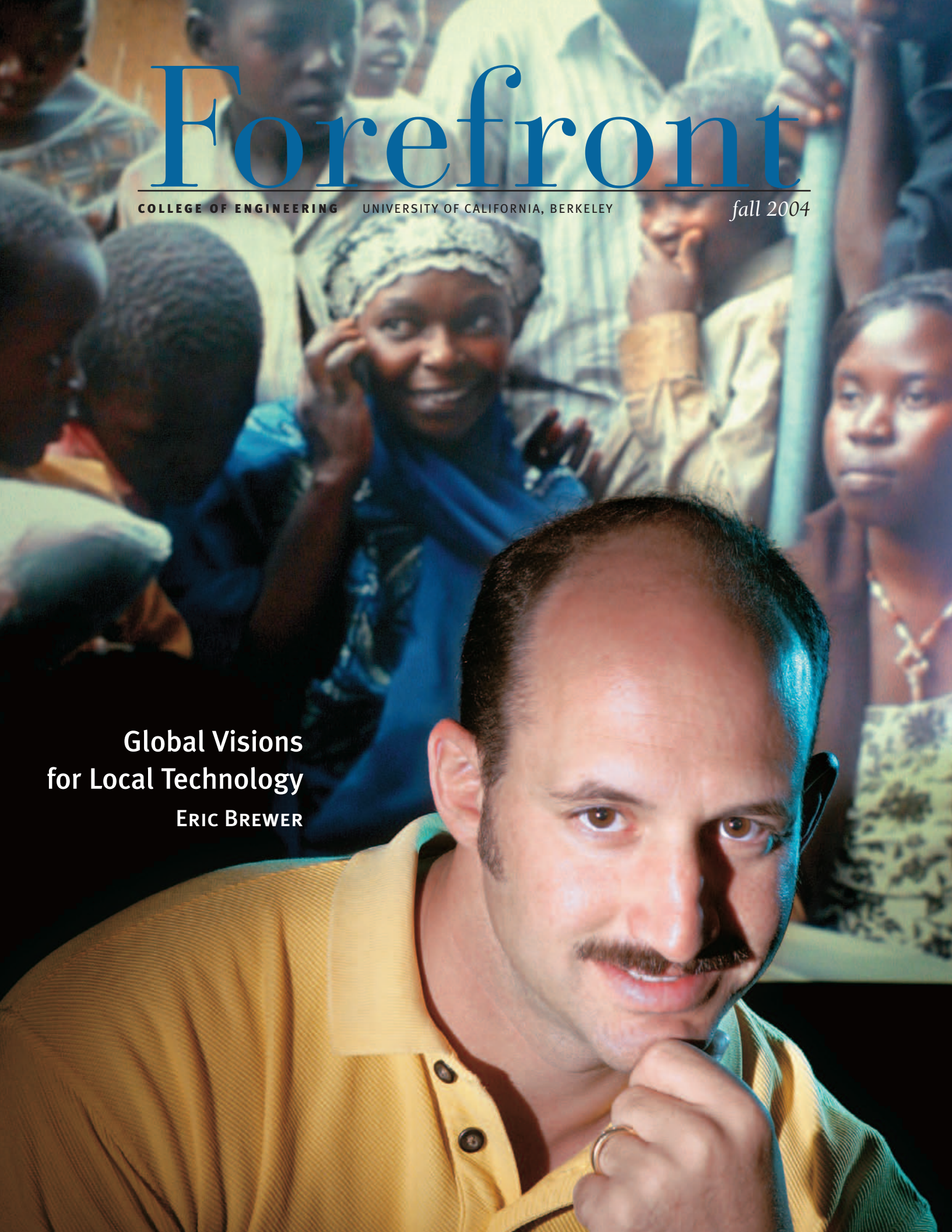
Forefront

COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA, BERKELEY fall 2004



Global Visions for Local Technology

ERIC BREWER

dean's message:
ICT FOR DEVELOPING REGIONS

I recently co-taught an exciting course with Berkeley colleagues Eric Brewer and Tom Kalil in which we explored ways to apply information and communication technologies (ICT) to help solve tough quality-of-life problems in developing regions of the world. Many feel that the developing world has more immediate needs than an ICT infrastructure—food, clean water, and health care, for example. However, we believe that by designing a stable ICT network infrastructure on which relevant applications can be built, we can help rural communities achieve self-sufficiency and long-term sustainability.

After a recent seminar where I presented some of the material from our class, one participant approached me and asked rather skeptically, "Do you really think a cell phone will save the world?" I was a bit taken aback. I explained that this project is not about saving the world. It's not about charity or about dumping a truckload of fancy technology on some unsuspecting village in India. What we are after is better expressed in the old adage: Give a man a fish; you have fed him for today. Teach a man to fish, and you have fed him for a lifetime.

By developing, demonstrating, and implementing an affordable ICT network infrastructure—one that can be deployed and operated as a sustainable local business—we believe we can empower villagers to solve their problems themselves; in essence, provide a modern version of that fishing pole. The key word here is *self-empowerment*—providing opportunity—the only scaleable and effective way to make a dent in the gap between rich and poor.

Of course, what works in L.A. won't work in Lagos, and the constraints we face in the developing world are very different. For example, we need different interfaces to our devices and cheaper components that can run on much less power. Access to precious resources must be shared, leading to very different ways of interacting with such systems. We also know that any new technology deployment is likely to have unintended, even potentially sinister consequences. So development and deployment must involve true partnerships with local and willing communities, step-by-step testing, iterative improvement, and a long-term perspective.

As an engineer, I believe that by actively participating in such a multidisciplinary, multicultural project, we can begin to build a truly global, mutually respectful, and inclusive community—one in which issues of poverty and national security are the exception rather than the rule. I welcome your thoughts at **dean.forefront@coe.berkeley.edu**.

— 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

The phone lady initiative established a decade ago served as inspiration for EECS professor Eric Brewer as he envisioned one of the College's most ambitious endeavors—Information and Communication Technology for Billions, dubbed ICT4B. With Dean Richard Newton and Tom Kalil, the team is dedicated to building an infrastructure that offers people in developing regions new access to technology.
Read the stories beginning on page 10.

COVER PHOTO BY NICK LAMMERS
BACKGROUND COURTESY GRAMEEN FOUNDATION USA

Forefront

COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA, BERKELEY fall 2004

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COURTESY OF GRAMEEN FOUNDATION USA

letters

WE WELCOME YOUR LETTERS AND COMMENTS.

Write to us at **forefront@coe.berkeley.edu** or at *Forefront* letters, 1925 Walnut St. #1704, University of California, Berkeley, CA 94720-1704. Please include the writer's name. Note that we cannot include all letters received and those published may be edited for length and clarity.

Dean Newton's message about a global peace corps of engineers in our last issue [spring 2004] stimulated many responses from our readers. We hope you enjoy this, our first letters to the editor page, and that we'll hear from more of you in the future. **—EDITORS**

Today was my first introduction to *Forefront.* I was very moved by your publication and all the wonderful research being done by the College of Engineering. Dean Newton's message on a global peace corps of engineers was particularly forward-thinking. In a period when our nation is making many missteps and enemies internationally, ensuring that our up-and-coming engineers gain worldly wisdom and share their skills to make a better world is a much-needed perspective. Other articles I found particularly enlightening were those on Berkeley awarding the most doctorates, earthquakes, bone-breaking work, and the Native American student finding his niche. Your magazine beautifully highlights what a contribution the College, its faculty, and its students are making to a better future.

—BARBARA POTTGEN
University Health Services (B.A.'94 Social Sciences)

My son is currently a student at Berkeley Engineering. From what I can tell, he is receiving a superb education, but I agree with Dean Newton about the need to broaden engineering students' horizons.... I have encouraged my son to study abroad, either during the school year or in the summer. He responds that studying abroad would interrupt and delay his engineering studies and that "engineers don't do that."

His attitude troubles me, but when I review his degree requirements, I can see how he might develop such notions. His humanities requirements are so limited as to be nonexistent. Isn't it the university's job to broaden, not narrow, his outlook? He's not required to take a language or even study the history and culture of a region where—let's say, just for the sake of this argument—technology is either flourishing or floundering. . . .

I applaud your initiative and encourage you to continue working toward a broader conception of the engineer's place in the world and the engineering school's notion of what it means to be an educated person.

—LEAH BRUMER
(M.P.P.'80 School of Public Policy)

The key is *experiential* learning. Experience extends boundaries and broadens thinking. My background contained relatively narrow thinking and experience; the *experiences* I had at Berkeley with people of different cultures, countries, and ways of thinking—including value systems—were more valuable than the "book" learning.

Berkeley continues to offer significant, and diverse, experiential opportunities. However, students in an engineering "peace corps" would, in a rural setting in a developing country, be exposed to different values, different ways of approaching and solving "technology" problems, and be constrained by local resources. The Taoist "flow" around rather than the "hammer" of technology might be the path . . .

Exposure to diverse worldviews and incorporation of them into our thinking enriches our ability to design—the key aspect of engineering—which has been defined as the conscious modification of the environment. Problems are increasingly complex, requiring new ways of thinking and doing. Enriching thinking with exposure to different worldviews is thus desirable and key to continued human progress. Such initiatives can continue Berkeley's eminence in engineering education and the education of leaders.

—PETER HODGES *(M.S.'84, Ph.D.'92 ME)*

I agree [with Dean Newton] that there is a real need for students to receive a global education. Our world is a *system*, and students need to learn how their knowledge and expertise affect the entire system positively or negatively.

My suggestions on how this could be done include: 1) a mandatory interdisciplinary systems (earth) engineering course for all engineering students, which would provide a view of engineering applications worldwide and their effect on our earth, and 2) a public interest summer internship for engineering students in any class. Funded by industry, alumni, and the college, the internship could function like a co-op program, sending students to various parts of the world to work. . . .

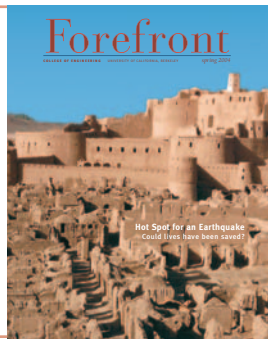
—OLUBUKOLA AFOLAYAN JEJELOYE
(B.S.'99 EECS, NE)

I think the engineering peace corps is a very good concept. I suggest it allow flexibility to include peace corps–type service in impoverished areas in the U.S. as well.

—RALPH T. BOYAJIAN *(B.S.'74 CE)*

CORRECTION

Last spring, *Forefront* and the worldwide media reported that the December 2003 earthquake in Bam, Iran, killed 41,000 people. Later, the Iranian government revised the official death toll to 26,000, explaining that there had been significant error in accounting for people in the chaos that followed the quake.



Clean energy generates jobs, Kammen team reports

Transitioning from fossil fuels to renewable resources to meet U.S. energy needs would not only be good for the environment and decrease our dependence on imported oil; it would also generate more jobs, concludes a report released in April by Berkeley researcher Daniel Kammen.

The report, "Putting renewables to work: How many jobs can the clean energy industry generate?," is based on an exhaustive review of 13 independent studies analyzing the clean energy industry and its effects on the economy and employment in the U.S. and Europe. Kammen is a professor in nuclear engineering and public policy, a member of the Energy and Resources Group (ERG), and founding director of the Renewable and Appropriate Energy Laboratory. ERG doctoral students Kamal Kapadia and Matthias Fripp are co-authors of the report.

"The renewable energy sector generated more jobs per average megawatt of power installed, and per unit of energy produced, than the fossil fuel–based energy sector," the report says. Kammen's team found that three to six times more jobs are likely to be produced if the same resources are invested in renewables compared to fossil fuel technologies. The ratio increases if opportunities for energy efficiency are included, resulting in at least a quarter million renewable energy jobs by 2020.

Kammen released the findings in Seattle at a forum focusing on the New Apollo Energy Project, a 10-year, $300 billion initiative designed to create incentives for developing clean and renewable energy sources such as solar- and wind-generated power and fuel recycled from municipal and agricultural waste. The goal of the program, sponsored by U.S. Representative Jay Inslee (D-WA) and Senator Maria Cantwell (D-WA), is to meet 20 percent or more of the nation's power needs by 2020 with resources other than imported fossil fuels, thereby reducing global warming and dependence on foreign oil.

PHOTO COURTESY OF JAY INSLEE

U.S. Representative Jay Inslee (left) sponsored the Seattle event announcing the New Apollo Energy Project, where Berkeley researcher Daniel Kammen (right) released the findings of his report on the job-generating potential of renewable energy sources like solar- and wind-generated power.

"For too long, innovations in solar, wind, and biomass/waste technologies, green buildings, highly efficient vehicles, and construction practices that minimize waste have languished on the edge of the market despite impressive technical advances," Kammen says. The U.S. would not need to import oil now, he says, if it had kept up the pace of innovations of the late 1970s instead of slowly falling behind in the energy technology industry.

Go to **http://socrates.berkeley.edu/~rael/outreach.html** for the full report. ■

Birgeneau Poised To Become Berkeley's Ninth Chancellor

Robert J. Birgeneau, a 62-year-old internationally renowned physicist who is currently president of the University of Toronto and served on the MIT faculty for 25 years, will become UC Berkeley's ninth chancellor when Robert Berdahl steps down from the post this fall.

After weeks of widely publicized speculation, the UC Board of Regents made the announcement July 27 in Doe Library's Morrison Reading Room, followed by a formal introduction of Birgeneau to the campus community by Berdahl and President Robert Dynes.

"I genuinely believe that UC Berkeley is simply the best public teaching and research facility in the world," Birgeneau said in addressing the crowd of faculty, students, staff, and media gathered outside the library. He pledged to ensure equal educational access for all Californians and aggressively pursue both public and private funding to see the campus and UC through its current budget crisis.

A Toronto native, Birgeneau received his B.Sc. from the University of Toronto and his Ph.D. in physics from Yale. He met Dynes, also a native of Canada, 30 years ago at Bell Laboratories, where both were performing research. He joined the MIT faculty in 1975, then in 2000 became president and professor of physics at the University of Toronto, Canada's largest university.

PEG SKORPINSKI PHOTO

Birgeneau (left), with Chancellor Berdahl on the steps of Doe Library, is described as a man with a deep commitment to students, social equity, and the responsibilities of a public university. He was the first in his Toronto family to graduate from high school.

Berdahl announced last fall that he would be retiring after seven years as chancellor. Birgeneau will take the helm around October 1, when an interim president is named at the University of Toronto. Go to **http://www.berkeley.edu/news/media/releases/2004/07/27_chancellor.shtml** for more details. ■

PEG SKORPINSKI PHOTO

EECS professor and CITRIS researcher David Culler (left) explains to President Dynes how he uses sensors to create a network that can collect and transmit weather and other habitat data from remote ecosystems.

UC President Dynes visits Berkeley campus

"This is like a vacation," UC President Robert Dynes told a labful of Berkeley engineers and scientists after hearing their presentations on top research efforts, including new sensor-powered technologies in development by faculty at CITRIS, the Center for Information Technology Research in the Interest of Society.

Dynes, a scientist by training, joined UC San Diego in 1991 as a physicist after 22 years at AT&T Bell Laboratories. He was named UCSD chancellor in 1996 and became president of the UC system last October. In lieu of a formal inaugural ceremony, he took organized tours of all 10 campuses, which he says have opened his eyes to the individuality of each of the campuses and their impact on the daily lives of Californians. He referred to Berkeley as the "mother lode" of the UC system.

