished to make way for what will be the largest research building on campus. Both QB3 and CITRIS grew out of the California Institutes for Science and Innovation (Cal-ISI), a project spearheaded by Davis to harness state and industry resources in support of interdisciplinary research and teaching in the biosciences.

"The Stanley Center will support the most up-to-date cross-disciplinary approaches in biomedical and bioengineering research," said Thomas Budinger, chair of the College's Department of Bioengineering. "With its specialized teaching labs and classrooms, it will significantly advance the education of undergraduate and graduate students in biotechnology and bioengineering and serve as the training ground for the next generation of biomedical scientists."

When complete, the center will contain 40 research and teaching labs, each designed to accommodate 10 to 20 scientists, as well as classrooms, seminar facilities, and the innovative Bio-Nano Technology Center, dedicated to fabricating submicroscopic bio-MEMS and robotic devices. It will also house the west coast's only 900-megahertz nuclear magnetic resonance spectrometer, a powerful device that can create images of protein structure on the molecular level. The spectrometer will be used to facilitate a better understanding of protein composition and dynamics, which is essential to tackle diseases and develop drugs to treat them.

The building is the first phase of the Health Sciences Initiative, a campuswide thrust to update laboratory space for 21st century research and spur new faculty hires and innovation at the intersection of the biological and physical sciences. The state has contributed $53.1 million to the new building from Cal-ISI and seismic retrofit funds. The balance comes from campus funds and private support. ■

Alumna Wei named dean of engineering at San Jose State

Belle Wei

Belle Wei, an alumna and former Berkeley instructor, has been named dean of the College of Engineering at San Jose State University (SJSU). She is the first woman in that position at SJSU and the only Asian-American woman dean of a four-year accredited engineering school.

Wei joined SJSU's faculty in 1987 and served as chair of electrical engineering for four years before becoming interim dean in 2002. She has been credited with elevating the standing of SJSU's electrical and computer engineering departments, now among the top 10 national programs without Ph.D.s, according to *U.S. News and World Report's* "America's Best Colleges."

A native of Taiwan, Wei joins the fewer than 20 women deans in 345 engineering schools nationwide. ■

Stanley Biosciences and Bioengineering Facility Facts

PHOTO COURTESY OF ZGF PARTNERSHIP ARCHITECTS AND ARTIST AL FOERSTER

WHAT: $162.3 million, 285,000 sq. ft., 11-story facility housing biosciences and bioengineering research (75%) and instruction

WHO: Home to QB3 and the Department of Bioengineering; will also house laboratory space for CITRIS

WHERE: East Gate of campus, next to Hearst Memorial Mining Building

WHEN: Scheduled for completion January 2006

WHY: Provides state-of-the-art and seismically safe labs to facilitate interactive research in bioengineering, computational biology, chemical biology, magnetic imaging, tissue engineering and other disciplines investigating complex biomedical and health issues

BREAKTHROUGHS

Cutting-edge research from Berkeley Engineering

We are pleased to introduce *Breakthroughs*, a regular column featuring brief updates on the pioneering research done by UC Berkeley College of Engineering faculty and students. See more at **www.coe.berkeley.edu/newsroom.**

Canary on a microchip

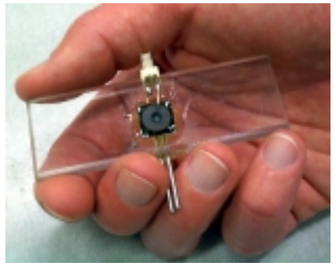


PHOTO COURTESY OF YONG HUANG

The MEMS device combines electronic circuitry and a living cell in a toxic sensor.

Professor Boris Rubinsky of ME and BioE and Berkeley engineering alumnus Yong Huang (Ph.D. '01 ME) have developed a microchip that can instantly determine whether a cell is dead or alive. In a study published in *Sensors and Actuators*, the researchers used their chip to detect changes in a cell membrane's electrical resistance milliseconds after exposure to a toxin.

"This MEMS [micro-electromechanical systems] device will be invaluable in the detection of a biochemical attack, because there you don't have the luxury of time and analysis," says Rubinsky, a researcher with the Center for Information Technology Research in the Interest of Society (CITRIS). The chip, patented by UC Berkeley, was exclusively licensed to Excellin Life Sciences, a Milpitas-based biotech startup where Huang is president. ■

Ethanol does more harm than good, report says

As the U.S. Senate debated a provision in the energy bill that would double the amount of ethanol used as a gas additive to five billion gallons a year by 2012, Berkeley researchers issued a report concluding that ethanol does more harm than good.

Professor Tad Patzek of CEE and his students found that by the time ethanol is burned as a gasoline additive in our vehicles, the net energy lost is 65 percent, a figure that factors in the energy spent growing the corn, converting it into ethanol, and transporting it.

"We're embarking on one of the most misguided public policy decisions to be made in recent history," Patzek says. ■

Clean water for developing nations

LAURA MCLAUGHLIN PHOTO

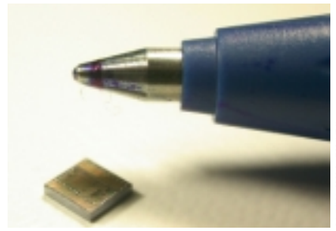
Florentino Mota, a community outreach worker in Mexico, installs the UV Tube.

According to the World Health Organization, as many as five million people die annually from drinking contaminated water. In the battle against bad water, the Mexican Institute of Water Technology launched a pilot project last summer to test an inexpensive water disinfecting system developed at Berkeley.

The device, known as the UV Tube, is easily installed in a home's water system. It consists of a PVC (polyvinyl chloride) tube lined with stainless steel and an ultraviolet light bulb. As water passes through the tube, the UV light damages the DNA of bacteria, viruses, and protozoa and prevents them from replicating. The tube costs $30 to $50, based entirely on materials readily available in local hardware stores.

The device was developed at Berkeley's Renewable and Appropriate Energy Laboratory, directed by Professor Dan Kammen of NE, the Energy Resources Group, and Goldman School of Public Policy, with Professor Kara Nelson of CEE serving as technical advisor. ■

A spec of smart dust

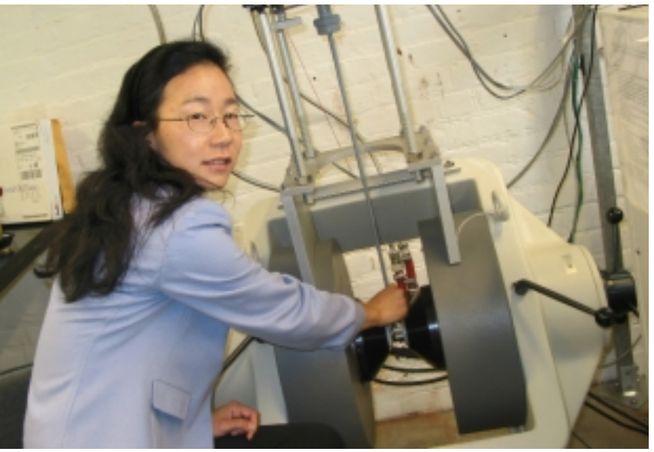


JASON HILL PHOTO

The wireless mote integrates radio frequency communication onto a sensor processing chip just 5 square mm in size.

EECS graduate students Al Molnar, Jason Hill, Ben Cook, Mike Scott, and Brett Warneke successfully tested a tiny chip outfitted with ultra-low power computation, communication, and sensing capabilities. Without the battery required to power it, the chip measures a mere 5 square millimeters. A key ingredient in the CITRIS-developed Smart Dust platform of tiny and inexpensive sensors, the aptly named Spec chip contains a novel transceiver that is 50 times smaller than a cell phone and consumes 1,000 times less power, yet operates at the same frequency.

"This is a major step toward sensors that cost less than $1 apiece and are integrated into the products we own, the buildings we live and work in, and the freeways we drive on," says Smart Dust inventor and Professor Kris Pister of EECS. ■



ANGELA PRIVIN PHOTO

Yuri Suzuki returned to her roots when she joined the Berkeley faculty. Her physicist father Mahiko has been on the physics department faculty since she was three.

NEW FACULTY PROFILE: YURI SUZUKI JOINS MSE

MSE professor Yuri Suzuki is part engineer, part farmer. Her research expertise involves "growing" new materials that might one day shrink computers to minuscule proportions and help them achieve mind-boggling speeds. She doesn't use organic materials like conventional farmers, but combines varying quantities and mixes of magnetic oxides to produce materials with properties that don't now exist.

The 35-year old physicist joined the Berkeley faculty in spring 2003 after five years on the faculty at Cornell University. Becoming a Berkeley engineering professor was a homecoming for Suzuki, who grew up just down the street from her Hearst Mining office. Her father, Mahiko Suzuki, has been teaching theoretical physics in Berkeley's physics department since his daughter was three.

At first, Suzuki wasn't interested in going into the same field as her father, but a dynamic undergraduate college professor at Harvard stoked her interest in physics. She got her Ph.D. in applied physics, specializing in high-temperature superconductors, at Stanford, where she began studying the properties of new materials. During her post-doctorate work at Bell Labs she focused on magnetism and the properties of oxides and has been working in that field ever since.

The addition of Suzuki doubles the number of women faculty in the MSE department, from one to two. While she was the only woman in the MSE department at Cornell, she says she hardly noticed.

"It wasn't at all hard being the only woman," Suzuki says. "What was tough was being the youngest person in the department." Her goal at Berkeley is to interact with its outstanding cohort of faculty and students and explore new research directions in photonics and optics. This sort of interdisciplinary collaboration is a great way for her to perform innovative research in fields she hasn't studied in depth, she explains.

Suzuki's method of growing materials involves pulverizing magnetic oxides like iron oxide and lanthanum manganese oxide and pressing them into puck-shaped pellets. A high-powered ultraviolet laser is then used to vaporize the pellet material into thin films in a controlled high-pressure, low-temperature environment.

Finer than a strand of human hair, these thin films contain an atomically ordered blend of the magnetic oxide materials. With very different properties than their bulk counterparts, these materials may potentially serve as building blocks for future magnetic storage devices and media and may provide new functionality that silicon, optics, and metal alloys don't have.

In five to ten years, Suzuki says, the new cultivated materials could enable a nonvolatile random access memory (RAM) that doesn't wipe clean every time a computer is turned off, as well as more sensitive computer read heads that would permit the use of denser hard drives. ■

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BY ANGELA PRIVIN, ENGINEERING PUBLIC AFFAIRS

OBITUARY: JOSEPH PASK

PHOTO COURTESY OF THE PASK FAMILY

Joseph Pask's work in mullite, an alumina-silica compound used in engines and turbines, set the standard for the field.

Joseph Adam Pask, Berkeley professor emeritus and an international leader in modern ceramic science and engineering, died in June at age 90.

Pask joined the Berkeley faculty in 1948, when the field of ceramics was bursting out of the confines of pottery and lavatory materials and onto the stage of modern engineering. Pask and Richard Fulrath, another professor emeritus who died in 1977, formed the first ceramic engineering programs on campus.

"There was no ceramic engineering at UC Berkeley before Pask," said Alan Searcy, another MSE professor emeritus who was recruited by Pask in 1954. "The graduate students have gone on to become industry leaders and faculty members at major universities."

