California Institute of Technology
Pasadena, California 91125

Change service requested

CaltechNews

Volume 32, Number 2
1998

In This Issue

California Institute
of Technology

Volume 32, Number 2
1998

CaltechNews

ON THE COVER:
A Ditch Day "Legend of Zelda" stack, based on a popular sword-and-sorcery video game, had participants testing their mettle in such events as a shopping-cart race. Sporting adventurers' hats are, from left, undergraduates Mike Fisher, Max Kullberg, and Brett Tolman.

Picture Credits: Cover, 2–5,7,13–17,19-Robert Paz; 2,6-Hillary Bhaskaran; 2,12,13,15-Judith Amis; 5,10,11-Ryan Poquette; 6,7-George Jackson; 7-Wheeler North; 8,9-Heidi Aspaturian; 12,13-Arlana Bostrom and Rebecca Rothenberg; 14-Tom Matthews Photography

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.

Visit Caltech on the Web at http://www.caltech.edu

Up Front

BACK TO SCHOOL: CALTECH'S FIRST ALUMNI COLLEGE ATTRACTS FRESH CROP OF "STUDENTS"

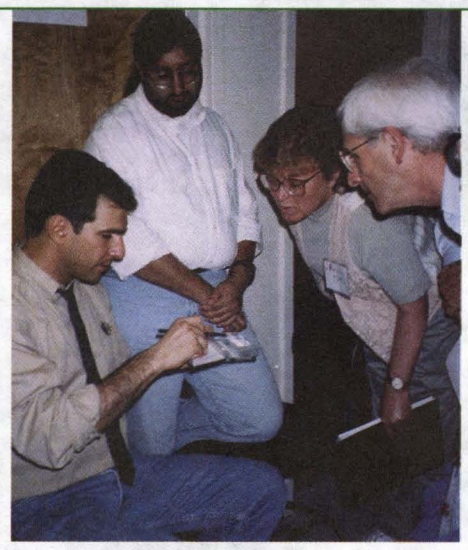
No sooner had the class of '98 cleared out following commencement than Caltech alumni and friends descended on the campus to fill vacated classrooms and line up to view laboratories. (The latter were still full of grad and SURF students and professors, all of whom share the alums' definition of "summer" as "a time to learn *more*.")

As participants in the first Caltech Alumni College, held June 19 and 20, these notebook-toting nontraditional students gave full attention to Caltech professors during two days filled with lectures, question-and-answer periods, and lab tours. In between, there were ample breaks and leisurely meals, all of them seasoned by discussion that sounded suspiciously like the Q&A periods. This is what Caltech alumni crave—it's quantifiably proven.

In a 1996 survey that canvassed 800 representative alumni nationwide, more than half of those surveyed cited "continued learning" as a reason for participating in alumni activities. The Alumni Relations Task Force, which had commissioned the survey, responded by recommending continuing-education and career-support programs, and the idea for the Alumni College was born. A continuing-education committee led by Fred Eisen '51 fleshed out the idea with Alumni Association staff, resulting in this year's pilot program—a two-day "short course" on a single topic of outstanding interest.

This year's topic was biology, focusing on "The Biological Revolution: Biology in the New Millennium." Buoyed by the success of the trial run, the organizers are planning a similar foray into astronomy on June 25 and 26, 1999.

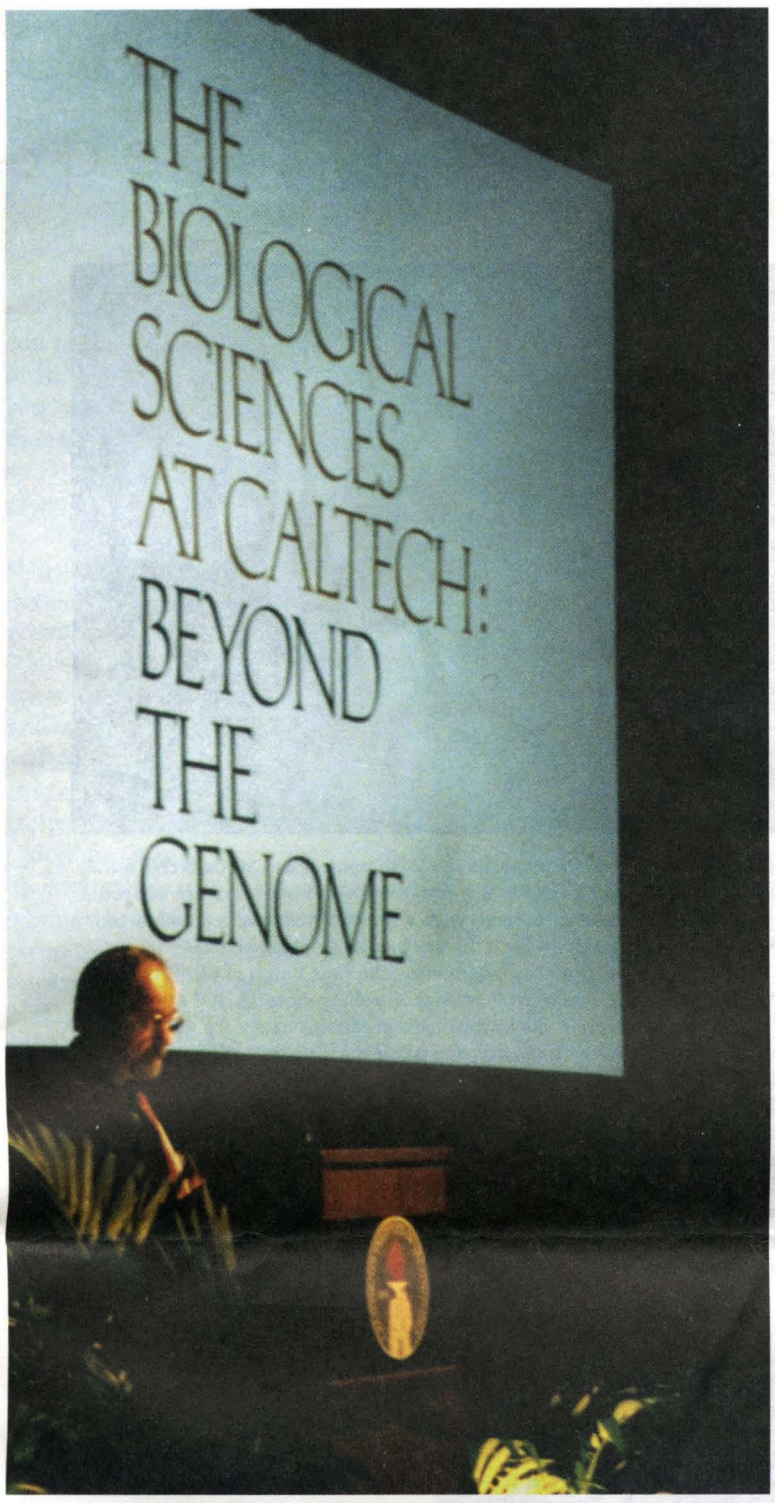
The nontraditional class of '98 learned how cells copy and distribute genetic information to proliferate and to form complex multicellular organisms. They saw examples of how this process is regulated, what happens when it goes awry, and how scientists strive to understand and manipulate it. In their lectures, professors led participants from a thorough review of biological basics to visions of biological research in the coming century. And one afternoon they led groups through their labs, where grad students spoke eloquently about their work. Keeping the mood lighthearted for the summer scholars, the professors engaged in collegial bantering, and everyone, even the grad students, argued the superiority of their chosen model.



From left, graduate students John Pezaris and Maneesh Sahani '93 show an electrode capable of multicellular neural recording to Ruth Logan, MS '69, and Barrie Logan, PhD '69, during a tour of Richard Andersen's lab.

Referring to a previous lecture, Professor Elliot Meyerowitz poked fun at Assistant Professor Ray Deshaies's model of choice. Although baker's yeast might be a perfect model to illustrate the complexity of cellular mechanisms, said Meyerowitz, "all it does is make a glass of beer." *He* would talk about the development of complex organisms, offering as one example human beings, "which can drink that glass of beer." But Meyerowitz soon focused his talk on his favorite model: flowers. "Why study flowers? Mostly because we like 'em." But also, Meyerowitz finds that his flower of

Continued on page 15. . .



Caltech President David Baltimore (left) communicates the Institute's goal of revolutionary advancement in the biological sciences and the means toward that end: the Biological Sciences Initiative. Cochairs of the campaign, Camilla Chandler Frost (at left in bottom photo) and Ben Rosen (right) have joined the cause in more ways than one, and here join Mary Johnson (center), who served on the Biological Sciences Advisory Council.

Caltech launches Biological Sciences Initiative

Trustees Frost and Rosen to lead effort

By Michael Rogers

Seventy years after Caltech established its biology division and began making discoveries and developing technologies that continue to shape the course of biology today, the Institute has announced a $100 million fund-raising effort to significantly expand its investigations in the biological sciences. Thanks in part to gifts of $5 million each from trustees Camilla Chandler Frost and Ben Rosen '54, the initiative has already achieved nearly 40 percent of its goal. The objectives of the campaign—called Beyond the Genome, the Biological Sciences Initiative at Caltech—include construction of a new building, funds to hire some dozen new faculty in the biological sciences, additional fellowships for graduate students and postdocs, and other capital projects and programs.

Rosen, vice chair of the Board of Trustees, and Frost are also cochairs of the campaign, which will run through the end of the year 2000. The aim of the initiative is to give Caltech the resources to make discoveries that will lead to new insights into how living beings are assembled and function and why they malfunction.

"Our Biological Sciences Initiative will both bring a deeper understanding of biology and provide leads toward curing the many diseases that still plague the human race," said Caltech president David Baltimore at a recent dinner celebrating the history of the biology division and its scientists, including its first chairman, Thomas Hunt Morgan, who identified the gene as a specific entity with a fixed location on a chromosome—an insight that has been central to all subsequent work in genetics.

"Caltech's biological heritage gives us a powerful advantage," added Baltimore. "The Biological Sciences Initiative will position us to play an influential role in the emerging, global, post-genomic era of biology. It will not only allow great advances in basic biology, it will support our scientists in designing therapies and fashioning cures that were once thought impossible. An investment in the BSI will allow us to participate fully in the revolutionary advances of the next decades as the power of genomic science becomes a reality."

The heart of the campaign is a $42 million building that will be located in the northwest part of campus. Expected to reach completion in the year 2000, it will house the 10 to 12 new faculty members who will join the Institute during the first decade of the next century. The building will include a new lecture hall for graduate and undergraduate courses, as well as a seminar room, and will be the site of three new research facilities.

One of these new facilities—a mammalian genetics center—will develop mouse models to investigate human genetic diseases and behavior. Another research facility—an imaging center—will feature powerful new magnetic resonance imagers that, for the first time, will give Caltech the capability to noninvasively view the brains of large mammals, including monkeys and humans, in an attempt to illuminate the relationship between brain-cell activity and behavior. The third facility—a biomolecular structures laboratory—will house state-of-the-art electron microscopes, allowing researchers to determine the structures of parts of cells, such as ribosomes—the biological nanomachines that help to build proteins.

