California Institute of Technology
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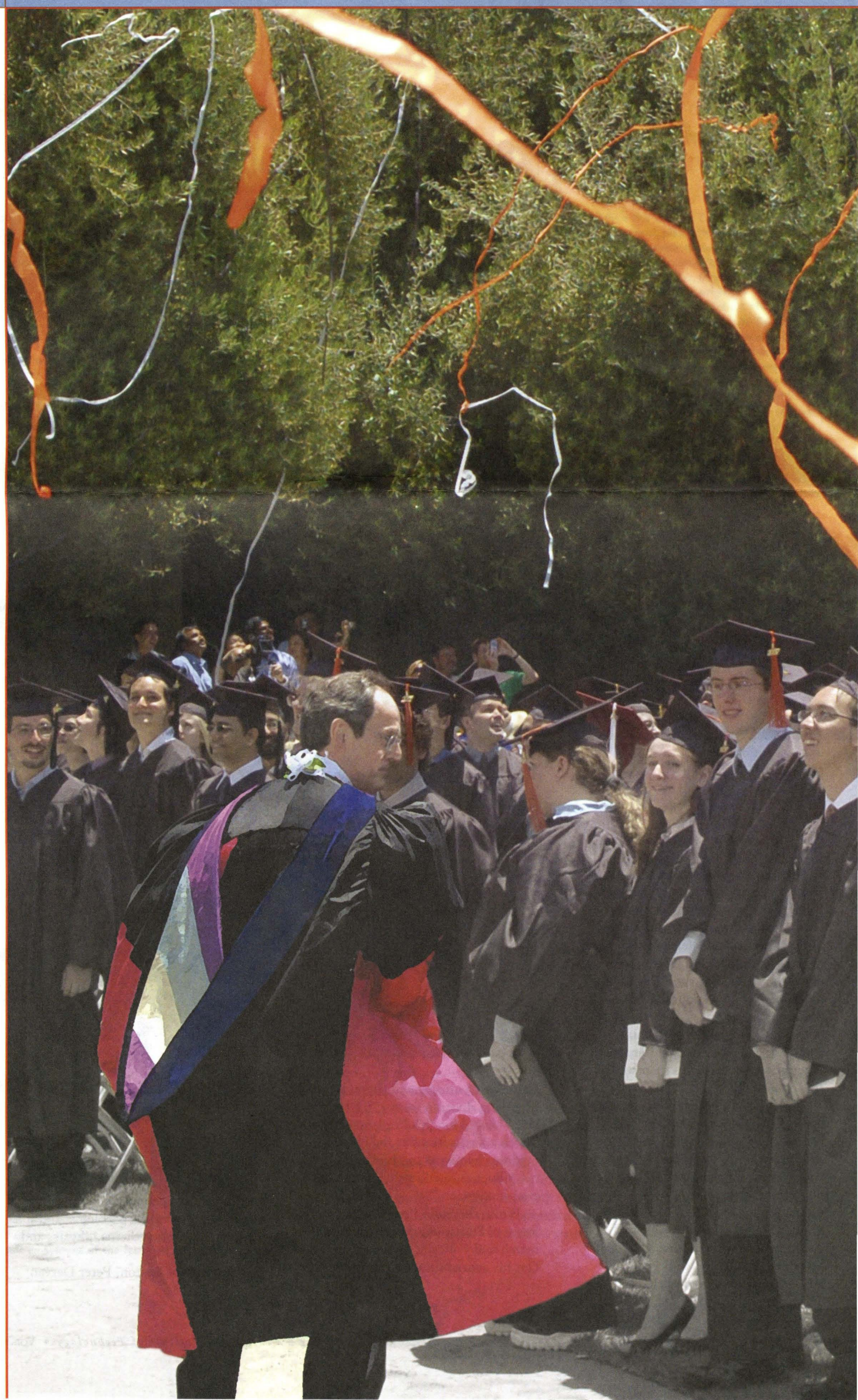
CaltechNews

Volume 41, Number 3
2007

In This Issue



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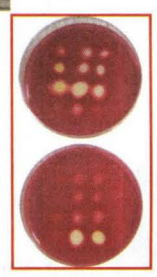

ON THE COVER—
The crowds stood up, the confetti streamed down, and Caltech had 500 new graduates and a freshly inaugurated president. Our cover photo was created by selectively editing the original to fade to black and white in the background, while applying a painterly digital filter to stylize President Jean-Lou Chameau's robe and inauguration hood.

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Issued four times a year and published by the California Institute of Technology and the Alumni Association, 1200 East California Blvd., Pasadena, California 91125. Third class postage paid at Pasadena, California. Postmaster: Send address changes to: *Caltech News,* Caltech 1-71, Pasadena, CA 91125.

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Up Front

Professor Dervan and alumnus Efron awarded National Medals of Science

Bren Professor of Chemistry Peter Dervan and Stanford mathematician Bradley Efron '60, have been respectively awarded the 2006 and 2005 National Medal of Science, the nation's highest civilian honor. The award ceremony took place at the White House on July 27, where President Bush presented medals as well to recipients of the National Medal of Technology, and lauded all the honorees for having "brought great credit to themselves and this country."

The National Medal of Science honors individuals for pioneering scientific research in a range of fields that enhances our understanding of the world and leads to innovations and technologies that give the United States its global economic edge. The National Science Foundation administers the award, which was established by Congress in 1959.

Dervan, who served as chair of Caltech's chemistry and chemical engineering division from 1994 to 1999, was honored for "his fundamental research contributions at the interface of organic chemistry and biology, and for his influence in education and industrial innovation."

In the East Room of the White House on July 27, President Bush presents the 2006 National Medal of Science to Caltech chemist Peter Dervan. Brad Efron '60, a 2005 medalist, was honored at the same ceremony.

Efron, the Stein Professor and Professor of Statistics and of Health Research and Policy at Stanford, was cited "for his contributions to theoretical and applied statistics, especially the bootstrap sampling technique; for his extraordinary geometric insight into nonlinear statistical problems; and for applications in medicine, physics and astronomy."

A native of Boston, Peter Dervan earned his BS from Boston College in 1967 and his PhD from Yale in 1972. He joined the Caltech faculty in 1973.

Dervan has influenced the course of research in organic chemistry through his studies at the interface of chemistry and biology. In particular, he has pioneered a field of bioorganic chemistry with studies directed toward understanding the chemical principles for the sequence-specific recognition of DNA. He and his coworkers have combined the art of synthesis, physical chemistry, and biology to create synthetic molecules with affinities and sequence specificities comparable to nature's proteins. This chemical approach to DNA recognition underpins the design of programmable cell-permeable small molecules for the regulation of gene expression.

Dervan is a member of, among other organizations, the National Academy of Sciences (NAS), the Institute of Medicine, the American Academy of Arts & Sciences, and the American Philosophical Society. His many prizes include the Harrison Howe Award, Arthur C. Cope Award, Willard Gibbs Medal, Nichols Medal, Linus Pauling Medal, and Richard C. Tolman Medal.

Brad Efron, one of the world's most

Continued on page 18

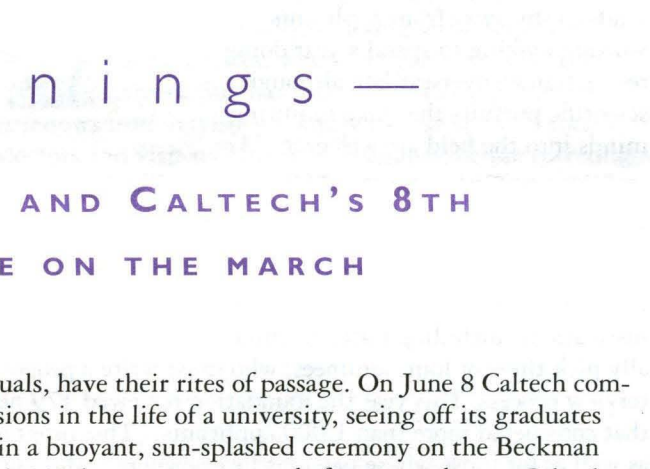
New Beginnings—

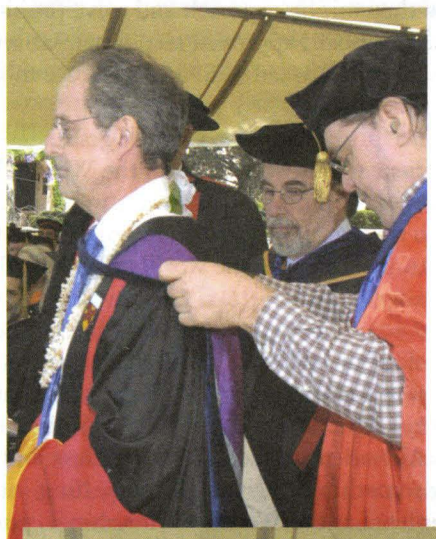
Class of '07 and Caltech's 8th president are on the march

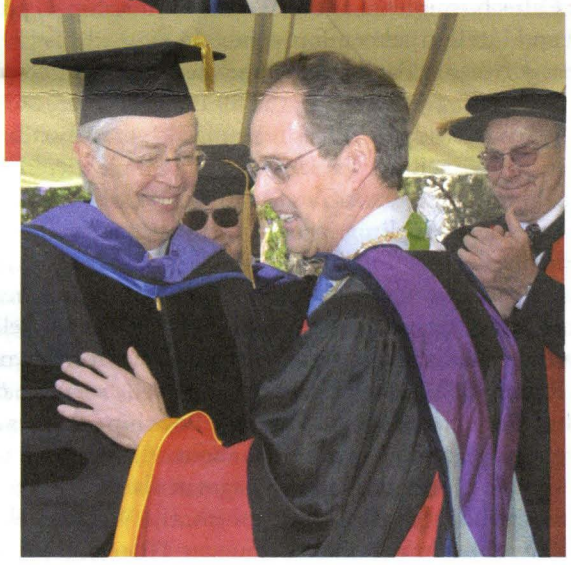
Institutions, like individuals, have their rites of passage. On June 8 Caltech combined two momentous occasions in the life of a university, seeing off its graduates and installing its president in a buoyant, sun-splashed ceremony on the Beckman Mall. At the start of Caltech's 113th commencement, before an exuberant Caltech crowd, the graduates' families and friends, and invited guests and dignitaries, Jean-Lou Chameau was invested with the hood (as the medieval nomenclature has it) of Robert A. Millikan, the Institute's first president (or, as Millikan's personal nomenclature had it, "the chief"), and sworn in as Caltech's eighth chief executive. All this was in line with Chameau's wish that his inauguration not be a lavish, expensive affair, and that pride of place go to the graduating students reaping the rewards of their years of hard work. In fact, the new president had barely finished his inaugural remarks before he too was put to work—handing out diplomas to the parade of nearly 500 newly minted graduates, each of whom crossed the stage to shake his hand.

"We are all starting a new chapter in our lives," a beaming Chameau told the class of 2007. "You, by leaving Caltech, I by staying here."

Inaugurations are typically more solemn affairs than graduations, which invariably feature clowning classmates, restless infants, a gowned rowdy or two, and camera-toting parents packing the aisles like paparazzi. In uniting the two events, the Institute seemed to bring out the best elements of both, honoring its graduates, celebrating its president, and paying tribute to Chameau's idea, articulated shortly after he settled into his job last summer, that Caltech's small size and rich traditions create conditions ripe for a more inclusive, communal atmosphere on campus. The inaugural event was very much a Caltech family affair, underscored by the new president's affectionate introduction of his wife, Carol Carmichael ("Carol and I are a team, and she's working very hard for Caltech"), and by the presence at the podium of an undergraduate student speaker, Ruddock House president Ricky Jones '08.







Top of page, graduates glide into position as the Institute's combined inaugural and commencement ceremony gets underway, and, above, share their enjoyment of the festivities.

Before the start of Caltech's 113th commencement, planetary scientist David Stevenson, head of the faculty presidential search committee that selected Jean-Lou Chameau, formally invests him with the hood originally worn by Caltech's first leader, Robert Millikan, as Chameau's predecessor, David Baltimore (center) looks on. Below, Chameau is congratulated by Baord of Trustees chair Kent Kresa (left), and his inauguration is greeted with applause from vice chair Wally Weisman (in shades) and Caltech president emeritus Tom Everhart (right).

Jones told the audience how he "and my friend Dvin [Adalian]" had been pruning olives from a tree on Caltech's Olive Walk last fall when the Chameaus happened by on an evening stroll. Out of this chance encounter came a challenge to distill campus-grown olive oil in exchange for a home-cooked meal at the president's house. The rest is, if not quite history, readily searchable on Google. A few months ago, Jones had been looking at a heap of black olives, trying to figure out what to do next. Now he stood before rows of (mostly) black-robed graduates, talking about a campus-wide harvest festival that will bring Caltech's own bottled olive oil to market this fall. Profits, should there be any, will be channeled toward the support of students and staff. If ever there was a classic example of the tendencies that make Caltech unique, this was it. (For the full olive-oil story, go to http://pr.caltech.edu/periodicals/CaltechNews/articles/v41/blackgold.html.)

Chameau has frequently said how much he enjoys the irreverence of Caltech students, and Jones did not disappoint. "Caltech students are terrible French speakers," the self-described Francophile told his audience. When they're not mispronouncing their new president's name as "Shamu" (the orca) or "chamois" (the soft suede), they're mistaking it altogether for Jean-Paul Revel (famous Caltech biologist) or Jean-Luc Picard (famous starship captain). On a more serious note, Jones praised Chameau and Carmichael for their commitment to the welfare of students and for giving the Caltech community a renewed sense of a campus alive with possibilities.

Continued on page 12 . . .

GRADUATES ABROAD

By Michael Rogers

As international collaborations in business and science have become commonplace and the Internet has made the world seem like one big switchboard, Caltech faculty and administrators have been encouraging the Institute's students to go global and explore other countries. In a *Caltech News* interview earlier this year, Caltech president Jean-Lou Chameau emphasized the need for students to have "meaningful" experiences with other cultures. "What you want to offer students is enough time to appreciate other cultures and discover for themselves how people in other parts of the world act, think, and behave, and how they might approach and solve problems differently." And this spring, Caltech's Faculty Board approved recommendations by the Committee on Exchange Programs and Study Abroad (CEPSA) to create more opportunities for students to study in other countries.

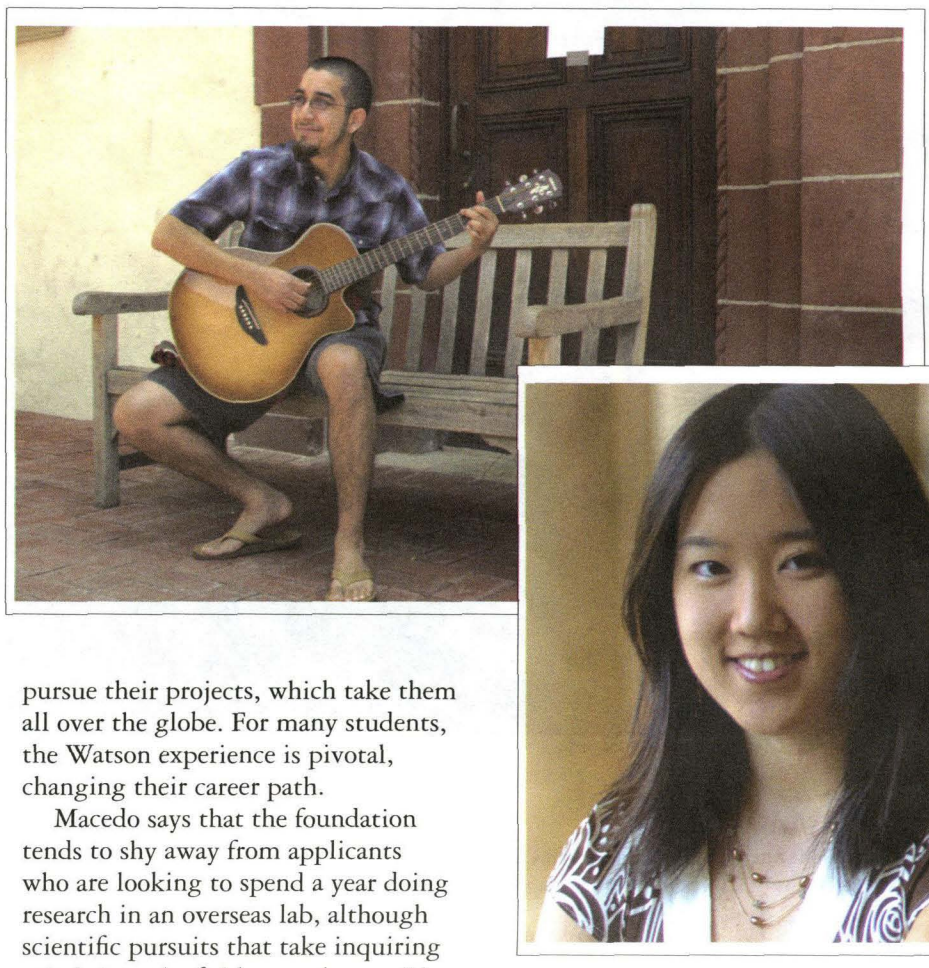
While these efforts will affect current and future students, Caltech graduates already have a unique opportunity to experience the world through the Watson Fellowship, which basically allows new graduates to immerse themselves in projects that range from luge building in Europe to the art of mime in Indonesia. Since 1973, 38 Institute graduates have had the opportunity to travel the world on Watson Fellowships to explore those and other intriguing subjects.