Pask was MSE chairman from 1958 until 1961 and associate dean for graduate affairs in the College from 1969 until he retired in 1980. He garnered respect for the ceramic engineering program worldwide and expanded MSE by recruiting faculty with a broad range of expertise, from minerals processing to physical chemistry. ■

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BY SARAH YANG, CAMPUS PUBLIC AFFAIRS

newsmakers

DAVID M. AUSLANDER, professor of mechanical engineering and associate dean for research and student affairs, received the 2003 Eckman Award from the Instrumentation, Systems, and Automation Society last spring. The award was established in 1963 to recognize outstanding contributions to education and training in the science, engineering, and technology of instrumentation.

Auslander was cited for his pioneering contributions to the development of innovative educational methods and materials for design, implementation of computer-based control and instrumentation systems, and for disseminating that education and methodology worldwide.

WILLIAM KAHAN, professor of mathematics and EECS, was elected to fellowship in the prestigious American Academy of Arts and Sciences in May. An expert on floating-point computations, Kahan's teaching and research interests include algorithms, mathematical analysis, computational theory, computer arithmetic, software diagnosis, error analysis, financial computations, matrix computations, and trajectory computations.

Ruzena Bajcsy

PEG SKORPINSKI PHOTO

David Patterson

RUZENA BAJCSY and **DAVID PATTERSON** were appointed in May to two-year terms on President Bush's Information Technology Advisory Committee (PITAC) to advise the president on how to maintain U.S. preeminence in advanced information technologies such as high-performance computing, large-scale networking, and high-assurance software and systems design.

Bajcsy, EECS professor and director of the Center for Information Technology Research in the Interest of Society (CITRIS), is an expert in robotics, artificial intelligence, and machine perception. Patterson, holder of the Pardee Chair of Computer Science, is an innovator in computer architecture and has designed several widely used architectural systems.

PITAC was mandated by an act of Congress, and appointees were first named under the Clinton administration in 1997. Its members include leading information technology experts from academia and industry. Previous PITAC recommendations have led to increased federal investment in long-term information technology research, such as the National Science Foundation Information Technology Research (ITR) program.

MICHAEL SILVER PHOTO

Dean A. Richard Newton and University of Melbourne Chancellor Fay Marles

DEAN A. RICHARD NEWTON, professor of EECS and Roy W. Carlson Professor of Engineering, was recently awarded a Doctorate of Laws, *honoris causa*, from the University of Melbourne, Australia, where he earned his B.E. and M.EngSci degrees in 1973 and 1975, respectively. Among his recent accomplishments, Newton was founding director of the MARCO/DARPA Gigascale Silicon Research Center, a major public-private partnership with the U.S. government and the semiconductor industry, and helped found the CITRIS Institute. Since 1979 he has been actively involved as a researcher and instructor in the areas of design technology, electronic system architecture, and integrated circuit design.

Engineering alumni design product to reduce diesel soot

A first-of-its-kind retrofit product for diesel engines—the brainchild of three Berkeley Engineering alumni—has been verified by the California Air Resources Board (CARB) as effective in reducing noxious emissions and is being purchased for installation on more than 1,700 diesel buses throughout the Bay Area.

The device, dubbed the Longview, reduces particulate matter (PM)—the tiny particles of black soot in diesel exhaust—by 85 percent and oxides of nitrogen (NOx) by 25 percent. Both PM and NOx emissions have been implicated in causing asthma and other respiratory illnesses, and PM emissions are a toxic and possibly carcinogenic air contaminant. NOx is also a prime contributor to ground-level ozone, or smog.

With the device already installed on about 70 Caltrans trucks and other state vehicles, the nine-county Metropolitan Transportation Commission has allocated $13.8 million in federal and $1.8 million in local funds to purchase and install the Longview on diesel buses throughout the Bay Area over the next two years. It is also being evaluated for use in the Washington, D.C., Metro Area Transit Authority bus fleet.

The Longview has been universally well received by diesel engine operators, not only because of its effectiveness in reducing emissions but also because it's easy to install and has minimal effect on engine efficiency. The rigorous CARB verification process makes the product eligible for purchase through federal, state, and regional incentive funds.

"We're trying to dispel the notion of the 'dirty diesel' engine," says Bradley L. Edgar, executive vice president and chief technology officer of Cleaire, the San Leandro company that manufactures the product. Vastly improved over the last 20 years, he adds, the diesel engine will continue to evolve to a cleaner, quieter, and lower polluting engine than the one we associate with billows of black soot. Near-term future developments probably include more diesel-powered passenger cars and a diesel-hybrid engine.

Cleaire engineers (left to right) Brad Edgar, Juston Smithers, Michael Streichsbier, and Marc Rumminger demonstrate how the Longview device fits on a diesel school bus. Rumminger coined the name on a day when rain had cleared the air of particulate matter, noting that he finally had a "long view" of the bay, the way it would look all the time if their product were successful.

The familiar black cloud of soot is completely eliminated when diesel engines are retrofitted with the Longview, and air-contaminating emissions are drastically reduced.

"Diesel is vital to our economy. It's used in mass transit, transporting most goods, and in marine applications," Edgar says, citing diesel's fuel efficiency, engine durability, superior handling with large loads, and other advantages over the spark-ignited gasoline engine.

Edgar and partners Marc Rumminger and Michael Streichsbier were all students together at Berkeley, earning their doctorates in mechanical engineering in the mid-'90s. Edgar rounded them up again to launch Cleaire in 2001 as a division of Cummins West, Inc., to distribute, install, and service the Longview and other Cleaire products. (Cummins West is the central and northern California distributor for Cummins Inc., an international blue chip engine manufacturing company.)

The Longview took about two years to develop and is engineered to seamlessly replace the muffler on diesel vehicles. The device combines a state-of-the-art PM filter with a NOx reduction catalyst and a proprietary electronic controller to maintain system performance. The result: That nasty cloud of black soot is completely eliminated.

Edgar fondly recalls the defining moment in his professional life when Professor Robert Dibble, whose lab he was working in as a budding graduate student, first inspired his interest in diesel.

"We were walking back to campus after a coffee break," Edgar says, "standing on the corner of Hearst and Euclid, when a UC shuttle bus started up from the red light and sent up an incredible billowing cloud of black smoke that nearly choked us. 'We ought to be able to do something about that,' Professor Dibble said. It was a pivotal moment for me in my research and my whole career." ■

Joe Costello shares the secrets of his success

It was standing room only in Sibley Auditorium the day Joe Costello came back to Berkeley to share the secrets of his Silicon Valley success in a spirited and expletive-filled motivational talk that felt a lot like a Dharma lecture laced with stand-up comedy.

Clad in bright yellow, talking fast, and gesticulating energetically, his enthusiasm and positive attitude were infectious. The one-time physics graduate student dropped out of Berkeley in the '70s to become rich and famous as CEO of Cadence Design Systems, which he converted from a tiny electronic design automation company into a $1 billion industry leader. He is now CEO at think3, a company that produces computer-aided design programs.

"Learn from every person and every interaction you have," he said, and "get adroit" at staying focused in the present moment. His mantra is "positive end in mind," and his methods include not believing everything you hear and saying "no" to anything you aren't passionate about.

"Be stubborn on the vision but flexible on the execution," he said, warning against our culture's tendency toward negative motivation. He used the example of "negative target fixation," a phenomenon used by the Federal Aviation Administration to explain plane accidents caused by pilots who keep looking at an object they don't want to hit.

Go to **www.coe.berkeley.edu/multimedia/index.html** to see Costello's talk in its entirety. ■

ANGELA PRIVIN PHOTO

"Life is a dance through time," Costello said in his animated talk last spring to a capacity audience of engineering students and staff.

Inventor Dean Kamen addresses 2003 graduates

PEG SKORPINSKI PHOTOS

Inventor and entrepreneur Dean Kamen, a tireless advocate for science and technology, was selected by the graduating class to speak at commencement 2003.

It was a cool and overcast day, but the only degrees on their minds were the ones they were about to receive, the nearly 1,000 bachelor's, master's, and doctoral degrees that were conferred last May at the College of Engineering's 140th commencement at the historic Hearst Greek Theatre.

By popular demand of the graduating class, inventor and entrepreneur Dean Kamen gave the keynote address.

Bioengineering graduate Alice Ann Chen was student speaker, and 31 top students received awards and scholarships, including Bechtel Achievement Awardee Ankur Luthra, Bechtel Engineering Scholar Jengyee Liang, and student citation winners from each of the College's eight departments.

Kamen, an inventor and entrepreneur who holds more than 150 patents for devices such as an infusion pump for people with diabetes and a wheelchair that climbs stairs, is best known for his Segway Human Transporter. He gave a droll speech entitled "99 Things You Need To Do To Succeed in Life." In the end, he said, only two really matter: finding something important to do in life and not giving up on that commitment. He also entreated engineers to "spread knowledge among the savages out there," by claiming a stronger voice in an ever-more complicated world.

The Segway itself made a surprise appearance just before Kamen got up to speak, as ME graduate George Ban-Weiss glided across the stage on one, clearly exhibiting an engineer's delight at its smooth handling. ■

Smart helmets could bring firefighters back alive

World Trade Center tragedy turns research in a new direction

BART NAGEL PHOTO

Dubbed the "Robocop version" of the heads-up display, the next-generation smart helmet, not pictured here but now in development, will feature an in-mask display mounted on the lower right region of the visor. The National Science Foundation funded the core technology for the smart helmet, with Intel and CITRIS support.

BY GORDY SLACK

On September 11, 2001, firefighters from all over New York City responded to the attack on the World Trade Center. As hundreds worked their way up to the floors where the first plane struck, those in charge set up a command post on the ground floor of the neighboring tower.

Though second to be hit, that tower was first to collapse, wiping out the command post and thrusting the rest of the rescue mission into chaos. Police helicopters circling the remaining tower predicted it would fall and issued an evacuation warning. That message, sent 21 minutes before the tower collapsed, never reached the firefighters.

Three hundred and forty three firefighters died in the towers that day. One hundred twenty-one were within sprinting distance of safety but did not hear the evacuation order.

Rolling back the clock is a luxury we wish for. Breakthrough technology is a luxury we have. Under way in mechanical engineering professor Paul Wright's Ford Prototyping Lab is budding technology that, in the face of events as monumental as 9/11 or as local as an apartment building fire, will make it possible for the first time for firefighters to remain oriented and within the secure control of their commanders.

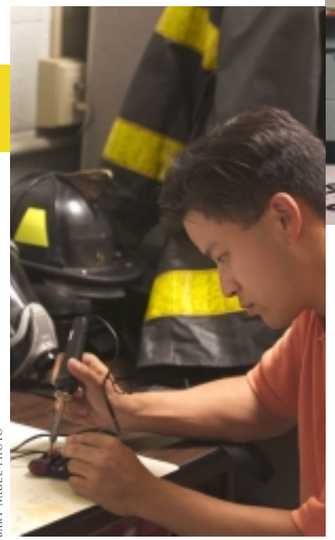
"September 11 set the groundwork for this project," says Wright. "In the fall of 2001, I was teaching a class on high-tech product design and rapid manufacturing. It quickly became clear to all of us in the class that we had to refocus our product research to include a significant social component. Now all our projects have this added layer."