Many of the new faculty members will be working in disciplines that are just now taking shape, according to Mel Simon, chair of the Division of Biology and the Anne P. and Benjamin F. Biaggini Professor of Biological Sciences. These disciplines will likely include computational molecular biology, in which scientists try, using computer modeling and theory, to determine how complex biological systems work; and geobiology, in which people trained in both geology and biology work to understand how the interplay of geologic and biological phenomena have affected the evolution of the earth and the life upon it, as well as the possibilities for life elsewhere in the universe.

One of Caltech's traditional strengths has been its interdisciplinary approach to conducting science. That emphasis will be a hallmark of the Biological Sciences Initiative, said Simon. "We have physical chemists, biologists, physicists, engineers, and social scientists all getting together to answer fundamental biological questions," he said. "We'll be approaching questions of biological function by integrating descriptive, physiological approaches as well as through molecular and biochemical approaches."

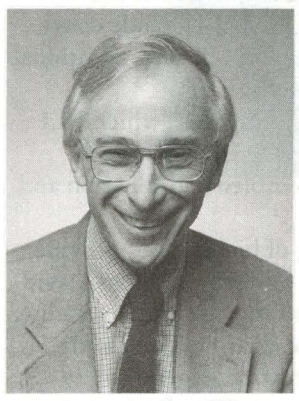
As new faculty members are hired, Caltech also plans to increase the number of postdocs and graduate students in the biological sciences. Simon estimates that the number of postdocs and graduate

Continued on page 16 . . .

Campus Update

TOMBRELLO TO CHAIR PMA DIVISION

"It's not exactly a piece of cake," says Thomas Tombrello of his recent appointment as chair of the Division of Physics, Mathematics and Astronomy. Tombrello, the William R. Kenan, Jr., Professor and professor of physics, was appointed by the Caltech board of trustees effective August 1.



Thomas Tombrello

The professor comes prepared for the upcoming challenges, having served as vice president and director of research at Schlumberger-Doll Research from 1987 to 1989. As for his long tenure on the Institute faculty since he arrived with his three diplomas from Rice University in 1961, Tombrello says the challenges of teaching and research are quite different from those of administration. "Instead of just being responsible for one's own research group," he says, "you're responsible for the needs of many research groups run by other people." He notes just how far-reaching the PMA research network is by mentioning such off-site locations as the Palomar, Owens Valley, Keck, and LIGO observatories. "I'll need to be the person who helps them get the attention of the Caltech administration."

Tombrello says that his immediate goals will be to strengthen the division's efforts in theoretical physics, mathematics, and observational astronomy by adding faculty members in order to redress the decrease that has occurred in the last decade.

In his own research, Tombrello and his group have primarily been involved in applying the techniques of theoretical and experimental physics to problems in materials science, surface physics, and planetary science. He seeks to understand the damage processes caused by megavolt ions in solids, to characterize the sputtering of materials by low-energy ions, and to grow and characterize novel light-emitting materials.

Welcoming Tombrello to his new post, President David Baltimore said, "Tom Tombrello has demonstrated remarkable abilities in both research and administration through the years. Not only does he pursue a huge variety of interests, but he is also equally at home with basic and applied research."

Tombrello the teacher has also received rave reviews. In 1994 he was awarded the first Richard P. Feynman Prize for Excellence in Teaching. The selection committee made particular note of two innovative physics courses that he introduced into the undergraduate curriculum: a seminar class entitled "Frontiers in Physics" and a course called "Research Topics in Physics" in which freshmen and sophomores design and carry out original research projects.

SURFERS HANG TWENTY: This summer marks the 20th anniversary of Caltech's SURF (Summer Undergraduate Research Fellowship) program, where students are offered the opportunity to do independent research with a mentor—usually a member of the Caltech/JPL research community—for a 10-week period during the summer. Although the SURF program had humble beginnings (the first batch of SURFers totaled only 18), today SURF is stronger than ever, enrolling close to 300 students each summer. In fact, the majority of Caltech undergraduates apply for at least one SURF while they're students at the Institute, and some participants publish their results in scientific journals. Effective science communication is another goal for SURF, and at Caltech's 61st Annual Seminar Day in May, attendees had the opportunity to hear talks by the three winners of the Doris S. Perpall SURF Speaking Award, given for excellent oral presentation of summer research results. Above, from left to right: Kartik Srinivasan, a sophomore in applied physics, talked about problems in the coatings of LIGO (Laser Interferometer Gravitational-Wave Observatory) optics; Keri Ryan, a graduating senior in civil engineering, discussed near-source ground motions in earthquakes; and David Tytell, a junior in planetary science, talked about the causes of elliptical cratering on Mars.

CORPORATE DONORS ANNOUNCE NEW GIFTS TO SUPPORT INSTITUTE PROGRAMS

Three longtime corporate donors to Caltech have announced new gifts totaling $400,000 to support an array of research fellowships, scholarships, seminars, and a student design contest.

The Dow Chemical Company Foundation, based in Midland, Michigan, will again fund its Graduate Research Fellowships and Seminar Series. The fellowships, for two graduate students in Chemistry and Chemical Engineering, will provide $75,000 each year for three years, while the Seminar Series grants will underwrite three annual seminars in those same fields at $10,000 each, for a total commitment by the foundation of $255,000 over three years.

In addition to the graduate fellowships, the Dow Foundation is again sponsoring the Materials Research Lecture Series, which presents recent advances in the synthesis, structure, and performance of materials. The weekly seminar program, in its third consecutive year, brings together the diverse Caltech communities engaged in materials research, and will be organized by the divisions of Engineering and Applied Science, Chemistry and Chemical Engineering, and Geological and Planetary Sciences.

Continued support is also forthcoming from the TRW Foundation of Cleveland, Ohio. The foundation's current grant of $45,000 will fund two research projects headed by Demetri Psaltis, the Thomas G. Myers Professor of Electrical Engineering, who is also director of the Center for Neuromorphic Systems Engineering, and Professor of Physics Michael Roukes.

Finally, a grant from Applied Materials, a semiconductor-wafer fabrication equipment manufacturer in Santa Clara, California, will provide $100,000 to support scholarships in applied physics and chemistry and chemical engineering, two SURF sponsorships, and a Minority Affairs scholarship. The award will also support the Institute's annual mechanical engineering design contest and an applied physics/material science laboratory course.

PARENT THAT TAKES CARE OF OFFSPRING TENDS TO OUTLIVE THE OTHER PARENT, STUDY SHOWS

The parent who stays home to take care of the kids may be getting a good deal healthwise. New primate research from Caltech shows that a primary caregiver tends to live longer than the other parent.

In a statistical study of ten primate species, including humans, apes, and various Old and New World monkeys, Caltech researchers show that the parent that cares for the offspring is significantly longer lived than the mate, regardless of gender. Titi monkey males of South America, for example, which take care of the baby after the mother has given birth, outlive their mates by 20 percent.

"The numbers show that if there is a difference in role, the sex doing the bulk of the care is likely to survive longer," says the study's lead author, John Allman, Hixon Professor of Psychobiology and professor of biology.

"This follows from the fact that it takes a lot of energy to raise a big-brained offspring like a human or an ape or a monkey," he adds. "The sex not caring for the infants will not be as crucial for the survival of the species."

The size of the brain is the key, Allman says. Species with big brains mature slowly and have only one baby at time, and these babies depend on their parents for a long time.

"Big brains are very expensive," Allman says. "They are costly in terms of time, energy and anatomical complexity. This reduces the reproductive potential of the parents because extra-special care must be provided to insure that this reduced number survive to reproductive age."

In an article appearing in the current issue of the journal *Proceedings of the National Academy of Science*, Allman and his coauthors outline their data from the ten species of primates. To determine the lifespans of males and females that have borne offspring, the researchers analyzed the data from zoo populations, field studies, laboratory research, and human historical and demographic documents.

The researchers were especially interested in reviewing field studies as well as zoo data to ensure that artificial effects were not skewing the data. However there are also data from natural populations of primates that support this hypothesis.

"Female gorillas, orangutans, and chimpanzees have a proportionally larger survival advantage than human females," Allman says. But the advantage of female gorillas is not so pronounced, and this could very well have to do with the fact that male gorillas play with their offspring and take on certain other nurturing duties.

Continued on page 16 . . .

Caltech's 104th Commencement Had Spectators Reaching for Umbrellas . . .

"This is some television advice. If you're going to get a bucket of water in the face, untuck your shirt. Now, you wouldn't think it would make that much difference. But a starched shirt under your lab coat can direct a great deal of water past your belly."

This was one of the many suggestions that commencement speaker Bill Nye—host of the popular, Emmy Award–winning, kids' science television show, *Disney Presents Bill Nye the Science Guy*—offered to this year's graduates on the morning of June 12.

It was also the one piece of advice that came in handy almost immediately, as the hot, sunny skies that appeared for part of Nye's speech filled up with menacing storm clouds, which then broke open during the second half of the ceremony, dumping buckets of water on the crowd.

The more than 500 assembled graduates—including 219 bachelor's degree candidates, 121 master's, 1 engineer's, and 191 doctor's—had obviously paid attention three years ago when it rained at commencement, and this time nearly everybody had an umbrella (photo, right).

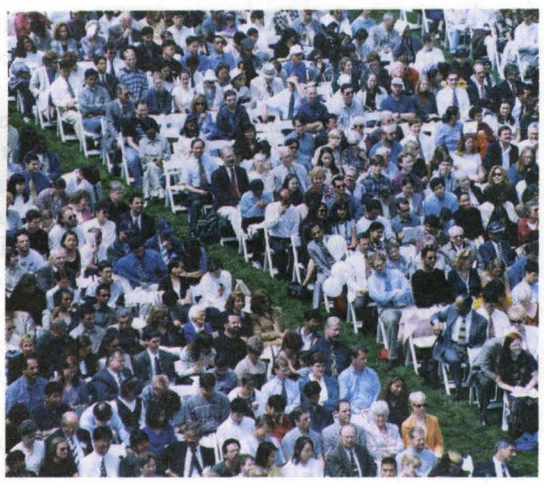
Nye offered some non-water-related advice as well, such as working to implement the everyday use of metric units as a strategy for greater economic growth, and the importance of voting. "My feeling is people who don't vote should at least shut up," said Nye.

He also gave a few tips for being more successful in the working world, including never writing a memo that's more than one page, learning from others on the job, and getting things right at the design stage of a project—instead of wasting time and resources later on.

On a more serious note, Nye asked his listeners to consider how the world itself might become more successful. Citing overpopulation, global climate change, and the destruction of biodiversity as the three key challenges, he offered a possible solution to the first of these problems. "Now, the most effective thing seems to be raising the standard of living, especially for women. And that is going to be your biggest challenge in the next century."

Umbrella brigade: Unlike commencement three years ago, when the bookstore sold more than 120 umbrellas, this year's troops were prepared for the skirmish with El Niño.

. . . and Sunscreen



The first half of the ceremony the skies above Beckman Mall produced both hot sun and chilly overcast, the latter forecasting the rain that was to come.

In the face of such dilemmas, Nye then asked, "why dabble in understanding the universe? Why study science? Well, it's fun, for one thing. And it's also, I think, the key to our future. It's how our species came to be such a tough competitor on this planet. We figure things out. We're *passionate* about it. And that, my friends, is the key. We pursue our passions, but of course, we keep thinking clearly, we're scientists. It's what makes discoveries happen. . . .