"While Caltech students often choose to attend Caltech because it offers in-depth opportunities to pursue scientific or technological interests that they are passionate about, the Watson allows them to pursue personal or academic interests (or combine both) outside of the structure of a university environment," says Lauren Stolper, director of Fellowships Advising and Study Abroad at Caltech. "This freedom and opportunity to travel abroad while pursuing something they have a compelling interest for and involvement in forces Caltech recipients of the Watson Fellowship to push the envelope of their personal and intellectual comfort zone."

Earlier this year, the Thomas J. Watson Foundation announced its latest crop of Watson Fellows, and two Caltech seniors were among the 50 undergraduates selected by the program. Jean Sun '07 plans to study the bioethics of health-care distribution in urban and rural areas. Her itinerary includes the United Kingdom, Switzerland, China, and South Africa. An avid musician, Issac Garcia-Muñoz '07 will spend the year in Spain and parts of South America looking into the history, construction, and sound of native musical instruments.

Sun and Garcia-Muñoz have a special connection to the Watson Foundation. In its most recent rotation of directors, all of whom are themselves former Watson Fellows, the Watson program picked a Caltech alumna to run the foundation. "It's the most extraordinary program," says Rosemary Macedo '87, who was named executive director last year and who traveled to Antarctica for her Watson Fellowship 20 years ago. "You get to spend a year doing anything you're passionate about. All you have to do is send us a two-page report every three months and five pages at the end."

One of the most prestigious post-undergraduate fellowships, the Watson Fellowship program—started in 1968 by the family of IBM cofounder Thomas J. Watson, Sr.—chooses up to 50 graduating seniors annually to spend a year outside the United States in "independent, purposeful exploration." Participants are given $25,000 to pursue their projects, which take them all over the globe. For many students, the Watson experience is pivotal, changing their career path.



Caltech's new Watson Fellows are Jean Sun, above, and Issac Garcia-Muñoz, shown strumming his guitar outside Ricketts House.

Macedo says that the foundation tends to shy away from applicants who are looking to spend a year doing research in an overseas lab, although scientific pursuits that take inquiring minds into the field are welcome. "Are you interested in medieval castles? Is there some burning question you'd like to explore? The Watson is a year of personal growth," Macedo says. Under the program, a select group of institutions, including Caltech, annually pick three or four nominees, who must write a proposal and go through an interview process. This year the foundation reviewed 179 nominations from 47 schools that considered more than 1,000 applicants. "This program is for serious scientists as well as for those whose passions lie elsewhere," Macedo says. "Participants have to challenge themselves and love what they're doing."

Scientists at Sea

In Macedo's case, she loved science, but also was an experienced rower and sailor. She found a way to combine these interests by embarking on a Watson Fellowship involving international scientific cooperation in oceanography.

After traveling through parts of southeast Asia, the Sargasso Sea, and western Europe, Macedo secured a berth on a German research ship headed to Antarctica. She boarded the ship in Argentina in December 1987 and spent three months at sea. "On that ship there were Germans, Swedes, Austrians, a New Zealander, and me," she says. "Some were geologists mapping the seafloor and others were biologists looking at underwater life. I was on the ship most of the time but also visited different bases. It was all thrilling. But in some sense I had a tame Watson because I was mostly hanging out with scientists."

Macedo ended her Watson year in South Africa, where she got a completely different view of international relations. In contrast to its role in Antarctica, the international community was actively discouraging scientific collaboration with the nation's apartheid regime. "I think it's important to note that I compared and contrasted two examples at the opposite ends of the spectrum: South Africa during the apartheid era, under economic and cultural boycotts which urged international scientists not to cooperate with South African scientists, and Antarctica, the 'continent for science' under the Antarctic Treaty System, where international cooperation was a specific goal."

After returning from her fellowship, Macedo briefly worked as an optical engineer, but soon took a job in finance and eventually became a top-rated fund manager of an international equity fund without ever having taken a finance course. "I found that I really liked it. You get instant feedback, compared with science, which is interesting to learn but so laborious to practice. With the stock market, every day you either win or lose."

When the Watson Foundation notified its alumni that it was looking for a new executive director, Macedo decided to apply. She was hired and left her investment job in the

Rosemary Macedo, at right, moved from the world of high finance last year to take the helm of the Watson Foundation, 19 years after embarking on her own Watson Fellowship to distant places around the world, including Antarctica.

San Francisco Bay Area in March 2006 for the New York–based foundation. Her colleagues didn't understand why she would quit the high-flying world of finance and take a big pay cut to run a small fellowship program. "It's not about the compensation for running a program," she says, "but about the program. I spend every day with the most fantastic people all over the country. I meet with applicants and alumni, as well as with college presidents, faculty, and liaisons at outstanding small colleges all over the country. I'm typical of a Watson. We don't follow predictable paths. We do what challenges and satisfies us personally."

The Magical Medical Tour

Caltech's two new Watson Fellows are passionate about both their studies and their extracurricular pursuits. Jean Sun, a double major in biology and English, has a strong interest in medicine and poetry. (She recently won all three of Caltech's McKinney writing prizes, including the poetry prize.) She also can't seem to say no to Caltech community service opportunities: she chaired the Board of Control, which oversees the Institute's Honor System, and at one time simultaneously served on seven different committees. She decided to apply for a Watson Fellowship so that she could get practical experience learning about the difference in health care between urban and rural communities before applying to medical school.

"I thought it would be cool if I could work on medical policy for a year and do it outside the U.S.," says Sun, who was also awarded the Frederic W. Hinrichs, Jr., Memorial Award at commencement, in recognition of her outstanding contributions to campus life and her qualities of leadership, character, and responsibility. "The Watson is perfect because it's so flexible."

Sun will first travel to Switzerland in August to read up on health policy, primarily at the World Health Organization, before going on to Shanghai. Although she was born in Boston, Sun spent four years of her childhood living with her grandparents in China before returning to the United States, where her parents—who both have medical degrees—were starting careers. Sun has relatives in Beijing, but the Watson program discourages fellows from relying on family ties, so she will spend two months accompanying doctors and visiting clinics in Shanghai, before traveling inland to the city of Chengdu in southwest China to visit clinics in rural areas.

"I spend every day with the most fantastic people all over the country," Macedo says. "I'm typical of a Watson. We don't follow predictable paths."

Working through the Chinese branch of the Red Cross, Sun also hopes to assist doctors making emergency calls, a task that should be made easier by the fact that she is a certified emergency medical technician. "I want to do more than observe," she says. "The Red Cross has an emergency response team that goes to remote areas, so I'll be on call. They said, 'Once you get here, we'll put you in some training and you'll go.'"

After four months in China, Sun will head to South Africa to spend two months in Cape Town followed by two months in rural areas of the country. Her plan is to accompany doctors on their rounds in hospitals and clinics in the city before going to villages with the Institute for Field Research, which runs a variety of volunteer programs. Sun will end her Watson year in London and the English countryside, observing the health-care system in a modern industrial country.

Sun's own medical plans are to get both an MD degree and a master's degree in public health. She expects to spend the early years of her career treating patients, and to eventually concentrate on health-care policy issues. "What's most important in the end is the doctor-patient interaction," she says, so having that clinical experience should be an advantage when making policy decisions. "The point of my Watson is to see doctors working in different environments. But it's also to get used to being in unfamiliar situations and adapting to them. For whatever you do, that's important."

Traveling to His Own Tune

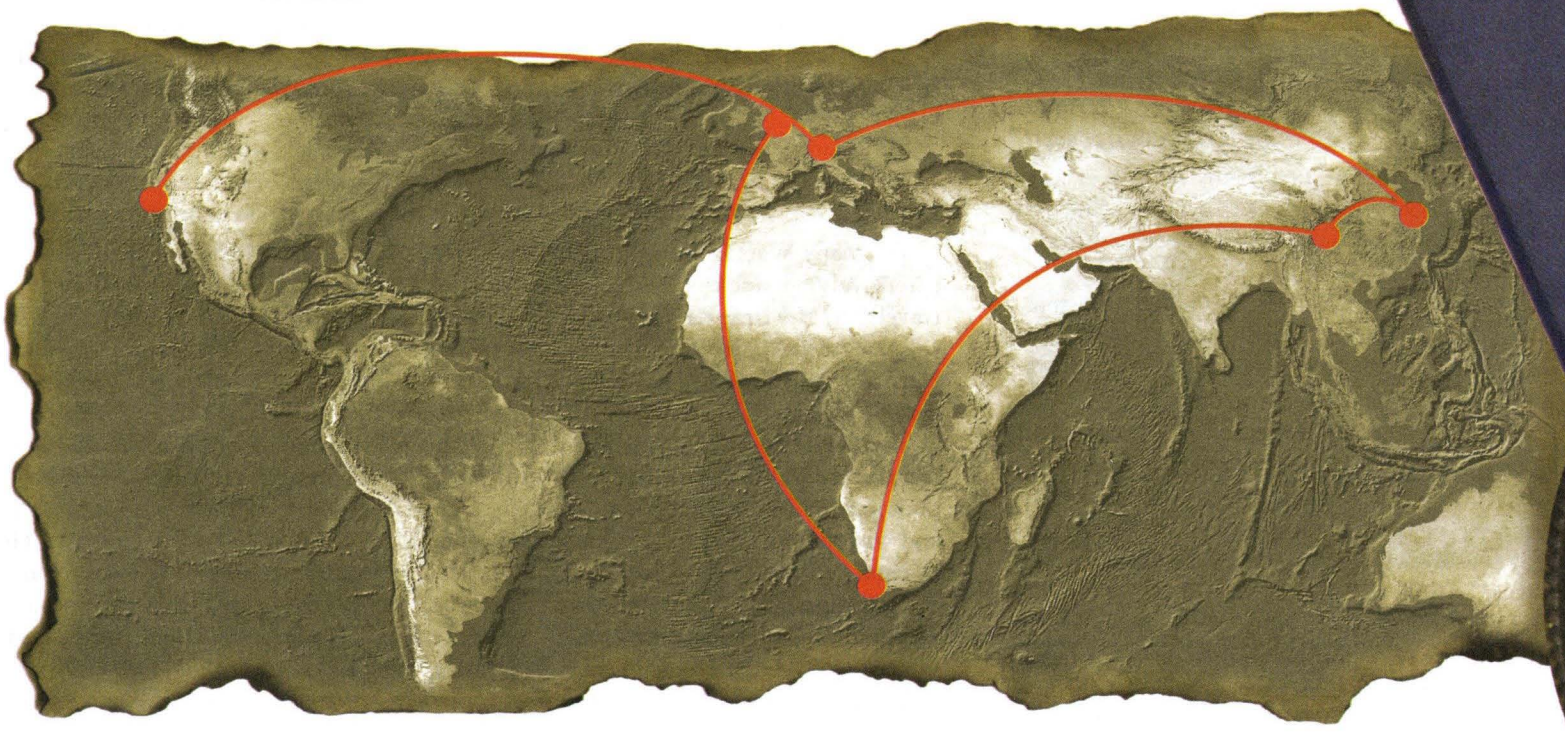
Like Sun, Issac Garcia-Muñoz is interested in connecting with people, but his medium is music. Born in Mexico City and raised mostly in Southern California, Garcia-Muñoz started playing the violin in fourth grade, and although he's never had a private lesson, he has since become proficient in several instruments, including the acoustic and electric guitars, the electric bass guitar, and the drums. Garcia-Muñoz eventually realized that he didn't have the talent to be a professional performer, but with an interest in science he found a way to pursue music at Caltech as an electrical engineering major, learning about audio circuits and digital audio signals. He has also worked the sound board at numerous Caltech events, and during the summer after his sophomore year, he got a job at Acoustic Engineering Associates, a Pasadena company that specializes in microphone manufacturing.

Now Garcia-Muñoz's Watson year will give him the chance to get to the roots of music. He'll spend 12 months tracing the history of musical instruments in Spain and South America, documenting manufacturing and playing techniques through interviews that he will conduct and recordings that he will make along the way. On his first stop, Barcelona, he plans to meet with luthiers (makers of string instruments). "I hope to gain insight into the craftsmanship that goes on while building lutes, violins, and guitars, as well as learn their history," he wrote in his Watson proposal. He also hopes to study flamenco guitar in the country where it originated.

In September, Garcia-Muñoz will travel to Chile, where he plans to get a firsthand look at guitar making and learn about Andean music, studying the history and manufacture of various traditional flutes and a tiny, 10-string guitar called a charango. He says his interest in Andean instruments was partly sparked by a Chilean folk band that performed last year in Caltech's Beckman Auditorium. "Hearing them

Continued on page 6 . . .

As the map below illustrates, Jean Sun will earn a surplus of frequent-flyer miles during her Watson Fellowship, traveling to Europe, Asia, and Africa.



Watson. . . .from page 5

was a powerful experience that reminded me why I want to pursue music engineering as my career," he wrote.

After spending the fall and winter in Chile, Garcia-Muñoz will head to Argentina to study that country's folk music and possibly to perform himself. He hopes to end his Watson year in Guatemala, where he will work with a design group to create his own instrument. "I have no idea what kind of instrument I'll make, but with my experience with string instruments, it will probably be of that nature."

Garcia-Muñoz's future plans include going to graduate school for a master's degree in electrical engineering, with a specialty in music engineering, and then going into industry. He hopes to eventually develop new acoustics technology that can be used by performers and sound engineers, and, of course, himself. "Music gives me energy and helps me express my emotions," he says. "I can do that better than using words."

In the Line of Fire

If the experience of previous Watsons is any indication, Sun and Garcia-Muñoz will likely return from their year abroad with many dramatic stories to tell. In 1990, the year she graduated from Caltech, Watson Fellow Jennifer Low went to the central African nation of Rwanda for a firsthand look at how the nation was dealing with early stages of what would ultimately become a widespread AIDS epidemic (it is estimated that today 11 percent of the nation's population harbors the infection). This project was sobering enough, but at the time, she had no idea that she would also find herself embroiled in a political crisis that would ultimately engulf and nearly destroy the nation's Tutsi minority population four years later.

Low's original plan had been to study how the HIV virus, which causes AIDS, spreads in a heterosexual population, and she flew to Kigali, the Rwandan capital, to work with an outpatient clinic, affiliated with UC San Francisco, that went by the name of Projet San Francisco.

"I wanted to spend time in Rwanda to make connections with the AIDS community and environment, hoping to compare and contrast treatment in Kigali with a European country such as Belgium," which had colonized Rwanda, Low says.

But she had no sooner arrived at the airport than the clinic's director, Susan Allen, met her with the news that the government-controlled press was reporting that Uganda had invaded Rwanda and that the Tutsis were mobilizing to overthrow the nation's Hutu-led government. Low was staying with Allen, and a few nights after she arrived, a group of researchers studying mountain gorillas near the Ugandan border took refuge in Allen's house.

That night, Low awoke to popping noises. The leader of the gorilla researchers, who was sharing her room, said, "I don't suppose they're playing Ping-Pong." They quickly concluded that bullets were flying, and Low and the others crawled on the floor to the central hallway in the house where they listened all night to the shooting. "Occasionally you could hear bullets hitting the house and mortar shells going off. It was scary. I thought, 'I've only been here for three days and I'm gonna die here and my parents will be so upset.' For four days, we stayed in the house the entire time. The shooting and mortars were mostly at night. We could hear lynch mobs roaming the streets.

"There was lynching and killing but at a lower level than in 1994," she says, when gangs of rampaging Hutu, goaded by their government and a conspicuous lack of outside intervention, butchered about 800,000 Tutsis and moderate Hutus in the span of barely three months. In retrospect, the 1990 turmoil was probably touched off by Rwanda's government, which used the rumor of a Tutsi offensive as an excuse to murder Tutsis still living in Kigali. Low and her companions managed to stay out of the line of fire until a convoy from the U.S. embassy eventually drove them to the airport where they boarded a Kenya Airways flight to Nairobi.

At the time, Low wasn't sure what was happening in Rwanda. "I called the Watson Foundation saying, 'I'm giving my money back and coming home because I don't know what to do,'" Low says. "The Watson people were wonderful. They said, 'We want you to be safe. You have all your options open. Think about what you want to do.'"

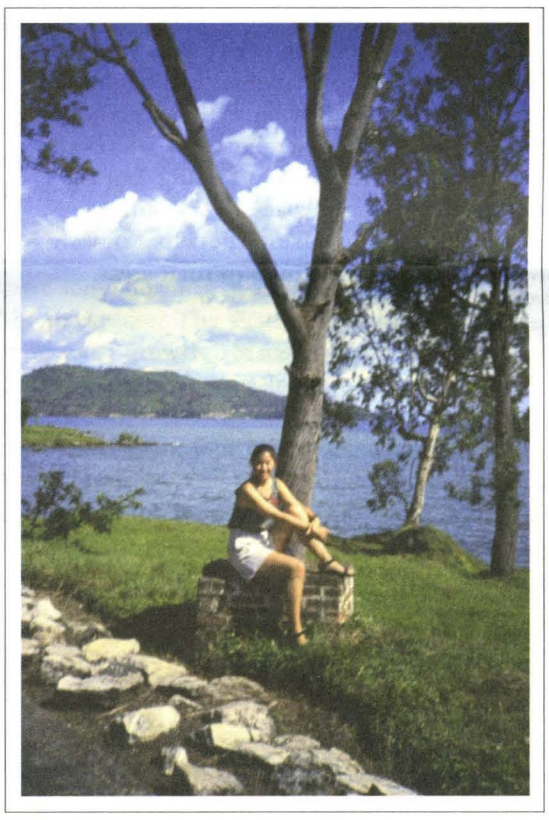
Low decided to stick with the program. She spent two weeks in Nairobi and then flew to Singapore where she lived with an aunt and an uncle for three months, researching AIDS education in the island city-state. By then, the situation in Rwanda had calmed down, and she returned to Projet San Francisco in January 1991. She concentrated on a subsection of the AIDS work involving women with cervical cancer, which, like AIDS, is caused by a virus.