Materials science engineering doctoral student Daniel Steingart was in Wright's class, where he was developing a "heads-up" display for motorcycle helmets. His nascent smart helmet display, which projected speed and cell phone caller ID on the inside of the helmet's visor, was designed to allow riders to keep their heads up and their eyes on the road rather than on the handlebars.

Word of Steingart's project reached Richard Nowakowski, special projects coordinator for Chicago's Office of Emergency Management and Communication. In sync with the stark political realities following 9/11, the Chicago City Council had passed a resolution that required all buildings more than 80 feet tall—seven or eight stories—to submit electronic floor plans to the Office of Emergency Management to help rescue workers navigate inside. Nowakowski called Steingart asking if the heads-up display could be adapted to exploit the digital maps his Chicago firefighters would soon have, and a partnership was born.

Over the past year, the Berkeley team has worked closely with the Chicago Fire Department to create customized smart helmets—oxygen masks outfitted with wireless sensor motes and miniature near-eye displays. A quick glance at the tiny screen inside their masks will allow firefighters to track their progress through a building and locate crew mates or victims trapped inside.

BART NAGEL PHOTO



BART NAGEL PHOTO

Outside the building, where commanders direct a rescue team, the smart helmet—via the Electronic Incident Command System (EICS)—will offer new levels of visual access, allowing command and control officers to efficiently monitor the progress of rescue operations, communicate with selected firefighters, or even call for an evacuation.

"In a smoky fire, firefighters and their commanders can be starved for reliable information," says Wright. "The smart helmets put them in a much more information-rich environment, allowing them to make better, safer decisions. Good information can make a huge difference when you're faced with the kinds of decisions they have to make."

The smart helmet marks the convergence of several technologies, according to Steingart, a key player on this project from the start. First, there was the evolution of small, inexpensive sensors, which can be placed in and around a building as well as on firefighters. The tiny wireless sensors and many of their application domains—developed by EECS faculty members Kris Pister, David Culler, Jan Rabaey, Richard White, and James Landay as a flagship project for the Center for Information Technology Research in the Interest of Society (CITRIS)—broadcast limited-range signals to create a sort of Local Positioning System (LPS) inside buildings.

"In a smoky fire, firefighters and their commanders can be starved for reliable information."

ABOVE LEFT: *Lloyd Lim solders the circuitry for a pulse-rate sensor. The circuitry casing was fabricated by the Fused Deposition Modeling Machine in the Ford Prototyping Lab.*

ABOVE RIGHT: *A pulse monitor like the one Steingart (left) fits on Wright's wrist gives central command a readout of a firefighter's heart rate on a laptop computer. This research was done in conjunction with Michael Scanlon, U.S. Army Research Lab.*

Then last December, Wright's engineers—who are taking the core sensor technology and adapting it for applications such as the smart helmet—journeyed to Chicago. In tandem with a group of Haas Business School students, the interdisciplinary team interviewed 140 firefighters to learn more about the kind of information firefighters consider most crucial in a helmet display. The Berkeley team was also seeking a realistic notion of how sturdy their new apparatus would have to be, given the abuse such equipment takes inside a burning building.

The Berkeley-Chicago collaboration continues to evolve. The miniaturization of powerful microprocessors and near-eye displays has been key to the project's success. "Firefighters already wear more than 40 pounds of equipment into a fire," says Steingart. "They are not about to strap a Pentium PC onto their backs as well."

The latest smart helmet packs an 11-ounce Xybernaut POMA computer, slightly smaller than a VHS videotape. Once the monitors, motes, transmitters, and batteries are all assembled, the unit will weigh between five and ten pounds. As with most portable electronics, battery weight and reliability are major challenges, says Wright. "For a firefighter using a smart helmet as a lifeline to safety, dead batteries take on a new meaning," he says.

Smart helmets will not only monitor the wearer's location, they will track a firefighter's well being. Lloyd Lim, one of Wright's ME graduate students, has adapted a pair of heart-rate monitors, one on the neck, another on the wrist, that give a commander an instant report on a firefighter's status.

A quick measure of the lag time between the pulse in the neck and the pulse in the wrist—key indicators of a firefighter's effectiveness—makes it possible to evaluate fatigue levels, says Lim. The monitor on the neck also picks up vibrations from the voice box, doubling as a microphone to transmit the voice clearly, even when a muffling oxygen mask covers the wearer's face.

"Smart helmets will give us another set of eyes," says Gil Dong, a fire captain and station commander in the City of Berkeley Fire Department, now working closely on a local level with Wright's group. "Every time we go in to search a building, it will make the job easier, safe, and more efficient. Firefighters can die, lost in the dead end of a burning closet or stairwell."

Ultimately, Wright says, the LPS will probably be established by multiple antennae arranged outside a building on fire trucks and helicopters positioned around the site. There they triangulate the points necessary to chart a position. That way, the position detectors—initially distributed inside the building in fire-resistant cases but still vulnerable to super-high temperatures and impact—will be out of harm's way. Even then, motes will still be used to monitor temperature and smoke levels throughout a building, where they could also provide position location redundancy.

Asked what Chicago's firefighters think about the new equipment, Nowakowski says, "Before 9/11 they'd have said, 'We don't need more stuff.' Now they're saying, 'Definitely, we need it!'" And in about two years, Nowakowski and the Berkeley team predict, they will have it. ■

BART NAGEL PHOTO

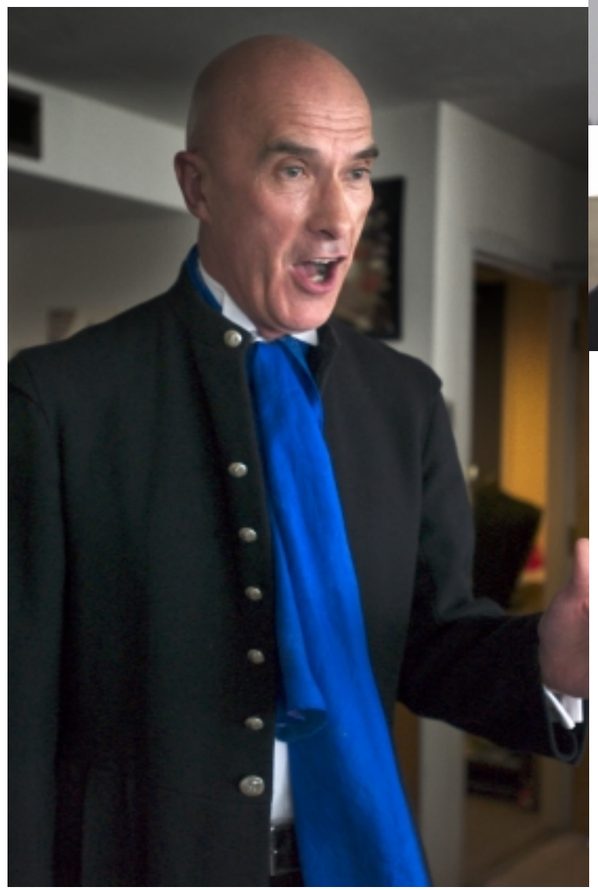
As part of a ladder drill, City of Berkeley firefighter/paramedic Dan Green removes "Rescue Joe," a 200-pound dummy from a smoke-filled building—this one swirling with non-toxic Fog Fluid. With the heads-up display mounted on his mask, Green's whereabouts and heart rate can be monitored on a laptop computer.

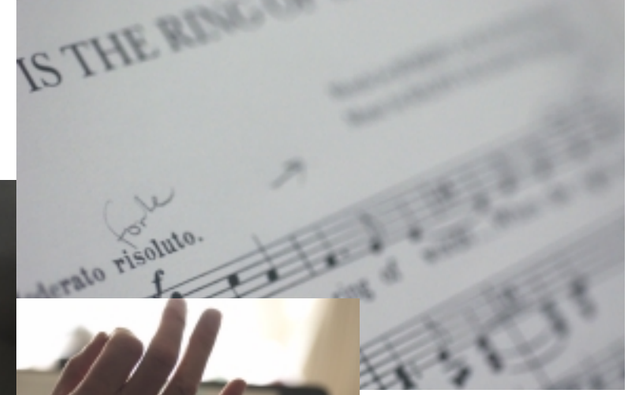
Life outside the lab

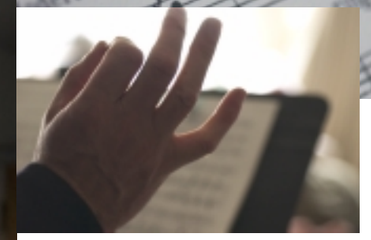
From master chef to opera singer, professors do have a life beyond the classroom and lab.

For Berkeley's engineering faculty, the balance between life and work is a precarious and precious one. Innovation comes not just from seeing far, but also seeing wide—drawing fulfillment and inspiration from art, music, culture, cuisine, literature, and of course, family. These esteemed professors and many others have achieved that balance, finding time to feed their minds outside the laboratory to help fuel their efforts inside.

BY DAVID PESCOVITZ
PHOTOS BY BART NAGEL







Paul Wright
MECHANICAL ENGINEERING

Opera Baritone

"Keep the energy up!" the voice instructor booms to his student. "Be resolute! Make sure you hit the final consonants."

The student, Professor Paul Wright, listens intently, glancing at the sheet music in front of him. He pauses, and then in his best *basso profundo* intones the opening lines of Ralph Vaughan Williams' opera "Bright is the Ring of Words."

"Good!" the instructor says. "But support the sound with a cushion of air. Again, please."

Wright has been studying opera under critically acclaimed San Francisco tenor Ross Halper for three years. Last year, the engineer had his operatic debut in Halper's chorus for the North Bay Opera's production of Jacques Offenbach's *Tales of Hoffman*. In March, he landed his first solo with the company in Puccini's *Tosca*, playing the sociopathic Sciarrone.

While Wright is relatively new to the realm of arias and librettos, music and performance have been lifelong passions. He remembers a "house filled with music" growing up in Watford, England. His father, he says, hammed it up on the piano, while his mother often crooned along to 1940s jazz tunes. As a child, Wright taught himself piano and then, as a teenager inspired by Bob Dylan and the Beatles, graduated to guitar.

"In my teens and twenties, I had real difficulties deciding whether to pursue music or engineering," he says.

Wright eventually made his choice. In addition to his smart helmets project, he's collaborating with Ed Arens, director of Berkeley's Center for Environmental Design Research, on a project within the CITRIS realm to develop "demand-response" thermostats and utility meters.

Sponsored by the California Energy Commission, the researchers are building intelligent thermostats and meters that take advantage of time-based pricing structures. The thermostat could receive real-time pricing information wirelessly from a utility company and, coupled with data from energy and temperature sensors around your home, automatically control heating and air conditioning equipment to establish the desired temperature at the lowest price.

"It's important for engineers to talk about technical issues, but they must also temper that within a broader social fabric," Wright says. "I think you can become a better engineer if you can integrate your 'feeling side'—whether that's an interest in the arts, nature, or social issues—with your scientific side."

Even as a busy young professor at New York University in the 1980s, Wright felt the lure of the Manhattan music scene, occasionally singing jazz with a small band at area nightclubs. He even shopped a studio recording to several record labels.

After moving to Berkeley in 1990, his focus shifted to raising his three sons as a single father and establishing the College's state-of-the-art Berkeley Manufacturing Institute. Once his children had grown and his research was in full swing, music returned to his life.