The two-day tour of Berkeley—a whirlwind series of meetings with students, faculty, and staff—included a budget meeting with Chancellor Berdahl's cabinet, an alumni reception at International House, a dinner with Berkeley Mayor Tom Bates and several regents, and an early morning run with the Cal track teams.

In addition to CITRIS, the Berkeley Health Sciences Initiative and the California Institute for Quantitative Biomedical Research (QB3) reported to Dynes on their high-level interdisciplinary research projects. He asked detailed questions about how research faculty plan to allocate space and administrative funding and resolve intellectual property issues.

The CITRIS projects presented included the "heads-up" display firefighter helmet in development by ME professor Paul Wright, the redwood habitat-monitoring sensor networks in use by EECS professor David Culler, and the "Chiclet"-sized syringes for delivering medication in the works by BioE and ME professor Dorian Liepmann. Also presented by ChemE professor Jay Keasling, who is working in the area of synthetic biology with BioE professor Adam Arkin, was a production method for malaria drugs involving transplantation of yeast and plant genes into the *E. coli* bacterium. ■

BY BONNIE AZAB POWELL, CAMPUS PUBLIC AFFAIRS

GSRC to share $29 million in semiconductor research funds

Berkeley's Gigascale Systems Research Center (GSRC) and four other U.S. university research centers will receive at least $29 million per year for the next three years. Intel CEO Craig Barrett described the funding as the "most ambitious research effort to keep the American semiconductor industry at the forefront of innovation."

The funding includes $19 million from the semiconductor industry and $10 million in federal funds to support long-range semiconductor research through MARCO, the Microelectronics Advanced Research Corporation. Established in 1998, MARCO is an umbrella organization designed to strengthen ties between industry and top academic centers doing research in semiconductor integrated circuit design and fabrication technologies.

Now under the direction of EECS professor Jan Rabaey, the GSRC was one of two centers originally established to investigate the areas of system design, integration, testing, and verification. Other centers exist at Carnegie Mellon, Georgia Tech, and MIT, each with a different research focus. A new center at UCLA was added last fall to focus on nanoscale materials.

"What's unique about this project is that it facilitates cross-university research," says Rabaey. "We are usually working in a more competitive process, but here we are getting together with researchers at MIT, Carnegie Mellon, and other campuses to share information and prepare publications. It has been working beautifully."

Funding for the five centers translates into roughly $10 million for the GSRC over the next three years to support the work of 32 researchers at 16 centers. This research, according to Rabaey, will have an "enormous impact" in the next 10 to 15 years, as the semiconductor industry reaches the limits of current paradigms and must come up with entirely new design solutions. ■

INNOVATIONS

Cutting-edge research from Berkeley Engineering

Innovations is a regular column featuring brief updates on the pioneering research done by Berkeley College of Engineering faculty and students. See more at **www.coe.berkeley.edu/newsroom.**

FACES IN THE NEWS

EECS graduate student Tamara Miller, CS professor David Forsyth, and colleagues are working on a project that could advance the science of computer face recognition and have potential applications in everything from image archiving to surveillance. They have developed computer software that automatically associates 45,000 images of human faces gathered from online news articles with the names of the individuals pictured.

"Most photos in the news aren't mug shots, with the person looking right into the camera," says Forsyth, who is also an investigator with the Center for Information Technology Research in the Interest of Society (CITRIS). Among the tasks the software must accomplish are separating the face from the photo's larger context, correcting the face's positioning to match a 'canonical' pose, and culling the associated name from photo captions. The software is 95 percent accurate at identifying dozens of images of a single individual, even when the face is shown in a variety of positions, angles, lighting conditions, and with a range of facial expressions. ■

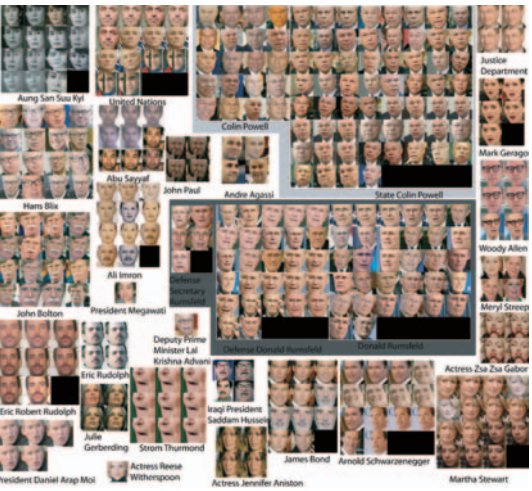
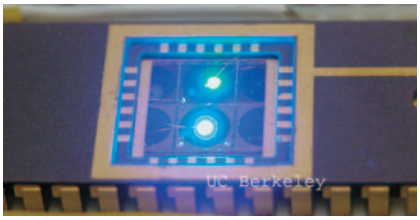


PHOTO COURTESY OF THE RESEARCHERS

The software presents the user with a cluster of photos of a particular individual, and each photo is linked to the news story where it appeared.

TINY COMPUTER CHIP CAN DETECT TOXINS



UC BERKELEY PHOTO

Research on the fluorescence microscopy detection system, which provides a cheap and portable method for identifying specific toxins or DNA, was funded by the National Science Foundation.

Berkeley has filed a patent application on a tiny computer chip that uses fluorescence microscopy to detect target molecules of a toxic substance in a sample. The "lab on a chip," its developers say, could have potential applications in law enforcement, environmental pollution detection, military medical care, or for anyone who needs a cheap and portable method of identifying the presence of specific toxins or DNA without the benefit of a laboratory.

"Imagine if you needed to determine whether a soldier in battle had been exposed to a biochemical agent," says MSE graduate student J. Alex Chediak. "This device could be developed into something medics use in the field to get answers in a matter of minutes rather than hours." Also involved in the research are graduate students Zhongsheng Luo and Jeonggi Seo, BioE professor Luke Lee, and EECS professor Nathan Cheung, under the leadership of Purdue's Timothy Sands, who initiated the work as an MSE professor at Berkeley. ■

VISUALIZING THE CHEMISTRY OF CONCRETE

In an effort to create a "band-aid" for concrete, CEE professor Paulo Monteiro has borrowed a research tool from the biological sciences to study the chemistry of concrete more closely than ever before. It is the soft x-ray microscope, which, because it penetrates water, a key ingredient in concrete as well as living cells, helps visualize reactions that occur when concrete is mixed with other substances.

"Using the x-ray microscope," Monteiro says, "we're able for the first time ever to watch these reactions as they happen." He and his colleagues are developing a polymer-based adhesive that would perform better than currently available repair materials at patching aging concrete in buildings and bridges. Their motivation? Most of the infrastructure in the U.S. was built during the economic boom following World War II, and already 60 percent of our 500,000 bridges are showing signs of decay. The price tag to repair just those bridges, Monteiro says, could be as high as $120 billion. ■

PEG SKORPINSKI PHOTO

Paulo Monteiro (M.S.'81, Ph.D.'85 CE) joined the Department of Civil Engineering in 1987 and is also group head of Structural Engineering, Mechanics, and Materials. His research in concrete microstructure could bring a new "band-aid" to the 60 percent of the half-million bridges in the U.S. that are showing signs of distress.

PEG SKORPINSKI PHOTO

ME professor Alice Agogino, among the faculty involved in the new program, helped introduce the concepts behind the new Berkeley Institute of Design at last May's event.

New institute to take human-centered approach to technology

The Berkeley Institute of Design (BID) officially opened as a new interdisciplinary research center in May with a day of tours, research overviews, and demonstrations by center faculty. The program incorporates computer science, education, mechanical engineering, art practice, and architecture to foster a more human-centered approach to technology design.

Under the direction of EECS professor John Canny and in affiliation with the Center for Information Technology Research in the Interest of Society (CITRIS), the BID will unite the efforts of 25 faculty from diverse departments and programs in an effort to transition from the "built" to the "interactive" environment in information technology. The program will be located in close proximity to CITRIS headquarters in the recently renovated Hearst Memorial Mining Building.

"The goal is to take a human-centered perspective on information technology and its impacts," Canny says, "reaching out to faculty from areas like sociology and education to 'close the loop' by giving them a direct role in the design of technology."

In the making for three years, the idea for the center grew out of the Human Centered Computing Group, initiated in 1998, and quickly gathered momentum. A number of other schools are creating similar programs, according to Canny. Cornell University combined its computer science and information sciences program, similar to Berkeley's School of Information Management and Systems (SIMS), and similar centers are in the works at both Stanford and UC Irvine.

Key application areas include educational technology and practice, where making design more learner-centered can increase the effectiveness of the learning, and new design methods for ubiquitous technologies like cell phones and PDAs. ■

Berkeley hosts kickoff event for tech initiative with UN

PEG SKORPINSKI PHOTO

Robert Reich, secretary of labor during the Clinton administration and a visiting scholar at Berkeley last spring, spoke at the conference, attended by 480 participants from more than 20 countries.

A new alliance between Berkeley and the United Nations to help integrate developing nations into the global economy held its kickoff conference, "Bridging the Divide 2004: Technology, Innovation and Learning in Developing Economies," on campus in April.

The three-day event—attended by 480 scholars, corporate leaders, and government officials from more than 20 countries—included lectures and panel discussions designed to stimulate discussion on ways to accelerate technological and sustainable economic development in emerging nations.

Berkeley's Management of Technology (MOT) program, a joint effort of the College of Engineering, Haas School of Business, and the School of Information Management and Systems, sponsored the initiative. The largest interdisciplinary program on campus, the MOT program has been working in conjunction with the United Nations Industrial Development Organization (UNIDO) for more than a year to forge the alliance.

"We were delighted by both the range of attendees and the depth of the discussion," says Andrew Isaacs, MOT program executive director and organizer of the conference. "The panels and lectures focused on real issues of technology adoption in the developing world and the challenges of meeting such a wide range of needs." The agenda included such issues as energy infrastructure and access in Asia and Africa, advancing education in Ghana, and the principles of adapting technology to local culture.

The conference inaugurated field projects to be undertaken this summer by eight faculty/student teams in China, India, South Africa, Ghana, Uganda, and Brazil. The conference will be held annually, each time generating field project teams who will document their experiences and outcomes.

The success of the conference, Isaacs says, would have been impossible without the "tremendous effort" by students from all across campus. (*For more see story page 10.*) ■

newsmakers

PEG SKORPINSKI PHOTO

Tom Budinger received the Berkeley Citation at commencement last May.

ALICE AGOGINO, the Roscoe and Elizabeth Hughes Professor of Mechanical Engineering, received the Director's Award for Distinguished Teaching Scholars, the National Science Foundation's highest honor for excellence in teaching and research. An expert in computational design, diagnostics, and monitoring systems, Agogino directs the Berkeley Expert Systems Technology Laboratory and the Berkeley Instructional Technology Studio and its Multimedia Classroom and is incoming vice chair of the Academic Senate's Berkeley Division. She was one of eight individuals nationwide to receive the award, which includes a $300,000 grant over four years.

THOMAS BUDINGER, professor of BioE and EECS, received the Berkeley Citation, the highest academic honor given by the campus to a handful of individuals each year who have achieved extraordinary stature in their fields and made significant contributions to the University. Budinger is also professor of radiology at UCSF and serves at LBNL as faculty senior scientist, head of the Center for Nuclear Medicine and Functional Imaging, and Henry Miller Professor of Medical Research. The first chair of bioengineering in 1998, he stepped down as chair in June and will be succeeded by Dorian Liepmann.

DAVID DORNFELD, the Will Hall Family Professor of Mechanical Engineering, is the recipient of the Society of Manufacturing Engineers Frederick W. Taylor Research Medal, one of several International Honor Awards granted in 2004 for worldwide contributions to manufacturing, education, science, and technology. Dornfeld was recognized specifically for his research in acoustic emission, burr formation, sensor fusion, and precision engineering.

PHOTO COURTESY OF KORET FOUNDATION

At a luncheon in their honor, Robert Dynes (left) and John Hennessy (right) participated in a discussion about the future of education and educational policy, moderated by UC President Emeritus Richard Atkinson, member of the Koret Foundation's board and 1999 Koret Prize winner.

UC President **ROBERT DYNES** and Stanford President **JOHN HENNESSY** received the Koret Prize, including $1 million grants for their respective universities. The San Francisco–based Koret Foundation has granted the award every other year since 2000 to recognize contributions in leadership and community service in the Bay Area. Dynes will allocate $750,000 to support UC's Leadership Excellence Through Advanced Degrees Program, which supports gifted undergraduates who are interested in science and engineering careers. The remaining $250,000 will go to Boalt Hall School of Law to support faculty recruitment, outreach, and a new research and teaching center.

DAVID MESSERSCHMITT, the Roger A. Strauch Professor in EECS, was recognized by the Association of American Publishers for his 2003 book *Software Ecosystem: Understanding an Indispensable Technology and Industry*, which was named outstanding achievement in professional and scholarly publishing in the business, management, and accounting category. Published by MIT and co-authored by Clement Szyperski of Microsoft, the book examines software in the context of its users and other constituents and provides non-technical scholars with the information they need to do better research relevant to the challenges faced by the industry and end-users.

SHANKAR SASTRY, EECS chair and NEC Distinguished Professor, was among the 2004 fellows elected to the American Academy of Arts and Sciences (AAAS) in recognition of leadership in scholarship, business, the arts, and public affairs. Sastry, who joined the College faculty in 1983, was named in the engineering sciences and technologies category. The AAAS was founded in 1780 and has more than 4,500 members, including more than 150 Nobel laureates and 50 Pulitzer Prize winners.

PEG SKORPINSKI PHOTO

David Messerschmitt

PEG SKORPINSKI PHOTO

Shankar Sastry

Construction begins on Molecular Foundry, center for nanoscale research

RENDERING COURTESY THE SMITHGROUP OF SAN FRANCISCO

Artist's rendering shows Lawrence Berkeley Lab's Molecular Foundry, which will sit on the hillside above campus. The Foundry will house six labs focusing on inorganic nanostructures, nanofabrication, organic polymer/biopolymer synthesis, biological nanostructures, imaging and manipulation, and theory.

Ground was broken early this year on the new Molecular Foundry, a centerpiece for Lawrence Berkeley National Lab's Nanoscale Research Program, one of five such programs planned nationwide by the U.S. Department of Energy for research in nanoscale materials.

"Understanding the properties of materials on the tiniest scale will have an impact on everything from medicine to manufacturing," said Berkeley Lab Director Charles Shank. Nanoengineering involves researching both organic and inorganic compounds on a scale of billionths of a meter, or about 75,000 times smaller than the width of a human hair. Working with materials on the molecular scale yields novel properties that can be harnessed into new applications.

The six-story, $85-million, 94,500-square-foot research building will provide labs dedicated to the research, design, and synthesis of both 'soft' (biological and polymer) and 'hard' (inorganic and microfabricated) nanostructures and integrating them into complex systems. The facility and its program are designed to enable scientists from a wide range of disciplines worldwide to submit proposals and engage in research there. When completed in 2006, it will house more than 200 scientists and engineers from Berkeley and around the world.

Nanotechnology is expected to enable such techniques as detecting and treating disease on a cellular level, potentially alleviating harmful side effects; creating carbon nanotubes to improve transmission of electric power; and manufacturing smaller and more efficient materials for such devices as electronics and solar cells. ■

Volvo awards $2.4 million for new center at ITS

A team of researchers from Berkeley's Institute of Transportation Studies (ITS) has been awarded a five-year, $2.4 million grant to establish a Center of Excellence in Future Urban Transport by the Volvo Research and Educational Foundations.