"HIV (the virus that causes AIDS) and the cervical cancer virus, HPV, are both transmitted sexually, so the question was whether HIV-positive women developed more severe cervical cancer because they had both viruses for a long time, or whether the immunodeficiency associated with AIDS made them less able to fight off cancer, or whether something about the AIDS virus itself made cervical cancer more aggressive," Low says. While most of her work was clerical, she also spent time accompanying women to hospitals for outpatient surgery. Although she knew that the hospital would fall short of the standards of a typical American facility, the situation was worse than she had expected. "The operating room looked like an elementary school cafeteria," she says.

"Basically we'd go and camp out at the hospital. There were people hanging out and waiting to be seen. Eventually they'd do the procedure. There wasn't very good anesthesia—only just enough to keep the patient under. Unlike American operating rooms, these had windows. That made it harder to keep sterile. There were concrete floors that had to be hosed down. There was nothing disposable, unlike in the U.S. At the end of the procedure, I'd help the person back in the car."

Low's time in Africa ended almost as dramatically as it had begun. She contracted hepatitis A in May and returned home to recuperate. In August, she entered the MD/PhD program at Georgetown University, focusing on tumor biology, and eventually went to the National Cancer Institute, specializing in breast cancer. She oversaw drug trials for a variety of cancers, and last December, she joined Genentech, the biotechnology company, as associate medical director, serving as the main clinician for some of the new cancer drugs that the company is developing. Along the way, she also married her Caltech classmate and boyfriend, Dean Brettle '92, who stays at home to help raise their two children.

"You could hear bullets hitting the house and mortar shells going off," Low says. "I thought, 'I've only been here for three days and I'm gonna die here and my parents will be so upset.'"



Jennifer Low relaxes by Lake Kivu, which straddles the border of Rwanda and the Democratic Republic of the Congo.

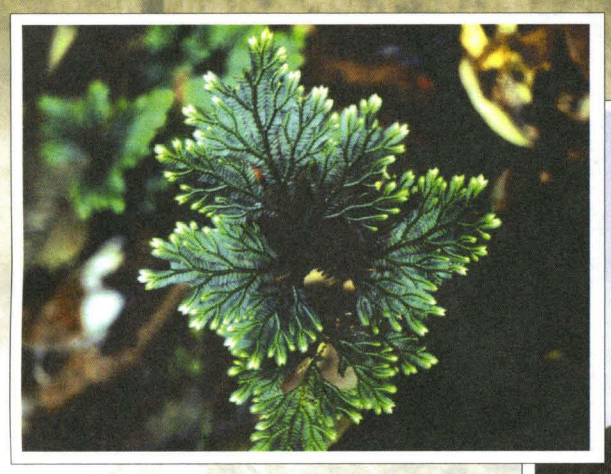
From her Watson experience, Low says she's gained "a greater appreciation for other cultures. Seeing a whole different aspect to health-care delivery broadened my perspective. Part of it was an experience that added to my confidence and self-esteem. It certainly made me a more interesting person at cocktail parties. I had already decided to be a physician, so the Watson didn't affect that. But when I started medical school, I felt I had a different maturity than those who went right from college."

Shutterbug of Borneo

For many Watson alumni, the fellowship constitutes their first chance to travel extensively outside the United States. But Joe Francis '87 was already a seasoned traveler by the time he got to Caltech, since his father had worked overseas as a consul general and director of the Voice of America in the State Department. "My first birthday was in India," says Francis, who majored in computer science at the Institute. "Once you travel a lot as a kid, it's hard to shake."

Besides travel, another interest that had engaged Francis since he was a child had been orchids, although he had only seen them growing in pots. He also had studied photography at the Art Center College of Design in Pasadena while he was at Caltech and was photo editor of the student newspaper, *The California Tech*, his senior year. The Watson Fellowship provided Francis with the opportunity to combine travel, orchids, and photography. "I wanted to see what it would be like to see orchids in their natural environment and to photograph them. So, on my Watson application, I said that I wanted to go to the jungle in Borneo and hunt down wild orchids."

His proposal was accepted. and in August 1987 he found himself in Kota Kinaba-



Joe Francis, at right, spent much of his Watson year photographing the flora of Borneo's rain forest. He also witnessed massive deforestation.

lu on the north coast of Borneo in the Malaysian state of Sabah. There, he hooked up with an organization that was focused on sustainable development. "They gave me an apartment and I helped them with computer stuff." When he wasn't in the office, he'd go on orchid-seeking excursions, often accompanying the organization's staff on their field trips.

In his search for wild orchids, Francis climbed Mount Kinabalu twice. At 13,435 feet, it's the third highest mountain in Southeast Asia. "To go from sea level to ice level is fairly dramatic. You see all stages of the rainforest on the two-day hike, from lowland rainforest to cloud rainforest, where it rains constantly, to high rainforest, where there are dwarf trees, to moraine, where there are no plants."

Francis says he photographed "tons of orchids," and "to see them in vivo, where their amazing color stands out, illuminates why horticulture works the way it does. You see fine differences that you'd never think about if you just grew orchids at home."

But he also downplays the idea that the rainforests he saw in the late 1980s were typical of the "*National Geographic* view, with strange animals and wild plants. Rainforests are extremely monotonous. They're dark at the ground level, the trees block out the sunlight, and everything is the same shade of green."

While there were no encounters with lions, tigers, or bears—none are native to Borneo—he had a grisly experience while hiking in a swampy area. He had been walking for several hours in thigh-high rubber boots when his feet began to feel squishy. He ignored the sensation for a while, figuring that it was caused by perspiration. But when he finally took off one boot, blood poured out. A leech had managed to crawl under his clothes and lodge in his groin. "That's when I realized, it's time for a hotel room," Francis says.

On another hike, his attention was riveted by a crunching sound under his shoes. Francis, who had not been paying attention to the ground, finally "looked down and saw that I was standing in the middle of a 20-square-meter area that was solid with giant millipedes crawling all over. I kept walking, though a little faster."

His adventures were tempered by the fact that much of the rainforest was rapidly succumbing to the depredations of logging. "You haven't seen deforestation until you've seen the destruction of truck-sized trees sliced down as far as you can see in all directions," he says.

"I went to the library there and looked at statistics of logging and figured out that the island would be out of trees by 2002. Even if they started planting then, they couldn't grow back fast enough. Now 80 to 90 percent of the rainforest is gone." He figures that the only reason his projection for zero trees by 2002 hasn't been realized is that government agencies and international organizations have established a handful of protected areas.

Francis had originally planned to attend graduate school at the end of his Watson year, but his experience overseas altered his plans. In 1990, he moved to Paris, where he joined a commune on the Left Bank for three years, working with video artists and doing music research at the Pompidou Center. He then took a more conventional path and went to work for an information technology company, living first in Germany and then in Scotland, before returning to the United States in 2000 to work for Compaq Computer Corporation in Houston. He helped manage the business operations of the company's industrial clients and eventually helped streamline its merger with Hewlett-Packard. In June 2006, Francis was named chief technology officer of the Supply-Chain Council, a Washington, D.C.–based consulting firm, where he keeps busy helping businesses scale up their operations to expand overseas.

Water Worlds

Caltech's most recent Watson alumna, Rebecca Adler '06, says that she's been interested in science policy since the seventh grade, when the cloning debates first became news. A double major at Caltech in biology and the history and philosophy of science, Adler interned at the U.S. State Department for George Atkinson, Colin Powell's science and technology advisor, during the summer of 2004, and quickly became convinced that science policy can have as much effect on the world as scientific research.

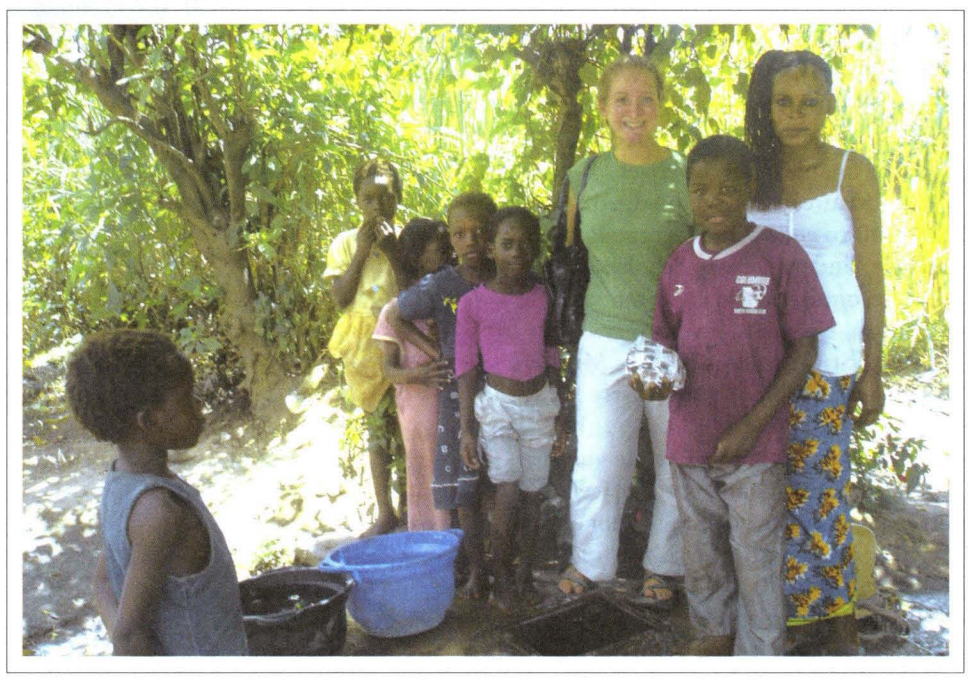
For her Watson, Adler decided to focus on water policy in the developing world. First, in July 2006, she went to London, where she pored over original records and documents in the British Library and the National Archives to investigate the impact of British colonialism on water policies in South Africa and Northern Rhodesia (now Zambia). In August, she traveled to Pretoria, South Africa's administrative capital, to work with individuals in a water-resource management group at the Council for Scientific and Industrial Research (CSIR), which she describes as a large think tank with labs.

While in Pretoria, Adler chose to focus her research on mine-water related issues, since she found that the economy of so many developing nations is so heavily based on mining. "Gold mining displaces large quantities of water each day, polluting ground water, modifying the water table, and causing sinkholes," Adler says. "When mine water is not managed properly, it becomes a very visible issue that can severely impact human and environmental health."

Adler spent several months visiting operating and abandoned mines, talking with farmers, attending conferences, reading documents, and meeting with government and mine officials to understand mine-water issues and the role of science in developing policy solutions. She wrote two reports for the CSIR, published a paper in the *Economics of Peace and Security Journal,* analyzing the water and mining issue, and, in February, met with the minister of the Department of Minerals and Energy to present her analysis of the relationship between the government, the mining industry, and science over time. "Additionally, I suggested how the government could strengthen policy frameworks to leverage new water-treatment technologies to better address issues."

Adler left South Africa at the end of March and spent the next month in Zambia, looking into water-quality issues related to the nation's copper mining and rock quarries. She then visited Australia, spending time in thr Hunter valley, a coal-mining region. After finishing her year in India, looking into mine-water policy and mine-closure guidelines, she will start graduate school this fall at the Johns Hopkins Bloomberg School of Public Health in the Department of Environmental Health Science, where she will be a Hopkins Sommer Scholar.

Although Adler has discovered that not many people in Africa have heard of Caltech, she says, "I'm grateful I went to Caltech. It's provided me with a great background in science that I've used to my advantage during the fellowship. In South Africa, I feel like I really got to know the culture and the history and that I was able to make a valuable contribution through my work and influence the way South Africans view mine-water management and mine closure." As for the Watson experience, she says, "It has given me a lot of confidence. Additionally, the experience of being away from familiar surroundings enabled me to see things differently and to gain more appreciation for my life in the United States."



Rebecca Adler stands with a group that gathered around her while she was collecting water samples in George, Zambia.

there's only **one.caltech**

THE CAMPAIGN

With the "There's only one. Caltech" campaign well into its fifth year, recent gifts and pledges have brought the fund-raising total to $1,190,817,895 as of July 31.

The Ralph M. Parsons Foundation, a longtime Caltech benefactor, pledged $1,000,000 to support construction of the Warren and Katharine Schlinger Laboratory for Chemistry and Chemical Engineering.

Enhancing Caltech's information-crunching ability, Dell Inc. donated computer equipment valued at $1,305,624 for the Seismological Laboratory, directed by Jeroen Tromp, Eleanor and John R. McMillan Professor of Geophysics. In addition, Dominic P. Orr PhD '82 provided $90,000 individually and, with Aruba Networks, $341,000 in equipment to upgrade the campus wireless network.

Biologists and chemists will benefit from a number of contributions. The Chicago Community Trust awarded two Searle Scholar Awards, totaling $480,000, to William Clemons, assistant professor of chemistry, and Sarkis Mazmanian, assistant professor of biology. The Weston Havens Foundation granted $1,300,000 to support the research of Mazmanian; Raymond Deshaies, professor of biology; Michael Elowitz, assistant professor of biology and applied physics; Stephen Mayo, Bren Professor of Biology and Chemistry; and Erin Schuman, professor of biology.

Helen and Will '49 Webster provided additional support to their areas of interest, with gifts of $300,000 for continuing research by Peter Dervan, Bren Professor of Chemistry, and $175,000 to the W. Wilcox Webster scholarship fund for undergraduates.

Other gifts have also boosted undergraduate financial aid. Michael Milder '59 and Maureen McGee pledged $800,000 to endow the George P. Mayhew Undergraduate Scholarship Fund, recognizing the late professor of English, emeritus, for his service as Master of Student Houses. Says Milder, "[Mayhew] stood out particularly for his easy dignity and kindness . . . because of what [he] meant to me and my generation of students, the gift feels personal." Anyone wishing to honor Mayhew may contribute to the fund.

Xiaolei Zhu '90 and Jun Teng '92 established a scholarship that will have a preference for talented students from mainland China, and John C. Trijonis '66, PhD '72 provided $300,000 to endow the Trijonis Scholarship for high-potential international undergraduates with financial need. In addition, Kiyo Tomiyasu '40 and his wife, Eiko, recently completed an endowment gift to the Kiyo and Eiko Tomiyasu SURF Scholars Fund, which will enable five students to gain hands-on research experience each summer.

A travel prize intended to broaden undergraduates' cultural horizons was recently created by Craig SanPietro '68, MS '69. Having visited nearly 40 countries, SanPietro says, "This travel has greatly enriched my life, and I want to make similar experiences available to Caltech students." In 2007, $12,000 was awarded to five students: Diana Lin and Yuan Gong, seniors in chemical engineering, who spent several weeks in China and Japan; senior in biology Lena Nguyen, who toured Vietnam, her country of birth, for six weeks; and Parvathy Menon and Tamara Reyda, juniors in engineering, who traveled to Peru and Argentina for three weeks.

Endowed graduate fellowships help Caltech attract the most promising scholars. The multidisciplinary Global Environmental Science field will benefit from two new fellowships—one established by Foster and Coco Stanback and another by the Caltech Associates, who have raised more than two-thirds of their $600,000 goal, including a lead contribution from Robert W. Walp '51.

Caltech has received $1,176,266 in distributions from the estate of Warren Shinn that will support undergraduate scholarships. Shinn, who died in January, had previously given the Institute an apartment building that is anticipated to provide future graduate and postdoc housing. Other bequests include an unrestricted distribution of real property valued at $1,925,000 from the estate of Earl K. Seals and a $1,198,938 gift from the estate of Carl Vollmer that will endow a graduate fellowship fund for students in chemistry or engineering.

For more information on the "There's only one. Caltech" campaign, please visit one.caltech.edu or call 1-877-CALTECH.

DARYN KOBATA

ASSOCIATES WELCOME NEW PRESIDENT

Taking the reins from Tom Tisch '61, Kathleen M. Wiltsey will become the next president of the board of the Associates on October 1. As leader of the venerable Institute support group, she will continue the job of directing the organization's ongoing efforts to enhance its operation and expand membership.

Wiltsey brings a wealth of management experience to her new role. She began her career with Procter & Gamble in 1977 as a process development engineer in product development, rising to section head in 1982. She later joined Amgen, Inc., as business development manager, becoming co-product development team leader and marketing director for Amgen's first product, EPOGEN®, a breakthrough biotechnology therapeutic that stimulates red blood cell production.

In 1991, Wiltsey was promoted to vice president, managing the product licensing function and the Amgen Venture Fund until she retired in 1998. She joined the X Prize Foundation in 2006 as executive director for the development and launch of the Archon X Prize for Genomics, a global technology competition to reduce the cost of sequencing human genomes and accelerate personalized medicine.

Among her honors, she was named one of 28 "People to Watch" in business in the *Wall Street Journal* centennial edition in 1989. She also received an alumni Distinguished Achievement Medal from the Colorado School of Mines, where she earned a BS in chemical and petroleum refining engineering in 1977. She also holds an MBA from Harvard University, with honors. Wiltsey serves on the boards of Lexicon Pharmaceuticals, Inc., and SEQUENOM, Inc. She has also served as a member of the board of the Los Angeles Opera and a discovery science center in development.