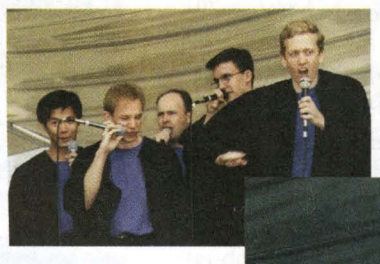
"Here we are, this humble, sometimes pitiful, proud little species on this remote, medium-sized, soaking-wet planet, in the middle of galactic nowhere. A speck in almost inconceivably vast and astonishingly empty space, and yet, we can figure things out. We can come to know a little of the universe's secrets. It's worthy of respect. It's worthy of excitement."

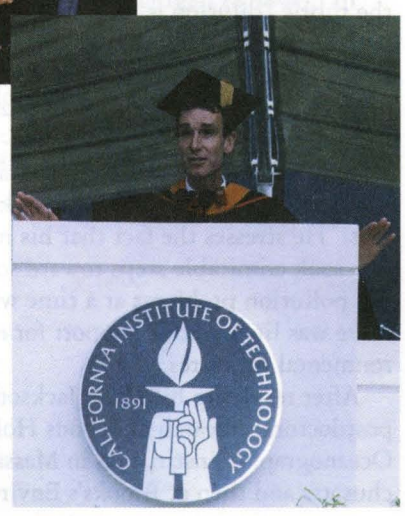
Nye offered one last piece of advice to the graduates. "There's an old expression, something my dad used to say, 'keep your shirt on, keep your shirt on, keep your shirt on.' It's good advice. But I can tell ya, there are times when it is best to keep it on, and times when it's best to let that shirttail go, *untucked.*"

And this seems to be a man who takes his own advice. Rumor has it that Nye untucked his own shirt later on in the day, presumably to downplay the effects of the downpour.

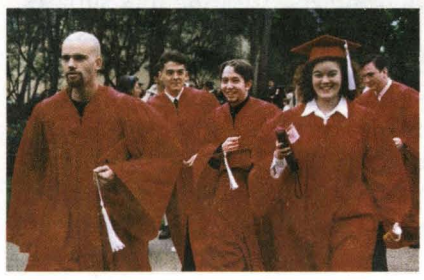
For more commencement coverage, including a video of the ceremony, check out Caltech's Web site at http://www.caltech.edu/~media/commence/index.html.

Bill Nye the Science Guy AND The 1998 Graduates





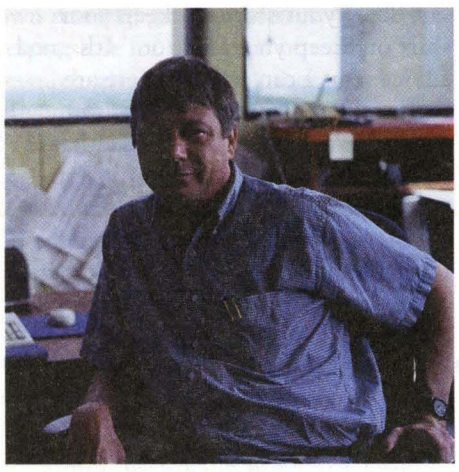
Science Guy inspires students, song, and even a stack: Nye (shown at podium, below right) made quite an impression on Caltech, above and beyond his suggestions to the graduates. He also inspired Ecphonema, Caltech's men's a cappella group—composed of graduates, current students, and post-docs—to offer a tribute (top photo) in the form of a live version of the sound-effects-heavy introduction to Nye's television show. Finally, Caltech's commencement speaker was the inspiration for "Bill Nye the Science Stack," where Ditch Day participants had to rescue Nye from terrorist kidnappers. The bow-tied Nye had the opportunity to meet the stack's creators at the Alumni Association reception before the senior banquet (left).



Student activities: As part of the "Slices of Caltech Student Life" precommencement program introduced three years ago, parents had the opportunity to tour Ditch Day stacks, listen to SURF award winners, learn about the ME 72 design contest, listen to a student concert, and partake of many food offerings, among other activities. But, in the end, it's the commencement ceremony itself that will remain indelibly in the minds of students and parents. So, here are some snapshots of the guests of honor, clockwise from bottom left: Fleming House graduates troop to the ceremony in their traditional red gowns; a master's candidate reflects on life in sunny Pasadena; a graduate bares his choice of footwear; a man and his bear ponder their accomplishments; and a senior bids a festive, flower-filled farewell.

More "Campus Update" on page 7

The Accidental Oceanographer



George Jackson '69, PhD '76, has settled down in College Station, Texas, to take a long, hard look at ocean dynamics.

By Hillary Bhaskaran

One month after George Jackson received his first degree from Caltech, Neil Armstrong walked on the moon. Like so many budding scientists of the time, Jackson was watching and permanently etching the moment into his memory. While at the time he was seeking a practical application for his physics education, he looked not up to the skies but into the deep waters below.

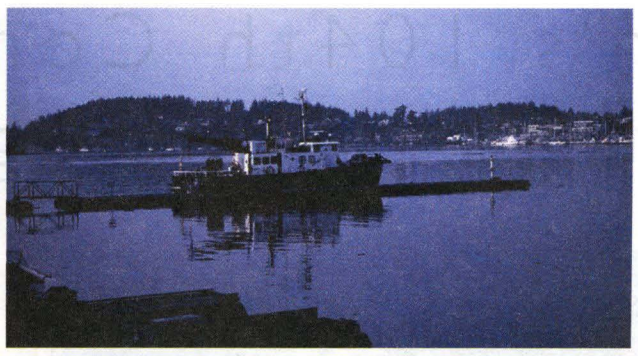
He watched the historic event from the deck of Arnold Beckman's sailboat along with other Techers and professors, including electrical engineer Floyd Humphrey, who had the transistor TV essential for the occasion. Such Pacific Coast outings were among the unofficial perks of attending Caltech in the sixties and seventies and galvanized Jackson's longtime interest in the ocean.

It was in these same waters that he had taken the plunge that launched his career in oceanography. He had come to Pasadena from San Antonio, Texas, to major in physics because, as he puts it, "physics is real science." His plan was to do graduate studies in physics at the University of Maryland so as to tackle the mysteries of gravity waves. But his undergraduate experiences had already begun to make waves in Jackson's carefully laid plans.

He had jumped into the Pacific Ocean and liked what he saw. Sea urchins? Well, those he could do without. So could Wheeler North, then associate professor of environmental health engineering, who was trying to restore kelp beds to offshore areas. In these areas, off the coast of Palos Verdes and Point Loma in Southern California, sewage outfalls, El Niños, and ravenous sea urchins had destroyed the kelp beds by the mid 1960s.

In 1967 Jackson saw an ad North had placed in the *California Tech* calling for students who wanted to spend their summer diving and get paid for it. Although Jackson was by his own admission wrapped up in "the macho image of physics" (intellectually speaking), he wasn't above getting his hands dirty, or wet, in the name of science. He had taken a diving class in New Orleans once, and now he'd get the chance to put what he'd learned into practice.

Scuba diving. Killing sea urchins with hammers. Clearing rock surfaces to provide a foothold for the lines of kelp that North's team lowered into the 30-foot, 65-degree waters. The hard, sometimes exhausting work didn't deter Jackson, who participated in North's Kelp Habitat Improvement Project throughout the year and signed on for another summer of diving. He



A research vessel in Friday Harbor, Washington, gives Jackson a chance to collect in situ data needed for his mathematical models.

discovered that he liked the idea of working in a smaller field, one that was "less heavily plowed" than physics, one where he could make a greater impact. He liked the ocean-going types that he was working with at a small school like Caltech. But there was one problem: Caltech didn't have an oceanography department.

So Jackson decided to do graduate work in the Institute's environmental engineering department, working primarily with North and Jim Morgan, a water chemist. In the process, he took full advantage of Caltech's small size and the accessibility of faculty members across disciplines. He cast his net wide and came into contact with such luminaries as professors Heinz Lowenstam, a paleoecologist; Sheldon Friedlander, who studied the effects of aerosol on smog; Jack McKee, an early mover in water quality research; and Norman Brooks, the resident guru of sewage discharge theory.

In fact many of Jackson's mentors could be considered early environmentalists. They were working with industries and government agencies to dispose of toxins in ways that would minimize health hazards. For instance, Brooks encouraged the mixing of sewage with the deeper, colder ocean waters below the thermocline, to keep it away from the more buoyant upper layer of warm water where people swim. Here, DDT, trace metals, and other particles could settle to the ocean floor and reconstitute themselves there, a process that Jackson learned to model mathematically.

Since 1989, Jackson has created models of particle interaction and settling, plotting the size of particles against the probability that they will collide and aggregate into larger particles in a process called coagulation, enhancing settling. In general, as particles join and form larger particles, more settling occurs, especially in richer surface waters where plant growth provides ample particles to fuel the process.

In the early days, when Jackson was helping Brooks find ways to safely dispose of sewage, scientists followed the rubric "dilution is the solution to pollution." This solution would eventually give way to more interventionist disposal techniques as people realized the deleterious effects of such compounds as DDT, especially in contained bodies of water like Lake Erie, Jackson says. He stresses the fact that his mentors took admirable steps toward solving pollution problems at a time when there was little public support for environmental measures.

After receiving his PhD, Jackson did postdoctoral research at Woods Hole Oceanographic Institution in Massachusetts and then at Brooks's Environmental Quality Lab back at Caltech. For the next 10 years he returned to his kelp-bed studies as a researcher and oceanographer at Scripps Institution of Oceanography in La Jolla, California. It was at Scripps that he met his wife, Ellen Toby, then a lab technician who learned to dive as well, later earning her PhD in math.

The kelp beds that Jackson dove in and studied have both ecological and economic value, he explains. They serve as a habitat for marine life—which has the side benefit of improving the scenery for divers—and they can be harvested for the chemical extract alginic acid, a thickening ingredient used in salad dressing, beer, and ice cream—"the cheap stuff that often replaces the cream."

The once-ravaged kelp beds have been successfully restored to Southern California coastal areas, including the Palos Verdes and Point Loma environs. They can be found in regions where cold water plumes result from upwelling, a process understood in terms of fluid dynamics. As part of this process, the drag on the ocean from an equatorward wind blowing along the California coast interacts with the earth's rotation to push the warm surface water offshore. Cold, nutrient-rich water rushes up from deeper regions to fill the gap, providing the conditions needed for kelp growth.

Abandoning his "soft money" position at Scripps in 1989, Jackson found a tenure-track position where he could stand on solid ground. In fact he was on such solid ground that there was not a beach or a bay to be seen for miles around, even from his vantage point on the seventh floor of Texas A&M University's impressive oceanography building. Without a shoreline or any surrounding landscape features to speak of, the 14-floor building itself is arguably the most noticeable landmark in College Station, where Texas A&M is located. (Even the newly christened George Bush Presidential Library, adjacent to the campus, is less conspicuous.)