Eight ITS faculty from CEE and the Department of City and Regional Planning (CRP) will team up to investigate the interaction between technology and policy in urban transportation, particularly sustainable transportation strategies. The center is one of two funded this year, following an international competition that attracted proposals from some of the world's foremost transportation research centers.

"This is an excellent opportunity to help improve cities around the globe by advancing and testing new ideas in a collaborative research environment," said Carlos Daganzo, the Robert Horonjeff Professor of CEE and the center's principal investigator.

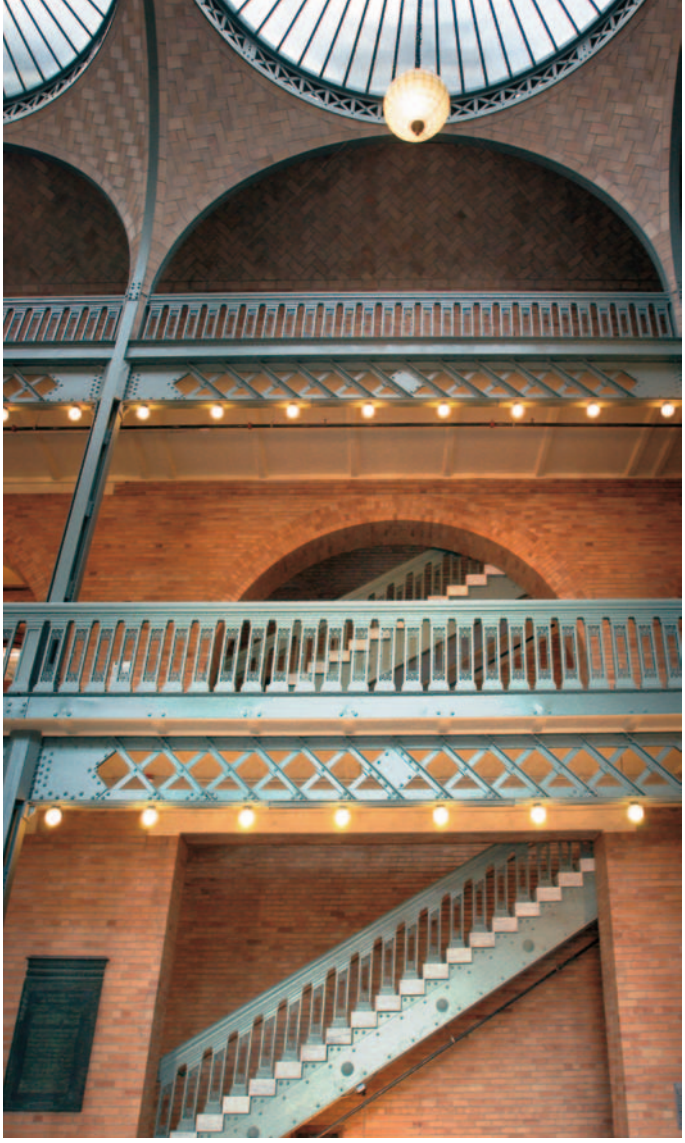
Research will focus on the interdependence of policy and technology—how new technologies can shape policy and vice versa—in order to develop a deeper understanding of how policy and technology should be integrated in proposed solutions.

The researchers set forth several themes that will drive their work, including balance between mobility and accessibility, tailoring transportation services to urban settings, the role of telecommuting and wireless communication in facilitating urban transport, and sophisticated strategies for mitigating congestion. The research, the proposal said, should be "guided by a city's vision of its own future."

PHOTO COURTESY UC TRANSPORTATION CENTER

Two of the themes of the new Berkeley ITS Center of Excellence in Future Urban Transport will be designing transportation services for urban areas and easing congestion.

In addition to Daganzo, other participants in the center are CEE professors Michael Cassidy, Arpad Horvath, Samer Madanat, Raja Sengupta, and Alexander Skabardonis, and CRP professors Robert Cervero and Elizabeth Deakin. ■



BART NAGEL PHOTO

Hearst Memorial Mining Building's Memorial Gallery features skylights and arches decorated with Guastavino tiles, an early method of fireproofing.

Hearst Mining restoration wins architecture award

The Hearst Memorial Mining Building was recognized by the San Francisco chapter of the American Institute of Architects (AIA) with a 2004 Best of the Bay Excellence in Design Award for the renovation that transformed the 1907 architectural landmark from its original purpose as the top mining school of its day to a new era of nanoscience and high-tech engineering.

AIA jury members cited the artful preservation of the building's architectural details despite drastic structural interventions and its exposed engineering systems, intended to serve as an inspiration to students. The four-year renovation was undertaken to restore the building to its original beauty, update its purpose, and improve its seismic integrity.

Project architects included NBBJ Architects and Page & Turnbull Preservation Architects, and the engineering team included Affiliated Engineers, Rutherford & Chekene, and Charles M. Salter Associates. ■

Berkeley graduate Engineering holds number three ranking

Berkeley's College of Engineering retained its number three overall ranking in the 2005 *U.S. News & World Report* Best Graduate Schools edition, behind frontrunners MIT and Stanford, which also held onto their first- and second-place slots, respectively.

Of 10 specialties evaluated, Berkeley ranked first in four programs, with civil repeating its first-place ranking of last year. In computer engineering, Berkeley jumped from fourth to a first-place tie with MIT and Stanford. The electrical/communications program moved up from second to a first-place tie, also with MIT and Stanford. Chemical engineering moved up from second last year to a first-place tie with MIT and University of Minnesota, Twin Cities.

Also moving up were environmental engineering, from third to second this year, and industrial, from fifth last year to a fourth-place tie with Penn State, University Park. Materials slipped from fifth to sixth, and mechanical slipped from second to third. The College's newest department, bioengineering, slipped off the top-ten ranking altogether from ninth place last year.

This is the 17th year the magazine has ranked the nation's best graduate and professional schools and specialty programs in engineering, business, education, fine arts, law, medicine, and nursing. Criteria include quality as perceived by deans and corporate recruiters, GRE scores of accepted students, ratio of full-time students to full-time faculty, number of doctoral degrees granted, externally funded research expenditures, and research dollars per faculty member doing research. The specialty program rankings are determined solely by assessments by department heads. Undergraduate programs are ranked in a separate edition.

An independent national study following the rankings found that six UC campuses—including Berkeley, UCLA, Irvine, Davis, San Diego, and Santa Barbara—enroll more low-income students than any other top public or private universities in the nation. The study, by Tom Mortenson of *Postsecondary Education Opportunity*, was based on Pell Grants, which are available to students from families earning less than $35,000 annually. UCLA ranked first, with 35.1 percent of its students receiving Pell Grants, followed by UC Berkeley with 32.4 percent. ■

Graduate School Rankings
US News & World Report

	MIT	Stanford	UC Berkeley
Biomedical/bioengineering	8	NR	12*
Chemical engineering**	1*	6*	1*
Civil engineering	5*	3*	1
Computer engineering	1*	1*	1*
Electrical/communications	1*	1*	1*
Environmental engineering	9	1	2*
Industrial/manufacturing	NR	6	4*
Materials engineering	1	5	6
Mechanical engineering	1*	1*	3
Overall	1	2	3

NR not ranked in category * tied with other school(s) ** program in College of Chemistry

BERKELEY'S NEW PEACE CORPS FOR TECHNOLOGY

Visionary research brings information and communication technology to the heart of developing regions

The stories that follow offer a glimpse into one of the College's most visionary new endeavors. Called ICT4B—Information and Communication Technology for Billions—this interdisciplinary project has roughly 10 faculty and 15 students from the College, Haas School of Business, the School of Public Health, and the School of Information Management and Systems at work in labs, classrooms, and in the field to bring this extraordinary endeavor to fruition.—Ed.

BY DAVID PESCOVITZ

Outside a tiny metal and straw hut in a rural Bangladesh village, customers line up to do business with the "phone lady." She has no computer, no electricity, no running water. But she does have a first-generation cellular phone. If you need to contact a relative living abroad or call about a job in a nearby city, you visit her. She charges by the minute to use her phone, and you're happy to pay. Phone ladies—and these days there's one in almost every Bangladeshi village—are newly minted entrepreneurs, part of a pioneering program by the Grameen Bank. These women are bootstrapping their economic situation in a sustainable way while providing valuable telecommunication services to their neighbors. With just a $200 investment, a phone lady can earn three to ten times the average annual income of someone from her village.

Berkeley computer sciences professor Eric Brewer considers the phone ladies, who first set up shop nearly a decade ago, to be quintessential examples of his vision for the four billion people on the planet who earn less than $1 a day. Brewer, with a team of Berkeley faculty, is dedicated to building a technological infrastructure that provides access to the technology and tools often unavailable to people in developing regions. Engineering Dean Richard Newton, Special Assistant to the Chancellor for Science and Technology Tom Kalil, and a host of researchers and graduate students from myriad disciplines have joined Brewer in this grand plan, dubbed "ICT4B," Information and Communication Technology for Billions. The National Science Foundation has signed on too, earmarking more than $3 million over the next four years for the project.

"A better information and communications technology infrastructure that is available and accessible to these communities will correlate more closely with improvements in their economic well-being than anything else we can do right now," Newton says.

A massive undertaking, ICT4B has multiple arms, some of which are officially part of the grant, while others represent the College's broader interest in the research agenda. Brewer, Kalil, and Newton

PHOTO COURTESY OF GRAMEEN FOUNDATION USA

Fatima Serwoni lives in the village of Namunsi in the Mbale district of Uganda. She is one of many village "phone ladies" in Uganda who are part of a cell phone initiative sponsored by Grameen Foundation USA, an offshoot of the Grameen Bank. With no electricity in her village, she relies on her car battery to recharge her phone. The nearest public pay phone is several miles from her small store.

teach a special topics seminar to fuel interest among graduate students and advanced undergraduates in engineering, social science, business, and public policy. This summer, a joint program between the University's Management of Technology (MOT) program and the United Nations Industrial Development Organization (UNIDO) sent 29 fellowship students into developing regions—from rural China to Uganda—to conduct a first round of initial field research. *(Read about the students' field research on page 19.)*

"What we have created is like a peace corps for technology," Newton says. "There is nothing you can read or be taught that will gave you the a real understanding of what it's like to live and work in a place other than the United States unless you've actually done it."

The students served as advance scouts for the first ICT4B technology deployment in the summer of 2005. The researchers plan to improve the wireless infrastructure in several villages that already have basic equipment. In 2006, they hope to expand the scope of their deployments to include South America.

Indeed, ICT4B is a case study in use-inspired basic research, the development of core technology with applications in mind. "Hand-me-down technology from Silicon Valley doesn't do the trick," Brewer says. "Education levels are low and illiteracy is often an issue in many of the regions in which we are working. We'd like to design technology with these people and their unique challenges in mind from the beginning. But the real key is to work with local NGOs [non-governmental organizations] on the ground; they are the groups that really understand the problems and the local culture and can facilitate successful technology."

Power is at a premium too—most rural villages in developing nations run on solar energy; and deployment will be difficult where technically savvy citizens are scarce. "These are the very challenges that drive our research agenda," says Kalil.

Fortunately, the ICT4B team has lined up what Newton calls a "tremendous set of partners" both in the U.S. and abroad, including Hewlett Packard Labs India in Bangalore, Intel, Grameen Bank, the Markle Foundation, India Institute of Technology Delhi, Microsoft, and the United Nations Development Programme. ICT4B is also closely affiliated with the UC Berkeley-based Center for Information Technology Research in the Interest of Society (CITRIS), a multi-campus hub for collaborative efforts among engineers, scientists, and social scientists. "CITRIS needs to be about big ideas that are tried at scale," Newton says. "ICT4B is one opportunity for us to do that."

According to Brewer, Kalil, and Newton, open communication and the exchange of information—whether it's through a mobile phone, a single shared Internet terminal in a village, or an inexpensive hand-held information appliance linked to a wireless network—is one way to begin bridging the gap between rich and poor.

To that end, ICT4B research projects range from novel wireless networking architectures, to speech recognition chips that understand multiple languages, to inexpensive flexible displays that can be cranked out in rolls; others in the College are developing medical devices to tackle some of the major health care concerns in developing regions.

"Information technology is not an end in itself," says Kalil. "It's a means to improve health care, improve the environment, strengthen democracy, and reduce poverty."

Easy access to accurate information, Kalil says, could even help eliminate corruption in government. Already, the Madhya Pradesh State Initiative in India has built an intranet that provides rural villagers with direct access to government agencies. Previously, farmers paid $100 to officials for a copy of a land title. Now, the same titles can be ordered online for pennies. Meanwhile, an experiment in China revealed that farmers could earn 60 percent more on their crops if they had access to telephones to learn the true prices in nearby urban markets.

Eric Brewer and the imposing 17th century Nandi the Bull outside a Shiva temple near Mysore, in southern India. Temples and hills, says Brewer, are a crucial part of rural connectivity in India. As shared public space, temples often house Internet kiosks, while hills enable lower-cost and longer-distance wireless communication.

PEG SKORPINSKI PHOTO

Andrew Isaacs was program director for the "Bridging the Divide—Technology, Innovation, and Learning in Developing Economies," conference held at Berkeley's Haas School of Business last spring, where the Berkeley-UNIDO Fellows Program was officially launched.

"The assumption of economics is that there's basic information available about the state of the market," Brewer says. "That may be true on Wall Street, but it's not true in a rural village in China."

Right now, farmers have to trust the middleman who picks up the produce from the village. "Obviously though, it's in that individual's best interest to give incorrect information," Brewer says. But if the farmer knows the real value of his produce, he can adjust his price accordingly, or even wait a few days to harvest until market demand is higher. "Ultimately, the productivity of the region increases and the market becomes more efficient," says Brewer.

"But it's crucial to underscore that ICT4B is not about charity," Brewer adds. "It's about sharing technology to solve pressing economic problems. Charity may be a short-term fix," he explains, "but once the donations run out so do the benefits. The key is to help the villagers establish their own profitable businesses to earn money that can then be re-invested in the region. If there is going to be long-term change, it has to be self-sustaining and pay for itself in the long run."

That self-sustaining model has worked wonders with Grameen's phone ladies. More than 52,000 Bangladeshi women have taken out small loans from Grameen Bank, a pioneering non-government organization, to buy mobile phones and establish themselves as phone ladies. In fact, rural poor in Bangladesh spend seven percent of their income on telecommunications, most of that going through phone ladies.

"The poor have some disposable income," Brewer points out. "It's not an oxymoron. In Dharavi, one of the poorest shanty towns in Bombay, 85 percent of the households own a television." So while these markets have been historically difficult for Western technology companies to reach, they do exist. Once the technology and market are proven, existing companies and nimble start-ups could "do well by doing good" in developing regions. ■

THE CLASS THAT LAUNCHED IT ALL

BY DAVID PESCOVITZ
PHOTOS BY BART NAGEL

Omar Bakr, first year Berkeley doctoral computer science student, expected to spend his summer at home in Berkeley, his nose buried in his textbooks preparing for prelims. But at the urging of his adviser, Engineering Dean Richard Newton, Bakr enrolled last fall in a groundbreaking new course, CS 294-12: An Information and Communications Technology Framework for Developing Regions, jointly taught with Carnegie Mellon University (CMU) via an advanced videoconferencing system. With an illuminating line-up of guest lecturers from diverse disciplines, CS 294-12 was designed to be the launch pad for the College of Engineering's technology peace corps.