Wiltsey resides in Westlake Village, California, with her husband, John LaValle, and their daughters, Alexandra and Whitney.

Associates Activities

September 29, *President's Circle Garden Party,* at the home of President Jean-Lou Chameau and Carol Carmichael, senior counselor for external relations and faculty associate in engineering and applied science.

October 6, *Northern California Associates Reception and Dinner Program,* The Fairmont, San José.

October 28, *West Los Angeles Associates Luncheon and Tours,* The Getty Villa.

November 3, *Northern California Associates President's Circle Dinner, with President Jean-Lou Chameau and Carol Carmichael,* the Los Altos Golf and Country Club.

December 7, *Associates Lunch and Program, with Carol Carmichael,* the Athenaeum.

Other Associates events and programs will be announced in the Associates Fall Newsletter. *For more information about the Associates and supporting Caltech, please call 626/395-3919 or visit http://associates.caltech.edu.*

Shower Power

By Michael Rogers

On the face of it, there wouldn't seem to be anything scientifically interesting or even mildly newsworthy about the fact that the men's and women's showers in the Braun Athletic Center now boast shiny, new liquid-soap canisters. But this is Caltech, and there is indeed provocative science in this soap saga.

First, some history. While Braun has been a prized athletic facility since it opened in 1992, featuring a well-equipped weight room, rows of exercise machines, racquetball courts, and a gleaming gymnasium, it has lacked liquid-soap dispensers in the men's showers. Originally, the women's showers, built in 1984, were furnished with soap dispensers, but in a nod to equal rights, or perhaps to equal lacks, they also went sans soap around the time that the men's showers in Braun opened for business 15 years ago (before that, men showered in the old Brown gym). Over the years, Braun patrons have either showered at home, brought their own soap, showered without soap, or, as Athletic Director Wendell Jack has observed (at least in the men's showers), lathered up using the dispensers for liquid hand soap by the sinks near the toilets and urinals, before executing an ungainly five-yard dash to the showers to rinse off.

Jack says that people have occasionally commented to him about the lack of liquid showering soap. "We didn't think it was a priority, so we were less inclined to do something about it, but to some people, it's a bigger deal than to others. Every few years it would come up in the athletics committee."

Earlier this year, when the men's showers in Braun were slated for a new floor because of tile buckling, the subject of soap surfaced again. It was of particular interest to one member of the Institute's Athletics and Physical Education Committee: Joe Kirschvink '75, MS '75, the Van Wingen Professor of Geobiology and a Braun regular. In his research, Kirschvink investigates the interactive relationship between Earth's surface geology and the planet's biological evolution. While daily showering might not be considered a major event on the geologic timescale, it turns out that there is some geobiology involved in the activity.

Kirschvink, who tries to swim a mile every day, says he first started thinking about the soap issue when the Braun facility opened in 1992. "I remember asking then why there were no soap dispensers, and noticed that many folks were raiding the sinks" for soap. But the issue took a backseat to some of his other concerns, such as why the men's locker room did not have a swimsuit dryer, while the women's showers did. Kirschvink's keen scientific eye had noticed that the bottom of his locker was rusting, a phenomenon he traced to the water dripping off his swimsuit. Thanks to his efforts, a small swimsuit-spinning centrifuge was installed for the men in 2005.

Kirschvink was back in the shower this spring when he cut the bottom of his foot on a broken chip of tile. "When I took a closer look—yes, with my geological hand lens—I could see the grout was being corroded."

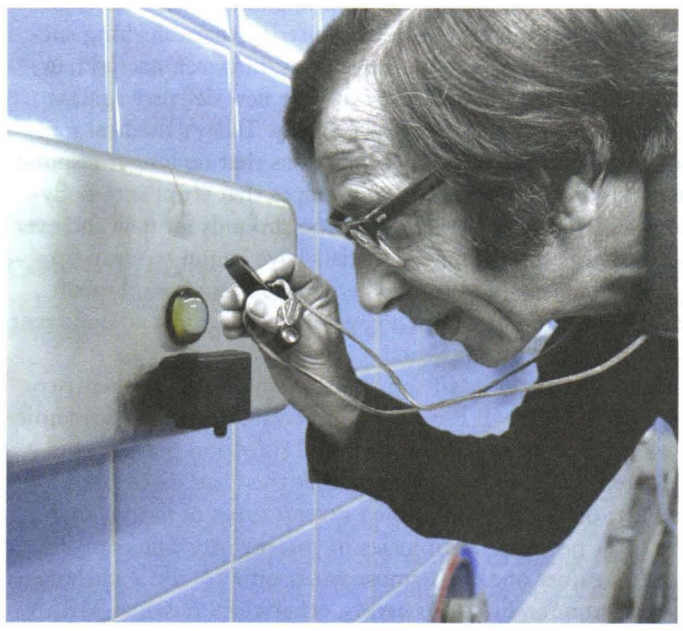
Like all Caltech professors, Kirschvink's a busy guy, but in May he got around to sending a note to the other members of the campus athletics committee about the state of shower grout. "Something similar seems to be happening in the Brown showers," he wrote. "This past week was the first time since Braun was built that I've set foot in the Brown student showers, and frankly the bottoms of my feet were hurting from the stones poking up. On closer inspection, it appears that the calc-silicate matrix of the cement is eroding away somehow, leaving the quartz pebbles in the concrete exposed. They hurt."

As has been the case across the centuries, from human aches and pains come scientific breakthroughs. Kirschvink explains that while examining the damage, he "remembered the work on endolithic microbes (those that tunnel into rocks) and the entire ecosystem that they support. Many years ago, Caltech's late professor of paleoecology Heinz Lowenstam [Kirschvink's undergraduate advisor] discovered that a group of mollusks called chitons had teeth made of the mineral magnetite, which allowed them to scrape away the microbe-infested layer of rock so that they could feed" on the endolithic algae growing in small cracks in the limestone. "Since then the process of microbe tunneling into rock, and the imprint it leaves in the fossil record, has been studied intensively by geobiologists."

In his letter to the committee, Kirschvink postulated that "the wet conditions, plus the general lack of soap, is promoting the growth of endolithic bacteria and fungi that can bore into, and mine, the grout and concrete matrix for nutrients, and grow on the organics being washed into them. This will destroy the tile grout and the cement matrix." He attached abstracts of several scientific papers devoted to the subject, including "Measurement of limestone biodeterioration using the Ca^{2+} binding fluorochrome Rhod-5N" and "Construction and destruction of carbonates by marine and freshwater cyanobacteria."

There's nothing like scientific evidence to peel the bureaucratic laminate off a committee, especially one consisting of Caltech faculty, staff, and students. "But honestly," says Kirschvink, "not having soap was inconvenient too. The need was obviously there. If I accidentally left a tube of shampoo in the shower, it would be half gone by the next day, and if I ran out of soap I would trek over to the sink as well."

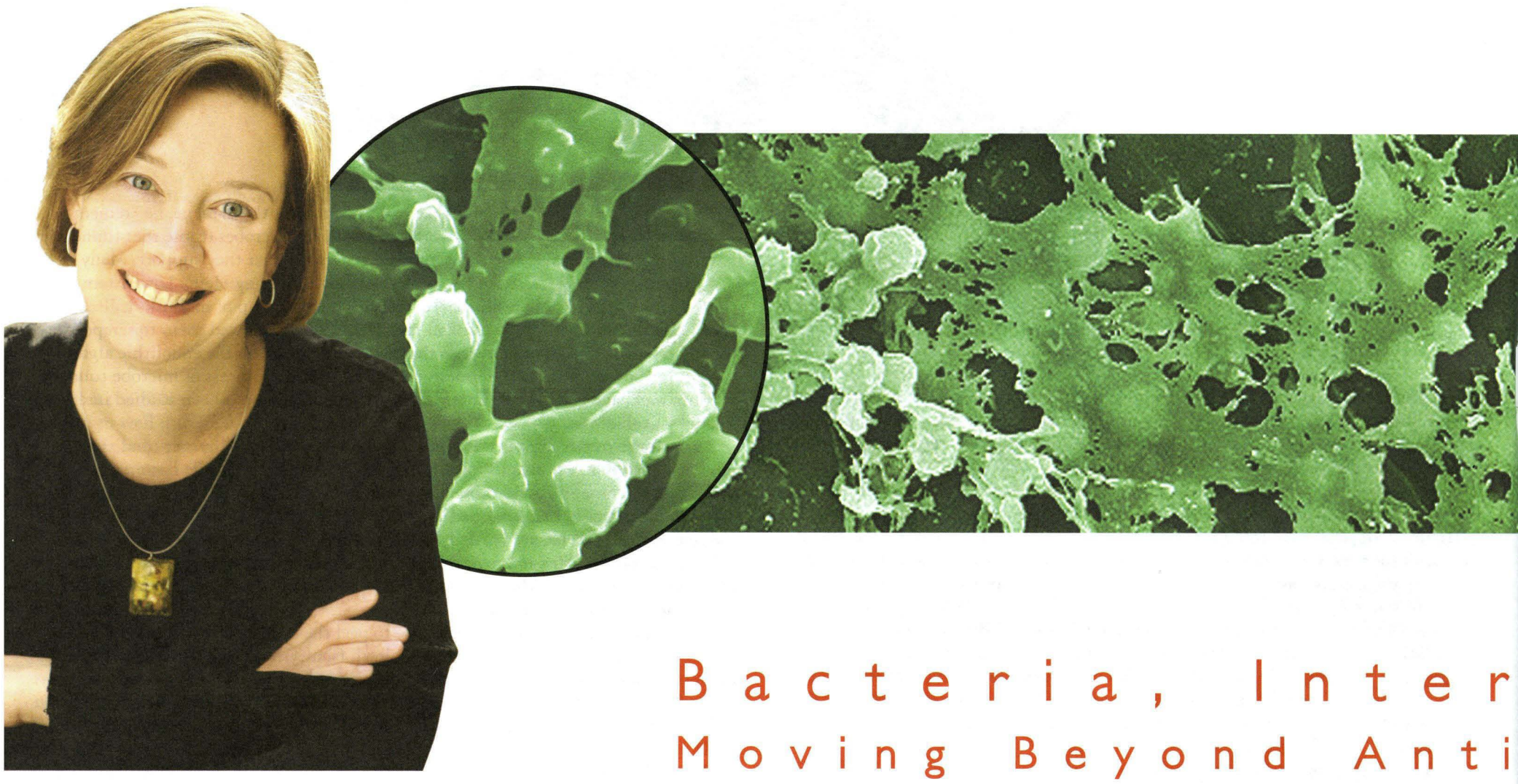
While Wendell Jack says that Kirschvink's theory about grout erosion is interesting, he thinks that the problem with the shower tiles also could have been caused by improper workmanship. Either way, he and the athletics committee decided that the time had come to provide Caltech men with liquid shower soap. Jack bought 20 stainless-steel dispensers, and they were soon filled with light-green piña colada–scented liquid soap. The women got the new dispensers and soap too.



Research by Caltech's late professor of paleoecology, Heinz Lowenstam, shown above in a creatively manipulated photo, inspired geobiologist Kirschvink, shown at top in a somewhat doctored 1975 Caltech yearbook photo, to probe the mystery of deteriorating shower tiles in the Braun gym.

Bringing the science of showering full circle, the shower floor shouldn't evince grout problems anymore, with or without the liquid soap, because there's no more tile or grout. In the spring, the old tiles and grout were replaced with an epoxy-based product called Dex-O-Tex. "It's used as floors in labs on campus," Jack says. "It's expensive, but without it, I'd hate to think we'd have to put in a new floor every seven or eight years. I can't say for sure why the problem developed in the first place, but we think we have it solved for the long term now."

What's still unclear is why the tiles in the women's showers have never had a buckling problem. Were the tiles installed differently? Do women routinely use more soap than men? Even more puzzling, and perhaps beyond the ken of scientific investigation, is the question of why some patrons are still raiding the sink soap dispensers even though there's now soap in the men's showers. "The other day," Jack says, "I saw one guy doing it the old way," lathering up at the sinks and then sprinting to the showers. "When I told him we had liquid soap in the showers, he said, 'I'm a creature of habit.'"



Bacteria, Inter

Moving Beyond Anti

By Barbara Ellis

Microbes and mankind have coexisted in good ways and bad for millennia, but by the latter half of the 20th century, humans seemed to have gained a decisive edge when penicillin and a host of other antibiotics began to be used with astonishing success against a wide range of bacterial infections. In recent years, however, bacteria, in textbook Darwinian fashion, have staged a comeback, evolving new defenses against antibiotics and passing their resistant genes on to their progeny. Today's medical journals are full of reports about childhood ear and throat infections that no longer respond to standard antibiotic therapies, garden-variety cuts and scrapes that erupt into body-ravaging infections, and hospitals that have become breeding grounds for new and ever deadlier strains of bacteria. In response, university scientists have begun to ramp up their research into new antibacterial therapies. But bacteria have been around much longer than humans. How easy will it be to mount a new offensive against an opponent that has had a head start of more than 2 billion years?

In a lab at the University of Wisconsin–Madison, assistant professor of chemistry Helen Blackwell, PhD '99, is one of a small but highly motivated group of academic scientists looking into novel approaches to combat bacterial infection. Earlier this year, her research group reported in *Chemistry & Biology* that they had discovered four new chemicals that, in the Petri dish at least, disabled several types of pathogenic bacteria as effectively as the most powerful antibiotics in current use. The compounds worked especially well against one of the most worrisome bacterial pathogens yet to emerge, methicillin-resistant *Staphylococcus aureus*, otherwise known as MRSA, some strains of which are now resistant to all antibiotics. One strain even became resistant to a new antibiotic less than a year after the drug won FDA approval. According to U.S. health experts, MRSA is responsible for an estimated 90,000 deaths a year. Although Blackwell's findings are highly preliminary and have yet to be tested on animals, let alone humans, her team's results are being hailed as a promising breakthrough in what is shaping up to be a long and complicated fight against antibiotic-resistant bacteria.

"There's an urgent need for new antibacterial therapies," says Blackwell. "It's a problem that unfortunately is not being addressed by most big pharmaceutical companies right now. Bacterial infections are not chronic diseases whose treatment generates a lot of profit. Further, the bar for the development of new antibacterials is extremely high." But several pharmaceutical companies are following her work with interest, and two have already given her seed funding for her research.

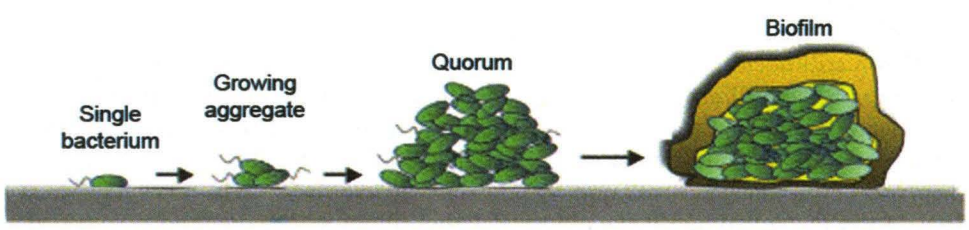
"One of the best things about the four new compounds we've found is that they're not related to antibiotics or any other antibacterial compounds used so far, so the bacteria haven't developed any resistance to them," Blackwell says. "We're not precisely sure how they work, but we're delighted they do." Finding out what their mechanism of action is, and improving on it, is shaping up as a focus for her future research.

Blackwell's team made their discovery while testing out their latest small-molecule macroarray, a small-molecule screening apparatus that has considerably shortened the time it takes to engineer and evaluate novel compounds. In the trial reported in the journal, just under 200 new molecules were screened on a variety of bacteria in less than two days. If the researchers were able to identify four promising new molecules (which they've already patented) in such a short space of time, says Blackwell, conceivably they will find dozens more in the space of a year.

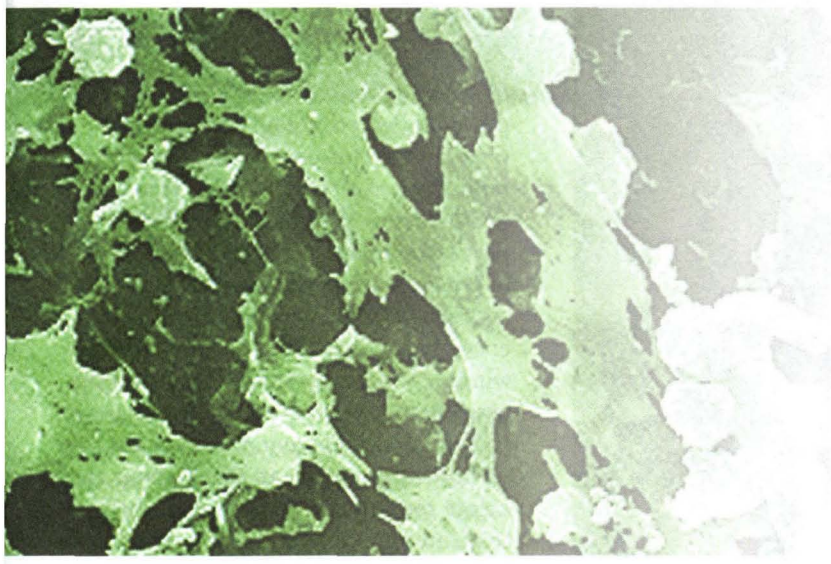
As well as looking for potential new drugs that kill bacteria, Blackwell's multidisciplinary group of 11 graduate students and three undergraduates is also pioneering research into molecules that are able to interfere with the way that many bacteria, including MRSA, organize themselves into disciplined and formidable collectives known as biofilms. For most of us, who recall gazing at a magnified bacterium or two under the microscope in biology class, it may come as a surprise that for much of their lives, many bacteria aren't autonomous, free-living individuals at all, but live in structured communities. Sheltered by a sticky protective coating, the bacteria in biofilms take on different roles and coordinate their activities using a language of simple chemical signals. In this, they are not unlike a colony of ants or a multicellular organism.