But this oceanographer-against-all-odds doesn't even have to see water to do much of his work these days. It's true that over the years Jackson has made excursions to Puget Sound and Florida Bay to compile data for modeling studies. And outside of work, he and his wife have gone diving in the Yucatan.

However, College Station serves the oceanography professor well for his latest research: modeling the movement of carbon from the upper to lower layers of ocean water. The nutrient carbon is taken in by plants—Jackson particularly studies the one-celled plants called phytoplankton—which remove the carbon from the upper layers of water as they die and sink. Subsequent decomposition releases the carbon and allows it to drift up to the surface again. Using equations that describe the relationships between

sediment size and interaction over time, and factoring in oceanic conditions like temperature gradients and upwelling, Jackson is beginning to build mathematical models to chart the behavior of carbon in the water. A better understanding of this process should contribute to other scientists' models of global climate change, since theories purporting global warming, for instance, must account for the dynamical interchange between carbon dioxide in the air and water.

When modeling such processes, Jackson combines the theoretical knowledge he gained at Caltech with the practical oceanographic experience he has picked up throughout his career. "The environmental engineering and oceanographic communities complement each other," he says, "but they have little to do with each other. Environmental engineers build theories that they test in labs, and they study fluid mechanics, but they do not tend to test their predictions in the environment. The oceanographers' strengths are in making measurements and observations, but they don't work over the data as thoroughly as they could. I try to walk the line and approach problems by applying physical science concepts to oceanographic situations."

One example of Jackson walking the line between two fields is his study of carbon movement in the oceans. In order to model the process, Jackson has a ton of data to "work over," and the task at hand brings a colorful analogy to his mind. Recently, a lot of money has been pouring into the effort of gathering all sorts of data to determine whether global warming is occurring and, if so, at what rate. But until the details and the mechanisms of interchange are better understood, Jackson is skeptical about how much we will actually learn from all this data.

"It's like a big parade where the elephants and the horses have gone by. The modelers are the guys with the shovels who come along at the end." Luckily his Caltech education prepared him for just this sort of dirty work.

Top photo: Sea urchins attack the base of a kelp plant. Below: A fellow oceanographer deploys a current meter.

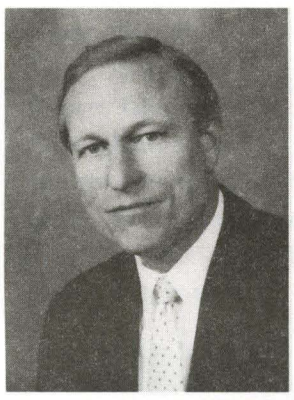
Campus Update

Continued from page 5 . . .

Ronald Olson elected to Caltech board

Caltech has announced the election of Ronald L. Olson to its board of trustees.

A senior partner at Munger, Tolles & Olson in Los Angeles, Olson specializes in commercial litigation, including antitrust and securities law, commercial contracts, and business torts, representing such clients as Merrill Lynch, Shell Oil, Universal Studios, and Southern California Edison. Besides his corporate clients, he counsels individual executives and boards of directors on a wide range of matters, including corporate governance. A leading advocate of mediation, Olson was chairman of the American Bar Association's alternative dispute resolution committee from 1976 to 1986. He regularly provides pro bono services for a variety of community organizations, including the Skid Row Housing Trust in Los Angeles.



Ron Olson

Olson sits on the board of directors of several organizations, including the financial holding company Berkshire Hathaway, the utility giant Edison International, the RAND Corporation, and the World Resources Institute, an environmental group based in Washington, D.C. From 1984 to 1994, he was chairman of the Claremont University Center and Graduate School board of trustees, of which he remains a member. He is currently Chairman of the RAND Corporation Institute for Civil Justice and the USC Annenberg School for Communication.

Olson received his BS in 1963 from Drake University and his JD from the University of Michigan in 1966. In 1967, he received a diploma in law from Oxford University, which he attended on a Ford Foundation fellowship. He and his wife, Jane, live in Pasadena.

Caltech, Huntington Library form new Library Humanities Committee

The Caltech-Huntington Committee for the Humanities (CHCH) has been formed to sponsor and support collaborative work between Institute faculty in the humanities and the curators and other scholars at the Huntington Library in San Marino. The committee, which is made up of faculty members from the Division of the Humanities and Social Sciences at Caltech and curators from the Rare Books, Manuscripts, and Art Divisions of the Huntington, was started through the efforts of Robert Ritchie, the W. M. Foundation Director of Research at the Huntington, and John Ledyard, who chairs humanities and social sciences at Caltech.

According to Caltech Associate Professor of History Bill Deverell, who will co-chair the CHCH with Caltech colleague Associate Professor of Literature Kevin Gilmartin, "The CHCH is designed to further the collaborative relationship between Caltech and the Huntington Library, a relationship that dates back to the founding of both institutions. The committee will sponsor seminars and symposia, support opportunities for Caltech faculty and Huntington curators to introduce Caltech students to the Huntington's art, manuscript, and rare-book collections, and work to further the ties between the two institutions in terms of coordinating talks, visitors, and events."

Upcoming events with which the CHCH is affiliated include an international symposium at the Huntington in January 1999 on the topic of "Romantic Metropolis"; a research project examining the environmental history of American rivers; and an undergraduate history course at Caltech on the history of American art.

In addition to Deverell, Gilmartin, Ledyard, and Ritchie (the latter two are serving as ex officio members), participants include, from Caltech, Warren Brown, assistant professor of history; Phil Hoffman, professor of history and social science and executive officer for the humanities; Cathy Jurca, assistant professor of literature; Cindy Weinstein, associate professor of literature; and Alison Winter, assistant professor of history. Huntington Library members are Shelley Bennett, curator of British art; Peter Blodgett and William Frank, both curators of Western Americana; Alan Jutzi, chief curator of rare books; Amy Meyers, curator of American art; and Mary Robertson, the William A. Moffett Chief Curator of Manuscripts. The CHCH steering committee is made up of Deverell, Gilmartin, Meyers, Jutzi, and Brown.

New Watson Fellow to travel abroad

Jeanne Wilson '98 has been selected as one of 60 Watson Fellows nationwide. Having graduated in biology in June, this fall she'll begin a 12-month project to study "Conservation Strategies in World Botanical Gardens." She will travel to three countries, doing field work and research at the Royal Botanic Gardens in Kew, England, the National Botanical Institute at Kirstenbosch in Cape Town, South Africa, and the Royal Botanic Gardens in Sydney, Australia.

As a student, Wilson did research in plant genetics with Caltech professor Elliot Meyerowitz, and she interned at the Huntington Botanical Gardens in San Marino.

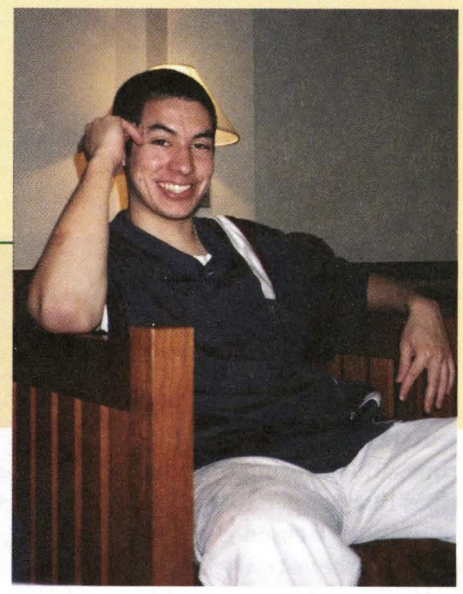
The Watson Fellowship Program was begun by the children of Thomas J. Watson, Sr., the founder of IBM, and his wife, Jeannette K. Watson, to honor their parents' long-standing interest in education and world affairs. The foundation selects Watson Fellows based on each nominee's character, academic record, leadership potential, and willingness to delve into another culture, as well as the personal significance of the proposed project.

Beckman honored for outstanding service to education

Caltech Trustee Chair Emeritus and Life Trustee Arnold Beckman, PhD '28, has been awarded the 1998 James L. Fisher Award for Distinguished Service to higher education. Presented for more than four decades by the Council for Advancement and Support of Education (CASE), the award honors extraordinary service to education of national or international significance. This year's other recipient is Georgia governor Zell Miller. Past recipients have included Notre Dame's president, Father Theodore Hesburgh; the United Negro College Fund; and *The Chronicle of Higher Education*. Caltech's Vice President for Institute Relations Jerry Nunnally accepted the award on Beckman's behalf on July 12 at the CASE Annual Assembly in Chicago.

Among the research and teaching institutions that have benefited from Beckman's support for higher education are Caltech, the University of Illinois, Stanford University, Rockefeller University, the City of Hope, Cold Spring Harbor Laboratory, Scripps Research Institute, Penn State University, and UC San Francisco and UC Irvine. With his wife, Mabel, who died in 1989, he has established professorships and numerous fellowships, and has funded the construction of several research centers, including the Beckman Institute, the Beckman Laboratories of Behavioral Biology, and the Beckman Laboratory for Chemical Synthesis, all at Caltech.

Parting Thoughts From the Class of 1998



" My sister's coming here next year. A lot of people say I'm a bad brother . . ."

Name: Casey Huang
From: Grosse Pointe, Michigan
Major: Physics/Math
Plans after graduation: Has been awarded the Churchill Fellowship to study at Cambridge University in England for one year, where he will earn his MPhil in physics. Then, after a PhD, he plans on working in computer theory or design.

Every year it happens. After their tenure here is done, a new batch of graduates goes off to face the world. So, while they were still around, poised on the brink of departure, *Caltech News* took the opportunity to talk to some graduating seniors about their Caltech experiences and plans for the future. We wanted to know how their experiences were similar to those of the graduates that have gone before them, and to find out about new trends that may have emerged in student life today. So, on a sunny morning three days before commencement, we watched as five students trooped into Avery Library—and immediately headed for the juice and muffins (Ditch Day seniors aren't the only ones who know how to bribe students). Although the students we interviewed have experienced Caltech in different ways, they agreed that certain things—the Honor Code, research opportunities, and yes, even the core curriculum—helped to enrich their stay at the Institute, as well as prepare them for the future. This is their story.

Caltech News: Why did you come to Caltech?

Sara Beaber: Originally I wasn't going to come here because of the size. I actually threw out the application twice in a row, and Caltech sent me a third one and let me apply late. But I really appreciated the early access to research. And that's what drew me to Caltech, because I wanted a PhD in science, and that was the best ticket that I could see. I did a SURF my freshman year with [Professor of Chemistry] Nate Lewis's group, and Caltech has funded me for three summers since then, including this coming one. But it's no longer in science; now it's more in social science.

Casey Huang: Size was kind of a big issue for me, too. I wasn't even sure if I wanted to go to another small school, because my high school was really small. But the small size makes life a lot easier. You know most of the people, and it's really easy to find out who you like the best. I think it's especially good for people who don't know exactly what they want to do. It's really easy to find your own way, rather than being absorbed into something else. On a different note, my sister's coming here next year. A lot of people say I'm a bad brother . . .

Melissa Sáenz: When I was a high school student, I had the impression that Caltech was really the hardest school to get into. For some inexplicable reason that actually made me want to come here.