"I realized that if I was ever going to do music again in a loving way, this was the time," he says. A conversation with a College staff member, also an opera buff, led Wright to Halper.

"As I was getting older, I realized that opera is a style you can sing in your later years," Wright says. "Nobody wants to see a mid-60s rock and roll singer."

While jazz singers Billy Holiday and Ella Fitzgerald are mainstays on Wright's CD player, he has grown to love classical Italian opera. As a Brit, he's also naturally drawn to early twentieth century English composers like Williams and Peter Warlock.

"Their music can really capture the drama and romance of the English countryside in the evening," Wright says. "It sounds corny, but music has to resonate with some deeper level of the soul. It has to speak to me in some way."

Wright hopes to work up a set of Vaughan Williams songs for voice and guitar. In the meantime, he and his new wife Taun, who holds a music degree from UC Santa Cruz, play the occasional duet at home.

"We have musical friends too," Wright says. "So occasionally when we get together for drinks and dinner, we have a little sing-a-long. It's quite lovely, really."

Christos Papadimitriou
COMPUTER SCIENCE

Novelist

One day in 1999, Professor Christos Papadimitriou left a movie theater in Greece, blinded with a flash of inspiration. He had just watched a biography of one of his favorite Greek poets, Constantine P. Cavafy. The film, Papadimitriou says, was just so-so. But the idea of creating a narrative honoring the life of a great thinker appealed to the computer scientist. A book cover appeared in his mind's eye: Papadimitriou imagined a fantastical homage to Alan Turing, the brilliant English mathematician and founder of modern computer science who took his own life in 1954.

"I wrote the first chapter on the plane ride back to Berkeley," says Papadimitriou, who had never produced a word of fiction before.

But he kept writing, every morning from seven to nine, for two years. And now, *Turing (A Novel About Computation)* is a reality. Following a first publication in Greek as *To Hamogelo tou Turing*, translated as *Turing's Smile*, the novel hit bookstore shelves in the United States last summer.

Published by MIT Press, *Turing (A Novel About Computation)*, is a love story set in the near future. "The basic plot begins with boy meets girl, girl leaves boy, boy is inconsolable," he says.

From there, the surreal tale truly begins to unfold. While searching for his love via the Internet, the protagonist stumbles on a computer program called Turing that can communicate in English. The man and the machine become immersed in a poetic conversation about life, love, math, death, and immortality. The program embodies one of Turing's best known ideas, the Turing Test, a game in which a human interrogates another human and a computer via text messages without knowing which is which. If the person could not distinguish the computer from the human, the computer would be deemed intelligent.

"In some sense in the book, the program is actually Alan Turing," Papadamitriou says.

Currently, Papadimitriou is collaborating with his friend and best-selling Greek author Apostolos Doxiadis and several illustrators on another unusual literary project. *Logicomix* is a graphic novel about the authors' joint quest to understand the lives of the great mathematical logicians of the 20th century.

"We are trying to come to grips with the strange fact that most of them died in psychiatric hospitals," Papadimitriou says.

Studying the triumphs and failures of the logicians who came before him informs Papadimitriou's work in the laboratory. He applies algorithmic and complexity theory to the Internet. The broad intent is to understand how Internet growth relates to congestion and the overall health of the massively complex system.

"The Internet is the first artifact that computer scientists must study in ways similar to how scientists study the brain or cells," he says. "The Internet is not a finished product. At the next technological fork in the road, we need to have some insight into how to improve it."

Turing would indeed be smiling.

"Writing fiction is not unlike my work with mathematics and computers," Papadamitriou says. "With both, everything has to fit together. The plot of a novel is very much like a mathematical proof."

Jim Demmel & Kathy Yelik
COMPUTER SCIENCE

Married with Children

Professors Jim Demmel and Kathy Yelick are collaborating on the most difficult, time-consuming, and rewarding experiment of their lives. They're raising a family. And while Demmel and Yelick are not the only couple in Berkeley's Computer Sciences Division, their relationship is a quintessential College of Engineering love story.

Demmel, a Berkeley alum (Ph.D. '83), spent six years on the faculty of the Courant Institute at New York Univeristy before returning to bear territory in 1990 with a joint faculty appointment in Berkeley's Computer Sciences Division and Mathematics. Several months after he arrived, Yelick completed her Ph.D. at MIT and accepted a faculty position at Berkeley, where she met Demmel.

Living in faculty apartments on the University's Clark Kerr Campus, they'd jog together in the mornings before immersing themselves in work that often kept them on campus into the night.

"I realized quickly that Jim never used his apartment oven for anything other than melting the snow seal on his boots," Yelick remembers. "So we'd work late on campus, then go out to dinner and talk."

Computer science was not their favorite topic of conversation, Demmel says. Still, they understood each other's dedication to their work. And as they grew closer, they realized they were more fortunate than many other academic couples.

"When I was single and a graduate student at Berkeley, I attended a seminar on what happens when one person in a couple gets a job offer somewhere and the other has to make a decision," Demmel says. "The psychologists leading the seminar said most couples break up over this. We counted our blessings because we met *after* we'd gotten our jobs."

The two bought a house together in the Berkeley hills in 1991. Eighteen months later they married. Then came a year-long sabbatical to MIT and Switzerland 1996 and the birth of their daughter Megan, now six and a half. "The news of Megan arrived right along with Kathy's tenure letter," Demmel says.

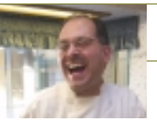
The couple was collaborating on a large grant proposal for an Advanced Simulation and Computing project about the time Megan was born. At two in the morning, Yelick, Demmel, and a group of graduate students would be hammering away on the proposal. Megan would sleep quietly in the corner, until she woke up hungry.

It was an exhausting time, Kathy says. "Jim would hold Megan in the rocking chair," she says, "but next to him would be all these papers with scribbles on them. Jim had been proving theorems all night while he rocked the baby."

Now parents of two—Nathan arrived in 1998—their research momentum continues. Demmel is chief scientist for the Center for Information Research in the Interest of Society (CITRIS), and Yelick is one of the CITRIS researchers. They're also principal investigators for the Berkeley Benchmarking and Optimization Group (BeBOP), studying how to tune computer software and hardware for optimal performance. Their efforts could dramatically improve methods of scientific computing and information retrieval.

Yet even under the unyielding pressures of academic life, Demmel and Yelick put family first. They alternate days picking up the kids from school (keeping the schedule straight with collaborative calendar software, of course), hit the hiking trails or the Chabot Space & Science Center on weekends, and take adventurous trips when the opportunity arises. Most recently, Demmel was invited to speak at the world's most prestigious mathematics conference in Beijing, China. After much deliberation about time zones and the unique challenges of traveling internationally with small children, the entire family packed their bags.

"What's the point of having kids unless you really want to spend time with them?" Demmel says.



Al Pisano
MECHANICAL ENGINEERING

Master Chef

The rich scent of Italian cooking wafts from Al Pisano's Danville kitchen. The mechanical engineering professor is massaging thick steaks of Ahi tuna with extra virgin olive oil, working the oil into the grain of the fish, preparing to sear the sushi-grade steaks in a reduced sauce of ginger, garlic, capers, and port. As he chops scallions, Pisano chats up his dinner guests, two esteemed professors visiting from Georgia institute of Technology.

"We're gonna thermal shock the living daylights out of this tuna," says Pisano, who holds the prestigious FANUC Chair of Mechanical Systems and is director of Berkeley's Electronics Research Laboratory.

Over appetizers of Gorgonzola cheese, marinated tomatoes in lemon, and fresh baguette dipped in fine olive oil, the conversation turns from the subtleties of olive oil to high-density generators, micro-turbines, and heat transfer. A few minutes later, the tuna is cooked to perfection, the asparagus artistically spread out like a Chinese fan over the warm polenta—stems touching together—and dinner is served.

Tonight's gourmet taste of Southern Italy is the norm at the Pisano home. Three or four times a week Pisano picks up his 8-year-old son Christopher from school, and the two make their rounds at one of the gourmet markets in the area. It's in their genes.

"Good cooking runs in my mother's family," Pisano says. "As a kid I noticed that the refrigerator and cupboards could look empty, but if 12 people arrived, my grandmother would have a feast ready in an hour."

This was the 1950s in Elizabeth, New Jersey—a time, Pisano says, "when stubbing your cigarette out on your plate after dinner was an accepted practice." During the Sunday family dinners, Pisano's grandmother, an immigrant from Calabria, Italy, would frequently call her eldest grandson into the kitchen and ask for his opinion on her tomato sauce.

"Of course when you're six, you think grandma's sauce is always good," Pisano says. "But she'd say, 'No, it needs more salt.' And then she'd add some salt and ask me again if it was good. It seemed important to her that I appreciated the quality of the food we ate."

But it wasn't until 30 years later that Pisano committed himself to the kitchen in earnest. It was a matter of survival, he jokes. "I got divorced," he says, laughing. "I had to eat anyway and decided that I wasn't going to live on TV dinners."

For ideas, he reaches deep into his memory. His grandmother, who passed away almost a decade ago, never used a recipe.

"My grandmother would just say, 'You throw in some of this and that, and if it's wrong, throw in this other thing,'" Pisano says.

So that's how he cooks too. Even his signature dishes—pizzas from scratch, single malt scotch filet mignon, veal and peppers "done the old Sicilian way"—are slightly different each time he prepares them.

"I cook like I lecture," Pisano says. "The spirit is always the same, but you have to find the balance between execution and novelty. If there isn't that innovation every time, a guy who likes research loses interest."

These short vignettes offer a taste of the richness and diversity of College faculty lives outside the lab. Here's a slightly wider sampling, still only the iceberg's tip.

Bob Brodersen *(EECS)* and his wife hiked from Tahoe to Whitney, 420 miles, in two one-month trips.

Daryl Chrzan *(MSE)* is an accomplished skateboarder and surfer.

Ron Gronsky *(MSE)* is an accomplished guitar player and composer.

Karl Hedrick *(ME)*, an avid tennis player, was nearly seeded in his youth.

Roger Howe *(EECS/ME)* is an expert fly-fisherman.

Richard Karp *(CS/BioE)* is an avid amateur chess player.

Dorian Liepmann *(BioE)* is a double black diamond skier.

Jennifer Mankoff *(CS)* has played the viola for 23 years.

Gene Myers *(BioE)* is an accomplished scuba diver/skier.

Benson Tongue *(ME)* and son are gold cup winning Scottish dancers.

Sensing Nature's Ways

TINY SENSORS KEEP A WATCHFUL EYE ON REMOTE HABITATS

BY DAVID PESCOVITZ

Protecting the delicate ecosystems on our planet is impossible if we don't understand them. From the microclimates in forest canopies to the mysterious breeding practices of seabirds, field ecologists yearn for a way to observe without interfering. To that end, a team of engineers and scientists from Maine and Berkeley are collaborating to develop a powerful and unobtrusive sensing system that biologists can leave behind in remote environments as a window onto nature's wonders.

Late last spring, Berkeley computer science graduate students Joe Polastre and Rob Szewczyk brought their research on the system out of the laboratory and into the real world. As summer interns at the Intel Research Berkeley Laboratory, the students are part of a dedicated team of researchers that was dispatched to Great Duck Island, the 237-acre island off the coast of Maine, where 5,000 Leach's storm petrels come to nest. During their two-week field trip, the researchers deployed a wireless network of small sensors that will monitor the shy seabird's habitat long after the air grows cold with the fall and the last human has returned to the mainland.