"Like humans with words, bacteria use a language of simple small molecules to communicate," Blackwell explains. "They use these molecules as signals to sense their local population density, and when they reach a sufficiently high density, which we call a quorum, bacteria can change their mode of growth and behave as a group. This is when many bacteria form these nasty biofilms." This mechanism, known as quorum sensing, is a relatively new concept in bacteriology.

Many biofilms are harmless, and some—like those that clean sewage water in treatment plants—are beneficial, but the ones that harbor pathogenic bacteria are a serious health problem. It has been estimated that biofilms are responsible for 80 percent of bacterial infections in humans. Dental plaque, the first biofilm to be identified, is, like many others, a mixed community of bacterial species, some good and some bad. The latter cause gum disease and tooth decay, but the good ones may counteract this to some extent. Biofilms formed by *Pseudomonas aeruginosa* in the lungs are a leading cause of death for cystic fibrosis sufferers, AIDS patients, and burn victims. Other biofilms are responsible for chronic ailments such as cystitis, inner ear infections, and bacterial endocarditis, a potentially deadly infection of the heart valves. As tenacious as they are ubiquitous, these microbial colonies are almost impossible to remove from the surfaces to which they've attached themselves. In



Top: Chemist Helen Blackwell is shown next to one of the deadly microbes she's aiming to scuttle: antibiotic-resistant MRSA bacteria, enveloped in insidious biofilm slime, growing on the inner wall of a catheter. The above illustration charts a biofilm's development from a single bacterium to a small aggregate, to a collective known as a quorum, which triggers the formation of the biofilm.



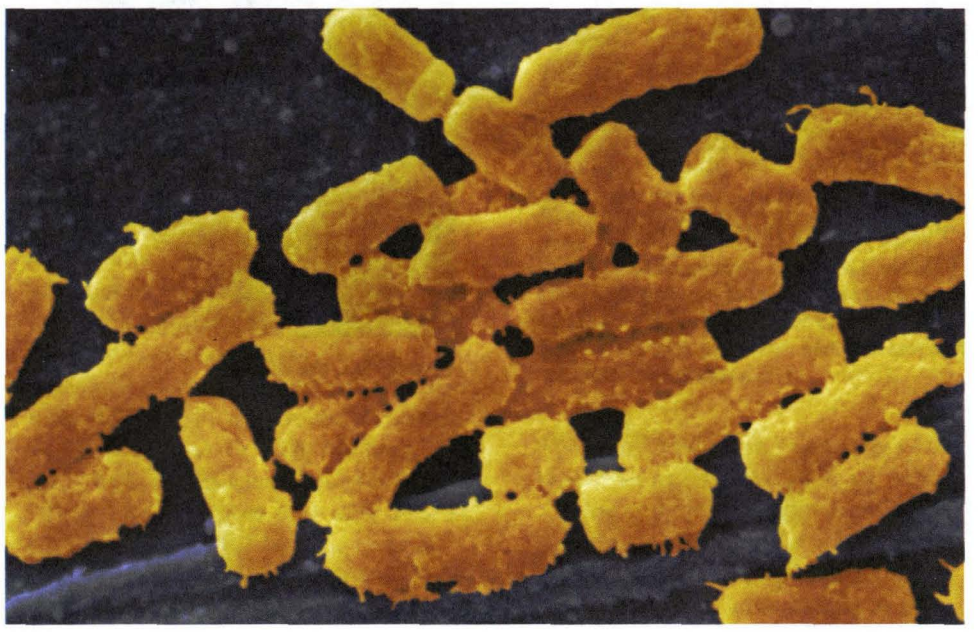
r u p t e d :

b i o t i c s

hospitals, a major breeding ground for antibiotic resistance, biofilms on the insides of reusable medical equipment such as catheters, ventilators, and breathing tubes are a huge problem because they survive sterilization procedures and pose the risk of infecting each new patient who uses the equipment.

For the last five years, Blackwell's group has been studying the dynamics of these pathogenic biofilms and analyzing their quorum-sensing pathways. "We're looking at efficient ways to synthesize the types of molecules that the bacteria use for quorum sensing" she says, "and then we'll make subtle changes to them." Like code breakers in time of war, Blackwell and her colleagues are looking to decipher and hijack the language bacteria use to talk to one another, and then turn it against them.

Biofilms form when the population density of free-swimming bacteria reaches a quorum, and a quorum-sensing signal summons them to come together and settle down. The clustering bacteria attach themselves to a surface, preferably a nice damp one with a regular supply of nutrients, and secrete a sticky polymer coating that glues them to their base and to one another. The hardened outer part of this polymer also acts as a strong, watertight, protective sheath. "It gives them a nice place in which to live," Blackwell says, "but because it acts physically like a shell, it's an enormous problem when it comes to dealing with pathogenic bacteria," because antibiotics have a hard time penetrating it. "And it's a double whammy," she adds. "Not only are the bacteria in the biofilm resistant to treatment, but their mutation rates are accelerated." The crowding in the colony seems to stimulate certain bacteria such as MRSA to rapidly evolve and swap antibiotic-resistant genes.



These *E. coli* bacteria are just beginning to glue themselves together into a biofilm.

Surprisingly, pathogenic bacteria in a biofilm are harmless until they reach another, higher, quorum density that triggers the activation of virulence genes. Then they turn ugly and surge out of the biofilm en masse to attack their host. "It makes sense that they should wait until there are enough of them before invading our cells, because the immune system has a harder time when it's attacked by a mob," Blackwell says. It's when the immune system is overwhelmed that we get ill.

"We've known about quorum sensing for the past 30 years, but it's only in the last 15 or so that people have started looking for the compounds that control it—it's still not a heavily researched area." So it's a wide-open field for her group as they work on identifying the chemical signals that the bacteria use to count themselves. Once they've found these, they can make small changes to the chemical structure of the signals to develop what Blackwell calls quorum-sensing modulators to make the microbial arithmetic go awry. One type of modulator might trick the bacteria into thinking (so to speak) that their numbers are insufficient to start up a biofilm, while another type might convince the pathogens that their numbers are greater than they actually are, in which case they'll prematurely turn virulent, and go on the attack, only to be picked off by the immune system. A big advantage of using these modulators is that "the compounds we're developing to control quorum sensing won't kill the bacteria, they'll just keep them from talking, if you will," Blackwell says. "There's a hope that if they're merely inhibited, there's less chance they'll develop resistance to the chemicals." Antibiotics will still be used to mop up the loose germs swimming around.

A native of Cleveland, Blackwell attended Oberlin College, also in Ohio, for her undergraduate degree, and found her calling. "When I took chemistry in college, it clicked, especially the research. I realized then that it was what I wanted to do," she recalls. Her father, an engineering professor at Case Western Reserve University, may have also been an influence, although Blackwell says that he never pressured her to follow in his footsteps. In 1994, she took the advice of Beckman Professor of Biology Harry Gray, "who came to Oberlin when I was a senior, and told me to apply to

Like code breakers in time of war, Blackwell and her colleagues are looking to decipher and hijack the language bacteria use to talk to one another, and then turn it against them.

Caltech, because it had such great research opportunities in chemistry." As her particular interest at that time was polymer chemistry, she joined the group of Atkins Professor of Chemistry Robert Grubbs. "But after I arrived, I did almost *no* polymer chemistry. I worked on a synthetic methodology project, which was biologically inspired. Quite a jump from polymer chemistry!"

It was an exciting time to be in the Grubbs group, she recalls, working on the reactions that would lead, a few years later, to Grubb's 2005 Nobel Prize in Chemistry, "though, while we knew that the work was amazingly powerful, we really had no idea at the time that he would get it." A seasoned outdoorsman and rock climber, Grubbs likes to take his research group on camping trips to such venues as Yosemite and Sequoia national parks. Blackwell enjoyed the camping, but left the rock climbing to others, one of whom—fellow grad student Dave Lynn—she married in 2002.

Grubbs encouraged his students to try things on their own, Blackwell recalls. "We had to teach ourselves. You could flounder with so much freedom, but it taught me self-reliance." Nearly a decade later, she has come to have fond memories of the Institute. "I didn't appreciate as much at the time as I do now that Caltech is a very special place, open and supportive, full of brilliant people, with a wonderful culture of excitement and possibilities."

Grubbs remembers that "when Helen arrived, she decided to go in a new direction for herself and our group, taking us in a more biological direction. She developed techniques for modifying peptides by using the catalysts we were developing, and had the personality and style to recruit collaborators so we could move into this new area and make progress. She was also a leader in the social, interactive scene. At Madison, Helen's found a new area for herself which is extremely important, and she brings to it a unique background—the ability to do biological research and the ability to make molecules."

After graduating in 1999, Blackwell went to Harvard as a postdoc. She "got the bug," as she expresses it, for biological research when she joined a group headed by pioneering chemical biologist Stuart Schreiber. The team was working to develop small organic molecules for use as probes in biology and medicine, and, toward the end of her stay, Blackwell initiated some novel experiments on plants, evaluating whether nonnative compounds—that is, substances to which plants aren't usually exposed—could interfere with their development as seedlings. The experience was a useful prelude to her current research on organisms that use a simpler form of chemical communication, but about which much less is known.

Continued on page 18 . . .

Commencement. . . .from page 3

Following the ceremony, Ricky Jones '08 (center), who spoke at the presidential inauguration, shared a moment with Chameau (left) and his wife, Carol Carmichael, senior counselor for external relations and faculty associate in engineering and applied science.

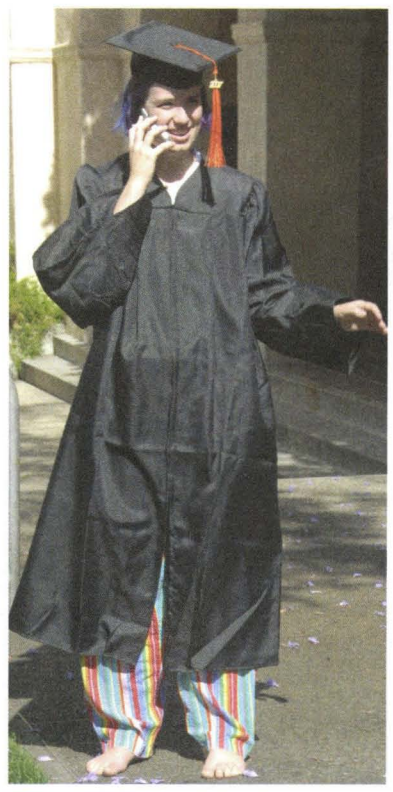
"I'm certain that Jean-Lou will continue to encourage the growth of Caltech in ways we never thought imaginable and will continue to teach us to appreciate Caltech in ways we never thought of before."

For his part, Chameau spoke of the sense of "honor and privilege" he felt at being entrusted with the stewardship of Caltech. He told how another university president had congratulated him on winning the lottery, saying "You have the best board of trustees in the country, the faculty [ranges] from outstanding to genius, and you don't have to worry about a medical school or a football team." Looking toward the future, he called for leveraging the Institute's small size and abundant intellectual resources to promote new opportunities for interdisciplinary research, to maximize student-faculty interaction, and to "address the toughest challenges we face in society." Chameau said that Caltech must be the "home of faculty and students who will do big things" and "the preferred destination for young people who can make a difference." He warmly praised Caltech's supportive alumni while acknowledging that their relatively small numbers made it imperative to expand Caltech's base of support by placing new emphasis on fund-raising through friend-raising.

"We must ensure," he said, "that we have a foundation that sustains and enhances excellence and that will allow the Institute to be the leader in creating new knowledge."

As commencement drew to a close, he returned to the podium with a few parting thoughts for Caltech's graduates, urging them to actively embrace challenges "outside your comfort zone. Do work you love," said Caltech's president, "and do it well, and the rest will take care of itself."

The care and keeping of Earth itself was the theme of the commencement address presented by UCLA professor Jared Diamond. "It's a privilege to join you for this double celebration," said the eminent physiologist, ethnologist, biogeographer, and evolutionary biologist whose reputation as a wide-ranging thinker and eloquent popular science writer is perhaps eclipsed only by the panoply of Greek prefixes orbiting his name. A recipient of the National Medal of Science, and author of the Pulitzer Prize–winning *Guns, Germs, and Steel*, and the bestseller *Collapse: How Societies Choose to Fail or Succeed*, Diamond asked Caltech's assembled graduates to think about the future roughly 32 years hence, when the Institute's graduating seniors would, on average, be about the age that Caltech's newly inaugurated president is now.



Can I put you on hold while I graduate?

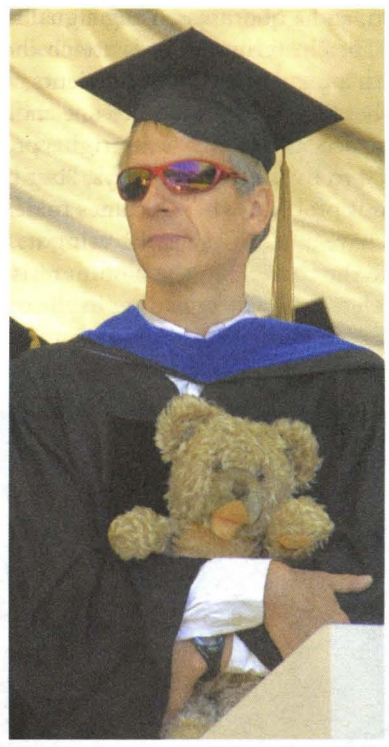
What can you and Caltech do, he asked, to ensure that the world awaiting you in 2039 is worth living in?

Standards of living, global sustainability, population growth, energy issues, and some numerical byplay all came into view here, as Diamond noted that "an average citizen of the First World consumes 32 times more resources, and generates both 32 times more waste and 32 times more money than does the average citizen of poor Third World countries." With Third World populations aspiring to First World standards of living, and the world as a whole already straining under the twin burdens of finite resources and seemingly infinite expectations, said Diamond, "these disparities will have to be resolved—either in pleasant ways of our choice, or in unpleasant ways, not of our choice."

The encouraging news is that technological advances and enlightened social engineering hold out the promise of arriving at peaceful and constructive solutions, beneficial to the future of the planet. Diamond challenged Institute graduates, "a talented bunch, with an outstanding education, and a president whose specialty is sustainable engineering," to get actively involved in seeking these solutions, utilizing such avenues as research, policy making, innovative business practices, political participation, and philanthropy. In closing, he said, to loud applause, "Do something that makes a contribution as a whole and that you can look back on with pride 32 years from now."

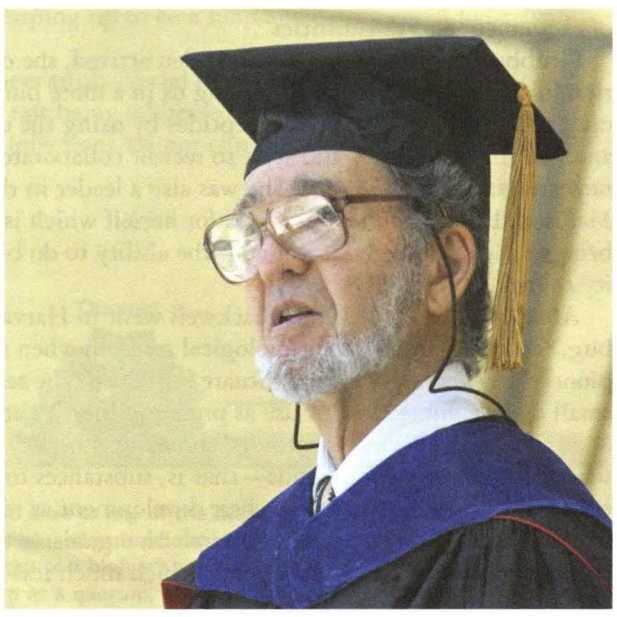
The number 32 also figured in a postscript to the day's festivities, although in a fashion few could have foreseen. Among the dozens of Caltech faculty and trustees seated on the commencement stage this year was renowned neuroscientist Christof Koch, cuddling a somewhat dilapidated Steiff teddy bear, whose name he later disclosed to be Winnie-the-Pooh. As Koch was in the front row, he drew media attention like eye candy—both the *Pasadena Star-News* and the *Los Angeles Times* ran pictures of the Troendle Professor of Cognitive and Behavioral Biology and his beguiling ursine companion. The *Star-News* also carried a comment by Koch, explaining that inasmuch as Winnie had been with him for—yes—32 years, through good times and bad, the bear's presence on such a joyous day seemed only appropriate. Rumors that a collection is being taken up to provide Winnie with a Build-A-Bear graduation gown and mortarboard in time for next year's commencement have yet to be confirmed.