Michael Shumway: I see Caltech as probably the best undergraduate science university in the country. I think that's one of the reasons that I came. Also, after I was admitted, I knew that if I didn't come here I'd always play the what-if game. Would I have made it? Would I have been able to take Caltech and graduate? . . . which I am now doing.

Peter Wang: Well, I've lived in California for 18 years, and although a lot of people here come from California, quite a few don't. So it was interesting to kind of show people around. I think the people were the main reason that I came here.

CTN: How about sharing some highlights of your experiences here, either pro or con?

Michael: I guess one of my biggest highlights is actually completely non-science based. I played in the Caltech jazz band all four years, and my freshman year the guest soloist for the year was Gregg Bissonette, who's probably one of the top 20 drummers in the world. I play drums, and so when he came in, we played a concert together. I played a couple of songs on his set, and then when he came out, we traded solos. It was just amazing. Here I am at Caltech and I'm doing these terrific things that I wouldn't have had a chance to do at a more wide-ranging school, even one with a formal music department.

Melissa: Personally, I didn't feel that I clicked very well with the Caltech social life. It just wasn't for me. But I had a very wonderful time living here in Los Angeles. I really enjoyed being in L.A., and going out to the clubs and the beaches. Caltech has a very high percentage of international students, especially graduate students; I think that really adds to the experience. I was very involved in Semana Latina—which is the expression of my own culture—but also in many other multicultural activities.

Casey: Last year, the L.A. *Times* did this really nasty article about our basketball team. They came in on the pretext that they were going to be doing some nice, fluffy article, and they ended up just totally slamming us. But, the community actually rallied around us. Tommy Hawkins, a vice president with the Dodgers, came out here and talked to us. CNN came and did a piece on us. It was just cool. Caltech has the support of a wide range of personalities, and the people are really great.

Sara: It's been so nice to be able to get small exceptions when you need them, because people really know about you on this campus. For instance, they just knew that I'm short and would need a stand for introducing Bill Nye as the speaker at commencement. Also, the fact that Caltech is willing to fund research they're not even really interested in means that I've been able to build up field experience in nontraditional Caltech areas. I've built up a résumé of work experience and publications in my field of hunger research, which I think will be really beneficial in the job market.

Peter: I'm really, really glad that Caltech and Pasadena's Art Center College of Design have a collaboration going. I'm a math major, but I took a lot of classes at Art Center, and it allowed me to see this totally different side of the academic experience. The people at Art Center are quite different—they tend to be a lot more laid back. It's really nice to kind of get away from the science once in a while. I think that was one of the highlights.

CTN: Sara, you talked about Caltech's research opportunities. Has anybody else benefited from these?

Michael: I think that definitely was one of the big draws of Caltech, and when I applied to grad school, I could clearly see that it was a huge bonus. You know, you've got professors who are looking at lots of applications from different schools. Maybe the Caltech student has a slightly lower GPA but has proven himself in the lab. I think professors are more inclined to go with the ones with more lab experience. So that really is a plus.

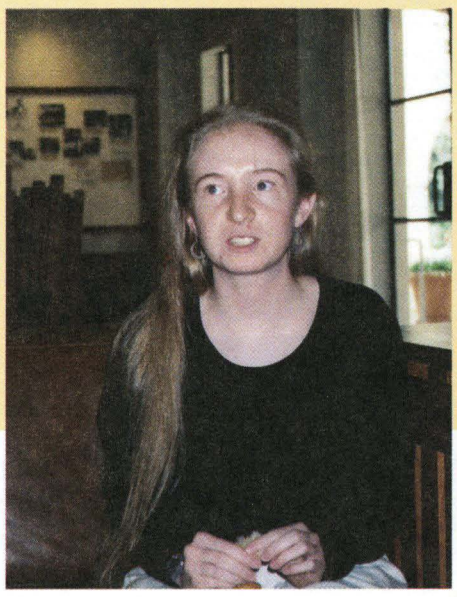
Melissa: I agree. I actually got into every graduate school that I applied to, and I was more surprised than anybody else. I had a good GPA, but it wasn't stellar. I think the Caltech name and the research in human perception that I was able to do here were the key things.

CTN: One of the defining characteristics of Caltech that until last year had hardly changed in nearly eight decades is the Institute's core curriculum. What were your experiences with it?

Melissa: I think that the core curriculum was actually very good for me, because

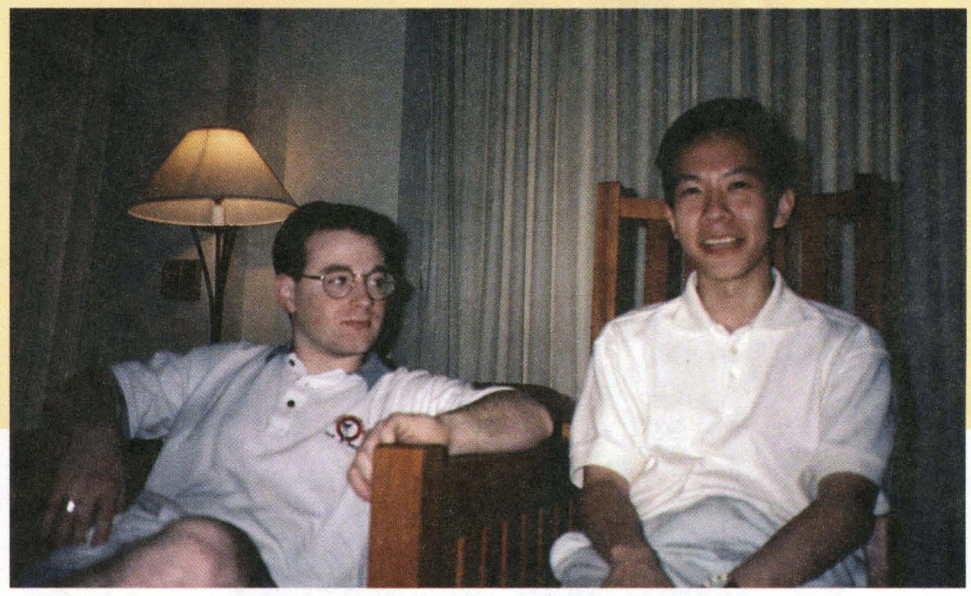
"I was pleasantly surprised when I got here, to find that the students were really helpful to each other and not competitive."

Name: Melissa Sáenz
From: San Antonio, Texas
Major: Biology
Plans after graduation: Go to grad school for neuroscience at UC San Diego, then do academic research. Recipient of the Mabel Beckman Prize for demonstrated academic and personal excellence.



"If you lower the expectations, people will meet them, whereas here, they've raised the expectations. And I think for the most part people meet them."

Name: Sara Beaber
From: Lawrenceville, New Jersey
Major: Chemistry and History
Plans after graduation: Will spend one year working with hunger policy development and implementation, before going to graduate school.



"I knew that if I didn't come here I'd always play the what-if game."

Name: Michael Shumway
From: The Woodlands, Texas
Major: Applied Physics
Plans after graduation: Get a PhD in electrical engineering from UC Berkeley, then most likely go into industry. Recipient of the Frederic W. Hinrichs, Jr., Memorial Award, for outstanding contributions to the student body.

"After Caltech I think I'm much more willing to try things that are not quite in the realm of convention."

Name: Peter Wang
From: Cerritos, California
Major: Mathematics
Plans after graduation: Get a job working in Internet Web page design for a while, then apply to graduate school. Hopes to integrate his interests in mathematics and graphic design.

coming out of Caltech with a degree in biology, I think I have a stronger background in mathematics and physics than a biology major from just about anywhere else. And that's really going to help me. I'm going into neuroscience, which is a very interdisciplinary field where I can actually use the mathematics and computer science.

Casey: I was on the committee that revised the core curriculum. I was a little concerned about what they were trying to do, because I think the core was designed to teach the basics. A lot of people said things like, "Why do I need to take physics, if I'm going to be a chemistry major?" Sure, they teach you some stuff that you'll never use, but a lot of it is really important. I also like the fact that the new curriculum gives the freshmen a lot more opportunity to try different stuff, like astronomy and biology.

CTN: You've all been pretty involved in various activities on campus. There's a traditional saying at Caltech: "Sleep, study, socialize, pick two." Does this still apply?

Sara: I slept about two hours last night, and the night before as well. I still haven't quite realized that I'm done and need to adjust my sleep schedule. I really haven't slept much in the last four years, but I think it's mostly been worth it. I'm young and I only live once, so why should I sleep through doughnuts at 2 a.m.?

Melissa: I slept. I think as a freshman when I lived on campus, it was very difficult to keep a real-person kind of schedule. But the past three years, no problem. Eight hours a night. It's a matter of learning good time-management skills.

Michael: You have to set your priorities. I've been involved in quite a few activities on campus, but I've also gotten eight hours of sleep. And I only missed seven classes in all. I was shooting for that little perfect-attendance sticker on my diploma, but I didn't get it. But I don't think that I sacrificed the social aspect, either. I think if you prioritize right, you can do it. You can't organize too much though, because if you pen in two hours of free time, then it's not so free. You lose that little bit of spontaneity.

CTN: What has the Honor Code meant to all of you?

Melissa: I was pleasantly surprised when I got here, to find that the students were really helpful to each other and not competitive.

Peter: It's definitely been beneficial. I think that if I'd gone to a school that didn't have it, I'd be a lot more cynical right now. It's given me a lot of opportunities to see people for who they really are. I think that it allows you to be closer to the instructors in your classes. You can go talk to them, and you get to know them as people. That's really important.

Michael: I think the Honor Code is special to everyone who comes to Caltech. It was definitely one of the reasons that I came. It's not only an important factor in the classroom; it's part of how you live here. In terms of the houses, you don't have to worry about locking your door every time you go outside, or down the hall. I think that's created a great atmosphere for learning.

Sara: It's been really refreshing with the Honor Code to be treated and trusted as an adult. It's been really helpful to be able to have keys to buildings that I need to get into anytime I need to, instead of only being able to go in during business hours or when someone is present. For a place not to trust its own students really puts a damper on how they learn. If you lower the expectations, people will meet them, whereas here, they've raised the expectations. And I think for the most part people meet them.

Casey: It's made me much more naive. Like, I expect the rest of the world to be much more like Caltech.

CTN: So how do you feel, now that you're about to graduate? What are your immediate plans?

Melissa: I feel great. It's really great, because actually I finished last term, so I've already been off for a while. I've enjoyed it completely, I've done no work, I feel brain dead. I have three months to go before graduate school, and I may do a lot of traveling. I'm going to graduate school in neuroscience at UC San Diego. I have no idea how I'm going to start up again.

Casey: I'm not antigraduation, but I'm just not as excited as I think everyone expects the graduates to be, because for me, for everyone, there's more after this; my work is unfinished. After graduation, I'll be a Churchill scholar at Cambridge. I'll be doing physics research there for 11 months to earn my master's degree. And then I'll work on my PhD.

Sara: I'm really excited. I mean, this place has been good to me, but it's also time to be done. After graduation, I'll be a Mickey Leland Hunger Fellow with the Congressional Hunger Center, which means I'll spend six months helping to set up a perishable-food rescue program. And then I'll head back to D.C. for six months of hunger policy study. It's a program for training leaders in antihunger programs. I've done similar work studying nutrition and poverty-related policy through my SURFs. In fact, it's something I've been interested in and worked with since high school. But never have I had somebody pay me to do it for a year, full-time.