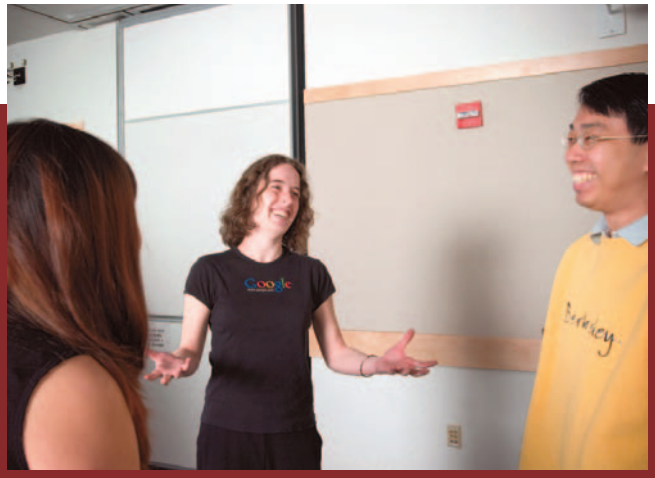
"When I return home to the Middle East, I'd like to bring back research methods that are relevant to that part of the world."

"This class was created to inspire students," says Newton, who jointly led the class with computer science professor Eric Brewer, Special Assistant to the Chancellor for Science and Technology Tom Kalil, and faculty from CMU. "We found out quickly that students are very attracted to research that improves the quality of people's lives."

Bakr is the perfect proof of Newton's claim. After a semester of inspiring lectures and insight into how information technology (IT) might be a tool with unique applications in the developing world, he was ready to take his class work into the field. Acceptance into the first Berkeley-UNIDO Fellows Program led to Bakr spending a month this summer in Ghana. There he and a small team of his classmates tested enhanced Internet access in Accra at the University of Ghana. Bakr hopes the skills he learns through the program will serve him well someday when he returns to his native Saudi Arabia.

"When I return to the Middle East, I'd like to bring back research methods that are relevant to that part of the world," Bakr says.

The students' backgrounds were as diverse as the teachers', representing multiple departments within the College, Haas School of Business, and the School of Information Management and Systems (SIMS). For EECS graduating senior Morgan Ames, the invigorating debates ignited by the numerous disciplines reminded her that efforts like ICT4B abhor a vacuum. Ames became aware of CS 294-12 through her ad hoc reading group, Technology and Sustainable Economic Development, a necessarily cross-disciplinary area she hopes to explore as a graduate student in SIMS.



As the educational component of the broader ICT4B effort within the College, the seminar was a gateway for students and faculty into the key research and deployment issues surrounding novel information and communication technology for the developing world.

"The ICT4B efforts are one of the reasons I decided to stay at Berkeley for graduate school," Ames says. "There's more momentum here than at any other university I visited."

Early on, the faculty realized that, like ICT4B itself, the course would only succeed if it was a tour de force of multidisciplinary discourse. To that end, guest lecturers from a wide variety of backgrounds provided the students, and faculty, with insight into the interaction among technology, policy, and business as they relate to sustainable development.

One week, Gita Gopal, associate director of Hewlett-Packard Labs India in Bangalore provided an overview of the company's initiatives in that part of the world, while another class featured Nagy Hanna, Senior Advisor on e-Development for the World Bank, discussing efforts to enhance the interaction between citizens and government in Sri Lanka. Toward the end of the semester, Professor Michael I. Shamos of CMU's Institute for Software Research International lectured on the massive differences between intellectual-property systems in the U.S. and abroad.

Of course, the lead instructors are luminaries in their own right. Along with helping launch many successful high-tech ventures, Newton is passionate about information technology as a way to solve grand-scale societal problems. He spearheaded the formation of the Center for Information Technology Research in the Interest of Society (CITRIS), one of four California Institutes for Science and Innovation. Kalil came to Berkeley from the Clinton White House, where he served as deputy assistant to the president for technology and economic policy. Along with his groundbreaking research on Internet-based systems, Brewer is known as co-founder with a Berkeley graduate student of Inktomi Corporation, acquired last year by Yahoo.

In fact, it was the instructors' connections to both academia and industry that inspired the course and the collaboration with CMU.

LEFT TO RIGHT: *Dean Newton and the students of CS 294-12; Tom Kalil; Morgan Ames and Matthew Kam; Eric Brewer, Omar Bakr, and Richard Newton; Tom Kalil, Eric Brewer, Richard Newton, and R.J. Honicky.*

"We believe this is a new research paradigm for universities in the 21st century," says Newton.

"We found out quickly that students are very attracted to the notion of work that connects directly to improving the quality of people's lives."

The seed was planted two years ago by Newton and CMU computer science professor Raj Reddy, an internationally known pioneer in artificial intelligence, at a meeting of the Microsoft technical advisory board. Reddy had been exploring new devices for developing nations, while Newton and the Berkeley team focused on infrastructure. The course emerged from those early discussions, with CMU faculty M. Bernardine Dias of the School of Computer Science Robotics Institute and Rahul Tongia of the Engineering and Public Policy Department also signing on to jointly teach the class with the Berkeley trio.

"The most heartening thing about the course was the students' determination to understand issues that are difficult, unstructured, and with no right or wrong answers," says Tongia, whose interdisciplinary research focuses on technology, infrastructure, and public policy in developing countries. "In fact, we learned a tremendous amount from the students and their presentations."

Now the real work begins.

"The class gave everyone involved a broad overview of the technological challenges and cultural differences you might face in developing regions," Brewer says. "It wasn't deep enough to enable us to solve the problems, but it did help us determine what the next steps could be." ■

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DAVID PESCOVITZ writes *Lab Notes*, the College of Engineering's online research digest, and contributes to *Popular Science*, *Small Times*, and *Business 2.0*. His writing on science and technology has been featured in *Wired*, *Scientific American*, *IEEE Spectrum*, and the *New York Times*.

THE TECHNOLOGY SUPPORTING THE VISION

BY DAVID PESCOVITZ

ILLUSTRATIONS BY MARK FRAUENFELDER

"If you don't change the way technology is spread, the gap between the rich and poor will just continue to widen," says Eric Brewer, professor of electrical engineering and computer sciences (EECS) and principal investigator for the ICT4B project.

To that end, Brewer established Technology and Infrastructure for Emerging Regions (TIER), a research sub-group within the vast, interdisciplinary ICT4B effort. TIER is tasked with developing the technology that will drive ICT4B to success. Ultimately though, Brewer hopes ICT4B will become just one "TIER customer" side by side with various non-governmental organizations (NGOs) and companies that also find value in the Berkeley developments.

Below is a sampling of the research projects proceeding under the auspices of ICT4B and, in the case of the medical technologies, the Center for Information Technology Research in the Interest of Society (CITRIS). The aim of this use-inspired basic research is to help citizens of emerging nations solve their toughest problems through a wide and creative range of innovative engineering solutions. TIER is not technological imperialism, Brewer says. It's about providing appropriate technologies for emerging regions to help themselves.

"In the last 100 years, technology has been the single factor that caused the most change in the first world," Brewer says. "Now, technology is the best source of hope in developing regions."

WIRELESS NETWORKING

The Problem: People are unable to communicate or share information quickly and easily beyond their own village. A robust wireless network must be developed to link rural villages in ways that are cheap and easy to manage. This infrastructure will be the foundation for most ICT4B efforts.

The Team: Professor Eric Brewer, EECS; Kevin Fall, Intel Research; EECS graduate students Sergiu Nedevschi, Rabin Patra, Michael Demmer, Sonesh Surana; Jordan Hayes, a Berkeley-based software engineer volunteering on the project.

The What: A robust wireless network is ICT4B's foundation in low-income developing countries where telecommunication infrastructure, not to mention electricity, may be nonexistent or prohibitively expensive to use. Novel hardware and software must be developed to link rural villages in ways that are cheap and easy to manage.

The How: One networking project focuses on dramatically extending the range of inexpensive 802.11 Wi-Fi chipsets, which use directional antennae to transmit data 50-80 kilometers from village to village until it reaches a cellular

base station or network hub in an urban location. However, users of wireless services in rural regions can't count on the instantaneous two-way communication of traditional networks. Everything from bad weather to a power outage can wreak havoc on a rural network. As a result, the ICT4B team is designing "delay-tolerant" systems that intelligently store data within the network, and route it in hops from point to point to its intended location during moments of connectivity.

The Status: This summer, the team visited several small villages in southern India where a variety of wireless solutions donated by industry made it possible for residents to exchange electronic information and videoconference with other villages about commerce and political issues. By studying the "logs," essentially the meeting notes, of how the villages use their technology, the researchers hope to better understand what kind of services the citizens are likely to use and what ingredients are necessary to build a more sustainable network infrastructure.

The Reason: "With networks that go into unusual or remote areas, it's either impossible or prohibitively expensive to have an always-on network," Fall says. "Before now, nobody has specifically tried to design a network for environments that have those problems."

BIO-CHIPS FOR DISEASE DETECTION

The Problem: Dengue fever, a tropical disease, incapacitates as many as 100 million people each year. Medical facilities capable of testing for this and other diseases are often far away from villages.

The Team: Professor Bernhard E. Boser, EECS; Professor P. Robert Beatty, Molecular and Cell Biology; Professor Eva Harris, School of Public Health; EECS graduate student Turgut Aytur; BioE undergraduate student Jonathan Foley; Department of Molecular and Cell Biology undergraduate student Wilfredo Lim.

The What: The two millimeter-square ImmunoSensor chip provides a quick, inexpensive test for the dengue virus.

The How: Melding microbiology with microcircuitry, the ImmunoSensor puts a laboratory on a chip at a cost that should approach less than $1 each. Plugged into a conventional laptop computer, the chip can analyze a drop of blood serum for antibodies that indicate if the patient is infected with the dengue virus. The entire test takes approximately 15 minutes.

The Status: The research team plans a summer 2005 field study for the ImmunoSensor Bio-Chips in Nicaragua. Meanwhile, they're also developing an HIV test that would run on the same platform.

The Reason: "In the Third World, there aren't very many means outside of specialized labs to test blood samples," Boser says. "Many regions don't even have the quality of water you need to do traditional tests. But you could imagine buckets of these chips, all coated with different antibodies or antigens, so not only can we detect on-the-spot when someone is ill, we can also find out exactly what illness they have."

SPEECH RECOGNITION

The Problem: Different languages and levels of education make traditional alphanumeric keyboard interfaces unsuited for most applications in developing nations. If you can't read, you can't type.

The Team: Professor Eric Brewer, EECS; EECS graduate students Sergiu Nedevschi and Rabin Patra; International Computer Science Institute researcher Chuck Wooters.

The What: An inexpensive all-in-one chip will enable users in developing regions to talk to next-generation information and communication devices in various languages, from Hindi to Tamil.

The How: Even though reliable recognition of large vocabularies is still a challenge in computer science, a single chip that can handle a very limited number of words is a reasonable goal. The researchers have built a single device that can accurately recognize 30 to 100 words spoken by any speaker. The chip can also be programmed dynamically during a particular application. For example, if a user is filling out a long online form, the chip may recognize specific words depending on the content of each page.

The Status: The device is currently being redesigned as a custom Application Specific Integrated Circuit (ASIC) to keep costs and power requirements to a minimum. With the aid of the Berkeley Tamil Studies Program, the researchers are collecting samples of the Indian language to program the chip.

The Reason: "We can't assume that the users of devices are literate, so spoken language input and output plays a major part in the design of user interfaces for emerging regions," Brewer says.

CHEAP PRINTABLE ELECTRONIC DISPLAYS

The Problem: Current costs for displays make it difficult to provide affordable information and communication devices for villagers.

The Team: Professor Vivek Subramanian, EECS; EECS graduate student Alejandro de la Fuente Vornbrock; EECS undergraduate student Teymur Bakhishev.

The What: A four- to six-inch computer display fabricated using an inkjet printer at a cost of under $5 dollars each.

The How: A reel-to-reel fabrication process negates the need for high-vacuum processes and clean room lithography that are the dominant costs in traditional displays. "Organic electronics" to drive the display are literally printed on a flexible substrate using organic and nano-particle inks. The display itself relies on polymer dispersed liquid crystals (PDLC), a material that can be made to look black or white depending on the application of an electrical field. Unlike traditional liquid crystal displays, the PDLC material does not require additional layers of optical components to produce an image.

The Status: By summer's end, the researchers were scheduled to have demonstrated a 3-inch passive matrix display with more than 100 pixels.

The Reason: "By developing a fully integrated, all-printed, low-res display, we hope to deliver unprecedented cost reduction in ubiquitous information appliances," says Subramanian.

DISTRIBUTED NETWORK IMAGING

The Problem: Some of the most advanced surgical techniques haven't reached rural villages because the hardware is too costly.

The Team: Professor Boris Rubinsky, ME and BioE; David Otten, a recent ME Ph.D. graduate; Dr. Gary Onik, medical director of surgical imaging at Florida Hospital, who works closely with Rubinsky.

The What: This novel system for medical imaging provides doctors in remote villages with a real-time view inside a patient's body during minimally invasive cancer surgery. The beauty is that the expensive equipment generating the images can be located thousands of miles away from the patient and shared by many remote physicians at once.

The How: Medical imaging systems convert data collected by sensors near the body into an image of what's inside. Although the sensors are often inexpensive, the computing power needed to translate the raw data into an accurate and detailed 3-D image is not. Distributed Network Imaging calls for the data collection hardware to be installed at the remote site where the actual surgery will take place. As the patient's raw data is generated, it is instantly digitized and transmitted via existing communication conduits—telephone lines, satellite links, or wireless networks, for example—to a state-of-the-art image reconstruction server located in an urban hospital or university, where it can be remotely accessed by doctors. The images are instantly sent back to the remote sites for a physician to consult during a surgical procedure or for diagnosis.

The Status: To prove their concept, the researchers used electrical impedance tomography (EIT) to image *in vitro* cryosurgery on a liver over a modem link. Commonly used in developing countries, cryosurgery is a minimally invasive surgical technique Rubinsky and Onik helped pioneer in which a tiny tubular probe inserted into the body kills cancer cells with blasts of intense cold. EIT imaging helps surgeons guide the tube to the tumor site and monitor the freezing to ensure that the tumor is completely engulfed in ice.

The Reason: "We believe that the distributed network concept will eventually provide diagnosis and treatment of cancer and genetic diseases to parts of the world population that have not been exposed to advanced medical technology in the past," Rubinsky says. ■

TO GHANA, UGANDA, AND BEYOND: FELLOWSHIP STUDENTS TAKE TO THE FIELD

BY KERI HAYES TROUTMAN

"Having an opportunity to conduct research that has a significant social impact is a dream that many of us share," says EECS doctoral student and Berkeley-UNIDO Fellow Matthew Kam.

To that end, this summer eight Berkeley-UNIDO fellowship teams—29 students in all—departed from Berkeley, bound for destinations from China to Uganda. Their work—underwritten with awards of up to $25,000 per project raised by Berkeley's Management of Technology (MOT) program and a long list of corporate sponsors—ranged from creating solar-powered lighting systems in rural China and advancing cancer prevention in southern Africa to enhancing Internet access in Ghana and extending microfinance loans in Uganda.