HEIDI ASPATURIAN

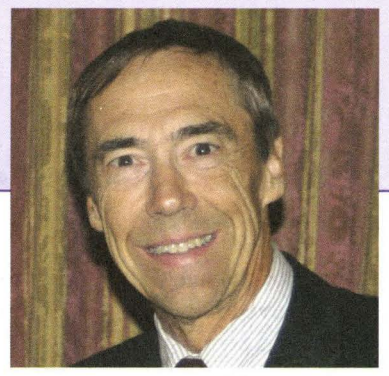


Grizzly Man, the sequel.

Diamond asked Caltech's graduates to think about the future 32 years hence, when the Institute's graduating seniors would be about the age that Caltech's newly inaugurated president is now.



UCLA professor and Pulitzer Prize–winning author Jared Diamond reminded graduates that their future and the planet's are inextricably intertwined.



Above, Carol Casey, associate director of Caltech's student–faculty programs, and Don Caldwell, for many years director of Caltech's Men's Glee Club and Chamber Singers, were welcomed into the Alumni Association as honorary members at the CAA's annual meeting in June. At the same event, the Association inducted newly elected board members (below, from left) Dhiraj Sharma, PhD '75; Rob Drew '69, Carl Larson '52, Dave Zobel '84, and Eileen Bridges '77. Not pictured: Ralph Lin '02.

From the Association president—A tradition reborn

"Once is an accident, twice is a coincidence, and three times becomes a tradition." Caltech is rich in traditions, and the origins of many of them have been deposited into the geological record, or more likely just lost from our 21st-century collective memory. Was the first Mudeo a spontaneous event after winter rains turned a campus construction site into a quagmire and a frosh pushed a soph into the muck? How did Wagner's "Ride of the Valkyries" become the only finals-week wake-up music?

Times change, and traditions evolve. Some just die. The Interhouse party, for instance, expired in the 1990s when security issues related to uninvited attendees became too great a burden. This January, to much acclaim, Interhouse had its renaissance.

What about Honor Keys? Many alums no doubt remember them. A half-century ago, Caltech undergrads awarded these keys to campus leaders: ASCIT officers, intercollegiate team captains, and publications editors, to name a few. The Honor Key that I've seen is gold, about an inch tall, suitable for attachment to a pocket-watch chain. By the time I entered Tech in 1970, however, the counterculture era was in full swing, and Honor Keys had disappeared. House blazers and ties at dinner were other "Establishment" symbols that also faded away.

Honor Keys may be returning, however, after four decades of retirement or, at the very least, consignment to fading memories. Craig Montuori '08, the 2006–07 Interhouse Committee Chair, has proposed recognizing Caltech student leaders again with something more tangible than frequent mention in *The California Tech.* He has been collecting information about the old Honor Keys and how they were awarded, but of course the historic record that he's unearthed is incomplete. Such is the nature of historic—or geologic—records. He has discussed his research and his preliminary ideas in the May 30 *California Tech*. He also has created a website http://donut.caltech.edu/ascit/index.php?title=Honor_Keys, where he includes many Honor Key details.

The Honor Key tradition began in 1921, about the time Robert Millikan arrived on campus. By 1957, Honor Keys were awarded based on an elaborate point system: 60–70 points for ASCIT treasurer, 10–15 points for assistant yell leaders, 15 points for *The California Tech* circulation manager, and 4 points for attending spring football practice, to name a few. Men—the first undergraduate women were just starting elementary school in 1957—earning 100 points in a year received Honor Keys, and those with 50 points received Honor Certificates. (Many thanks to Jim Workman '57, MS '58, whose *little t* contributed these details.)

So, fellow alumni, here's your chance to stay involved and resurrect a Caltech tradition by helping today's undergrads recognize their leaders. If you'd like to share your thoughts and memories of Honor Keys, you can e-mail Craig at montuori@caltech.edu, or you can snail-mail a real letter to Craig Montuori, MSC 346, Caltech, Pasadena, CA 91126. Send him whatever tidbits you recall. Was there a point system for earning Honor Keys when you were a student? If not, how were the keys awarded? Late at night, in a dark, smoke-filled room? If you've been wondering why you've been saving that 1947 *little t* all these years, here's your chance to justify your pack-rat habit!

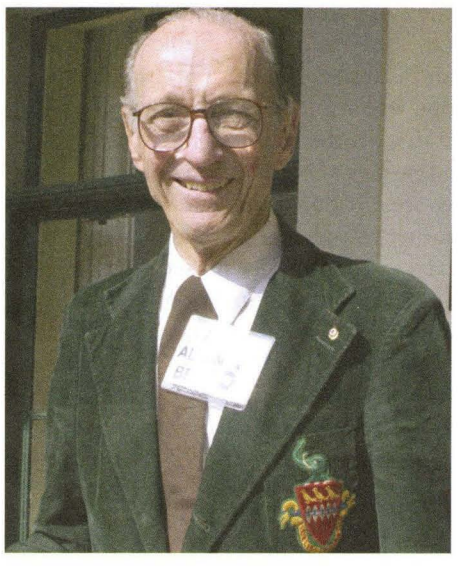
One endearing attribute of Caltech students is and always has been their creativity. So in the coming months, when you see an announcement that the Honor Key has returned, don't expect the program to be identical to the one you remember from your student days. Things have changed since the last Honor Keys were awarded . . . and not only because there are now female undergrads. Twenty-first-century Techers will no doubt craft an award program that fits today's Caltech while incorporating relevant parts of the earlier tradition. Today's Techers are just as independent as you were.

Speaking of old traditions being revived, is it possible that the house blazer will experience a renaissance too? Allan Beek '50, one of the more energetic Darbs at May's Dabney House reunion, wore his green Dabney blazer. We didn't formally vote, but Allan certainly was the Most Dapper Darb. Several twenty-something Darbs wondered why they hadn't had the opportunity to purchase House blazers during their undergrad years. Will formal dinners make a comeback, too?

Bob Kieckhefer

New Alumni Association president Bob Kieckhefer (second from right) joins his fellow 2007–08 CAA executive committee members. From left, they are Jasmine Bryant '95, secretary; Chris Wheeler '78, vice president; Angie Bealko '96, past president; and Tom Lloyd, MS '95, PhD '99, treasurer.

Blazing a trail? Allan Beek '50 shows his true colors at May's Dabney House reunion.



Stay Connected

Flex the power of your alumni network—log in to the CAA website at http://alumni.caltech.edu. Make sure your profile is up-to-date with your current e-mail address, career information, and photo. While you're online, post a class note, look up an old friend, or make a business connection. Your username is your 10-digit alumni ID (located on the mailing label of this very publication!), and your password is your last name in lowercase letters. For help logging in, contact information@alumni.caltech.edu.

Volunteer for 2008 Reunions

If your undergraduate class year ends in a 3 or an 8, volunteer to help plan your reunion celebration! Your ideas, time, and efforts will help bring your classmates together for a memorable weekend of fun and nostalgia. E-mail reunions@alumni.caltech.edu, or call Patsy Gougeon at 626/395-8366 for more information, and save the date for Seminar Day and Reunion Weekend: May 15–18, 2008.

Alumni Activities

October 24—Presidential event, New York City

January 1, 2008—Rose Parade event

March 6, Presidential event—Boston

May 15–18, Seminar Day/Alumni Reunions

Alumni receive Caltech's highest honor

Four of the five Caltech graduates who received Distinguished Alumni Awards on Seminar Day, May 19, posed with president Chameau (center) for a photo before the ceremony, right. They are, from the left: Peter Shor '81; Ben Rosen '54; Ronald Davis, PhD '70; and France Córdova, PhD '79. Sadly, the fifth honoree, Francis Dahlen '64 was too ill to attend and died of cancer three weeks later.

Peter Shor is a professor of applied mathematics at MIT and an affiliate of MIT's Computer Science and Artificial Intelligence Laboratory and Center for Theoretical Physics. He is widely known for his work on quantum computation, and particularly for Shor's algorithm, which permits numbers to be factored exponentially faster than with the best available algorithm that can be run on a classical computer.

Ben Rosen, chairman emeritus of the Caltech Trustees and cofounder of the venture-capital firm Sevin Rosen Funds, was also principal investor in both the Lotus Development Corporation and the Compaq Computer Corporation (which he chaired for 17 years). He also served as vice president and senior electronics analyst at Morgan Stanley & Co.

Ronald Davis, professor of biochemistry and genetics, and director of the Genome Technology Center at Stanford, played a key role in the early development of recombinant DNA methods, and made advances in the analysis of whole genomes that provided the complete sequences for several organisms, as well as substantial parts of the human genome.

On Seminar Day, France Córdova was the chancellor of UC Riverside, but she had just learned that she was to be the new president of Purdue University. A renowned astrophysicist, she also served as chief scientist at NASA, and as a professor of physics and vice chancellor for research at UC Santa Barbara.

Theoretical seismologist Francis Dahlen, pictured at right, was a professor of geosciences at Princeton, and was 64 at the time of his death. Among his many achievements, he pioneered research into the waves generated by earthquakes, including the very low frequency waves that make the earth ring like a bell after a big temblor, work that led to a greater understanding of the structure and dynamics of the interior of the earth.

Tech Talk

Dear Editor,

I read with interest the article "Eight with Caltech Connections Named to National Academy" in the last issue, but I'm pleased to report that you should revise that to at least nine. My PhD adviser, Professor Laura Kiessling, currently at the University of Wisconsin–Madison, was inducted into the Academy this year, and she was a postdoc in Professor Peter Dervan's laboratory in chemistry. So the Caltech connection is there; one may argue that Laura is a leader in the transformation of an interdisciplinary pursuit formerly described by some as "Peter Dervan stuff" into what has become chemical biology.

—Josh Kurutz '89
Chicago, IL

Your recent *Caltech News* was the best of all those issued through the years. Rather than merely informative, it was artistic, fascinating and beautifully presented.

My husband, a graduate of Caltech, and I have always looked forward to this mailing, but this time the olives, the art, and the poetry were truly special. Jessica Goodfellow is a real winner. Sounds as though you have another good president too.

—M. Webster Beckstead '43 &
Helen Beckstead, Pismo Beach, CA

I enjoyed reading Bob Parker's "Letter to the Editor" about the old houses in the spring issue of *Caltech News*. I was a couple of years behind him, and his reminiscences have prompted some memories of my own.

I spent four years in Blacker House from 1965 to 1969, and I can't remember any graffiti on the walls of Blacker in those years. Perhaps that came later, or perhaps it's among the many details that have slipped from my memory.

The walls themselves were made of remarkably sturdy plaster. Super Balls first reached the market in the sixties, and inevitably there were experimental efforts to approximate perpetual motion in the uncarpeted hallways. The walls emerged unscathed, although the lightbulbs and fixtures did not.

The walls also survived the occasional flood that would cascade down the stairs from the upper floor of Dabney into Tunnel Alley linking Blacker and Dabney. If memory serves, someone would block drains in the shower stalls, fill the whole shower room with a few feet of water, then open the door to steer it down the hall. I remember a rather impressive cascade of water, and having spent many subsequent years as the owner of a couple of old houses, I am, in retrospect, much impressed at how little damage the plaster suffered from the floods.

I also remember the smoky basement fire over the 1965 Thanksgiving holiday. I lived back east, so a Thanksgiving trip back home was not in the cards. The fire department didn't make it to Blacker; guys went down the hall pounding on doors shouting "WAKE UP, BLACKER! FIRE!" I woke up, looked through the open transom, and saw what looked like flames in the hall. I grabbed for my glasses as I rose from the bed to dash for the window, and was relieved to see that the lights were flashlight beams. It was an hour or two before the fire was knocked down enough to let us back into the dorm and a couple of days before we got our power back.

—Jeff Hecht '69
Auburndale, MA

What a surprise and thrill it was to open *Caltech News* and find that Jessica Goodfellow was a Caltech student! As a member of the *Beloit Poetry Journal* staff and board, I well remember the *BPJ* editors' 2004 reading of her "Pilgrim's Guide to Chaos in the Heartland" that convinced them to publish her poem, and later to award it the Chad Walsh Prize. Thanks so much for the wonderful article.

By the way, "Pilgrim's Guide" and the rest of Goodfellow's poems published by the *BPJ* are online. Look for Goodfellow in the *BPJ* author index at http://www.bpj.org, then click on the poem you want.

—Al Bersbach '67
Farmington, ME

After reading your last issue, I want to be the first in line to buy olive oil. To make it and sell it is a great idea; however, President Chameau is in a big quandary. Being one of the originators of the olive oil venture, he is now confronted with when to announce the renaming of our Institute to Caltech A&M.

—Gene Muehlberger '53
Scottsdale, AZ

I read the note about Simon Ramo on page 15 of your last issue. Although I worked briefly at what was then the Ramo-Wooldridge Guided Missile Division and took a class at Caltech ostensibly given by Dr. Ramo, the work of his that had the most profound effect on my life was not mentioned in your story. That work was the book he wrote with John Whinnery entitled *Fields and Waves in Modern Radio*.

This textbook was the basis of my undergraduate study of electromagnetism. It seemed to match my capabilities very well. In retirement, I still refer to it. I used it to develop my calculation methods for optical thin-films. The methods described seem more easily adaptable to optical calculations than those ordinarily used in optics books. When William Smythe's book is just too much, Ramo and Whinnery often fits the bill.

—William Buchman, PhD '56
Los Angeles, CA

Alumni Notes

1939

Charles Townes, PhD, who received the 1964 Nobel Prize in Physics for his role in developing the laser, was recognized by the University of Central Florida when it named its new Center of Excellence in advanced laser technologies in his honor. The Townes Laser Institute was dedicated in May. Not a physical building but an association of faculty, students, engineers, and scientists, the institute will focus on the use of lasers in medicine, advanced manufacturing tools, and defense. Townes, 91, continues to be interested in questions such as those of consciousness and free will. "We think we can make free choices, but science says we are the result of the laws of physics and have no control," he says. "There's no reason to think we understand everything at this point," he adds.

1962

Carl E. Baum, MS '63, PhD '69, a distinguished research professor in the University of New Mexico's department of electrical and computer engineering, has been selected by the Institute of Electrical and Electronics Engineers (IEEE) as recipient of its 2007 Electromagnetics Award, recognizing "his contributions to fundamental principles and techniques in electromagnetics. These contributions have led to new target-identification algorithms, various high-power electromagnetic pulse radiators, and techniques for analyzing the response of complex electronic systems to electromagnetic fields." Baum is perhaps best known for inventing the singularity expansion method (SEM), which revolutionized the field of transient electromagnetics. He is also an authority on the subject of electromagnetic pulse (EMP) simulation and has designed EMP simulators for the U.S. Air Force and other U.S. government agencies and for allied and friendly countries. An IEEE life fellow, Baum has received the IEEE Harry Diamond Memorial Award and the IEEE Electromagnetics Society Richard Stoddard Award. From 1971 to 2005, he served as senior scientist at the Air Force Research Laboratory and is a fellow of that institution. He is a recipient of the Air Force Research and Development Award and the Air Force Systems Command Harold Brown Award.

Roland Haden, MS, dean emeritus of the Dwight Look College of Engineering at Texas A&M University, has received the Benjamin Garver Lamme Award of the American Society for Engineering Education (ASEE) in recognition of "his more than forty-year commitment to the improvement of engineering education as demonstrated by his superior leadership, exceptional teaching abilities, and pioneering research as well as for his personal dedication to the advancement of the engineering profession through exemplary service to industry, professional societies and volunteer organizations." Haden has served on the faculties and administrations of the University of Oklahoma, Arizona State University, and Louisiana State University, as well as Texas A&M, where he was founding director of the Institute for Solid State Electronics and retired in 2002 as vice chancellor for engineering, dean of the Look College of Engineering, and director of the Texas Engineering Experiment Station. A licensed professional engineer in Texas and Oklahoma and, formerly, Arizona, he was named an inaugural member of the Texas Governor's Science and Technology Council, a post similar to one he had held in Arizona. He is a fellow of the ASEE and a member of its Academy of Fellows, a life fellow of the IEEE, and a member of both the National Society of Professional Engineers and the Texas Society of Professional Engineers, for which he served as chair of the Professional Engineers in Education Division. He also twice served as chair of the Texas Deans of Engineering.

1963

David L. Barker has joined the board of directors of NextBio, "the world's first data search and collaboration engine for life scientists and clinicians." He will help define the strategic goals of the company. Previously he had served as vice president and chief scientific officer at Illumina Inc., which he joined in March 2000. One of the leading companies in the life sciences, Illumina is an innovator in the BeadArray chips used for genotyping. From 1998 to 2000, Barker was vice president and chief science advisor at Amersham Biosciences, now part of General Electric. Until Amersham acquired it in 1998, he held senior positions, including vice president of research and business development, at Molecular Dynamics Inc., a firm he joined in 1988. During his academic career, Barker conducted interdisciplinary research in neurobiology as a postdoctoral fellow at Harvard Medical School, an assistant professor at the University of Oregon, and an associate professor at Oregon State University. Barker received his PhD in biochemistry from Brandeis University.

1966

J. Roger P. Angel, MS, the University of Arizona's Regents Professor of Astronomy and scientific director of the Steward Observatory Mirror Lab, has been named by the Optical Society of America (OSA) as recipient of the 2007 Fraunhofer/Burley Prize, in recognition of his "innovation in optical systems development, including large astronomical telescope and mirror technology, methods for observing extrasolar planets, fiber-fed spectroscopy, adaptive optics, and a possible optical solution for global warming." The award, which consists of a silver medal and $1,500 prize, will be presented in September. "Over the past 20 years, Dr. Angel has led a technological renaissance in telescope optics," the society reported in the summer issue of *Optics and Photonics News* magazine. The Mirror Lab has created the optics for several telescopes, including those for the Large Binocular Telescope on Mount Graham, Arizona. "He has also developed ideas for imaging and searching for primitive life on Earth-like planets that likely orbit nearby stars," the society adds. "Now he is developing optics for solar photovoltaic electricity." Angel received his doctorate from Oxford in 1967, and he taught physics and worked in X-ray astronomy for six years at Columbia before joining the University of Arizona in 1974. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences, a Fellow of the Royal Society, and a former MacArthur Fellow.