Michael: Right now, I plan on getting my PhD in electrical engineering at UC Berkeley. I was an applied physicist here, so it's going to be crossing over a little bit. I won't have the same background as, say, 95 percent of the people in the grad department at Berkeley, but I'm looking forward to the challenge.

Peter: My immediate plans after graduation are to get a job doing something that

Continued on page 10. . .

Parting Thoughts . . . from page 9

combines what I've learned from both Caltech and the Art Center. I think that one of the biggest challenges in terms of communication design nowadays is to get your ideas across in new and exciting ways. Right now we've got the Internet, and I don't think it's being used to its full potential. So, I plan to get a job doing Web design, and after doing that for a little while, I'll apply to the graduate program at Art Center. They offer a two-year degree program leading to an MFA in New Media and communication design. But I'm also considering an MS/PhD in mathematics, although probably not at Caltech. There can be too much of a good thing!

CTN: What do you see yourselves doing 10 years from now?

Melissa: Probably academia. My plan is to do research.

Michael: I would say I'm going into industry, but I know that can change.

Sara: Hmm, well, perhaps I'll be working with the U.S. Department of Agriculture. Another possibility is working with Second Harvest, the national food bank network. Being involved in large-scale issues of food distribution really interests me. There's enough food in this country; it just doesn't get distributed quite as well as it should. Actually, right now 10 percent of Americans have to use emergency food sources. I really find that unacceptable. So that's something I'd like to work to address. What arena I will do that in is unclear right now. I've got to get through grad school first.

Casey: I'm definitely shying away from the academic side. I'd like to get involved with the computer field, but not programming. Something more in theory or design.

Peter: I think, 10 years down the line, if everything goes my way, I'll figure out a way to integrate my interests in mathematics and graphic design. But I'm not really sure how I'm going to mix all these elements together.

CTN: Do any of you have long-term goals that don't necessarily involve your field?

Sara: One of the things that I really want to do is be a volunteer cross-country coach for high-school girls. I did cross-country for three years at Caltech, and all four years in high school; it was incredibly meaningful for me, both in confidence and leadership building. That's something I'd really like to start giving back, once I *finally* have time.

Melissa: I have a very simple, commonplace goal, and I don't think this fits in with my career or my academics. I want to be married and have a family—I just don't see many young women professors who have had time to be successful in their career and who have also had children. I don't know how I'm going to do it.

Casey: I've already started working on a book. My grandma was a linguist, who spoke about 11 different languages; I think it turned into kind of a multiple personality thing. She could switch on and off, all the time—German grandma, Italian grandma . . . She wrote a book about her life, which was just the most bizarre thing I've ever read; some amazing things happened to her. She made a few copies, and sent them out to her friends, and she ended up publishing it; I was kind of inspired by that. And, my family has tended to inherit what I like to call "the grandma curse." We have crazy things happen to us. We've started writing a book, where we take events that have happened to our family, and we've each written a kind of perspective—an editorial—on the event. So, we're going to combine them into a book like *Hiroshima,* by John Hersey.

Michael: I could see public office being down the road. I was president for Fleming House, and in high school I participated in other organizational leadership things. So that's always been something that I've done, and it's been a way to give back to the community, too. I wouldn't see public office precisely as a goal, but after becoming successful at something else, maybe I'll be looking at that.

Peter: I'm thinking I would like to go bungee jumping in New Zealand. I've never been the really outdoorsy kind of adventure-seeking type, but I don't know . . . after Caltech I think I'm much more willing to try things that are not quite in the realm of convention, so to speak. Maybe not bungee jumping in New Zealand, but something along those lines. Because I've seen a lot of what Caltech students do, and it's quite amazing.

CTN: As you prepare to depart, do you have any advice to offer incoming frosh?

Peter: You're on pass/fail for the first two terms. Make the most of it.

Sara: I think sometimes freshmen, including myself back then, have a tendency to stick within their own house for too long. Be aware that there's life outside of those 80 people. And all the frosh should join the Caltech Y early. I think that out of 900 undergrads, we have more than 300 students a year volunteer all over the community. For me, it's been really refreshing to get in touch with those people, and the community outside.

Melissa: I would tell them that the work here is definitely very hard, but that the reputation of the work is even harder than the work itself. I mean, I know I had this problem. You come in and assume that what you're doing is so hard that you can only figure it out by some kind of pure inspiration. But if you actually just really study and work at it, it will come to you on its own.

CTN: As you look back on your Caltech education, if you had to point to one thing you're bringing away with you from the Institute, what would it be?

Michael: The people, the friends that I've made here. They'll be contacts and friendships that I'm sure will last my lifetime.

Melissa: For me, it would be confidence. I think that if I could do well at Caltech, then I can do well at graduate school.

Casey: I'm going to extend that a little bit. I think that even more than just being able to do anything, it's a sense of being able to do something better. Professors give you the opportunity to find a new or better way to do something, and they're willing to work with you on that. I had one class where the prof assigned a two-part homework problem as extra credit. The first part he had just proven. The second part no one had proven yet. I and one other person solved the first part, and he said, "Okay, get to work on the second part," expecting us to be able to do it. I couldn't do it, but he thought I could. And I honestly thought that I might be able to do it. I think Caltech is very important for giving you that kind of feeling.

CTN: It sounds like the nearly impossible math problems that the MIT professor gives to his students in the movie Good Will Hunting.

Casey: I'd like to say about that movie, I was extremely offended by the comment one of the guys said about them being at the finest technical institution. Don't think so.

Sara: And some of the math on the chalkboards in the movie was basic algebra. You could *cancel factors!* . . . but, to get back to your question, I guess one key thing for me is the importance of being able to work on a team. That really wasn't emphasized before I got here. High school was very much "take your work home, finish it up, bring it in the morning." Whereas here, while my own skills are important, they are more important when added together with the skills and strengths of the other people whom I know and have worked with. And the realization that together we really can get a lot farther has been really important to me.

Peter: I think the biggest thing that I'm carrying away is—maybe it sounds kind of cheesy—but it's the increased knowledge of myself. I went through this arrested development thing throughout high school and, coming to Caltech, I truly grew as a person. I got to understand who I was, and where I belong. It's not necessarily in the mathematics field that I studied—but at least I think I know where I want to go.

Caltech News would like to thank Associate Dean of Students Barbara Green and Assistant to the Dean of Students Suzette Cummings for their help in organizing this interview. (A task that was complicated by the fact that they had to track down our interviewees during Finals Week!)

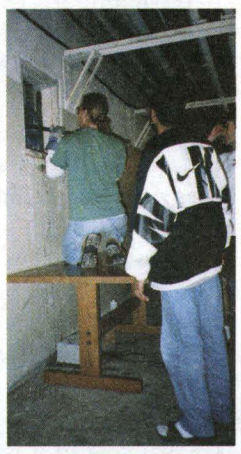
Seven Tips for Planning a Successful DITCH DAY in the '90s

Ditch Day. One of Caltech's time-honored traditions, dating back to 1921, one year after Throop College of Technology officially became Caltech. The administration didn't know it then, but other changes were in the air—including a new trend whereby seniors would collectively ditch classes, homework, and everything else one day during the school year, and head off-campus. As time went on, seniors started keeping this date secret, smugly saying, "It's tomorrow, frosh!" to anyone foolish enough to ask the date of the exodus. The underclassmen therefore felt compelled to find out the date and "modify" the seniors' rooms while they were gone. To protect their rooms in their absence, the seniors devised protection plans such as stacking cement blocks or furniture in the doorway . . .

Today, Ditch Day is a campuswide activity, and over the years the "stacks" themselves have evolved into large, imaginative endeavors, some carefully planned out months or years in advance. The main objective has changed very little: A group of seniors challenge the other classes by barring access to a senior's room. The three types of "stacks" have not changed much either. 1) Brute Force—just like it sounds. The objective is to smash, break, or otherwise destroy the various obstructions, including, but not limited to, obstructions placed in the doorway to the room itself. 2) Honor—requires the participants to do something (many times something strange), which may or may not lead to clues for solving the stack. 3) Finesse—requires the stackers to use their wits to solve various types of "thought puzzles," which may require outside assistance. Once inside the room, the participants find a bribe (generally something to eat or drink). If the bribe is not sufficient, the bribees may choose to turn it down and seal up the senior's room with a counterstack.

To get an idea of Ditch Day in the 90s, *Caltech News* tagged along on the "Hitchhiker's Guide to the Galaxy Stack," loosely based on Douglas Adams's five-book science-fiction "trilogy." The objective of the stack was to lock the interdimensional Wikkit Gate (photo at top, right-hand corner of page) before the terrible flesh-eating termites could get through. Like other modern-day stacks, the Hitchhiker stack wove a complex web of brute force, honor, and finesse tasks. And, following another emerging trend, the Hitchhiker stack divided its participants into separate groups, each with a different series of tasks. Yet, in the best Ditch Day tradition, all five groups ultimately had to work together to solve the stack and save the universe.

1. Do Something Completely Different: The initial task of the group that we followed was to get *out* of the senior's room—Caltech's first ever "reverse stack." This was accomplished using a video-game interface (above, left) that interacted with a custom-built hardware mechanism on the door (inset). Unfortunately, after failing to get out of the room on time, the students found that the backup codes didn't work, and that they were *really* stuck in the room. Then came the reassuring sound of an electric drill . . .

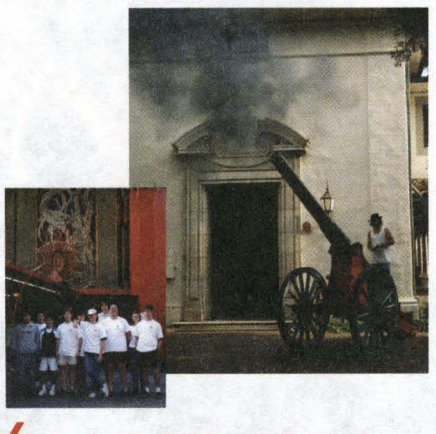


2. Include Brute Force, But With a Twist: The group got a surprise when soda pop sprayed out of the cinder blocks that they were breaking through, while they were in the process of retrieving a set of secret plans in the basement of Ruddock.

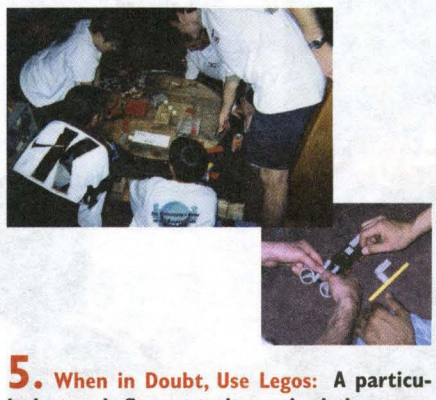
3. Use Daihatsus and Other Forms of Transportation: What would a Ditch Day stack be without a Daihatsu? (In this case labeled *Heart of Gold*, after the spaceship in Adams's books.) The stack organizers also provided a sleek rental car for one of the groups, to assist the participants in their road-rally tasks. Call it saving the universe in style.