A short course co-taught last spring by Haas professors Andrew Isaacs and Kristi Raube readied students for field work, offering the nuts and bolts of field methods and data collection tools. "It was the launch pad for their work abroad," says Haas faculty member Isaacs, executive director of the University's MOT program and program director of the Berkeley-UNIDO "Bridging the Divide" conference held on campus last spring. Professor Raube is executive director of the Haas Graduate Program in Health Management.

"UNIDO has 170 member nations and field operations on the ground in 35 different countries, but it doesn't have large-scale technology research programs like we have at Berkeley," Isaacs says.

Initiated two years ago, the fellowships emerged from discussions between UNIDO and Berkeley's MOT faculty—the campus's largest interdisciplinary program, which includes the College of Engineering, Haas School of Business, and the School of Information Management and Systems (SIMS). "These fellowships provide our students with a rare opportunity to get into the field and make a difference in peoples' lives," says engineering Dean Richard Newton.

ASSESSING MICROFINANCE IN UGANDA: MAKING INFORMATION TECHNOLOGY A "BEST FRIEND"

Throughout the developing world, small businesses thrive or fail on what, to Western minds, are minute amounts of cash. When Muhammad Yunus, economics professor at Chittagong University, Bangladesh, observed local women in need of cash to expand their bamboo chair-building business, he approached local banks seeking loans on their behalf, unsuccessfully. Instead, he loaned $26 each to 42 village women, launching a mini-economic revolution. Two decades later, the Grameen Bank that emerged from those initial transactions has more than a thousand branches and three million borrowers in 44,000 villages—accomplished using IT as a "best friend," as Yunus puts it. More than 50 countries have since modeled their microfinance programs—granting microloans to the poor—after the Grameen Bank.

"It is well understood, after 20 years of experience, that microfinance can have tremendous impact, not only at the grassroots level for communities in the developing world, but also in a macro-sense to shift the direction of an entire country's economy," says Isaacs.

Matthew Kam (left) and Tu Tran of the Uganda microfinance team prepare for their upcoming fieldwork.

PEG SKORPINSKI PHOTO

"This is exactly the work I've been waiting to do for the past five or six years," says Honicky, who transferred to Berkeley for his doctorate to be part of the ICT4B project.

PEG SKORPINSKI PHOTO

In that context, the Berkeley-UNIDO Ugandan Fellowship team of two—Matthew Kam (EECS) and Tu Tran (SIMS)—settled into the lush green capital city of Kampala and three rural outlying districts in late August to begin formal assessments of the newly developed Remote Transaction System. The RTS is a combination of loan-tracking technologies and business processes developed by the international consortium known as the Microdevelopment Finance Team (MFT), which was convened by Hewlett-Packard. It aims to reduce operational overhead and promote sustainability, creating breakthroughs in the scale of microfinance operations.

A few months prior to the students' arrival, MFT had established a pilot program with three local microfinance institutions and some 4,500 clients in the region, granting small loans for a one-year trial, or two loan cycles. The MFT set up the technology and ran the trials, while the Berkeley Fellows acted as third-party evaluators.

The timing was right for the Berkeley project in Uganda, as the East African country recently implemented regulatory changes allowing microfinance institutions to make savings deposits. Such institutions usually rely on governments and donor organizations for capital to fund loans.

"This really helps the lenders stay financially sustainable because they can rely on their own funds rather than strictly upon donors," says Tran. "It helps too that Uganda already has a pretty extensive cellular network. It's one place the government has invested."

Picture this scenario: A young Ugandan woman who buys and sells fruits and vegetables for a living needs cash to make her initial purchases. She asks for a small loan to tide her through, travels to the city market, then returns home to sell her produce at the local market. En route, she stops at a roadside petrol station to make a loan payment to the station owner, who acts as a "loan agent" for a microfinance institution.

The structure supporting such transactions, as designed by the MFT, uses a combination of cellular communication, point-of-sale (PoS) devices, and new business processes. Agents for the microfinance institutions use the PoS devices—equipped with smartcard readers, printing, and cellular networking capabilities—to avoid manually recording loan and payment details. Transaction information travels wirelessly, either in real time or in batches when connectivity isn't present, from the PoS devices to servers at each microfinance institution.

The Berkeley-UNIDO Fellows timed their arrival to coincide with the middle of the first loan cycle, giving them an opportunity to gather feedback and propose changes to the technology design and business practices for the remainder of the trial. They set up interviews and focus groups at the MFT and participating microfinance institution headquarters in Kampala and the three rural pilot sites, and talked at length with stakeholders, program administrators, microloan agents, the microfinance branch office administrators, even local microloan clients.

"We observed the social interaction of agents and clients and watched clients making their payments, and agents disbursing funds to see what problems users encountered interacting with the technology, to see how the RTS is working," says Tran.

"If it's successful, this pilot project will show other microfinance institutions that the RTS solution is viable and can be deployed in other parts of the world," adds Kam.

TESTING ENHANCED INTERNET ACCESS IN GHANA'S CAPITAL CITY

Accra, the seaside capital city of Ghana has a largely well-educated, English-speaking population and is a vibrant mixture of modern and Third World culture. Ambassadors, students, travelers, and locals stroll the city's streets and open-air markets among tin-roofed concrete structures, open sewers, and red dust clouds. Internet cafes are a common sight, filled with Ghanaians and foreigners checking e-mail and surfing the Web. Like many Western visitors, Berkeley CS doctoral student R.J. Honicky frequented these cafes in his earlier trips to Ghana—a region he knows well, as his wife lived there as a child.

Relative to many other African locales, Ghana has a developed Internet infrastructure—the first West African nation to dial up in 1994. Yet slow connection times and high usage fees still make Internet access prohibitive for many. Accra's Internet cafe patrons pay about 25 cents for 10 minutes of online time. Compare that to a Ghanaian's median income of $1 per day and those minutes are simply unaffordable. When users log on, limited bandwidth often results in slow and erratic connections.

Honicky, who scoped out fieldwork options in Accra, EECS doctoral student Omar Bakr, and Haas students Aaron Chatterji and Samir Mehta journeyed to Ghana last May, computer hardware in tow, to set up a computer system designed to increase Internet availability and usability.

Ghana has been making clear strides over the past 10 years adopting technologies for economic development. "It seemed like the right fit for this project," says Honicky. "We were able to hit the ground running."

The team geared their work to Internet users with an interest in digital libraries—students, professors, researchers, and small business owners, setting up at the University of Ghana, where users were paying per-minute for access at Internet cafes on campus. While there, Berkeley's Fellows provided users free access privileges.

To bypass the bandwidth and connectivity issues there, the team used a Distributed Searchable Cache (DiSC) system that makes frequently viewed Internet content available offline. Rather than accessing the Internet for each search query, a user can retrieve content from the offline cache at speeds much faster than any dialup connection. DiSC uses an algorithm similar to peer-to-peer file sharing networks to stage popular content on a local network.

"It's possible that the search results we're getting from the cache could become better than those you'd get from sites like Google," says Honicky, "By downloading what's relevant to them, users personalize the data."

To improve the system, the team also "primed" the cache for a particular deployment, for example, when the users are software developers at a contracting firm. For them, the DiSC system could be loaded up with technical articles and papers relevant to software engineering.

The team took six computers to Ghana to build the local network in the university library. They also installed a few smaller DiSC systems at Internet cafes in Accra, where they gathered preliminary usage data and user feedback. Now they can collect traces on Internet usage patterns for as long as necessary.

"Ultimately, I'd like to make the reality of a slow, intermittent, or expensive connection as transparent as possible so that people in developing countries can use the Internet at dramatically reduced costs and in a much more interactive way than they do now," says Honicky. ■

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Berkeley-based freelance writer KERI HAYES TROUTMAN writes for the *East Bay Express*, *Alameda Magazine*, and *TechTarget.com*. She is co-author of *Going Mobile: Building the Real-Time Enterprise with Mobile Applications that Work.*

PEG SKORPINSKI PHOTO

SAMIR MEHTA PHOTO

RONNIE CHATTERJI PHOTO

TOP: *"These projects are about opening up streams of information to people, which in turn will open up education, improving standards of living and economic well-being," says Isaacs.*

MIDDLE: *Omar Bakr assembles a computer at the Balme Library, University of Ghana, last summer.*

BOTTOM: *Berkeley teammates Samir Mehta (left), R.J. Honicky, and Omar Bakr discuss DISC issues after assembling the computer shown above.*

studentnewsmakers

ANGELA PRIVIN PHOTO

Gian-Claudia Sciara

GIAN-CLAUDIA SCIARA, Ph.D. student in city and regional planning, was awarded the Helene M. Overly Memorial Scholarship by the Women's Transportation Seminar (WTS). The award is given to women graduate students in transportation and related fields. Sciara, an active member of the WTS since 2001, works with Martin Wachs, CEE professor and director of the Institute of Transportation Studies. She helped the New York City chapter develop and coordinate its mentoring program, which pairs young professionals with senior women in the field. The mentoring was symbiotic, she says. "WTS women helped inspire and energize me to pursue my goal to earn a Ph.D."

AVIJIT MUKHERJEE took first prize in the Federal Aviation Administration's Air Transportation Center of Excellence Student Paper Competition on Future Air Transportation Systems and second prize in the Center's poster competition. The Ph.D. student in transportation engineering researches and develops optimization models for air traffic flow management. His winning paper discusses the benefits of optimization models to determine the value of such measures as predeparture delay of flights, airborne holding while en route, and dynamic rerouting. His poster presents an optimization model for managing traffic flow into an airport whose arrival capacity falls below demand.

IEOR Ph.D. candidate **JUSTIN TUMLINSON** is the second engineer ever and the first Berkeley engineer to win the German Chancellor's Scholarship for 2004. The scholarship, established after the fall of the Berlin Wall, is an effort by Germany to engage U.S. scholars in German industry. Tumlinson was one of 10 scholars selected from hundreds of applicants to receive the award, worth more than $50,000. He will apply IEOR tools to the public policy and investment policy arena by studying the German government's investment incentive policy and working with German venture capital firms.

ANGELA PRIVIN PHOTO

Justin Tumlinson

The **2004 DEPARTMENTAL CITATIONS** were awarded at yearend to eight top graduating seniors, one from each of the college's eight departments, and the **BECHTEL AWARDS** were given to two engineering students for their achievement college-wide. All 10 students were selected by College faculty from among 724 class of 2004 undergraduates for their academic achievements and community activities. Citation awardees include Ryan Doan, BioE; Sarah Giddings, CEE; Ryan Hannink, NE; Olivia Or, Eng. Sci.; Anthony Paganini, IEOR; Matt Panzer, ME; Priam Pillai, MSE; and Kevin Simler, EECS. The two Bechtel winners include Engineering Science sophomore Austin Minnich, winner of the 2004 Bechtel Scholarship, and ME senior Emory Sanford, winner of the Bechtel Achievement Award.

NICK LAMMERS PHOTO

2004 honorees (from left) Olivia Or, Austin Minnich, Emory Sanford, Kevin Simler, Anthony Paganini, Ryan Doan, and Priam Pillai. Not pictured are Sarah Giddings, Ryan Hannink, and Matt Panzer.

Graduate student makes tough transition to teacher

CEE Ph.D. student Kofi Inkabi dreamed of being a college professor, but after taking his first stab at teaching as a graduate student instructor (GSI), he wasn't so sure he had what it takes.

The class was one he had aced the year before, CE 180/290E: Construction, Maintenance and Design of Civil & Environmental Engineered Systems. Inkabi thought he had a great idea for how to improve the discussion section by adding lectures on material not covered in class. But his first lecture didn't go as planned.

"The students just sat there with blank stares. There was no interaction, and I don't think they got the material," he says. Discouraged and feeling as if his professional aspirations were dashed, he spoke to Robert Bea, who taught the class.

"I told Professor Bea I wasn't cut out to be a professor. He said I shouldn't give up because I failed the first time. He suggested that I relate the material to personal experience to help the students connect to it better."

At the next class Inkabi apologized for giving his students too much dense information. He reviewed the material, this time using a PowerPoint presentation and personal examples from his own professional experience. To his amazement, the students gave him a round of applause at the end of the class.

In a recent survey of 32,000 doctoral student teachers at U.S. universities, 45 percent reported feeling unprepared to teach, according to *U.S. News & World Report.* In an effort to improve his own teaching skills, Inkabi has sought the advice and experiences of fellow GSIs, visited the GSI Teaching and Resource Center, and solicited feedback from his students. But he contends that the best teacher for teaching is simply experience.

"It's very hard to train someone to be a teacher," he says. "The most important thing is to be committed to learning as you go. Like everything, teaching takes practice." ■

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BY ANGELA PRIVIN,
ENGINEERING PUBLIC AFFAIRS

ANGELA PRIVIN PHOTO

Kofi Inkabi told his story about transitioning from student to teacher in the graduate school edition of U.S. News & World Report. *He received the 2004 GSI Teaching Award last spring and says he now spends about 20 hours a week preparing lesson plans.*

Letter from the Real World

ANGELA PRIVIN PHOTO

EECS alum Tobin Fricke graduated from the College of Engineering in Spring 2003. Through a series of letters, Forefront *has stayed in touch with Tobin, tracking his life after Berkeley.*

Memorial Glade, UC Berkeley

It turns out that applying to graduate school is something like a full-time job. The fun finally began after the submitted applications had time to gestate. In the early weeks of February, the e-mails started rolling in, some containing the welcoming words, "Congratulations! We invite you to our recruiting weekend, at our expense." Only then did I breathe a deep sigh of relief.

And then the March flurry of airline reservations and hotels and endless schmoozing began, a lot like academic speed-dating, where in half-hour appointments you meet with as many faculty as possible, at each meeting hoping the right sparks would lead to a long-term student-advisor relationship.

Then came the hardest part, three good offers on the table: two fancy private schools with fellowships, one bustling public school down south. Would it be the small school in the middle of nowhere, cold climate, nearly ideal research program? Or the big school, warm climate, friendly people, not as well ranked, and not the research program I had in mind? I had six days to decide and every day a new idea of where to go.

In the end, I chose Rochester's doctoral program in physics, a program known for its excellent work in quantum optics and fusion. I'm excited about graduate school, about settling in for another intensive period of studying, working, and exploring a new place. In a sense, physics is at the center of science, and physics and engineering have a complementary relationship, each utterly impossible without the other.

Berkeley has been an easy place to be during this spring "between" time. I worked part time at LBNL and took courses in differential geometry and solid-state physics. Over the summer I went back to UCSD's Institute for Geophysics and Planetary Physics. Geophysics combines physics and engineering and allows you to tramp about the earth. It's further proof that engineers can sneak their way into any field! I worked with ROADNet, a project which is taking a unified wireless network that brings geophysical data from distributed sensors from the field into the lab. It was a good mix of CS theory (in routing data and developing algebras to describe operations on data streams), productive coding, and fieldwork.

And now I'm packing for Rochester. There are still some uncertainties. My youngest brother is in Iraq with the U.S. Marine Corps Reserve, working long days in 112° F heat, he says, his "hands crusty with sticky half-dried hydraulic fluid from repairing helicopters." He e-mails the family as often as he can. Sometime it feels ridiculous to be working a comfy research job knowing he's out there.

Still, my work is here. I have some doubts about Rochester. I dreamed of going to MIT as a high school student, but after six years in and around Berkeley, I believe this is the finest institution in America. I hope my experience in upstate New York will be as successful as my time at Cal.

Tobin Fricke

TOBIN FRICKE
Tobin@alumni.eecs.berkeley.edu

Jon Chun and Katherine Elkins, who now live in Menlo Park, had their first son, Beckett Elkins Chun, in January. "The career tentacles pulled us down here," Chun says, "but we miss Berkeley and its unique community."