Baldomero M. Olivera, PhD, professor of biochemistry and neuroscience at the University of Utah, and recently honored by the Harvard Foundation for Intercultural and Race Relations as its 2007 Scientist of the Year, has been elected to the American Philosophical Society as a member of its Biological Sciences class. Olivera studies neurotoxins isolated from the venom of the deadly cone snails that live in the waters off his native Philippines, in an effort to better understand the nervous system and to develop new commercial drugs such as painkillers that can be administered to patients who do not respond to morphine. Founded in 1743 by Benjamin Franklin for the purpose of "promoting useful knowledge," the American Philosophical Society offers to its members opportunities for interdisciplinary, intellectual fellowship, supports research, discovery, and education, and maintains a research library.

1967

Christopher Bajorek, MS '68, PhD '72, a well-known materials expert, has been named vice president of advanced development by Intematix Corporation, a leading innovator in advanced materials solutions and a provider of phosphor products for solid-state lighting applications. Bajorek will lead the company's initiatives for developing new materials for emerging, high-growth clean-technology markets, including those involving solar, fuel cell, and battery technologies. He previously held executive positions at thin-film disk innovator Komag and at IBM's Storage Systems Division and also spent 10 years at IBM's Thomas J. Watson Research Center. In 2002, Bajorek received the IEEE's Reynold B. Johnson Information Storage Award for leadership in the development and manufacturing of magnetoresistive heads for data-storage devices. He is also a recipient of the IEEE Magnetics Society's Third Millennium Medal Award for outstanding contributions to the field of applied magnetism. A fellow of the IEEE, Bajorek has contributed to more than 25 patents and 50 publications in the semiconductor, electronic packaging, and data recording fields.

1968

Gregory J. Brewer, professor of medical microbiology, immunology, and cell biology at the Southern Illinois University (SIU) School of Medicine, has been awarded a five-year federal grant by the National Institutes of Neurological Disorders and Stroke, a division of the National Institutes of Health (NIH). The grant, with a budget of $942,072, is a subcontract of a grant awarded to the University of Illinois at Urbana-Champaign. The goal of the study is to understand how learning and memory work, and as principal investigator for the SIU portion, Brewer will study the function of neurons in the rodent brain and whether they can be engineered to form useful patterns and connections. This could lead to new treatments for human memory problems and to the development of better computers and teaching methods. Brewer has received funding totaling more than $4.3 million over 30 years from NIH and the National Science Foundation. He received his PhD from UCSD in 1972 and joined the SIU faculty in 1980.

1972

Sarah C. R. "Sally" Elgin, PhD, professor of biology and of education, in Arts & Sciences, and of biochemistry and molecular biophysics and of genetics, in the School of Medicine, all at Washington University in St. Louis, has been named the university's first Viktor Hamburger

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Name_____

Degree(s) and year(s)_____

Address_____

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NEWS_____

Distinguished Professor in Arts & Sciences. Since 1981, Elgin's work has expanded scientists' understanding of the role of chromatin structure in the regulation of gene expression, and in 2006 she was awarded a $1.25 million grant by the National Institute of General Medical Sciences. She has published more than 170 articles in journals, and her research has been supported by the National Science Foundation, the National Institutes of Health, and the American Cancer Society. She also directs the university's Howard Hughes Medical Institute Undergraduate Biological Sciences Education Program. In the late 1980s, she also began a science-education partnership with her children's University City School District, leading to the development of materials that enable high-school teachers to integrate teaching DNA science, as well as information on the Human Genome Project, into their genetics unit. Elgin is currently focused on bringing genomics into both the undergraduate curriculum and the K–12 science-outreach program, efforts that have been supported by her appointment as a Howard Hughes Medical Institute Professor in 2002 and again in 2006. After postdoctoral work at Caltech, Elgin taught at Harvard from 1973 to 1981. She left to join Washington University as an associate professor of biology, and she was appointed full professor in 1984.

1973

Dennis Y. Loh, former vice president for research of the Pharmacy Division of Hoffmann-La Roche and a former professor of medicine, genetics and immunology at Washington University in St. Louis, writes that he has been retired for five years and is having a great time. Most of his time, he says, is spent on philanthropy and social activism, particularly in regard to the Middle East. He has been elected to the advisory board of the Middle East Institute in Columbia University's School of International and Public Affairs.

1974

James F. Battey Jr., director of the National Institute on Deafness and Other Communication Disorders (NIDCD), one of the National Institutes of Health (NIH), has been selected as the first recipient of the Distinguished Service Award from the Association for Chemoreception Sciences, an international body of scientists whose research focuses on understanding the senses of taste and smell, which can have a major impact on a person's quality of life, food preferences, diet, and overall health. The newly created award, to be conferred on special occasions, recognizes individuals "with a record of outstanding service to the chemical senses research community." After receiving his MD and PhD in biophysics from the Stanford University School of Medicine, Battey held a postdoctoral fellowship in genetics at Harvard Medical School. He is widely recognized for his work on G-protein coupled receptors, a family of proteins important in cell-to-cell communication and integral to an array of physiological processes, including taste and smell, and his laboratory is collaborating on a large-scale project to identify molecules that are important for taste. Before being named director of the NIDCD in 1998, he held a variety of positions at the NIH, including in the National Cancer Institute, the National Institute of Neurological Disorders and Stroke, and NIDCD.

Rex Gibbons, PhD, has been nominated as a new director of Vulcan Minerals Inc. Recently retired as senior vice president of the Jacques Whitford Group, based in St. John's, Newfoundland, Gibbons served as minister of mines and energy for the province of Newfoundland and Labrador from 1989 to 1997 and was instrumental in ensuring that modern petroleum regulations were put in place to encourage exploration in Western Newfoundland. The recipient of many academic and industry awards throughout his career, he is noted for his experience both in petroleum exploration and development and in mineral exploration and development. Vulcan Minerals is a diversified junior exploration company focused on petroleum exploration in the underexplored onshore and offshore areas of Western Newfoundland.

Jessica Tuchman Mathews, PhD, president of the Carnegie Endowment for International Peace since 1997, has been elected to the American Philosophical Society as a member of its Arts, Professions, Leaders in Public and Private Affairs class. Mathews has served as a senior fellow at the Council on Foreign Relations and was founding vice president and director of research of the World Resources Institute. She has also served as deputy to the Undersecretary of State for Global Affairs and as director of the National Security Council's Office of Global Issues. In addition, she has been a member of the editorial board of the *Washington Post*, and she currently serves on the board of SomaLogic Inc. Founded in 1743 by Benjamin Franklin for the purpose of "promoting useful knowledge," the American Philosophical Society offers to its members opportunities for interdisciplinary, intellectual fellowship; supports research, discovery, and education; and maintains a research library.

1981

James E. Quick, PhD, has been named associate vice president for research and dean of graduate studies by Southern Methodist University (SMU). Currently the program coordinator of the Volcano Hazards Program at the U.S. Geological Survey, Quick has been with the USGS for 25 years, serving in positions that include chief scientist, project chief, and staff geologist. The Volcano Hazards Program studies volcanic processes and also keeps an eye on active volcanoes in the United States. In addition to initiating planning for an "enhanced monitoring network" for the most dangerous volcanoes in the United States, Quick started the planning for and implementation of a volcano-monitoring network for the Commonwealth of the Northern Mariana Islands. SMU notes his familiarity with the federal grant process and his experience working with congressional delegations.

1982

Donald Schneider, PhD, professor of astronomy and astrophysics in Pennsyvlania State University's Eberly College of Science, has received a C. I. Noll Award for Excellence in Teaching. Sponsored by the Eberly College of Science Student Council and Alumni Society, the Noll Award "is presented annually to faculty members and instructors in the Eberly College of Science who demonstrate a record of excellence both in teaching and in their interactions with students." The award is the college's highest recognition for teaching." Schneider teaches the year-long introductory course for astronomy majors and is active in placing students in research programs throughout the department. With his primary interest in observational cosmology, he is chair of the Sloan Digital Sky Survey (SDSS) Quasar Science Group and is the SDSS Scientific Publications coordinator. The most ambitious survey of the sky ever undertaken, SDSS uses a telescope at the Apache Point Observatory, New Mexico, to map a quarter of the entire sky and determine the position and brightness of hundreds of millions of celestial objects. After receiving his PhD, Schneider served as a research fellow at Caltech from 1982 to 1985. He was a member of the Institute for Advanced Study in Princeton, New Jersey, from 1985 to 1994, then joined the faculty at Penn State in 1994 as associate professor of astronomy and astrophysics, becoming professor in 1999.

1983

Alex Leibovich has joined Xponent Photonics, a provider of PLC optical components, as vice president of sales. He comes to Xponent from Cortina Systems where, as vice president of sales, he developed markets in North America, Japan, China, Europe, and Korea. Leibovich has also held senior sales, marketing, and business-development positions at Pine Photonics (acquired by OpNext), Auroranetics (acquired by Cisco Systems), Picolight, and AMP (now Tyco Electronics). After graduating from Caltech, he went on to receive an MBA from the Anderson School of Management at UCLA and an MS in mechanical engineering from Stanford University.

1984

Pedro P. Rodriguez has been appointed chief marketing officer by Virage Logic Corporation, where he will be responsible for demand-creation initiatives in the global semiconductor IP market. With more than 23 years of semiconductor-industry engineering, sales, and senior management experience, Rodriguez currently serves as a director for EXAR, and he previously served as president, CEO, and a director of Xpedion Design Systems. Prior to joining Xpedion, he held senior management positions in sales and marketing at Escalade Corporation, as well as senior sales-management positions at LSI Logic and product-management and process-engineering positions at Aerojet Electronics, Teledyne Microwave, and Siliconix. Rodriguez received his MS in electrical engineering from Cal Poly Pomona and an MBA from Pepperdine University.

1986

Alan P. Sylwester, PhD, has been elected to the board of directors of Power Air Corporation. Currently serving as president, chief technology officer, and chairman of Nanodetex Corporation, a developer of chemical microsystems technology, and as chairman of the board for Energy Materials Corporation, a creator of next-generation materials for fuel cells, Sylwester has more than 20 years of experience in technology development and business management. Prior to starting Nanodetex, he was energy-programs manager at Sandia National Labs, where he led the development of chemical microsystems, fuel cells, catalysts, and materials for energy applications. From 1998 to 2004, he served on the governing board of directors for the Council for Chemical Research, a national organization of executives from industry, academia, and government agencies, and he chaired it in 2004. He is also the author or coauthor of more than 100 publications and presentations and a coinventor on more than 10 patents, with several patents pending.

Margaret Tolbert, PhD, a professor in the University of Colorado at Boulder's chemistry and biochemistry department, has been awarded the 2007 Hazel Barnes Prize, the university's highest faculty recognition for teaching and research. Honored for her contributions to understanding the chemistry and climate of planetary atmospheres, including Earth both past and present, Tolbert was also cited for her teaching and research efforts with undergraduates and graduate students, 15 of whom have won prestigious NASA and Environmental Protection Agency fellowships in recent years. The prize includes an engraved university medal and a $20,000 cash award, the largest single faculty award funded by CU-Boulder. Elected to the National Academy of Sciences in 2004, Tolbert is best known for her research on polar stratospheric clouds, or PSCs, which form 12 to 20 miles above Earth's poles each winter and provide surfaces where chemical reactions linked to stratospheric ozone destruction occur. In 1987, early in her career, Tolbert received the Newcomb Cleveland Prize from the American Association for the Advancement of Science for her pioneering work linking chemical reactions on the surfaces of PSCs to the formation and activity of ozone-gobbling chlorine molecules in the atmosphere. Her other honors and awards include the American Geophysical Union's James B. Macelwane Medal in 1993, the Boulder Faculty Assembly Award for Excellence in Research, Scholarly and Creative Work in 2001, and a Guggenheim Fellowship in 2005.

1990

David A. Edwards, PhD '94, associate chair of the mathematical sciences department at the University of Delaware, has been promoted to full professor. His wife, Jacqueline M. Holmes '91, remains Of Counsel at the Washington, D.C., office of Jones Day. They live in Newark, Delaware, with their six-year-old daughter, Hope.

Lance Fors, PhD, joined YES Reading's board of directors in November. A local nonprofit organization dedicated to empowering children through literacy, YES Reading operates six school-based reading centers in Santa Clara and San Mateo counties and recruits and trains community volunteers to work one-on-one with students who are reading significantly below grade level. Fors is the founder and former CEO of Third Wave Technologies, and he currently owns an investment firm specializing in niche real estate and technology opportunities. He is also lead director and co-owner of Lance Construction Supplies. In 2000, Fors received an Ernst and Young Entrepreneur of the Year award. He is on the boards of several public benefit organizations, including Silicon Valley Social Ventures (SV2), where he serves as vice chairman. Additionally, Fors is an inventor on several dozen patents and has authored numerous articles and successful grant proposals.

Claire Gu, PhD, professor of electrical engineering at UC Santa Cruz, has been elected a fellow of the International Society for Optical Engineering. She is among 56 new fellows honored by the society this year for "significant scientific and technical contributions in the fields of optics, photonics, and imaging," and was specifically honored for her achievements in information photonics. She has been working in this area for 20 years and is currently focusing on optical trapping and sensors for chemical, biological, and environmental detection. Her research interests also include volume holographic data storage, optical fiber communications, nonlinear optics, liquid crystal displays, and optical information processing. The author of more than 180 journal and conference papers, Gu has also published nine book chapters,

coauthored a reference book, *Optics of Liquid Crystal Displays*, and coedited two technical books on photorefractive nonlinear optics and applications. She served as a topical editor of *Optics Letters* from 2000 to 2006 and has been a reviewer for numerous journals in the fields of optics and applied physics. Before joining the UCSC faculty in 1997, Gu was a member of the technical staff at Rockwell Science Center in Thousand Oaks, California, and an assistant professor of electrical engineering at Pennsylvania State University.

1991

Kelly Smith, MS, PhD '96, writes, "I'm pleased to announce that my biotechnology startup, Pasteuria Bioscience, has raised $5.3 million in venture financing. We will be using the funds to further the scale-up of our production process for our biological nematode control products and to file for our first EPA registration. My research team has pioneered the use of submerged fermentation to grow bacteria of the genus *Pasteuria*, heretofore believed to be obligate parasites of their nematode hosts. We have developed processes that will allow industrial-scale production of these bacteria for application on a huge variety of crops, including turf, vegetables, grapevines, orchard fruit, cotton, and soybeans. Our products will replace a number of chemical pesticides that are being phased out due to their safety and environmental problems. I'm pleased to say that my years at Caltech have provided me with a unique ability to synthesize biological, chemical, and mathematical information. This has enabled us to succeed at growing these bacteria in fermentation where many other researchers tried and failed. More information about our company and products can be found at www.pasteuriabio.com."

1992

Ian Agol reports, "I'll be getting married this September to Michelle McGuinness. We'll be moving immediately to California so that I can take up a new job in the fall at UC Berkeley. I've spent the last six years at UI Chicago, but I'm looking forward to being back in California."

Amit Kumar, PhD, has been appointed a director of Ascent Solar Technologies, a developer of state-of-the-art, thin-film photovoltaic materials and modules, located in Littleton, Colorado. Kumar is currently serving as president and CEO of Combimatrix Corporation, a position he has held since 2001. Previously, he was vice president of life sciences at Acacia Research Corporation, and prior to that founding president and CEO of Signature BioSciences, a life-science company developing technology for advanced research in genomics, proteomics, and drug discovery. Earlier, Kumar was an entrepreneur in residence (1998–1999) with Oak Investment Partners, a venture capital firm; a senior manager (1996–1998) at IDEXX Laboratories, a biotechnology company; and head of research and development (1993–1996) for Idetek Corporation, which was later acquired by IDEXX Laboratories. He completed a postdoctoral fellowship at Harvard in 1993.

1997

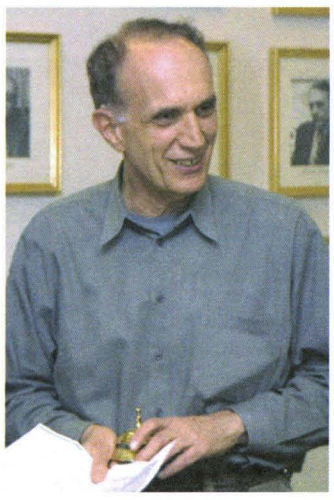
Jonathan Aldrich, an assistant professor in the Institute for Software Research (ISR) in Carnegie Mellon University's School of Computer Science, has been selected to receive the 2007 AITO (Association Internationale pour les Technologies Objets) Dahl-Nygaard Junior Prize. He is being honored for his work—considered to be groundbreaking—in object-oriented programming, the dominant programming paradigm in industry. One of the greatest challenges in industrial software development is getting the large-scale structure of programs right. With programs exceeding a million pages of code, a code accidentally introduced that is inconsistent with a system's design could cause the entire system to fail. According to Carnegie Mellon, "Aldrich is being honored for developing ArchJava, an extension of the Java programming language that encodes the high-level structure of a system inside the code and uses automated analysis tools to verify that the code is consistent with that structure. The goal of his work is to summarize the architectural design of huge software systems on a single page, then automatically ensure that all million pages of code are consistent with that summary over time." The director of Carnegie Mellon's ISR minor program in software engineering, Aldrich in 2006 received a National Science Foundation Career Award for "lightweight modeling and enforcement of architectural behavior."