7. Take Reduced Class Loads and Enlist Help: A stack like this requires time, effort, and people (and perhaps a Swiss bank account). In fact, some of the stack organizers took overloads in previous semesters so they could reduce their class loads in their final semester to finish the stack. Hitchhiker stack organizers and volunteers, clockwise from back left: Jeremy Mans '98, Mark Stewart '97, Sean Suchter '98, Louis Thomas '98, Michelle Miller '98, and Jeremy's friend Paul Hindemith, who flew in from Southern Methodist University in Texas to help out.

4. Offer Food To Appease the Natives: A Morse code message led the group to a shuttle transport, and an off-campus pizza lunch. Besides feeding all five of their hungry groups, the stack organizers had each group share information with the others, providing clues to the next tasks.



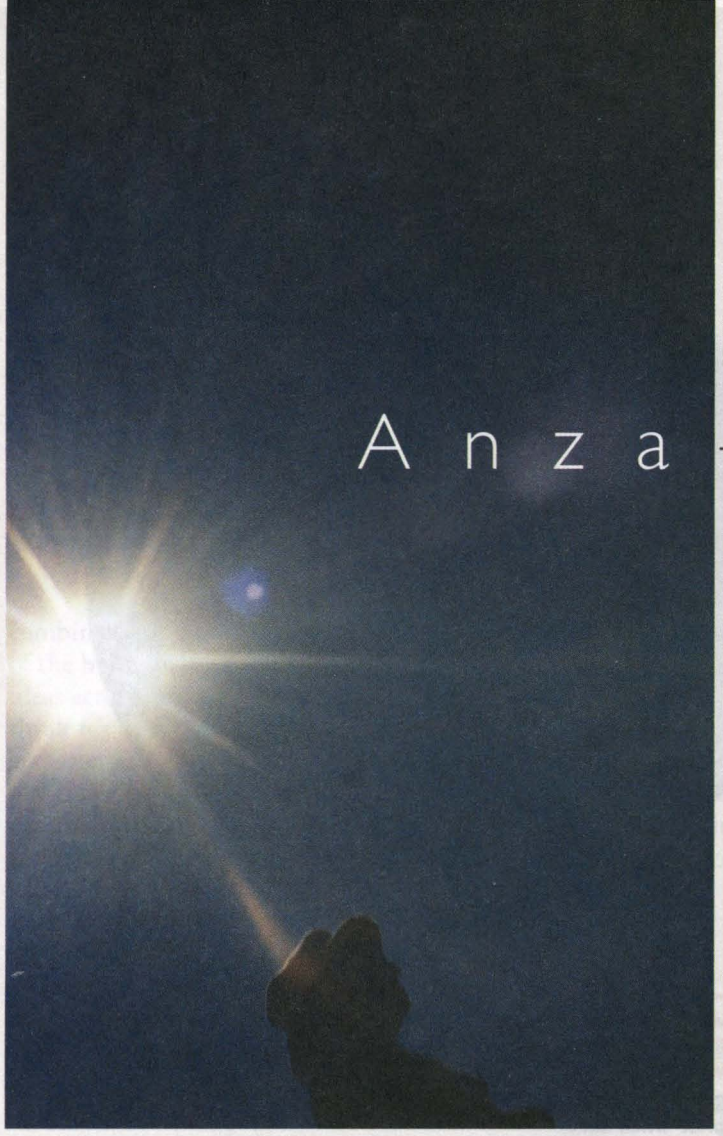
6. End With a Big Bang (and a Movie): One thing that hasn't changed is the 5 p.m. cannon blast (above, right) to signal the end of Ditch Day. But the stack organizers decided to extend the festivities—they took all of their participants to Mann Chinese Theater in Hollywood (inset) to see *Deep Impact*, a movie where just the earth, and not the whole universe, is in danger of being destroyed.



5. When in Doubt, Use Legos: A particularly tough finesse task required the group to build a motorized Lego vehicle (inset), to retrieve their piece of the Wikkit Key from inside a large wood and Plexiglas maze (above). Once acquired, the piece of the Wikkit Key was used in conjunction with the pieces from the other four groups to lock the interdimensional gate.

BY RYAN POQUETTE

Anza–Borrego abloom



"The sun is shining in the desert, and the flowers are waiting for us," Lee Silver, PhD '55, assured fellow alumni as they headed for Anza-Borrego. Good fortune and careful planning joined forces for this happy occasion, in which 42 Caltech alumni arrived in California's largest state park during the peak bloom in March.

Winding their way through carpets of sand verbena dotted with dune primrose, and catching rare glimpses of desert lilies, the alumni followed the lead of Silver, Caltech's Keck Foundation Professor for Resource Geology, Emeritus. Not to bypass the geologic wonders of the Southern California region extending from Palm Springs to the Salton Sea, participants also viewed the rifts and valleys created by seismic activity along the San Andreas and nearby faults.

In the space of two busy years, Silver ventured to the low desert and Alaska twice and New Mexico once, all with the Alumni Association. Often accompanying Bob Sharp '34, MS '35, the Sharp Professor of Geology, Emeritus, Silver has helped lead tours for Caltech since their inception.

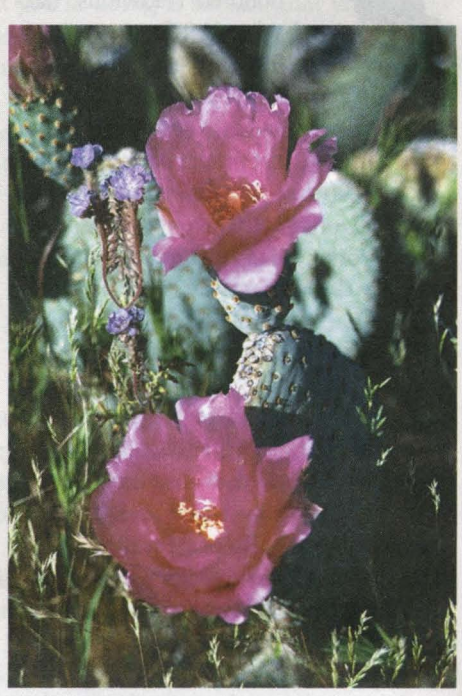
Geology field trips are not the only sort led by Caltech faculty for alums and Associates of the Institute. But they seem to have been the first such trips and, by many accounts, are still unique to Caltech for their faculty involvement. Now it may seem only natural to Caltech community members to take an "essential" part of a geologist's education, as Silver refers to field trips, and offer it as a hands-on form of continuing education, but the idea burst to life in the mid 1970s in a dramatic way.

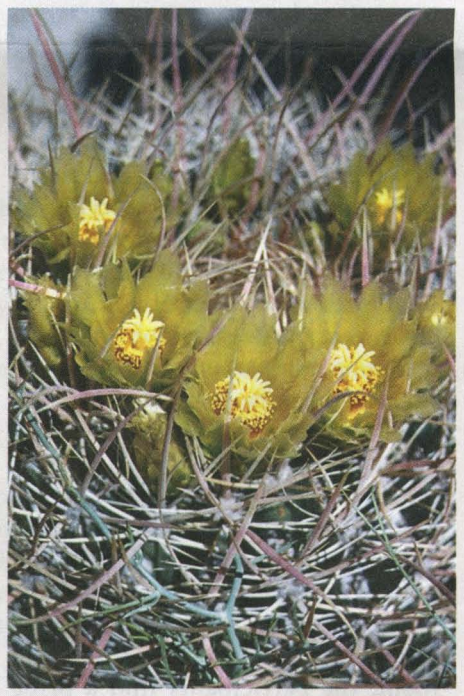
As Sharp recounted in an interview in 1990, the geological and planetary sciences division of the 1970s was seeking support to establish its first endowed professorship. Professors Silver and Gene Shoemaker lit upon the idea of sponsoring what was billed as the trip of a lifetime—"a raft trip through the Grand Canyon guided by geologists. Silver, Shoemaker, Barclay Kamb, and I led [three of these] trips," collecting $50,000 per person and $75,000 per couple, with much participation by trustees and Associates, and garnering one million dollars. It was only later that Sharp learned that the professorship would be named after him.

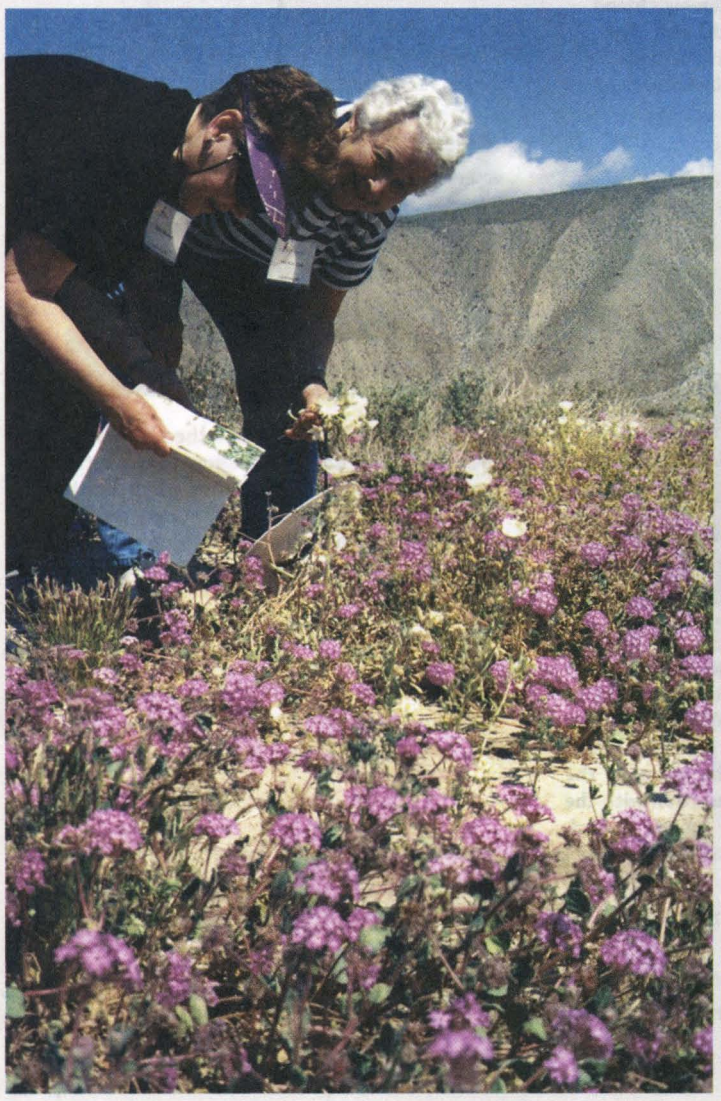
After that trip, says Silver, "the guy who really picked up the ball on that [idea] was Professor Sharp. He offered walk-in trips into the Grand Canyon" and has led trips far and wide ever since, joined once again by Silver throughout the past dozen years. Along with other faculty tour-leaders, they have had the satisfaction of seeing students graduate and then return to join them on alumni trips in groups that also include many of their contemporaries.