Chun and Elkins: Sharing their start-up success

Jon Chun (B.S.'89 EECS) launched his startup company SafeWeb in March 2000, just as the tech boom started to fizzle. But his range of skills, solid business plan, and the doggedness he says he acquired during his years at Berkeley Engineering helped him rise above the Silicon Valley statistics.

"I couldn't have done this without Berkeley," Chun says. "I got my degree here and so did one of our company cofounders. This is where I met my wife. So I feel a personal indebtedness."

Chun and his wife Katherine Elkins (Ph.D.'02 Comp. Lit.) have established an endowment to provide need-based scholarships, beginning in 2006, to College of Engineering undergraduates in EECS or those doing projects for CITRIS, the Center for Information Technology Research in the Interest of Society.

Chun paid his own way through college, with the help of the Financial Aid Office and several scholarships, and recognizes the critical role of scholarships and fellowships in attracting top-notch students to Berkeley. Elkins, who recently joined the faculty at Kenyon College in Gambier, Ohio, also feels strongly attached to Berkeley and its role in her career success.

"There have to be public institutions and flagship programs to support world-class research," Chun says, explaining his loyalty. Two years spent in Japan, he adds, gave him a strong sense of *giri*, obligation to one's school or community.

Chun and two business partners started SafeWeb in a Berkeley rental they called "the geek house," developing their product and building venture capital. The result—a VPN (virtual private network) appliance that reduces the cost and complexity of securing corporate resources for remote access—was acquired last October by Symantec Corporation, a world leader in Internet security, for $26 million.

"There was a thrill-seeking aspect to the startup," Chun says. "I did everything, from the technical side to training, sales, and writing the patent." After the acquisition, he and his colleagues spent three months adapting the SafeWeb product as a standalone for sale through Symantec, where he is now director of development for the clientless VPN gateway.

Chun went to UCLA summer school directly after high school in Dubuque, Iowa. While visiting Berkeley that summer, he decided to move to California to gain residency, work, and apply to Berkeley Engineering.

"I never expected anyone to hand anything to me, and that gives you a strong drive," Chun says. "Berkeley opened a new world of personal and professional opportunities, and the College in particular is a challenging and competitive place, a great preparation for the startup experience." ■

Senior gift committee raises record amount

The Senior Gift Committee this year raised $15,502.99, a record high in both number of gifts and dollars raised. It included $5,502.99 from 237 students and $10,000 from alumnus Bob Sanderson (M. Eng.'66, Ph.D.'70 IEOR), who for the second year in a row pledged a two-to-one match for funds raised by graduation day.

Committee members, whose year-long grassroots efforts included personal appeals, incentives for giving, and setting up tables across campus, included Andrew Cheng (EECS), Alykhan Kurji (BioE), Danny Lau (ME), Stanley Lau (IEOR), Matthew Lowry (ChE/MSE), Olivia Or (Eng. Sci.), Adelina Ratner (EECS), and Mimi Yang (EECS).

The gift is designated to the Berkeley Engineering Fund, unrestricted funds allocated at the dean's discretion to support needy students, facilities upgrades, faculty research projects, and other College priorities. Go to **www.coe.berkeley.edu/alumni_friends/annual_fund.html** to find out more or to make a gift to the Berkeley Engineering Annual Fund. ■

PEG SKORPINSKI PHOTO

Members of the 2004 Senior Gift Committee (from left) Kurji, Cheng, Lowry, and Ratner proudly presented the fruits of their labors to the College at commencement ceremonies May 22.

Alumni Update brings you news from Berkeley Engineering graduates, as well as news and events of interest to alumni.

Please keep in touch by mailing your news and photos to us at Class Notes, College of Engineering Public Affairs, 1925 Walnut St. #1704, Berkeley, CA 94720-1704. Or go to **www.coe.berkeley.edu/classnotes** and click on *Submit Your Class Note*.

CLASS NOTES

2000s

SCOTT NEWMAN *(B.S.'03 Engineering Physics)* is currently in the EECS Ph.D. program at UC Santa Barbara, researching gallium nitride lasers and LEDs. **snewman@engineering.ucsb.edu**

MARC OMAN *(B.S.'03 IEOR)* is living in San Francisco and working for ZS Associates, a global management consulting firm. He comes back to campus as often as possible, especially to visit Hearst Pool and his friends in the College of Engineering. **marcoman@cal.berkeley.edu**

DUC BIEV PHAM *(B.S.'02 EECS)* of Campbell, California, is running his own photography business in the Bay Area shooting concerts, sports and action, fashion shows, and other events. Recent shoots have included the Tour de France in July and the Summer Olympics in Athens in August. **duc.pham@sbcglobal.net**

KAREN RAYMENT *(B.S.'01 EECS)* of Alameda is working in hardware design and as an R&D engineer at a broadband equipment and services company.

1990s

COLLEEN (DELGADILLO) BELLER *(B.S.'91 EECS)* of Greenwood Village, Colorado, has a 21-month-old son, Ethan, and was expecting another little boy in July of this year. **colleenb22@earthlink.net**

B. TOM BOARDMAN *(B.S.'90 CE)* of Oakland writes, "Catherine Engberg and I recently married under a beautiful oak tree in San Diego and honeymooned in Provence, France, in summer 2003." **btom_boardman@yahoo.com**

Five computer science visionaries on the state of the industry

PEG SKORPINSKI PHOTO

Berkeley alumni (left to right) Nicklaus Wirth (Ph.D.'63 EECS), Ken Thompson (B.S.'65, M.S.'66 EECS), Jim Gray (B.S.'66 Eng. Math, Ph.D.'69 CS), Bill Joy (M.S.'79 EECS), and Butler Lampson (Ph.D.'67 EECS), in the words of moderator Randy Katz, "an incredible brain trust of computer science expertise," participated in the visionaries panel. Wirth, Thompson, Gray, and Lampson are all recipients of the Turing Award, in 1984, 1983, 1998, and 1992, respectively.

At a computer science summit hosted by the College of Engineering last semester, five of the world's preeminent computer pioneers met to discuss the future of computing, from ubiquitous sensors and new programming languages to Internet security and the buggy behavior of today's software. The meeting was not a technical conference or corporate board meeting; the Computer Science Division of Berkeley's EECS Department was celebrating its 30th anniversary, and these visionaries were here for the party.

Hosted by Professor Randy Katz, the Berkeley Visionaries Panel provided a rare opportunity to hear Jim Gray, Bill Joy, Butler Lampson, Ken Thompson, and Nicklaus Wirth look back at their Berkeley years and ahead to the future of the industry they helped create.

The panel was the closing event in a day that began with a series of presentations highlighting the department's rich history of invention. After all, this was the birthplace of Berkeley UNIX, the relational database, RAID (Redundant Arrays of Inexpensive Disks), Reduced Instruction Set Computing (RISC), Simulation Program with Integrated Circuit Emphasis (SPICE), and dozens of other innovations that are directly connected to multibillion-dollar industries.

And the innovation continues. Berkeley computer scientists described their latest breakthroughs in such diverse disciplines as artificial intelligence, pervasive computing, and computational biology. Later presentations showcased the multidisciplinary efforts of the Berkeley-based Center for Information Technology Research in the Interest of Society (CITRIS), which is working on use-inspired basic research to solve major world challenges through information technology.

Go to **http://netshow01.eecs.berkeley.edu/CS-day-004/Berkeley_Visionaries.wmv** for the Webcast of the panel discussion. ■

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BY DAVID PESCOVITZ

PHOTO COURTESY OF GREATER BAY AREA MAKE-A-WISH FOUNDATION

Eric Johnston (left) met with Ben Duskin weekly for six months to create Ben's Game. A man of many talents beyond video game making, Johnston has also worked as a NASA engineer, a stunt man, and a flying trapeze instructor since he left Berkeley in 1992.

Alum helps turn a boy's wish into reality

Eric Johnston (B.S.'92 EECS), maker of video games since 1989, took on a unique project last fall, one that kept him working nights and weekends for six months, enlisting the help of his employer and colleagues, and bringing to life unheard-of monsters like Robarf.

The project, which made its debut in May, is "Ben's Game," a video game envisioned by nine-year-old Ben Duskin of Greenbrae, who believed his own experience with leukemia and two years of chemotherapy could help other kids with cancer. Ben called on the Greater Bay Area Make-A-Wish Foundation, which spread the word to gaming companies, looking for someone to take on the project. Make-A-Wish representatives were told it would require several years and several million dollars to accomplish.

But Johnston, senior software engineer and technical director at LucasArts, stepped up to the challenge. He met every Tuesday night with Ben, whose cancer is now in remission, to create the game according to his specifications. LucasArts donated after-hours use of its recording studio and other professional facilities. Johnston's colleague and former classmate Brad Post (B.A.'91 CS) got involved in the programming, and co-workers Chris Miles and Ellen Meijers provided character art and sound.

"I thought Ben's idea sounded like an amazing project, but I had no idea how much fun it would really be," Johnston says. "Ben is smart, mature and articulate, and he came prepared with design ideas we could put to use right away." Still involved in putting finishing touches on the game and doing media and other events, Johnston says he feels like he acquired a new little brother in Ben.

"I wasn't ready for the project to end," he says. "I worked about eight to 20 hours a week on it and honestly can't think of a better use for six months of spare time."

The object of the game: To search and destroy mutated cells and collect shields that confer protection against nasty creatures representing the common side effects of chemotherapy like vomiting (Robarf Monster), hair loss (Qball Monster), and fever (Firemonster). The weekend it was released for free download by Make-A-Wish **(www.makewish.org/ben)**, the Web site got more than 60,000 hits and 20,000 downloads, and the story got worldwide media attention.

Also participating on the project as medical advisor was Seymour Zoger, Ben's physician at UCSF Children's Hospital, who had counseled Ben early in his treatment to visualize his body fighting the cancer. The hospital will be the first medical facility to install the game for use by its pediatric patients.

"The science for the game came largely from what Ben learned himself in the course of treatment," says Dr. Zoger. An avid video gamer who played for distraction and solace during his own illness, Ben thought his game would provide not only relief from pain and stress, but also give patients like him a sense of fight in their cancer recovery.

The Greater Bay Area Make-A-Wish Foundation, located in San Francisco, is one of 103 U.S. chapters and international affiliates offering to grant a wish to children with life-threatening illnesses. ■

NAOMI CALICK *(B.S.'93 EECS)* of Fort Collins, Colorado, just celebrated 10 years with Intel. **ncalick@yahoo.com**

JAY CHANG *(B.S.'91 IEOR)* is vice president of consumer products at Visa International in Foster City, supporting Visa's regional offices in the U.S., Asia, Latin America, Europe, Canada, the Middle East, and Africa. **jayschang@aol.com**

VIRGILIO CRISTOBAL *(B.S.'97 EECS)* is a financial planner with Waddell & Reed in San Mateo. **virgcristobal@yahoo.com**

FRANCISCO LLOSA *(B.S.'97 ME)* is in the MBA program at McCombs School of Business, University of Texas at Austin, and plans to specialize in operations and energy finance. **francisco.llosa@mbaOS.mccombs.utexas.edu**

LIWEN MAH *(B.S.'94 IEOR)* is back in Berkeley to study law at Boalt Hall after eight years working as a quality engineer at Altera. **limabean@cal.berkeley.edu**

DEBJIT MUKERJI *(B.S.'94 ME)* got an M.S. and Ph.D. from Stanford, finishing graduate school in 2001, and is now employed in the aerospace industry in Los Angeles, doing technical consulting on the side. **debjit@alumn.berkeley.edu**

KEN SUSILO *(B.S.'90, M.S.'91 CE)* is vice president and associate and regional director of surface water for Psomas in Los Angeles. A die-hard Cal fan, he writes, "Go Bears! and congratulations to the 2003 football team!"

MING DAT TAM *(B.S.'99 EECS)* is a software engineer in aerospace and defense in Los Angeles.

1980s

STEVE CHAN *(B.S.'86 ME)* of San Francisco was recently elected vice president at large of the California Alumni Association. **steve@calalum.org**

FRANCOIS DECOPPET *(M.S.'84 CE)* of Miami is working with Schlumberger Oilfield Services in Venezuela as drilling and measurements operations manager. **decoppet1@slb.com**

COREY DUNSKY *(B.S.'86, Ph.D.'91 ME)* writes, "Aften 10 years in the beautiful Pacific Northwest (Seattle and Portland), I'm back in the Bay Area, Silicon Valley,

Water engineer Luthy takes CEE chair at Stanford

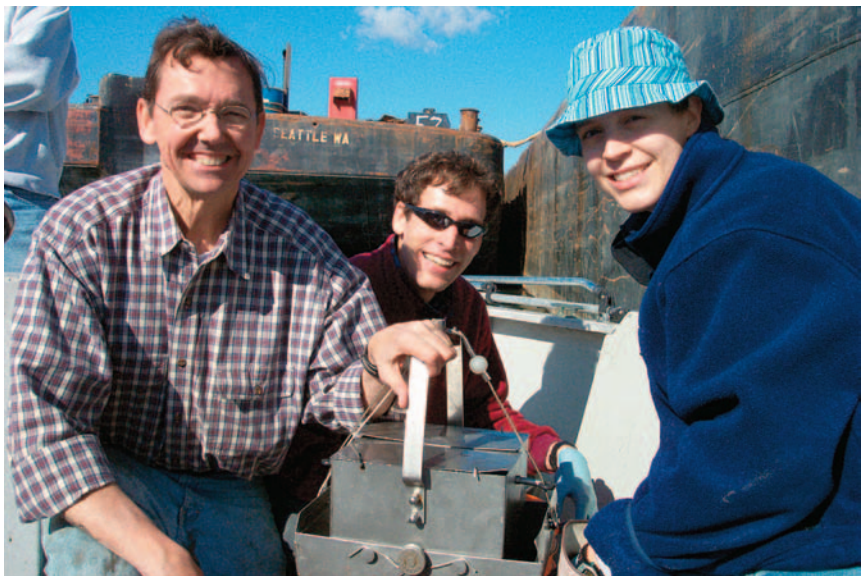

PHOTO COURTESY DICK LUTHY

At the Lauritzen Channel in Richmond, Dick Luthy (left) collects sediment with Stanford postdoctoral researcher David Werner (center) and graduate student Jeanne Tomaszewski (right). "We got a lesson from nature when we saw that things like charcoal were already there," Luthy says.

"It doesn't have the bustle of Sproul Plaza," says Dick Luthy (B.S.'67 ChemE; M.S.'74, Ph.D.'76 CEE), "but the tranquil Stanford campus belies its exhilarating intellectual energy."

After a youth spent in Palo Alto, three Berkeley Engineering degrees, and 24 years at Carnegie Mellon, Dick Luthy returned to his Bay Area roots in 1999 when he was recruited to Stanford, where he became CEE chair last fall.

"Stanford gave me the opportunity to do broad interdisciplinary research at the intersection of biology, geology, and industry," he says. His work focuses on physical processes and aquatic chemistry in treating waste and remediating contaminated sediment, or, as he calls it, "making the bay safe for fish and humans."

His primary project uses clams as bioindicators for DDT and PCBs in San Francisco Bay sediment. When the clams feed on the mud, the toxins accumulate in their fat and move up through the food chain. Contaminated areas can be treated cheaply with activated carbon, which Luthy and his students learned would stabilize the toxins and reduce their bioavailability. Only the top one or two feet, where the clams and worms live, need to be treated.