The trip begins in earnest on a dock at the College of the Atlantic in Bar Harbor. There, the group loads a 35-foot motor boat with several weeks of supplies and begins the journey to the island. One hundred yards from the island, the gear is transferred to small rowboats. All the electronic equipment is packed tightly in custom-made Tupperware-like containers to protect it from the waves that bash the small boat and its passengers. From shore, it's less than half a mile to the old lightkeeper's cottage—mission control and living quarters for this field study.

"We can get a feel for what happens on Great Duck Island when humans aren't there."

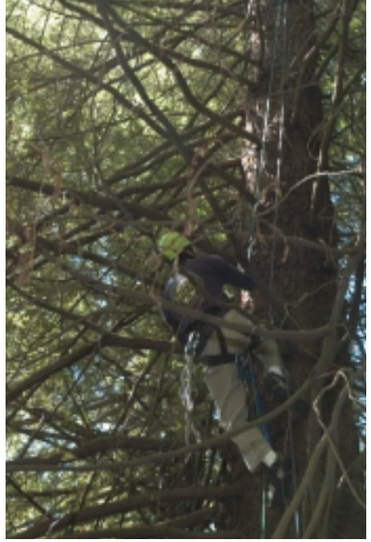
The petrels, the locale's natural summer denizens, have a much easier time getting to Great Duck Island. Indeed, it's these ground-nesting seabirds that Polastre, Szewczyk, and their colleagues from UC Berkeley, Intel Research, and the College of the Atlantic have traveled all this way to see. The goal of the trip, the first of two last summer, was the deployment of a new habitat monitoring system of 100 sensors to collect raw data about what may be one of the largest petrel breeding colonies in the eastern United States.

"The data can stream continuously from the island onto the Internet so it can be analyzed by biologists anywhere in real time," says David Culler, Berkeley computer science professor and director of the Intel Research Berkeley Laboratory, who oversees this project.

The tiny black seabird—so small it fits comfortably in the palm of a hand—is a challenge to study because it lives most of its life on the water, save for its breeding period from the end of May through October. And even then the petrels, an easy mark for predatory sea gulls, emerge from their burrows only in pitch dark. In the summer months in Maine, that's less than two hours a night.

John Anderson, College of the Atlantic conservation biologist and Berkeley alumnus who spearheaded the collaborative Great Duck Island effort, hopes the data the researchers gather will help scientists identify the petrels' attraction to Great Duck Island—a site they prefer over thousands of other local islands.

"There's nothing else like this sensor network available for conservation biologists, nothing that can provide good data in such dense numbers," says Anderson. "What's really exciting here is that we can get a feel for what happens on the island when humans aren't there. This sensor network will have a profound effect on how we do field ecology."



PEG SKORPINSKI PHOTO

JOE POLASTRE PHOTO

"This kind of sensor network will have a profound effect on how we do field ecology."

The petrel project began last year when Polastre, Szewczyk, and Intel Research scientist and Berkeley alumnus Alan Mainwaring collaborated with Anderson's team to deploy a network of 32 sensor motes on the island. The system, Polastre explains, had to be built from scratch—from identifying the desired sensing capabilities for the motes, to designing the network architecture, to installing the photovoltaic system needed to power the laptop computer in the lighthouse. It was an iterative process that spanned several scientific and engineering disciplines, Culler explains.

"We were deploying a new technology into a space that we'd never dealt with before," he says.

Previously, keeping an eye on the petrels' private matters involved either reaching inside the burrows or installing portable video systems for remote feeds. These methods are risky, as too much human disturbance can cause the birds to abandon their nests, chicks, and eggs.

That's where the sensors can improve matters. The motes were developed in a partnership between the Berkeley-based Center for Information Technology Research in the Interest of Society (CITRIS) and the Intel Research Berkeley Laboratory. Inexpensive to manufacture and easy to deploy, the tiny devices boast myriad applications, from energy monitoring in offices to diagnosing a building's structural stability after an earthquake.

Each of the environmental monitoring motes designed especially for the Great Duck Island research is just under an inch wide and just as tall, substantially smaller than the batteries that power it. A hard plastic cylinder protects the batteries and delicate microprocessor from the elements. Every five minutes, onboard humidity and temperature sensors take a data snapshot of the surroundings. Meanwhile, an infrared sensor scans for body heat to determine if a petrel is inside the burrow. Above ground, strategically placed weather station motes keep tabs on atmospheric pressure, sunlight, and the other general environmental conditions on the island.

Thanks to Culler's TinyOS operating system, the motes self-organize into an ad hoc wireless network and pass their data from one to another, bucket-brigade style, until the information reaches a gateway sensor above ground. Eventually, all the data makes its way to a laptop computer tucked inside the lighthouse where it's relayed to a Web site via satellite.

"It's ironic to be somewhere that has amazing Internet access, but no running water," Szewczyk says.

According to the researchers, the data gathered during the preliminary deployment was not crisp enough for biological study. Still, mining the massive database containing more than one million readings from the initial deployment revealed a gold mine of information about the network's performance in its first real-world test.

"It's not just a matter of the motes behaving when they're supposed to," Culler says. "You also have to think about things like what happens when the birds decide to chew on them for a while."

Even as the Great Duck Island data pours in, Culler, Szewczyk, and Polastre are embarking on another deployment of their environmental monitoring system. Last summer in collaboration with Berkeley Professor Todd Dawson of integrative biology, the researchers mounted their motes high in the redwood trees in the UC Botanical Garden's Mather Redwood Grove.

Currently, Polastre explains, biologists use a winch to raise large trolleys of sensors up and down a tree to acquire a sampling of environmental data at different heights in the canopy. The aim is to better understand the micro-climates that the redwoods create as a consequence of their enormity. The beauty of the motes—outfitted with sensors to detect weather conditions and photosynthetic activity—is that hundreds of them can be deployed simultaneously in a cross-section of the canopy to provide a three-dimensional picture of the ecosystem across space and time.

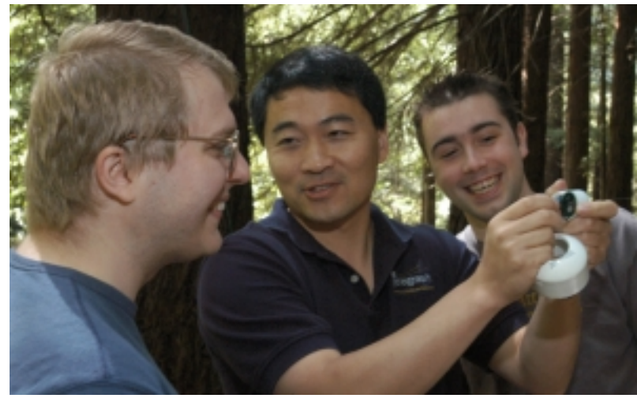
"The idea is to get a sense of what's really going on in the grove in order to better understand the plants' physiology," Polastre says.

Once the technology is proven, the team will install 200 sensors in Big Basin Redwoods State Park and the Russian River area where Dawson conducts most of his research.

"This kind of environmental monitoring technology is really a new microscope," Culler says. "It gives scientists the ability to perceive what they've never perceived before." ■

OPPOSITE: *Digitizing redwoods in the UC Berkeley Botanical Gardens requires an agile student tree climber who can slip through the redwood branches to wrap as many as 50 sensors (these, twice the size of the petrel's sensors) along the tree's lanky trunk. This tree was one of a dozen outfitted with sensors last summer.*

BELOW: *EECS graduate students Rob Szewcyzk (left) and Joe Polastre flank Intel research scientist Wei Hong as they prepare sensors for installation in the redwood canopy. The sensors serve as miniature weather stations, collecting data on air pressure, humidity, temperature, and ambient light levels in the redwood habitat.*



PEG SKORPINSKI PHOTO

JOE POLASTRE PHOTO

PHOTO COURTESY DIY NETWORK

Eric Park, Bharathwaj Muthuswamy, and Daniel Lehrbaum (left to right) built the Cal Clutter Collector in less than a day.

Engineering students race to build robots for TV fame

Building a robot, even a simple one, is no small task. Some Berkeley engineering classes spend an entire semester doing just that. Now imagine that you are in an eight-hour competition to build one that can, say, quickly collect toys and put them in a box—using only parts on hand in a warehouse.

Sound hard? Not for Berkeley engineering students Eric Park, Bharathwaj "Bart" Muthuswamy, and Daniel Lehrbaum, who beat a University of Tennessee team on the Do-It-Yourself (DIY) Network television show "Robot Rivals."

The biggest challenge, they say, was the television cameras pointed at them the entire time. "They kept making us take the pieces apart and do it over more slowly for the cameras," says Muthuswamy, a first-year Ph.D. student in EE. "We also couldn't swear, which was hard. I won't make fun of actors ever again."

Park was the first to hear that "Robot Rivals" was looking for contestants, when Professor Ron Fearing of EECS announced it in his EE192 class, Mechatronics Design Lab. An EECS major who graduated in May and is now working at NASA Ames Research Center in Mountain View, Park recruited ME senior Lehrbaum and Muthuswamy. Theirs turned out to be the only Berkeley team to apply. Other contestants might have been scared off. Park and Lehrbaum are veteran robotics contestants who used to be on rival robotics teams in high school in San Francisco and Palo Alto, and Muthuswamy has several robotics projects under his belt.

Each episode of "Robot Rivals" pits two teams of top-notch engineering students from 14 leading U.S. technical institutes and colleges. The show throws them into a gigantic warehouse stocked with parts and gadgets, then challenges them to design and build a robot that can perform a specific task, such as a "Lunar Rover" robot (with two wheels or less that can traverse a number of different surfaces) or "Paul Bunyan" gadgets (cut down three trees and chop and stack wood). After students design the robot, they get handed surprise household items with bonus points if they can incorporate them.

The Berkeley team designed a street-sweeping robot that incorporated all their surprise elements—a garden hose, snow shovel, twine, watering bucket, and a rake—earning all the available bonus points. Then the "Cal Clutter Collector" had to face Tennessee's "Horned Scooper" in a heated contest that Cal won by just a matchbox car worth 25 points.

The next test, against Southern Illinois University, was to build robots that could propel golf balls at glass targets. But the "Berkeley Bomber" failed to hit as many glass targets as SIU's "Cleopatra Needle." Muthuswamy, Lehrbaum, and Park came home while the SIU team continued on to the next challenge.

The winning team received $2,000 for their school's engineering department, and the other 13 teams got $500 scholarships for future robotics competitions for their departments. While the scholarship money was attractive, all three say they entered the contest for the fun of it.

"We thought it would be interesting to go across the country and see Knoxville," says Lehrbaum. "Classes and lectures get routine. It's nice to get out there and use something you've learned." ■

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BY BONNIE AZAB POWELL, CAMPUS PUBLIC AFFAIRS

New Laminates for Old Masonry Reduce Shear

A series of preliminary shear tests conducted last spring by a student research team in CEE professor Khalid Mosalam's structures lab shows that an affordable, transparent fiber-reinforced polymer (FRP) laminate applied to the surface of historic brick buildings could significantly minimize building damage and lives lost in a major earthquake.