1998

Eduardo Repetto, PhD, has been promoted to chief investment officer at Dimensional Fund Advisors, an asset-management company based in Santa Monica, California. Previously Dimensional's head of research, he was responsible for the design, development, and delivery of the analytics and data that guide the firm's scientific approach to investing. Prior to joining Dimensional in 2000, he was a research scientist at Caltech, and he also worked as an engineer for Simulation Technologies and for CINI and IBM in his native Argentina.

2004

Edo Berger, PhD, a postdoctoral fellow at the Observatories of the Carnegie Institution of Washington, has won the 2007 Trumpler Award for his Caltech PhD thesis, "Cosmic Explosions: The Beasts and Their Lair." The award is given annually by the Astronomical Society of the Pacific to a recent recipient of the PhD degree in North America whose research is considered unusually important to astronomy. His thesis has provided new insights into the nature of cosmic gamma-ray bursts, among nature's most spectacular explosions. They are believed to originate in the supernova explosions of very massive stars, which result in black holes.



Alum Brad Efron has received the 2005 National Medal of Science.

Medal of Science . . . from page 2

often-cited mathematical scientists, was born in St. Paul, Minnesota. After receiving his BS in mathematics from Caltech, he earned his PhD in statistics from Stanford in 1964 and joined its faculty in 1965. He is known for the invention of the bootstrap method, which has been described as "a general computer-based way of attaching plus-or-minus values to a statistical estimate (as in, for example, '57 percent of the public plus or minus 3 percent are in favor of subsidizing public utilities')."

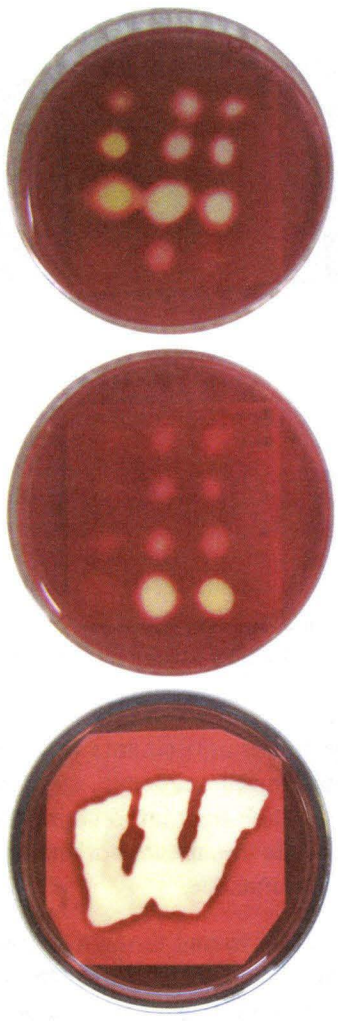
The winner of a 1983 MacArthur "genius" fellowship, Efron is also a member of the NAS, and his prizes include the Wilks Medal, the Parzen Prize, and the Rao Prize. Efron has served as president of the American Statistical Association and of the Institute of Mathematical Statistics, and as chair of Stanford's department of statistics, as well as associate dean of science, and chair of the university's faculty senate.

Efron has made important contributions to many areas of statistics, and his research has spanned both theoretical and applied topics. He is the author of a classic monograph, *The Jackknife, the Bootstrap, and Other Resampling Plans*, and has also coauthored (with R. Tibshirani) the text *An Introduction to the Bootstrap*.

It has been many years since Efron left Caltech, but his undergraduate days do seem to have spurred an early interest in qualitative statistics, to judge by a 1960 article he wrote for *E&S* entitled "Bring on the Girls!" a frequently hilarious and consistently non-PC guide to the comparative virtues of assorted L.A.–area coeds. Among its more restrained comments is the observation that "the average Scripps girl is spiritually [close] to the Tech ideal . . . she scorns the accumulation of mere facts, depending instead on flashingly incorrect insight." Interested readers can find the original piece at http://calteches.library.caltech.edu/201/01/student.pdf.

Recognition

For an up-to-date list of awards and honors bestowed recently upon Caltech faculty and staff, go to http://today.caltech.edu/today/oncampus.tcl and scroll down to Honors and Awards in the right-hand column, as well as to the Archives link in that section.



Newly minted molecules effective against MRSA leave white circles of dead bacteria among the living, red-stained ones. One of these molecules was subsequently pipetted over the colony in the form of a W in tribute to the University of Wisconsin.

Biofilms . . . from page 11

Currently, Blackwell's Wisconsin lab is one of approximately seven university labs worldwide that focus on the chemical aspects of bacterial quorum sensing. "What makes my lab's approach unique," she says, "is that we are applying novel combinatorial chemistry approaches to the discovery of nonnative quorum-sensing modulators." A technique pioneered by chemists, combinatorial chemistry enables scientists to put together hundreds of different molecular combinations quickly and cheaply by combining chemical "building blocks" in a variety of ways, then trying them out one after another on an organism to see what happens. "It's really effective for our type of research, as it accelerates the discovery process," Blackwell says.

When she embarked on her quorum-sensing work, it wasn't clear which compounds would have the ability to intercept and disrupt the appropriate bacterial signals, so Blackwell and her students designed an initial collection, called a library, of 100 or so molecules that she thought might have the desired properties, and tested them on selected bacteria to see what effect they had. After identifying a handful of molecules that showed some effect, they made another batch of compounds with similar molecular structures, and tested those. Through repeated fine-tunings, the team gradually honed in on compounds that actively interfered with bacterial quorum counting.

All this testing sounds like a lot of work, but Blackwell's group has pioneered ways to automate and speed up the process. The state-of-the-art small-molecule macroarray that they used to identify the four MRSA antagonists can assemble and screen a 100-molecule library in less than 24 hours. In this system, the compounds are built up ingredient by ingredient in an array of small dots on a planar polymeric substrate (oftentimes made from cellulose, or simple filter paper), which, if needed, can be warmed in a microwave oven to "bake" the organic reactions. The dots of molecules are then punched out with a hole punch and placed on top of bacteria growing in a Petri dish. After a few hours of incubation to let the chemicals soak into the bacteria, the dishes are rinsed with a "live-dead" stain that colors living bacteria red and dead ones white so that it's really easy to see which molecules have worked—they're the ones that leave white dots on the dish. The bigger the dot, the more toxic the chemical.

Using these screening methods and others, Blackwell and her colleagues have already found, and patented, several synthetic signaling molecules that effectively disrupt or promote cell-to-cell communication in a variety of bacteria. Interestingly, many of these molecules seem to be highly specific to a single bacterial strain, and minor changes to their chemical structures can make them effective against a different one. Each strain seems to have its own signaling words—which raises the possibility that quorum-sensing drugs will one day be able to target only the bad bacteria in a mixed biofilm community, leaving the beneficial ones untouched. That's something antibiotics have never been able to do, which is why many people cannot take them without experiencing unpleasant side effects.

While Blackwell carries out her antibacterial investigations, her husband is working with biomedical polymers and devices in the department of chemical and biological engineering on the UW campus. "We're lucky in that we've managed to move on to the same places together," she says. Blackwell also has her teaching duties at UW, and last year she received the Chancellor's Award for Distinguished Teaching, the university's highest teaching honor. "It was a big thrill to win this," she says, "because teaching is something I really enjoy doing." She's also gained a slew of other awards to help fund her research projects and, in 2005, MIT's *Technology Review* named her a TR35 Young Innovator, "one of 35 up-and-coming scientists under the age of 35."

Blackwell expects to spend the next few years making more libraries of molecules, finding out how they work against pathogenic bacteria, and honing them to be more effective. The rapid screening methods she's developed should identify many new designer compounds, although she reckons it'll be a decade or more before any of them move toward the clinic. She stresses that no "magic bullet" in the form of a super antibacterial agent is going to solve the problem of bacterial resistance. With billions of years of experience to rely on, microorganisms are simply too good at learning how to outsmart any chemicals used against them. New therapies will need to be developed all the time, simply to keep up with bacteria's ability to mutate into resistant strains. But Blackwell's upbeat about the future: "Bacteria are smart little beasts, but with continued research efforts toward new anti-infective targets—like quorum sensing and others—humans might someday get the upper hand. It will take a lot of work, but the payoff for humankind will be enormous."

Obituaries

1929
Winston J. "Bud" Olney, Ex, on May 30, 2006.

1933
Raymond Cromley, on February 23, 2007.

1934
Robert O. Boykin Jr., on December 18, 2006; **Robert A. Howard**, MS '35, on February 11, 2007; **Darrell H. Sluder**, MS '35, January 16, 2006.

1935
Charles M. Blair, PhD, on December 26, 2006.

1936
Henry J. Goodwin, MS '37, on March 14, 2007; **Robert L. Janes**, MS '44, on June 2, 2006.

1937
Frederic E. Dion, on March 21, 2007; **Eustace A. Lycett**, on November 16, 2006.

1939
Joseph Carlton, on January 10, 2007; **C. Howard Craft**, on January 13, 2007.

1940
George C. Barber, on March 4, 2007; **James B. Glassco**, on June 9, 2007; **Robert E. Wallace**, MS, PhD '46, on January 8, 2007.

1941
Sidney C. Bruce, MS, on April 17, 2005; **C. Victor Sturdevant**, MS '42, on December 24, 2006.

1942
Edward Novitski, PhD, on June 29, 2006.

1943
Paul R. Gorham, PhD, on November 9, 2006.

1944
Thomas C. Fleming, Ex, on March 9, 2007; **Winfield H. Hughes**, on January 8, 2007; **George D. McDonald**, on December 16, 2006.

1945
Harrison W. Fox, on January 7, 2007; **Leslie H. Levin**, on December 22, 2006; **Duane T. McRuer**, MS '48, on January 24, 2007; **Grant D. Sullivan**, on December 29, 2006.

Obituaries have moved online

The full Caltech News *obituaries can be found online at http://alumni.caltech.edu/network/obituaries, where readers can browse expanded content and additional biographical information about the alumni listed here.*

1946
Fletcher L. Brooks, MS, on September 13, 2006; **Keith N. Doig**, on November 24, 2003.

1947
James W. Follin Jr., PhD, on March 2, 2007; **Jean G. Goppert**, MS, on May 5, 2006; **Charles R. Hill**, MS, on April 7, 2006; **Paul C. Yankauskas**, Eng, in November 2006.

1948
Raymond V. Adams, PhD, on February 2, 2007; **Perry H. Eubank**, MS, on February 10, 2007; **Donald P. Wilkinson**, on July 18, 2006; **William L. Woodson**, MS '49, March 11, 2007.

1949
Arthur E. Bruington, MS '50, on February 3, 2007.

1951
Harry Sutcliffe, MS, on March 12, 2007.

1952
Elias A. Jarvineva, MS, on March 17, 2006.

1953
David B. Wittry, MS, PhD '57, on May 5, 2007.

1955
Leighton D. Hanon Jr., MS '58, on November 25, 2006.

1957
Frank E. Goddard Jr., PhD, on January 6, 2007.

1959
Donald J. Ketter, MS, on December 11, 1999; **James E. Potter**, on December 6, 2005.

1960
Edward H. Simon, PhD, on October 11, 2006.

1962
Peter A. Laszlo, on January 19, 2007.

1963
James S. Clovis, PhD, on November 2, 2006.

1965
Charles W. Van Atta, PhD, on February 11, 2001.

1968
Terry R. Bruns, on September 26, 2006.

1971
Allen T. Chwang, PhD, on June 13, 2007.

1974
Ronald F. Ayres, PhD '79, on January 9, 2007.

1984
Denes L. Zsolnay, on February 1, 2007.

1997
Ronald H. Stowell, on March 4, 2007.

JOHN TODD
1911–2007

John Todd, Caltech professor of mathematics, emeritus, and a pioneer in the field of numerical analysis, died on June 21 at his home in Pasadena. He was 96.

Todd's legacy and impact on modern-day mathematics can be seen in

his contributions to analysis, linear algebra, and computation. His work was a precursor to and helped shape the foundation for today's computer science field. Todd developed the first undergraduate courses at Caltech in numerical analysis and numerical algebra, fields that play a key role in scientific computing.

Born in Ireland, Todd grew up near Belfast. After earning his BSc degree from Queen's University in 1931, he went to Cambridge University for graduate studies under renowned mathematicians J. E. Littlewood and G. H. Hardy. Subsequently he went to work at King's College, London, where he soon met Olga Taussky, a Czech-born matrix and number theorist. They wed in 1938.

In 1939, when Britain declared war on Germany, Todd joined the British Admiralty, which assigned him to Portsmouth to help develop methods for degaussing—or demagnetizing—ships to keep them from being blown up by enemy torpedoes.

One of Todd's most stellar achievements was an action that led him to be called the "savior of Oberwolfach." As World War II ended, he and colleagues traveled to Germany to investigate rumors that mathematicians were being held as prisoners of war in the country's Black Forest. Instead they discovered the Mathematical Research Institute at Oberwolfach, where the University of Freiburg was protecting the mathematicians. Todd claimed the building for the British Admiralty and prevented Moroccan troops from destroying the institute and its work. In his Caltech oral history, Todd described the incident as "probably the best thing I ever did for mathematics."

In 1945, Todd returned to teaching at King's, developing a specialty in numerical analysis. In 1947, he and Olga came to the United States to help establish the National Applied Mathematical Laboratories at UCLA, part of the National Bureau of Standards. They later moved to the NBS headquarters in Washington, D.C., where they helped launch the field of high-speed computer programming and analysis and also became U.S. citizens. Todd was chief of the computation laboratory and later headed the numerical analysis section, while Olga served as a consultant.

In 1956, the couple received job offers from Caltech, which was just entering computer science. The following year, they arrived at the Institute, where Todd developed and taught courses in mathematics. As a faculty research associate, Olga Taussky-Todd also broke new ground, becoming the first woman to receive a formal Caltech teaching appointment, and, in 1971, a full professorship. She remained active in research until her death in 1995.

"It was a terrific day for the mathematics department when we succeeded in attracting Jack and Olga to come to Caltech," said Gary Lorden, professor of mathematics.

"Not only did we gain eminent scholars, but wonderful colleagues and teachers. They made a remarkably generous commitment to the future of Caltech and the mathematics department, and their legacy also includes the inspiring stories of their lives and careers. These two remarkable people will always be remembered with great affection and regard by mathematicians and the Caltech community."

HOMER STEWART
1915–2007

Homer Stewart, PhD '40, an early pioneer of rocket research who helped develop Explorer I, America's first satellite, died May 26 at his home in Altadena. He was 91.

A native of Dubuque, Iowa, Stewart came to the Institute for graduate study in 1936 and became interested in the early pioneering rocket research being carried out by a small group of Caltech engineers and scientists, including Theodore von Kármán. He, von Kármán, and others began testing rockets in a rugged foothill area of the San Gabriel Mountains about five miles northeast of the Pasadena campus, thereby forming the nucleus of the research group that would one day evolve into JPL.

In 1938, Stewart joined the Caltech faculty, teaching both aeronautics and meteorology; but for many years he divided his time between his faculty duties and research at JPL. As chief of the Lab's research analysis section, he participated in many rocket projects, including the WAC Corporal, the Corporal, the Sergeant, and the Jupiter C. He was chief of JPL's liquid propulsion systems division when JPL and the Army Ballistic Missile Agency (now the Marshall Space Flight Center)

developed and launched Explorer I.

His research interests included rocket exhaust velocity requirements for maintaining the exact trajectories of spacecraft. He also investigated wind-driven energy, and he used his knowledge of fluid flow to collaborate with von Kármán in constructing a turbine in the mountains of Vermont in the late 1930s. The machine generated up to a megawatt of power and was in operation through World War II in cooperation with a local electrical company. The project was abandoned after the war, in part because of the availability of cheap fossil-fuel energy.

Stewart, who retired from Caltech as professor of aeronautics, emeritus, in 1980, is survived by two daughters, Barbara Mogel of Chesapeake Beach, Maryland, and Kay Stewart of San Diego; a son, Dr. Robert J. Stewart of Burien, Washington; and two grandchildren.

BANDS OF LIGHT

On a balmy summer evening, Beckman Auditorium, which a few weeks earlier had provided the stately backdrop for Caltech's commencement/presidential inauguration ceremony, was transformed into a wedding-cake version of the Hollywood Bowl when the New York City band Mango Blue performed its highly original mix of salsa, funk, folklore, and jazz before an appreciative audience. The free public concert, organized by Caltech Public Events and sponsored by the Caltech Employees Federal Credit Union, was the first of two "Dance Under the Stars" campus evenings. In our photomontage, however, the "stars" sparkling in the night sky are actually galaxies belonging to the Abell 2667 cluster, which was recently imaged by the Spitzer Space Telescope, managed by the Caltech/JPL Spitzer Science Center. If the galaxies look more diffuse than in the original image (which can be seen at http://gallery.spitzer.caltech.edu/Imagegallery/image.php?image_name=sig07-004), that's because they've been treated with a noise-reduction filter in case Mango Blue's lively music didn't fire them up. (Mozart's "Eine Kleine Nachtmusik" is probably more suitable.)

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