"Dredging—the historic way of dealing with this—doesn't solve the problem," Luthy says. "It's expensive, it destroys the ecosystem, and then you have to dispose of the mud somewhere." Luthy's research showed that the new treatment, already used to purify water, would also work in bay sediment.

As an undergrad studying chemical engineering, Luthy balked at this career choice after spending a summer making 200 tons of ammonia every day. He had always loved the water and, in 1969, joined the U.S. Navy Civil Engineer Corps in an effort to avoid the draft. It worked. Rather than going off to Vietnam, he ended up in Southern California, working in ocean engineering and scuba diving off the Santa Barbara coast.

"It was 1970, the year of the first Earth Day," Luthy says. "I read Rachel Carson's *Silent Spring*, and my wife Mary and I got involved in recycling." When he left the Navy, he returned to Berkeley on the GI Bill to study environmental engineering, and he credits his faculty mentors with helping him find a fitting career path.

This past year brought some new responsibilities as CEE chair. Luthy has worked with the faculty to put a new emphasis in the department and campuswide on engineering for sustainability. He intends to continue both his research and teaching and, as he has for the past five years, he will relish the opportunity to work a "Go Bears" cheer into his afternoon lecture the Friday before the Big Game.

"I have to be very diplomatic," he says. "I root for Stanford, but I pray for Cal." ■

leading the Laser Applications Center at Coherent Laser, Inc." **cdunsky@nwlink.com**

MARK FREITAS *(B.S.'80, M.S.'82 CE)* and his wife **SUSAN GALLARDO** *(B.S.'80, M.S.'85 CE)* are both principal engineers with Geomatrix Consultants, an environmental and geotechnical engineering firm in Oakland.

ERIC LENZ *(B.S.'80 ME)* is principal engineer at Lam Research in Fremont.

KLAUS PETERSEN *(B.S.'86 ME, MSE)* of Austin, Texas, now owns his own company after working many years with primarily German companies in the areas of quality assurance and environmental protection. He has two children, nine and five years old.

VICTOR SCHRADER *(B.S.'89 EECS)* of Palo Alto is an analog designer for Linear Technology. He has several patents in the areas of PLL, amplifier, and data converter design.

EDWARD TSE *(Ph.D.'85 CE, M.B.A.'88)* is now running Booz Allen Hamilton's Greater China operations, based in its Shanghai and Hong Kong offices. He writes, "China is not only one of the fastest growing economies in the world; it is also a large business laboratory. Companies, including both multinationals and locals, are seeking innovative ways to create and extract value. It is very exciting to be a strategy consultant in this dynamic market at this time. If you need help in China, please let me know." **edtse1@netvigator.com**

AGNES CHOK-HUNG YEUNG *(M.S.'82 EECS)* is director of manufacturing at Vishay-Siliconix Semiconductor Company in Santa Clara. **agnes.yeung@vishay.com**

PHOTO COURTESY JENNIFER FIEGEL AND JUSTIN HANES, DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING, JOHNS HOPKINS UNIVERSITY

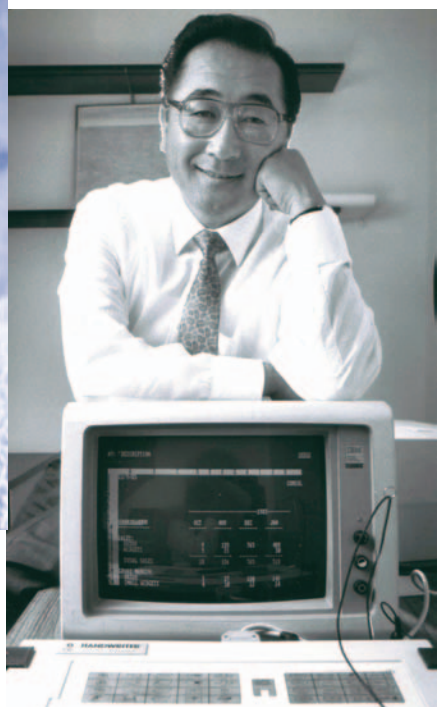

PHOTO COURTESY JAMES DAO

James Dao, who immigrated to the U.S. from China at age 11, is founder, president, and CEO of Genyous, which is working to develop diagnostics and therapeutics that could make cancer—like heart disease—a medically manageable disease. He also endowed the C. Lester Hogan Chair in EECS, which he refers to as "a humble gesture to honor a great friend." The scanning electron microscope image (above left) shows delicate lung epithelial tissue in vitro *being studied for the effects of sustained-release therapeutic drug particles.*

Alumnus Dao works 24-7 in fight against cancer

James Dao (B.S.'60 EECS) is a man with a mission. Without formal training in medicine or biology, Dao got involved in cancer research in the 1970s, an interest that only intensified after losing both his mother and mother-in-law to cancer in the 1980s. Now he works around the clock in the search for diagnostic tests and nontoxic multi-mechanism treatments that could dramatically reduce cancer deaths worldwide.

The Silicon Valley inventor and entrepreneur started his 35-year career by founding ETEC Systems, where he developed a new generation of scanning electron microscopes that accelerated the pace of cancer research in the 1970s. After profoundly contributing to cancer research, ETEC applied its core technologies to create the industry standards for semiconductor mask production that are still in use today. Upon retiring in 1998, Dao founded Genyous to work on products to prevent, detect, and treat early-stage cancers.

"I want to make things that the whole world—not just a few rich people—can afford," says Dao, now president and CEO of Genyous. "We know we could be saving tens of thousands of lives every year, and that is a great motivator."

Genyous's initial product is the Automated Quantitative Cytometry (AQC) test for lung cancer. The deadliest of all cancers, lung cancer will cause an estimated 160,440 deaths in the U.S. this year, 28 percent of all cancer deaths and more than colorectal, breast, and prostate cancers combined. The test, developed by Perceptronix Medical Inc., a Genyous subsidiary in Canada, uses pattern recognition software to analyze epithelial cells from a sputum sample for correlating with known cancer-associated changes.

Clinical trials were launched in 2003 and, Dao says, the AQC test could be in use around the world within two to three years. Cheap, fast, and noninvasive, the test is highly accurate in detecting cancers at an early stage, when long-term survival is more than 70%. Lung cancer cannot now be detected until much later, when a lesion or tumor is visible radiologically, and survival at that point is only 15%. This test gets a jump on detection by pinpointing cancerous changes in the DNA at a molecular level, well before they manifest clinically.

"We need a new paradigm for treating cancer," Dao says, "one that uses early detection and treatment like we do in treating heart disease." Dao is trying to steer American health care away from "heroic medicine"—the expensive, invasive, and traumatic surgical and toxic measures often used as a last resort—toward prevention and treatment of healthy individuals before disease strikes.

"The biology of cancer is so complex, we need to employ multiple mechanisms and integrate knowledge from all over the world," Dao says. The multidisciplinary approach embraces many disciplines, from basic sciences to clinical specialties like pathology, oncology, and pulmonology, and employs a wide range of tools, including genomics, nanotechnology, and bioinformatics.

To accomplish the translational research and clinical trials, Genyous works with major academic and medical centers in Europe, China, and North America, including Harvard, Johns Hopkins, UC Berkeley and the British Columbia Cancer Agency, one of the first institutions to deploy cytology testing for screening cervical cancer in the early 1950s.

Also in the works are new multi-mechanism therapies, including immune system boosters that can better target cancer cells and leave healthy tissue unharmed. In June 2004, the FDA implemented new guidelines for botanical drugs, paving the way for approval of multi-mechanism medicines.

Dao envisions a day in the not-too-distant future when early stages of cancer could be treated with safe oral drugs instead of the highly toxic infusion therapies used today. He sometimes sounds like a man who is racing against time.

"I retired six years ago, but now I'm working harder than ever," he says. "When I goof off, I feel like I'm hurting someone." ■

1970s

CHRIS ERICKSON *(M.S.'78 ChemE)* of Thousand Oaks, California, was recently promoted to director of systems engineering and software in the Rocketdyne Division of Boeing. He and his wife Sabrina have two daughters, Liv, age three and a half, and Anneliese, 17 months.

SIDNEY FORBES *(B.S.'74 ME)* received his master's in civil and environmental engineering from the University of Tennessee, Knoxville.

ROBERT NELSON *(B.S.'74 ME)* is a mechanical contractor specializing in HVAC. He returned to UC Berkeley to work on Stanley Hall's air conditioning in 1992 and writes, "That work has all recently disappeared!" **rsnelson@compuserve.com**

1960s

STUART BLANK *(M.S.'64, Ph.D.'67 Metallurgy)* and **BETTE BLANK** *(Ph.D.'65 Metallurgy)* are avid grandparents now living in Madison, New Jersey. Stu retired from Bell Labs as department head of display technology and other departments, last as a director. Now he is active in amateur radio and digital photography. Bette, who taught an MCAT review course for 30 years, is now an artist. She exhibited three shows last year, two in New York City.

JAMES CUMMINS *(B.S.'66 EE)* of Columbus writes, "I retired from Motorola in 1996 and have been writing mystery novels under the penname James Dona. *The Souse American Run* and *The Sea Chameleon* were published by Publish America, and *Maelstrom Mill* should be out by the end of the year. I live in Georgia with my wife of 39 years, **AINA** *(B.A.'68 Biochemistry)*, whom I met at Berkeley. We were married while students there in 1965." **jimandaina@aol.com**

FRED DANIELSON *(B.S.'67 CE)* is project manager at UC Davis Medical Center in Sacramento. **maydan@inreach.com**

HAROLD FORSEN *(Ph.D.'65 EECS)* of Truckee, California, retired as foreign secretary after eight years at the National Academy of Engineering.

HERBERT FRANKLIN *(M.S.'62, Ph.D.'72 CE)* of Orinda is principal engineer in the Bechtel Group.

LUIS GUTIERREZ *(M.S.'67 CE)* of San Francisco works for the California Department of Transportation in highway design. **luisgutierrez_c@hotmail.com**

ROBERT HAMILTON *(B.S.'69 EECS)* of Salem, Oregon, is a marketing consultant for high-tech companies in Oregon and southwest Washington. **rob_hamilton2000@yahoo.com**

ANTHONY JOHNSON *(B.S.'60 IEOR)* of Carmel retired from the U.S. Army after 28 years as a missile and nuclear weapons officer. He has been working in non-profits and his rural school district and teaching business classes part-time at area community colleges. He writes, "My Cal engineering degree has been invaluable!"

ROBERT KENNERKNECHT *(B.S.'63 EECS)* of Amity, Oregon, retired from General Dynamics as well as Cal Poly, Pomona, with the title of Lecturer Emeritus. He is now living in Oregon growing fruits and vegetables.

STEVEN KIMBERLIN *(M.S.'69 EECS)* of Cupertino is back to work after more than a year seeking employment in Silicon Valley. He writes, "Now that's a lousy economy!"

MICHAEL MCGINLEY *(B.S.'66 CE)* of La Crescenta, California, is director of engineering and construction at Southern California Regional Rail Authority. He writes, "We are building and operating viable alternatives to automobile commuting. Take the train!" **mcginleym@scrra.net**

EVERT NYGREN *(B.S.'66 EECS)* retired in June 2003 following a 37-year career in the space telecommunications business as an engineer and manager. He now lives in Incline Village, Nevada.

HAROLD PRESCOTT *(B.S.'62 CE)* closed his engineering firm based in California and is retired in Naples, Florida.

DAVID SELWAY *(B.S.'61, M.S.'63 ME)* of Danville is currently retired after working for 20 years at Lawrence Livermore National Laboratory and three years at Huffaker Engineering. He now volunteers as a docent at the Blackhawk Museum.

TIMOTHY SHEA *(M.S.'63, Ph.D.'68 CE)* of Fairfax Station, Virginia, is president-elect of the American Academy of Environmental Engineers and a principal technology consultant at CH2M Hill. He retired as a vice president with Parsons Engineering Science after 30 years. **tshea1@ch2m.com**

MARSHALL SILVER *(M.S.'67, Ph.D.'69 CE)* of Hanoi, Vietnam, has been awarded the Distinguished Engineering Alumni Award from the University of Colorado, Boulder. **msilver@hn.vnn.un**

GEORGE WEATHERSBY *(B.S.'65, M.S.'66, NE; M.B.A.'67)* of Skillman, New Jersey, founded Genesys Solutions LLC in 2002 to improve execution of strategy in large organizations. An office in San Diego allows him to return to California often, where he would love to meet colleagues. **gweathersby@earthlink.net**

1950s

ALAN GRADWOHL *(B.S.'55, M.S.'58 IE)* of Marina del Rey, California, worked as a computer analyst for General Electric and Planning Research Corporation. In the mid-70s, he became a lawyer and practiced law with a specialty in engineering cases until he retired in 1998. He now does volunteer work as a temporary judge, in mediations, and tutoring in a grammar school. **al.grad@verizon.net**

ROBERT SARQUIS *(B.S.'54 EE)* of Healdsburg, California, worked for Sylvania and Microwave Electronics for 15 years developing and manufacturing traveling-wave tubes. He then worked for 25 years in solid-state microwave devices for California Microwave and TRW Microwave in Sunnyvale. He retired in 1993 and took up the hobby of flying radio-controlled model airplanes. **bobsarquis@comcast.net**

CHARLES SCHEFFEY *(M.S.'51 CE)* received a D.Sci. from George Washington University in 1984 following his engineering studies at Berkeley. He is now living in Vienna, Virginia.

DONALD STILING *(B.S.'50, M.S.'52 IEOR)* of Sebastopol is producing high-quality wine grapes for Chardonnay and Pinot Noir in the Russian River Valley of Sonoma County.

DONALD TOOMB JR. *(B.S.'51 Eng. Physics)* of Claremont, California, is retired from nuclear power development and aerospace engineering.

CHARLES VOTAW *(M.S.'59 Naval Architecture and Offshore Engineering)* retired to the beach and is now living in Avon, North Carolina.

JOHN WILSON *(B.S.'50 EECS)* retired from Jet Propulsion Laboratories and is now living in La Canada, California.

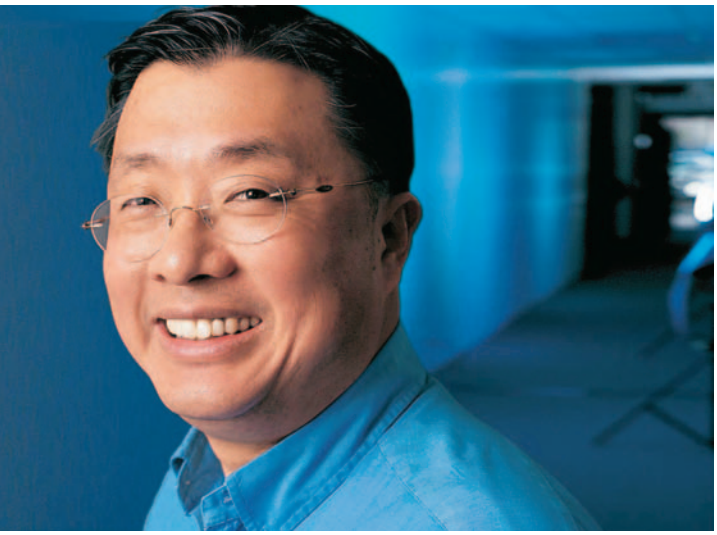

PHOTO COURTESY UTSTARCOM

Hong Llang Lu was president and CEO of Unison World, Inc., then of Kyocera Unison, before he founded UTStarcom. He went to China, he says, because he didn't think "the country's telecommunications infrastructure could go anywhere but up."