Reid Senescu, one of Mosalam's students on this project, built six masonry test walls—each 2½ feet square—designed to mimic the old brick walls typical of historic buildings and low-cost homes in Third World cities. For these tests, the wall specimens were rotated 45 degrees into a vertical position for mounting inside the compression test machine. "This tilted position makes the shear test easier," said Senescu, "because we are investigating the validity of FRP for multiple-layer masonry walls for the first time."

Each test lasted no more than five minutes, during which the wall was subjected to a vertical load reaching 150,000 pounds—well beyond the load buildings can endure in major earthquakes. The student team varied mortar type and wall thickness, as well as the strength of the FRP laminates in the wall specimens developed in Mosalam's lab.

"It looks like the FRP improved the strength of the walls by as much as 50 percent," said Mosalam, moments after the test. "The amount of deformation in this test was impressive, and this is even more important than the strength gain, because the longer it takes a building to deform before failure, the more warning the people inside have."

Mosalam's team will conduct more tests this fall, this time with 17-foot-long masonry walls that will be built into large-scale reinforced concrete buildings. The masonry will be tested at the Richmond Field Station shake table and structures lab, where true earthquakes of all magnitudes can be simulated.

"It will be the first time such combined masonry and reinforced concrete structural systems are examined in this way," said the Egyptian native, whose passion for historic buildings has been life-long. "Brick masonry is beautiful. It's the oldest construction material around, yet it's the least understood." ■

PEG SKORPINSKI PHOTO

CEE graduate student Reid Senescu monitors the width and extent of cracks that finally caused the masonry specimen to fail. The shear tests were funded by the NSF, the Hellman Family Faculty Fund, and Sika Corporation.

Letter from the Real World

PEG SKORPINSKI PHOTO

EECS major Tobin Fricke graduated from the College of Engineering last May, poised to enter the real world. Through a series of letters from abroad, *Forefront* will stay in close touch with Tobin, following him as his life-after-Berkeley unfolds.

Geneva, Switzerland, June 12, 2003

The notion that I was leaving Berkeley didn't hit me until I came home to my co-op to find all my stuff tossed out of my room and into the hallway. I didn't take move-out day seriously, but I suppose I should have known that someone would be moving into my room at Oscar Wilde house.

It really was time to leave Berkeley, say goodbye to my friends, return my keys and turn in my LBNL badge, get those last timecards signed and head out. Eager promises to visit, write, and return to live in Berkeley next year made it all a little easier.

On the way to my summer internship in Europe, I stayed in a suburb of Boston with a friend just back from two years in Beijing. He told me about class systems and cultural quirks, adventures learning Mandarin, and about SARS. I told him about socialism in Sweden, about the plight of the Russians in Estonia, about popular opinion in Israel and hospitality in Jordan. This summer is the last of a series of summer research programs that have taken me to Sweden, Alaska, and Israel during my college breaks.

I'm now in Switzerland, working at the European Laboratory for Particle Physics (CERN). Every day there's a morning of advanced lectures on modern physics, an afternoon working on the test beam, where we're building an electron calorimeter, and an evening socializing with students from all over the world. Sometimes we make excursions to Lake Geneva or the mountains nearby.

But the other day I was thinking back to Berkeley, about one of the departmental commencement ceremonies I attended last semester, where a student speaker remarked on the subject of the real world. Bound for a Ph.D. program, and then maybe a professorship, he said he doubted he'd ever enter that real world. Sometimes I feel the same way.

And then there's another real world, where my parents and my friends' parents are out of work, and my friends with fancy EECS, math, and physics degrees are working as bank tellers, collection agency callers, telemarketers, actuaries, a programmer for an insurance company. Someone here told me he supplements his income by babysitting. I don't think this is what they dreamed of.

Our commencement speakers belabored the point that things are much worse now than when we started college. Maybe so, but I refuse to believe it.

I don't really have a sense of being "out there" yet. I still measure the year in semesters and I'm trying to figure out whether I'll return to Berkeley "next semester" and sit in on a math and language class, or stay at CERN. Then there's working with the Red Cross in the Middle East or pursuing one of my dreams to spend a few months working at the South Pole.

I think opportunity still lurks for those who can and are willing to chase after it. Being young and unattached has its benefits.

Tobin Fricke

TOBIN FRICKE

studentnewsmakers

The UC Berkeley Concrete Canoe Team with the Bearkelium

CAL'S CONCRETE CANOE TEAM piloted their craft, the Bearkelium, to a third-place overall finish in the 2003 National Concrete Canoe Competition held in June at Drexel University in Philadelphia. The 13-member team of undergraduates headed by Lacey Walker also finished in first place for their technical paper, second for their business plan presentation, and received the Tony P. Chrest Innovation Award recognizing superior use of materials and technology in construction of their canoe. They won $2,500 in scholarship funds.

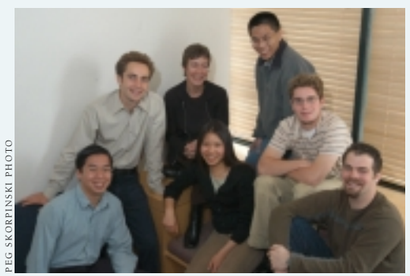
Cal teams have qualified for the national competition 14 of the 16 years it has been held, placing among the top three 10 times and in first place four times. Sponsored by the American Society of Civil Engineers (ASCE), the competition's purpose is to inspire ingenuity in use of materials and design to build concrete canoes that can actually float.

THE 2003 DEPARTMENTAL CITATIONS were awarded to eight top graduating seniors, one from each of the College's eight departments. The awardees are Peter Chen, EECS; Nathan Huebsch, BioE; Kenny Kamrin, Engineering Science; Marc Oman, IEOR; Siddharth Patel, ME; Brian Quiter, NE; Melissa Santala, MSE; and Mark Wan, CEE.

Two additional students were recognized for their achievement collegewide with the Bechtel awards. They are IEOR sophomore Jengyee Liang, winner of the 2003 Bechtel Scholarship, and EECS senior and University Medalist Ankur Luthra, who received the Bechtel Award.

CALSOL, THE BERKELEY SOLAR VEHICLE TEAM, placed second in its class at the American Solar Challenge in July. Twenty solar vehicles from the U.S. and Canada traversed 2,300 miles through eight states along Route 66. Team captain Nathan Mandernach reported that Cal's vehicle, Solar Bear, was close to withdrawing at the outset due to technical difficulties. But the team borrowed a motor and controller from the car entered by the University of Kentucky, whose car did not qualify.

Ten days and several misadventures later, the team crossed the finish line in Claremont, California, with a time of 110 hours. "We are very happy with our performance," said Mandernach, a senior double majoring in ME and MSE. "Route 66 is a punishing road in a normal car." The competition is held every other year to promote awareness of solar power.



PEG SKORPINSKI PHOTO

2003 Departmental Citation Awardees pictured are (from left to right) Wan, Oman, Santala, Liang, Chen, Kamrin, and Quiter.

CalSol with their solar-powered vehicle, Solar Bear.

SENIOR GIFT COMMITTEE *members (from left) George Chao, Landra Chan, Marc Oman, Jenny Banh, Ricky Hwa, Reina Ligeralde, and Natalia Carse helped raise $10,886 from 161 members of the class of 2003, an increase from last year in both dollar amount and number of gifts. Alumnus Bob Sanderson (M.Eng.'66, Ph.D.'70 IEOR) boosted the campaign by matching dollars raised three-to-one.*

Howard and Candy Friesen: Helping students to help themselves

ANGELA PRIVIN PHOTO

In addition to funding scholarships for more than 70 students, Howard and Candy Friesen will endow two EECS chairs through their estate.

Candy Penther (B.A. '50 L&S) and Howard Friesen (B.S. '50 EECS) met at a Sunday orientation council party at Berkeley in 1948. They were sophomores then and married in 1951 when both were working in San Francisco. They have lived in Marin County since 1954.

The Friesens have fond memories of their days at Berkeley, but it was philanthropy rather than nostalgia that beckoned them back to campus. The couple has funded more than 70 scholarships to entering first-year or transfer students since 1994.

"Uncle Sam paid for my education through the veterans' program," says Howard. "If it weren't for that I might not have gone to Cal." He is retired owner and president of Yamas Controls, Inc., a manufacturers' representative firm specializing in installation of commercial building control systems in California and Nevada.

So impressed with the accomplishments, rigor, and enthusiasm of the students they are funding, the couple has decided to do more to support the College. As part of their Berkeley overall giving plans, the Friesens plan to establish two endowed chairs through their estate. One will honor Candy's father, the late Carl J. Penther (B.S. '27, EECS), and both chairs will support the research of distinguished faculty in the College's EECS Department.

Their reward for supporting Berkeley, they believe, is the knowledge that they are contributing to a better world.

"One of the best things you could do to benefit society," Candy says, "is to make sure that a fine education is available to those who need it and want it." ■

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BY ANGELA PRIVIN,
ENGINEERING PUBLIC AFFAIRS

$3.3 million Vodafone–US Foundation gift to support wireless programs

Vodafone–US Foundation has awarded the College of Engineering $3.34 million over five years to fund fellowships for graduate and undergraduate students and enhance existing curriculum in wireless telecommunications engineering.

"We're very proud to support the Vodafone–US Foundation Fellows Initiative at Berkeley," says Mark Hickey, president of Vodafone–US Foundation. "Berkeley is an excellent school with excellent faculty and students, and they will certainly help advance the future of wireless engineering and technology."

At press time, a faculty committee was finalizing the selection of the first 13 Vodafone Fellows, including four seniors and nine graduate student fellows. Over the five-year period, the program will help support tuition, fees, and living expenses for more than 70 students in all. The goal is to foster a world-class community of scholars dedicated to advancing the field of wireless technology. As part of this effort, the College is creating a new teaching facility to be called the Vodafone-US Foundation Wireless Laboratory.

"We already have courses in communications, but the Vodafone Fellows program will enable us to add both undergraduate and graduate courses that are more focused on wireless technology," says Jan Rabaey, professor of EECS and scientific co-director of the Berkeley Wireless Research Center (BWRC). Unlike the BWRC, which is located off campus and oriented toward wireless applications, the Vodafone-US Foundation Lab will be located in Cory Hall and will focus primarily on undergraduate and graduate education in technology and wireless systems.

"The new lab will also bring together more theoretical faculty, more students in wireless, and more funding to add to our existing programs. The BWRC and the new lab will complement each other nicely," says Rabaey, who is serving on the faculty committee to select the student participants. Professor David Tse of EECS will serve as the Vodafone Fellows faculty coordinator, providing strategic leadership for programming, student selection, and laboratory design.

The gift will help fund substantial enhancements to Berkeley's wireless telecommunications program over the coming five years, with additional support coming from the College, EECS, and the Center for Information Technology Research in the Interest of Society (CITRIS). Berkeley is one of three engineering programs selected from a yearlong nationwide search by the Vodafone-US Foundation. The other two are Auburn University in Alabama and the University of Illinois at Urbana-Champaign.

The Vodafone-US Foundation, located in Walnut Creek, generally gives more than $1 million throughout the San Francisco Bay Area each year. This is Vodafone-US Foundation's first major initiative involving higher educational institutions. Vodafone Group Plc., headquartered in the U.K., is one of the world's largest mobile telecommunications network companies, with operations in 28 countries. ■

ALUMNI UPDATE BRINGS YOU CLASS NOTES FROM YOUR FELLOW BERKELEY ENGINEERING GRADUATES, AS WELL AS NEWS, EVENTS, AND COURSES OF INTEREST TO ALUMNI.