Tech event brings Berkeley—and China—closer to Silicon Valley

When Hong Llang Lu (B.S.'78 CE) went to China looking for business opportunities in 1991, he says, his mother was the first one to tell him he was "out of his mind." But what he found there—a bustling world that was without basic telephone service—enabled the Taiwan-born entrepreneur to build what is now one of the fastest-growing technology companies in the world.

Lu is president, CEO, and founder of Alameda-based UTStarcom, which doubled its 2002 revenue from $1 billion to $1.96 billion in 2003 during a tough business climate when many high-tech businesses failed. UTStarcom was named by the World Economic Forum this year to its Technology Pioneers list, 30 companies making products with "the capacity to transform the way society and business operate."

Keynote speaker at the College of Engineering's fourth annual Berkeley in Silicon Valley last spring, Lu gave a talk entitled "Focus on China: Breaking through the Great Wall." He chronicled his experience discovering a void and creating a business plan to fill it with wireless technology. Lu is now working to bring other regions like Vietnam, Haiti, Mali, and Cameroon the same product—the Personal Access System—that, because of its affordability, has given hundreds of villages and cities in developing nations communications tools they never had access to before. And at the same time it has made Lu a successful businessman.

About 150 faculty, alumni, friends and future students attended the faculty symposium and networking event designed to bring the Berkeley campus to the Silicon Valley. Cosponsored by Sun Microsystems and held at its Santa Clara campus, this year's event had as its theme "Engineering a Better World," with six faculty presentations and a panel discussion on Berkeley Engineering projects like Lu's venture.

Faculty speakers discussed their own research projects, including Greg Fenves of CEE on earthquakes, Dan Fletcher of BioE on cell biomechanics, Roger Howe of EECS on micromachines, William Kastenberg of NE with attorney Gloria Hauser-Kastenberg on engineering ethics, Vivek Subramanian of EECS on printed electronics, and Yuri Suzuki of MSE on data storage. The panel featured Marti Hearst of the School of Information Management and Systems, along with Tom Kalil and Eric Brewer speaking on the College's National Science Foundation–funded ICT4B project (see story page 10). ■

1940s

DONALD ALDEN *(B.S.'47 CE)* of Carmichael writes, "This year I finally retired after 37 years with Caltrans, followed by 18 years part-time with Imbsen & Associates as a bridge engineer. Now I am a successful world class veteran rower—a sport I learned at Cal." **rowdon21@aol.com**

ROBERT DAL PORTO *(B.S.'49 IEOR)* of Discovery Bay, California, retired in 1999 from his own company, Dal Porto Enterprises. Previously, he worked for 19 years as an agricultural consultant for Chevron Shale Oil Company on an oil shale project in Grand Junction, Colorado.

JOHN DURYEA *(B.S.'44 EE)* of Chambersburg, Pennsylvania, is a towrope specialist and flight data manager for Mid-Atlantic Soaring in Fairfield. He is also treasurer for the Chambersburg Community Chorus and ran the Fencers' Club short course for grades 5-8 at his local Montessori School last fall.

FRED JACKSON *(B.S.'44 CE)* of Fair Oaks, California, spent 40 years working for the California Department of Transportation in freeway location and design. Now in retirement, he has helped convert a barn into Sierra Christian Church and enjoys salmon and halibut fishing in British Columbia, gardening, and turning wood bowls.

LEO JENSEN *(B.S.'47 ME)* of Tarzana, California, was supervisor and program manager on component fabrication for space structures such as Galileo, ATS F&G spacecrafts, tracking and data relay satellite systems (TDRSS), and the Minuteman third stage missile system, and received patent #3,768,760 in 1973 on a commercial aircraft spoiler. He is now retired.

ROBERT MARKS *(B.S.'47 CE)* of Los Angeles and his partner have sold their company, Architectural License Seminars, and Robert is easing into retirement.

ROBERT MORRIS *(B.S.'42 CE)* of Mill Valley retired last October after 50 years at Wildman & Morris, a San Francisco architectural and engineering company he started with **BOB WILDMAN** *(B.S.'47 CE)* in 1953.

JAMES NEIGHBOURS *(B.S.'40 ME)* of West Caldwell, New Jersey, is now full-time caregiver for his wife with Alzheimer's. He writes, "We are in a lovely life care retirement community with several of my wife's long-time friends, and my daughter lives nearby. I enjoy keeping up with the Cal Band and other Cal activities."

GEORGE QUINN *(B.S.'47 ME)* spends his time working on home improvement projects, travel, and enjoying his four grandchildren. He writes, "Last July I celebrated my fiftieth wedding anniversary with my wife Mary and our family and friends at our home in Portola Valley."

ALAN SAMUEL *(B.S.'43 ME)* is enjoying retirement and living in San Jose. **ajs2013@prodigy.net**

RALPH WILCOX *(B.S.'43 ME)* of Pollock Pines, California, is retired from Chevron Research and the U.S. Air Force Reserve. He enlisted in the Army Air Corps at Cal in 1951.

1930s

PERCY DAWSON *(B.S.'35 ME)* of Walnut Creek works as a consulting mechanical engineer and hydraulic turbine designer.

WILLARD KNUPP *(B.S.'38 ME)* of Oakland went to work for Standard Oil Co. of California the Monday after he graduated and worked for them or one of their subsidiaries for 42 years.

FRANK LORD *(B.S.'30 EE)* of Redding, California, is retired and has been living in a retirement residence for nearly 17 years. He still drives but is now on a one-year license.

PAUL SHERIDAN *(B.S.'30 CE)* of Sacramento is still directing a senior citizen duplicate bridge game every Monday and participating in two Alzheimer's caregiver support groups and a weekly senior bowling group. He writes, "Not bad for a 94-year-old!"

HUBERT WOLFF *(B.S.'39 EE)* of San Diego is retired from several jobs including lieutenant colonel for the U.S. Air Force. He volunteered with the San Diego Sheriff's Department for 20 years and now works as a volunteer with the American Red Cross in the estates and trusts department.

OSAMA ABUDAYYEH *(M.S.'86, M.Eng.'87 CE)*

was appointed interim associate dean for research and graduate programs of the College of Engineering and Applied Sciences at Western Michigan University, where he has been on faculty since 1996. Abudayyeh, who holds professional engineering licensure in four states, taught at North Dakota State University and served with the California Department of Transportation for three years before joining the WMU faculty.

SCOTT CARLYLE *(B.S.'04 CE)* was named

JOHN DUNBAR PHOTO

a first team Academic All-American, one of 15 student athletes nationwide in the at-large category to achieve this distinction. The golfer, from El Dorado Hills, California, received Cal's 2004 Neufeld Scholar Athlete Award for the highest GPA (3.95) among senior male student athletes. He also earned Pac-10 honorable mention and was one of five finalists for the Byron Nelson Award. Carlyle is now working as project engineer for Cleveland Golf on design, testing, and manufacturing aspects of golf equipment.

ANANT JHINGRAN *(M.S.'87, Ph.D.'90 CS)* has been named an IBM Distinguished Engineer, a career title awarded to staff engineers who have achieved a sustained record of invention and recognition company- and industry-wide. Director of business intelligence of IBM's Silicon Valley Lab, Jhingran heads research and development and is working on ways for companies to extract valuable business intelligence from unstructured data. He is the holder of 20 patents relating to electronic commerce and search technologies.

ANKUR LUTHRA *(B.S.'03 EECS, Business Administration)* has received a 2004 Paul & Daisy Soros Fellowship for New Americans, a program initiated in 1997 to help new Americans achieve their educational goals and highlight the contributions immigrants make to the quality of life in the U.S. Luthra is now pursuing a master's in computer science at Oxford University as a Rhodes scholar and will begin at Harvard Business School this fall.

GARY MAY *(M.S.'88, Ph.D.'91 EECS)*

received two 2004 awards from the American Society for Engineering Education: the Minorities in Engineering Award for his achievement in increasing participation and retention of minorities and women in engineering; and the William Elgin Wickenden Award for his paper on underrepresented minority students in engineering, published in the *Journal of Engineering Education* last year. May, Motorola Foundation Professor of Microelectronics in Electrical and Computer Engineering and executive assistant to the president at Georgia Institute of Technology, also received the 2004 Georgia Tech Outstanding Undergraduate Research Mentor Award.

JIGAR MEHTA *(B.S.'01 ME)* was cinematog-

BONNIE AZAB POWELL PHOTO

rapher on "My Flesh and Blood," which won the Documentary Audience and Directing Awards at the 2003 Sundance Film Festival. The film tells the story of Susan Tom, a single mother from Fairfield, California, who adopted 11 special-needs children. It was screened on HBO last Mother's Day and will be available in DVD format this fall. Mehta, who is now pursuing a master's at Berkeley's School of Journalism, also made "The Many Voices of Cal," a 17-minute video for prospective students.

1920s

JOHN HOMSY *(B.S.'28 ME)* of Amador City, California, worked for the U.S. Army Signal Corps as a scientific advisor and has enjoyed retirement since 1962.

in memoriam...

JOHN FISKE *(B.S.'41 EE)* died March 31, 2004.

GORDON HART *(B.S.'52 CE)* of Modesto died of heart failure in March at the age of 74. An innovator in the design of relocatable school classrooms, he was engineering manager for Cuckler Steel and Varco-Pruden Buildings, both in Turlock, California, before starting his own architectural and engineering firm in Modesto in 1974. He was a Modesto planning commissioner, served as president of the Structural Engineers Association of California, and received the Northern California Engineer of the Year Award in 1983. A resident of Modesto for 34 years, he was active in many area non-profit organizations including the YMCA and the Modesto Symphony.

RALPH MORGAN *(B.S.'62 CE)* of Modesto died in January at the age of 65. He opened his own engineering and architectural firm in 1968, Ralph Morgan and Associates. Among his design projects in Modesto were the Salvation Army building and its Red Shield Community Center, St. Dunstan's Episcopal Church, and his own home. Morgan was a life member of the Salvation Army Advisory Board and active in the United Way, the Rotary Club, and the Visiting Nurse Association of Stanislaus County.

JOHN STODDARD *(B.S.'37 ME)* of Belmont died at age 89 last November. Born in San Francisco, he went to work for Lockheed in 1940. During World War II he redesigned the maintenance manual for the P-38 Lightning Fighter with color-coded breakaway drawings and overlays, which set a standard for Air Force and future aircraft manuals. After the war, he travelled worldwide supporting the Constellation airliner and C-130 cargo plane. He is survived by his wife of 58 years, Mary, two sons, and several grandchildren and great grandchildren.

BRUCE WOOLPERT *(B.S.'42 CE)* died at age 84 this past January. Born in Delia, Kansas, he also earned degrees in soils mechanics from Harvard and in civil engineering from Stanford, where he met his wife Betsy. As an engineer at Graniterock in Watsonville, he supervised the building of the BART rail line and other Bay Area projects. He was a passionate traveller, operagoer, and swing dancer, and was known for mentoring young people and his involvement in the community and world around him.

National Academy of Engineering honors eight alumni

PEG SKORPINSKI PHOTO

Butler Lampson will share the prestigious Charles Stark Draper Prize, a $500,000 annual award, with Alan Kay, Robert Taylor, and Charles Thacker, described by the Academy as "the indispensable core of an amazing group of engineering minds that redefined the nature and purpose of computing."

Eight alumni of Berkeley Engineering were recognized by the National Academy of Engineering (NAE) this year when new members were announced and the Academy gave its highest honor—the Charles Stark Draper Prize—to the four-man team that developed the first networked PC.

BUTLER LAMPSON (Ph.D.'67 EECS) was among the four individuals to receive the Draper Prize. The NAE recognized their "vision, conception, and development of the principles for, and their effective integration in, the world's first practical networked personal computers." Lampson is a distinguished engineer at Microsoft Corp and an adjunct professor of computer science and electrical engineering at MIT.

Also recognized were seven alums among the 78 new members elected to the Academy, bringing total U.S. membership to 2,174. New 2004 members include:

PRADMAN KAUL (B.S., M.S.'68 EECS), chairman and CEO of Hughes Network Systems, Germantown, Maryland, for leadership in developing satellite communication networks. Kaul received the College's Distinguished Engineering Alumnus Award in 1999.

CHIEN-FU "JEFF" WU (Ph.D.'76 Engineering Statistics), Coca Cola Professor at Georgia Institute of Technology, for conceiving and building modern systems of experimental design based on contemporary methods for parameter estimating to provide quality improvements.

KASPAR WILLIAM (Ph.D.'69 CE), professor of civil engineering, University of Colorado at Boulder, for contributions to constitutive modeling and computational failure analysis of concrete and quasi-brittle materials and structures.

DARSH WASAN (Ph.D.'65 ChemE), Motorola Chair Professor of Chemical Engineering and vice president, Illinois Institute of Technology, Chicago, for pioneering research, inspirational teaching, and the development of novel technology in colloidal processing and interfacial rheology.

GEORGE TCHOBANOGLOUS (M.S.'60 CE), professor emeritus at UC Davis, for contributions to education, practice, and public service in the field of environmental engineering.

DENNY PARKER (B.S.'65, M.S.'66, Ph.D.'70 CE), senior vice president, Brown and Caldwell, Walnut Creek, for significant advances in the scientific understanding, engineering development, and design of chemical, physical, and biological processes for treating wastewater.

KWADWO OSSEO-ASARE (B.S.'70, M.S.'72, Ph.D.'75 MSE), professor of metallurgy and geo-environmental engineering at Pennsylvania State University, for contributions to the fundamental understanding of interfacial phenomena in leaching and solvent extraction. ■

Blue Skies over Berkeley

Join us for these upcoming events

September 18 — *6:00 p.m.* **Distinguished Engineering Alumni Awards Dinner** celebrates G. Wayne Clough, CE '69; E. Floyd Kvamme, EE '59; Steve Wozniak, EECS '86; and Outstanding Young Leader In Sik Rhee, EECS '93.
Hearst Memorial Mining Building.

October 16 — **Homecoming 2004**
Join us for a faculty presentation and continental breakfast beginning at 8:30 a.m.
Bechtel Engineering Center.

October 18 — **Associate Engineering Dean David Auslander speaks**
"An Inside Look at Admissions to Cal," in San Diego.
To register, visit **www.coe.berkeley.edu/alumni/socal**

October 29 — *3:00 p.m.* **CITRIS Headquarters Groundbreaking Celebration**
near O'Brien Hall.

Berkeley Engineering. It's your College.

For details and updates, visit **www.coe.berkeley.edu/alumni** *or call 510.643.7100*

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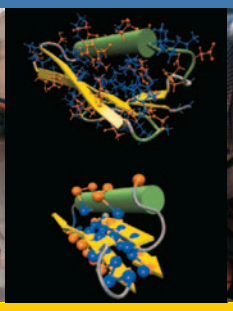

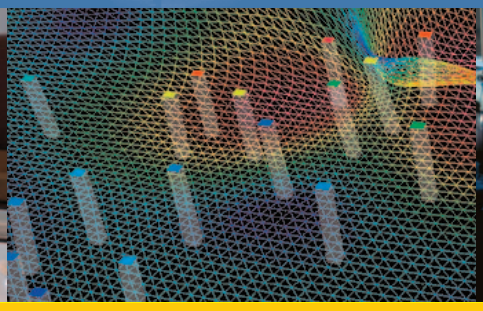


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