Please keep in touch. Let us know what's new in your life by sharing your personal and career news and photos with us. Mail your class note to Class Notes, College of Engineering Public Affairs, 102 Naval Architecture Building #1704, Berkeley, CA 94720-1704. Or go to **www.coe.berkeley.edu/classnotes** and click on *Submit Your Class Note*.

MARQUE MESA: BIOE ALUMNUS LAUNCHES MUSIC CAREER

When Marque Mesa (B.S. '98 BioE) started his engineering studies in 1994, he didn't realize he was destined for a different career. Nearly 10 years later, he has produced a music CD and is booking live performances at cafes and clubs throughout the Bay Area, in Los Angeles, and overseas.

Following in the footsteps of his father, who earned his degree in EECS, Mesa intended to become an engineer. As a BioE major, he loved the science, found the people inspiring, and started doing environmental research in the Earth Sciences Division at Lawrence Berkeley Laboratory.

But one day about three years ago he started "messing around" on a keyboard and found himself singing, then writing songs. He started playing guitar, got a good response to his music, and even made a little money. With almost no formal musical training, he has learned how to play from videos, books, and simply listening. He wrote all the songs on his debut CD, *Conflicting Memories*, and recorded them in his home studio, performing every track—guitar, keyboard, bass, percussion, lead and backup vocals—himself.

"Going through BioE taught me that if you want to learn something, you can," Mesa says. "Engineers love problem solving and they are extremely creative people. That's why so many engineers are musicians."

With a voice that can range from breathy falsetto to angry growl, his sound is vulnerable and raw. The songs themselves—some sad ballads, others sweet and upbeat—are intensely personal. They tell the flip side of this soft-spoken young man's transformation from scientist to artist: the healing power of music.

"My pop left the family my first year, so college was a trying time for me," Mesa says about the wound left by his father's departure. "I started to ask, 'How can I heal myself?' and the music has really done that for me. The power of a song is amazing."

Strong CD sales (he's sold more than half the 1,000 CDs he produced) and support from fans and music business insiders have given him the confidence to pursue his music seriously.

"My grandparents wish I was still in engineering," he says, "but I'm happy." Details about Mesa's CD and upcoming engagements can be found at ***www.marQuemusic.com***.

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ABOVE: *Mesa appeared one summer night at Larry Blake's, playing selections from* Conflicting Memories, *whose title track is about his father. With each song, he admits, he feels as if he's saying, "This is me."*

CLASS NOTES

2000s

MICHAEL J. FELDSTEIN *(B.S. '00 BioE)* is a medical student at Harvard Medical School. After completing his M.D. at Harvard, he will start his Ph.D. in EECS at Massachusetts Institute of Technology this fall.

1990s

JASON BURKE *(B.S. '95 mineral engineering)* moved to Big Timber, Montana, to work in underground platinum and palladium mining for Stillwater Mining Co. He has two daughters, 5 and 3, and he and his wife are expecting a third child in February.

RULA DEEB *(M.S. '94, Ph.D. '99 CEE)* of Walnut Creek was awarded Malcolm Pirnie Inc.'s 2002 Paul L. Busch Prize, recognizing her outstanding technical achievements and leadership. She is a senior project engineer at the company, and her research in water and wastewater treatment and hazardous waste remediation has been recognized with numerous awards.

JAMEY JACOB *(M.S. '92, Ph.D. '95 ME)* was recently promoted and received tenure as associate professor of mechanical engineering at the University of Kentucky in Lexington.

LIWEN MAH *(B.S. '94 IEOR)* is back at Berkeley studying law at Boalt Hall.

MARK A. SHANNON *(B.S. '89, M.S. '91, Ph.D. '93 ME)* is a professor of mechanical engineering at the University of Illinois at Urbana-Champaign.

JOSEPH WARTMAN *(M.E. '96, Ph.D. '99 CEE)* led a team of geotechnical engineering experts on an engineering reconnaissance of the region damaged by the 7.8 magnitude earthquake in Colima, Mexico, last January. An assistant professor of civil, architectural, and environmental engineering at Drexel University, Wartman was principal investigator on the team, which was supported by a National Science Foundation Small Grant for Exploratory Research.

1980s

CARLTON AIHARA *(B.S. '80 EECS)* was elected a corporate officer of PCTEL Inc., a Chicago-based provider of Internet access products and wireless mobility software. He is vice president of global sales.

YEW KHOY CHUAH *(B.S. '82, Ph.D. '85 ME)* of Taipei, Taiwan, was elected a fellow of the American Society of Heating, Refrigerating and Air Conditioning Engineers.

BRIAN DEMCZYK *(M.S. '85 MSE)* was a physics post-doctoral fellow at Lawrence Berkeley National Laboratory in 2000 and 2001 and is now a senior materials engineer at MMC Technology, a subsidiary of Maxtor Corp., in San Jose.

JAMES D. GREENSTEIN *(B.S. '80, M.S. '81 CEE)* is working at the City of Solano Beach Engineering Department. He is married with two children.

REVIS W. JAMES III *(B.S. '79 EECS, M.S. '81 NE)* of San Ramon is program manager of the Strategic Science and Technology Program at the Electric Power Research Institute.

STEVEN SCHOCH *(B.S. '85 EECS)* of Sunnyvale runs StarNet Communications, the company that makes X-Win32 software to connect Windows and Unix computers.

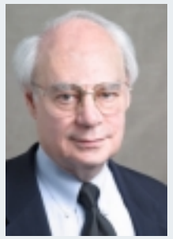
1970s

TERENCE CHOY *(B.S. '74, M.Eng. '77 ME)* of Lawndale, California, designs Hot Wheels toy cars for Mattel Toys.

THE 2003 DISTINGUISHED ENGINEERING ALUMNI AWARDS (DEAA) were given to four illustrious Berkeley engineering alumni at "Celebrating Engineering Excellence," a September 13 conference featuring talks by six faculty and concluding with the awards luncheon. Awardees included:

- Eugene Herson (B.S. '65, M.S. '66 CE), one of the world's foremost experts in solid waste management;
- Yong Kyung Lee (Ph.D. '75 EECS), president and CEO of Korea Telecom;
- Robert L. Taylor (B.S. '56, M.S. '58, Ph.D. '63 CE), UC Berkeley professor emeritus of civil and environmental engineering; and
- Dawn Tilbury (M.S. '92, Ph.D. '94 EECS), associate professor at the University of Michigan, winner of the Outstanding Young Leader Award.

The DEAA has been awarded annually since 1975 in recognition of alumni who have distinguished themselves in engineering careers. The Outstanding Young Leader Award was instituted last year to recognize alumni under the age of 40.



JOHN H. LIENHARD *(Ph.D. '61 ME)* was elected to membership in the National Academy of Engineering for developing basic burnout theories in boiling and condensation and for fostering public awareness of engineering and technology.

Lienhard is the M.D. Anderson Professor of Mechanical Engineering and History at the University of Houston and is known for his research in the thermal sciences. He is also the writer and host of the public radio series, *The Engines of Our Ingenuity*, broadcast five days a week by more than 30 National Public Radio affiliates nationwide (*www.uh.edu/engines/*). The program reveals how art, technology, and ideas have shaped our culture throughout history. Lienhard received the College's Distinguished Engineering Alumni Award in 1994.

CLAIRE J. TOMLIN *(Ph.D. '98 ECCS)* is the recipient of the prestigious Donald P. Eckman Award for her outstanding contributions in the field of automatic control. Tomlin is assistant professor in the departments of aeronautics and astronautics and electrical engineering at Stanford University.

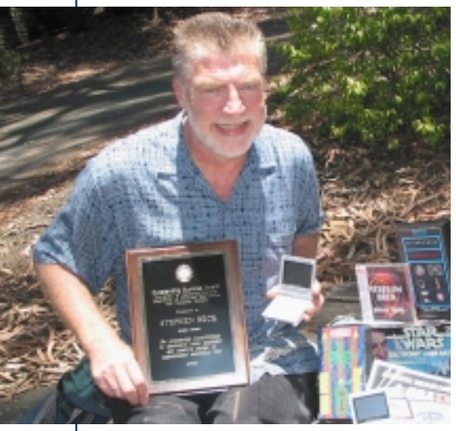
The Eckman Award is given to an outstanding engineer under age 35 in the field of automatic control. The award is given by seven engineering societies, including the IEEE, ASME, AIAA, AICHE, SPIE, and ISA. Tomlin completed her doctoral work in the Intelligent Machines and Robotics Laboratory, where she applied her work in control to air traffic and flight management systems.

Leslie Robertson and wife Saw-teen

LESLIE E. ROBERTSON *(B.S. '52 CE)* received the Outstanding Projects and Leaders (OPAL) award for lifetime achievement in civil engineering design from the American Society of Civil Engineers.

The lead structural engineer for the World Trade Center Towers, Robertson has designed three of the eight tallest buildings in the world. His innovative structural design projects have included the Bank China Tower in Hong Kong, the first composite mega-structure space frame high-rise; and the U.S. Steel Building in Pittsburgh, the largest privately owned building worldwide. Robertson was recognized with the College's Distinguished Engineering Alumni Award in 1991.

Steve Beck: Alumnus turns engineering into entertainment art



ANGELA PRIVIN PHOTO

Steve Beck received the 2003 EECS Alumni of the Year Award.

Steve C. Beck (B.S.'71 EECS) has never done things the conventional way. He transferred to Berkeley as a senior, received a grant from the National Endowment for the Arts for an engineering project, and personally redefined the "EE" in EECS.

While he holds his degree in electrical engineering, he prefers to think of himself as an "entertainment engineer" who uses electronics as his mode for inventing.

"Entertainment engineering encompasses the multibillion dollar categories of movies, cartoons, video games, and toys," Beck says. "To entertain means to engage the mind, and I use engineering to create products that engage the minds of children."

The recipient of this year's EECS Alumni of the Year Award, Beck has more than 500 inventions under his belt. His Berkeley-based company, Beck-Tech, has relied heavily on a network of talent that includes Berkeley engineering professors and students to develop games, products, and technology for corporate clients. He is also director of research and development at 4Kids Entertainment, where he is working on a software compressing system that allows children to watch cartoons on a Nintendo Game Boy.

Beck blends art and creativity with crack technical skills. The secret to his success, he says, has been passion, playfulness, persistence, and thinking way outside the box.

He knew he wanted to be an electrical engineer from the age of eight, when he made $50 a week fixing neighborhood radios in Illinois. He transferred from the University of Illinois at Urbana-Champaign to be in Berkeley, which he saw as the epicenter of technology and innovation. Thirty-two years after graduation he still lives up the hill from the College.

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BY ANGELA PRIVIN, ENGINEERING PUBLIC AFFAIRS

NORMAN ENG *(B.S. '74 CEE)* of San Jose has worked in the nuclear power industry since graduating from Berkeley. He was married in June 1982 and has two children, 15 and 19. His oldest son is a second-year cadet at the U.S. Military Academy at West Point, N.Y.

WAYNE HJELMSTAD *(B.S. '70 EECS)* of Colorado Springs writes, "After working 31 years in aerospace, I retired. I live the life of leisure. I golf two to three times a week and have more time for family and travel."

ROBERT B. MCCULLOUGH *(B.S. '77 CEE)* of Dallas writes, "I found a career in construction at Cal. After graduation, I married Ann Eavaly (Cal '77 dramatic art) and took a job in Hawaii with a large construction company. We moved around a bit and settled in Texas, where I started my construction consulting company, McCullough & Associates. We evaluate delay and impact claims on large construction projects. My son is 16 and just came back from the Boy Scout World Jamboree in Thailand."

JAMES M. SHORT *(Ph.D. '76 ME)* works for the U.S. Navy and is assigned to the Office of the Secretary of Defense. Last summer, he received a Meritorious Civilian Service Award, the third highest award granted by the Navy to civilians.

ARTHUR E. WATKINS *(B.S. '72, M.S. '74 CEE)* of Fair Oaks, California, started a firm specializing in water and wastewater treatment projects.

1960s

BETTE A. BLANK *(Ph.D. '65 MSE)* of Madison, New Jersey, had an exhibit of her paintings at the Gallery Schlesinger in New York last winter.

FRED DANIELSON *(B.S. '67 CEE)* is a project manager for the design and construction of facilities at the University of California Davis Medical Center in Sacramento.

HOWARD J. FLEMMING *(B.S. '66 EECS)* of Valencia, California, is chief engineer at Deluxe Film Labs in the motion picture industry. Prior to that, he spent nine years at Sony and developed the SPPS format for film. He was a 1996 Academy Award winner.

COL. ANTHONY JOHNSON *(B.S. '60 IEOR)* retired after 28 years in the U.S. Army in missiles and nuclear weapons. He lives in Carmel, where he teaches math and business courses at local community colleges.

MEL MENDELSON *(B.S. '64 ceramic engineering)* writes, "After working in industry for more than 20 years, I made the transition into academia and love it. I am currently professor and chair of mechanical engineering at Loyola Marymount University. I think back to my education in materials science and find that it has prepared me well to take on the challenges of micro/nanotechnology. I would love to hear from my former classmates." Contact him at *mmendels@lmn.edu*.

CARLOS A. MORALES *(B.S. '69 IEOR)* of Jackson, New Jersey, is working as North American data administrator for Rhodia Inc., developing a global data warehouse for financial data.

DONALD H. MORRIS *(B.S. '65, M.S. '66 ME)* of Thousand Oaks, California, retired from the Boeing Rocketdyne division.

Documentary on Gene Kan in the works

The talented young alumnus Gene Kan (B.S. '97 EECS), who was best known as a spokesman for Gnutella peer-to-peer software and died tragically in 2002, is now the subject of a film that will begin production this fall.

Gone Silent, an independent documentary, is the project of Vikki Merriman, a Boston-area filmmaker and web designer, and Sean Fitzroy, who will serve as technical director and co-producer. Merriman was Kan's housemate in Berkeley in 1995.

"I got the idea for the film the day after I read about Gene's death," Merriman says. "A friend forwarded me a story about it, not realizing that I had known him." She hopes the film will not only pay tribute to Kan's brilliance but also educate viewers about the promise of peer-to-peer technology and the depressive and suicidal feelings that often plague highly intelligent and successful people like Kan.

A gifted programmer who graduated from EECS in three-and-a-half years, Kan had a whirlwind career with Gnutella, the controversial distributed search network he helped develop, and InfraSearch, a real-time search engine he and his colleagues subsequently created based on Gnutella-type technology. Comparable to Napster but even more powerful, Gnutella was a free download that enabled users to swap and search files outside a corporate or commercial server setting.

By the time he was in his early 20s, Kan was thrust into the high-tech limelight. He had earned wide respect in his field and was aggressively recruited by Sun Microsystems, which ended up buying his 15-person start-up. He testified before the Senate Judiciary Committee about music on the Internet and was interviewed by National Public Radio and other mainstream media on Gnutella and its implications for peer-to-peer technology.

Despite these successes, he suffered from depression and, on June 29, 2002, after writing notes to family and friends, he took his own life. His sense of failure was documented in the months leading up to his death in his writings and online journals, which Merriman will use to help tell Kan's story in his own words.

The film is sponsored by Boston Film and Video Foundation, and Merriman is seeking other sponsors as well as information about Kan. Production and release date will depend on the progress of research and funding, she says. For more details, go to the film's Web site, ***www.gonesilent.org***.

A scholarship fund is being established in Kan's honor to support a student working on innovative technologies. For more information, contact the Special Gifts Steward, College of Engineering, UC Berkeley, 201 McLaughlin Hall, Berkeley, CA 94720-1722, 510/643-8361.

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LEFT: *Gene Kan became an unofficial spokesman for his file-swapping software Gnutella at the height of the Internet's fascination with peer-to-peer technology.*

LOTHAR R. SCHICKER *(B.S. '61 ME)* of Campbell, California, writes, "I finished with the last client, and the next has not called yet. Therefore, I am raising orchids."

BAL RAJ SEHGAL *(M.S. '57, Ph.D. '61 NE)* teaches at the Royal Institute of Technology as professor of nuclear power safety. The institute is the premiere engineering school in Sweden. He was elected a foreign member of the Royal Swedish Academy of Engineering Sciences in 2003.

NIRAN G. SHAW *(M.S. '63 CEE)* retired from Bechtel after 35 years and is now assisting the City of Berkeley.

1950s

DON CANNON *(B.S. '51 EECS)* is retired and living in Sacramento.

ROBERT N. CORDY *(B.S. '57 EECS)* writes, "I retired after 35 years of research and development in nuclear power and undersea technology. Subsequently, I served as business manager for the Naval Facilities Engineering Service Center at Port Hueneme, California. I am now happily semi-retired in the beautiful mountains of west central Idaho, still active as a registered patent agent."

JOHN M. LEACH *(B.S. '59, CE)* does some consulting on land development and dispute resolution but is mostly retired in Del Mar, California. A major focus is his 1939 Ford Tudor Deluxe hot rod.

KARL G. RESECK *(B.S. '56 ME)* retired from engineering and engineering management in 1998. He lives in Los Altos, California.

PHILIP C. WARRINER *(B.S. '56 , M.S. '61 CEE)* of Sacramento is retired from a 40-year career in bridge engineering at the California Department of Transportation.

HAROLD H. YACKEY *(B.S. '55 ME)* of Citrus Heights, California, retired in March after 48 years in consulting engineering and related fields. He plans to devote time to his wife, children, and grandchildren, traveling around the Western U.S. and

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working with Habitat for Humanity. He also wants to make use of his lifelong accumulation of woodworking tools.

1940s

GEORGE COOPER *(B.S. '40 mining and metallurgy)* of Saratoga, California, is manager and winemaker of Cooper-Garrod Estate Vineyards. He retired in 1973 as chief of flight operations and chief research pilot after 28 years with NASA Ames Research Center. From 1974 to 1986 he was an aerospace consultant for aviation safety and human factors.

JACK E. PEEBLES *(B.S. '43 EECS)* of Roanoke, Virginia, retired from General Electric.

1930s

LINWOOD L. CLARK *(B.S. '30 CEE)* worked for the U.S. Bureau of Public Roads and the U.S. Air Corps. He was officer of the day at McClellan Field and was recalled in 1951. He retired in 1968 and lives in Pleasanton, California. He writes, "I am 95-plus years old. I married my college sweetheart, Katherine Isabel Hermann, class of '31, on February 12, 1935, and although she passed away September 18, 2001, in my mind she is still my beloved wife and will be for eternity. We had a very excellent marriage."

JOHN L. PEARSON *(B.S. '38 CE)* of San Leandro, California, retired in 1978 as principal transportation engineer with the California Public Utilities Commission and is involved in various volunteer services. His wife, Elrose (Balcomb) Pearson, class of '38, passed away.

HARRY C. ROWE *(B.S. '31 CEE)* is enjoying retirement in Santa Rosa.

PAUL SHERIDAN *(B.S. '30 CEE)* of Sacramento writes, "I'm 93 and still bowl. I direct a duplicate bridge game every Monday at a senior center and am active in Alzheimer caregiver support groups."

in memoriam...

ROBERT BURLEY *(B.S., '82 EECS)* died March 12, 2003, while on vacation in Hawaii. He was an active member of the Engineering Alumni Society and served on the Southern California EAS Board from 1994 to 2003 and as its president in 1998. He also served on the Berkeley Engineering Fund Board from 1998 to 2000.

WILLIAM (BILL) FELZER *(B.S. '40 ME)* died January 30 at age 86. He was an esteemed faculty emeritus at City College of San Francisco, where he taught many courses and established the Fluid Mechanics Laboratory, and a mechanical engineer for the U.S. Navy. He retired in the 1970s but continued to teach part time and do volunteer work, most recently as a library volunteer and tutor. He is survived by his wife Ester, his son Alan, daughter-in-law Laura, granddaughter Karen, and several brothers and sisters. Donations may be made in his name to any hospice.

WERNER GOLDSMITH *(Ph.D. '49 ME)*, an internationally recognized authority in the mechanics of collision, died in Oakland August 23 at age 79. A native of Germany, Goldsmith was best known for his 1960 textbook *Impact*. He was professor of mechanical engineering at Berkeley and a frequent consultant and expert witness on the mechanics of collision. He is survived by his wife Penelope, daughters Andrea and Remy Margarethe, son Stephen, and four grandchildren. Donations in his memory may be made to the Berkeley Engineering Annual Fund or the Bay Area Holocaust Oral History Project, P.O. Box 1597, Burlingame, CA 94011-1597.

IN MEMORIAM: JOHN LINFORD
MECHANICAL CONTRACTOR AND WWII PILOT

PEG SKORPINSKI PHOTO

John A. Linford (B.S. '47 ME), who ran his own mechanical contracting company for 40 years, died of cancer May 2, 2003, at age 80.

Linford was born and raised and lived his entire life in Oakland, spending 46 of those years in his Piedmont home. He began his engineering studies at Berkeley in 1940 but left school to enlist in the Army Air Corps during World War II. He flew 34 combat missions, including piloting the lead B-24 in the Eighth Air Corps' last mission over Europe. Returning home in June 1945, Linford resumed his studies in mechanical engineering and earned his degree in 1947.

In 1954, he started his own company, Linford Air & Refrigeration Company of Oakland, which became the second largest mechanical contractor in northern California. In 1990 Linford received the Samuel Terry Award, the most prestigious honor of the Oakland chapter of the Sheet Metal & Air Conditioning Contractors' National Association.

An avid skier, fly-fisherman, and outdoorsman, he also continued to fly planes after his military service. He visited all seven continents and piloted aircraft over four of them. He was proud of his pioneer ancestors—on both parents' sides—who sailed the Atlantic and walked across the plains to build a new life with the Latter Day Saints.

Linford served as president of the Engineering Alumni Society in 1994 and was an active supporter of the Berkeley Engineering Fund. He and his wife's support of the Soda Hall Campaign is commemorated by the John A. and Louise T. Linford Lounge on the seventh floor of Soda Hall. In addition to his wife, he is survived by a son, two daughters, two granddaughters, and four grandsons.

ABOVE: *In his retirement, John Linford (right) served for two years as mentor to George Ban-Weiss, a 2003 graduate in mechanical engineering.*

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