Mary Johnson '76 and Bob Nason '61 were the two geology alums who joined Silver in Anza-Borrego. In the course of such trips, Johnson says she develops "an appreciation for the landscape as [if it were] a human being," and she has "delightful adventures along the way." Professing that "Lee is the epicure of the geology department," Johnson recalls an adventure along those lines, when she went on an alumni trip to Yellowstone led by Sharp and Silver. Heading to dinner "in a little corner of the world, at Chico Hot Springs," the group had heard nothing from Silver about the coming fare when they were surprised by a spread "centered around filet mignon, cherries jubilee, and an extremely palatable bottle of red wine," all served up in plastic and on paper. "It was tremendous," says Johnson, who adds that her husband, Mark Parisi '75, having only heard of geology trips as an engineering student, "has fallen in love with them too."

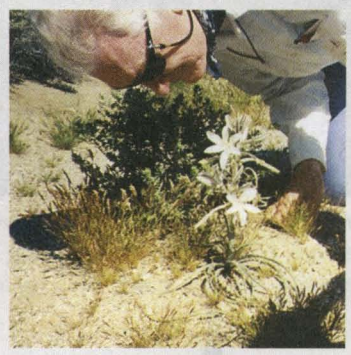
At right: Agave stands tall in the desert, backed by spindles of red-tipped ocotillo. Both are up close in full bloom at far right. This page, from top: Beavertail presents a study in contrasts; barrel cactus flowers peek out from their thorny nest; and (from right in bottom photo) Silver disseminates landscape lore about the San Felipe Wash to Duane McRuer '45, MS '48; Jack Cortelyou '34; and Hunt Holladay '56.

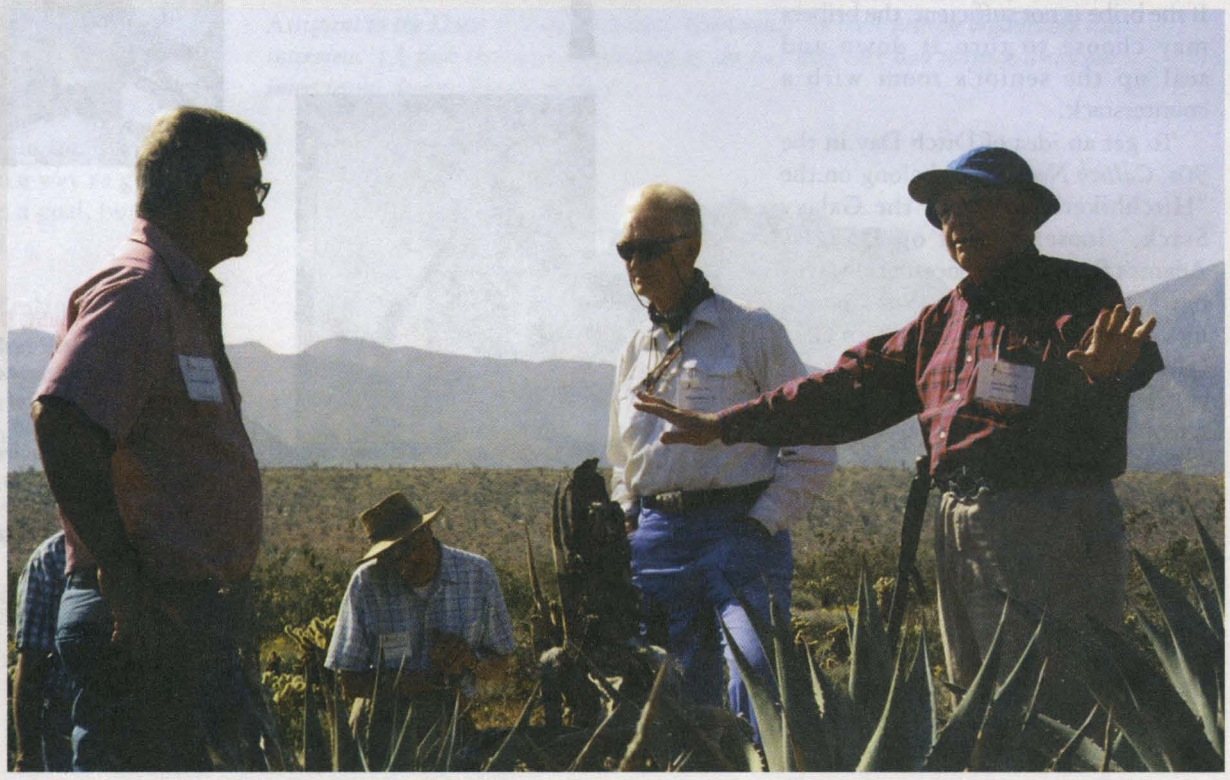




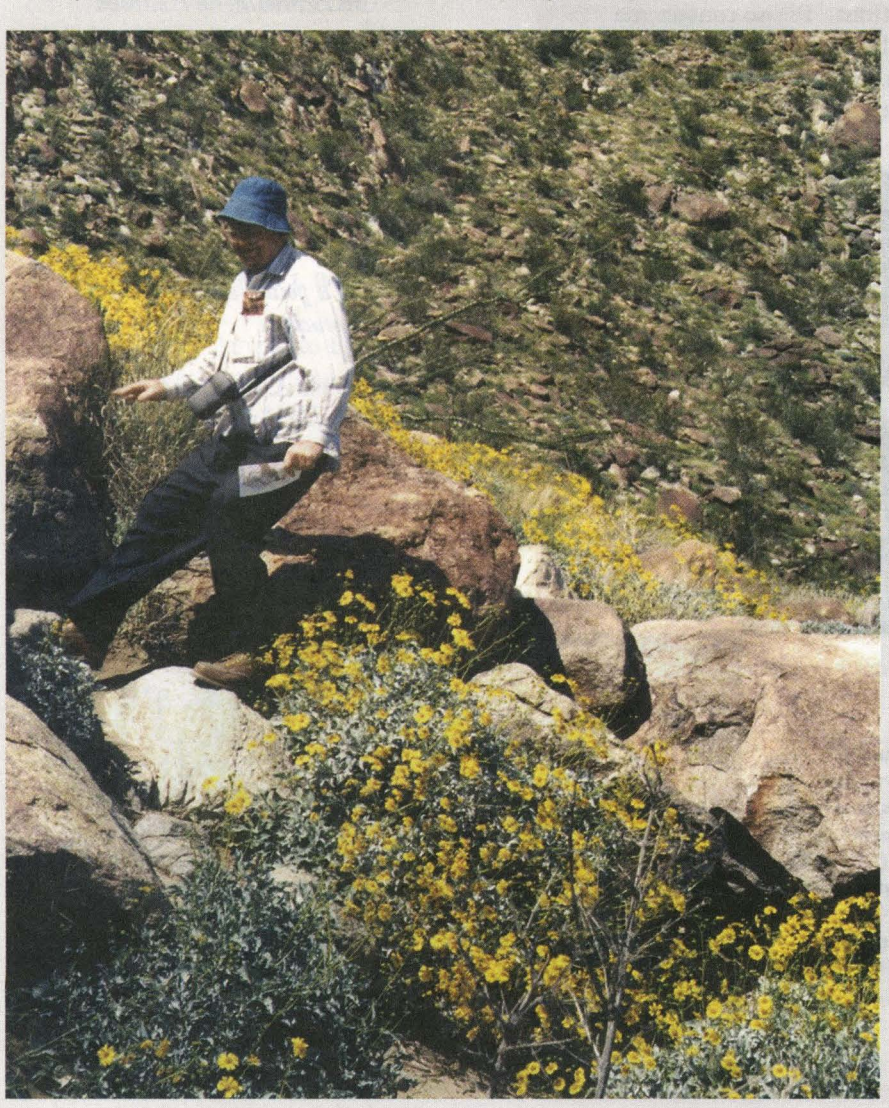


On a trip he led in Alaska, says Silver, the group cry was "Moose! Moose!" Here it was "Desert lily! Desert lily!" At right, Duane McRuer takes time to smell the hard-to-find flower, while, at far left, Betty McRuer checks out the verbena with MaryLou Lind. Participants became familiar with other desert calls, discovering that the most dreaded cry was not "Snake!" but rather "Board!" as in "all aboard."





Above at left, the fearless tour leader keeps his cool behind a jumping cholla cactus. Alongside Silver, Larry Baldwin, Eng '55, is determined to bring a few souvenirs back to Virginia, but prefers that they not be stuck in his fingers. (One participant had a close encounter with a cactus on her way to learn how to extract needles: with scissors from a penknife.) And wandering through the wildwoods of Palm Canyon, below, John Carney '56, MS '57, passes brittlebush along the way.



Alumni Update

GIFT FROM ALUM WILL ENABLE STUDENTS TO TRAVEL WITH FACULTY, ALUMNI, ASSOCIATES

The wide range of people who participate in travel-study programs with the Alumni Association and the Associates just got wider. Students—up to four per year—will be selected to accompany the faculty lecturers on the trips, thanks to an endowment gift from an alumnus faculty member and his wife.

The faculty lecturers will recommend student participants from the sophomore, junior, or senior classes and from any division at Caltech. Whether exploring the rifts and valleys along the San Andreas fault or marveling at evidence of an ancient Mayan civilization, students will have opportunities for extraordinary field study as well as in-depth interactions with alumni and Associates.

Participants come to the programs with "a vast set of experiences, and it's fascinating to learn from them about life and history," says Diane Binney, director of the Associates. Thinking back to her college days, she believes that "it is unique opportunities such as these that can help shape a person." She imagines that students may be invited to lecture on the trips, providing them with additional challenges and giving proud professors a chance to "show how talented their students are." They may also be asked to give a seminar or write about their experiences upon their return.

Judy Amis, director of the Alumni Association, says that "by bringing alumni and students together to share outstanding educational experiences, this generous gift will enrich the lives of all involved in ways far beyond the travel events themselves."

Alumni Activities

AUGUST 22–SEPTEMBER 5
Peru Expedition Travel/Study program, led by William Schaefer, senior research associate, emeritus, chemistry.

OCTOBER 9–10
Board of Directors and committee meetings.

OCTOBER 16–20
Canyons and Craters of the Coconino Plateau Travel/Study program, led by Robert Sharp '34, MS '35, the Robert P. Sharp Professor of Geology, Emeritus; and Leon Silver, PhD '55, the W. M. Keck Foundation Professor for Resource Geology, Emeritus.

Among the more than 1,600 alumni and guests who returned to campus in May for the Alumni Association's Reunion Weekend and 61st Annual Seminar Day were the four pictured below with President Baltimore (at far left), who presented them with Caltech's highest honor, the Distinguished Alumni Award. Left to right, Robert Conn, PhD '68, dean of UC San Diego's school of engineering, was recognized for his leadership in the field of plasma physics; Stanford University professor Sharon Long '73 was honored for her groundbreaking achievements in plant genetics; Richard MacNeal, PhD '49, of the MacNeal-Schwendler Corporation, was recognized for wide-ranging contributions to the fields of computation, aerodynamics, and structural analysis; and Stanford professor and 1996 Nobel laurate in physics Douglas Osheroff '67 was hailed for his pioneering research in low-temperature physics.

Letter from the Association President

By Warren Goda '86

A mission of Caltech is enrichment of the lives and opportunities of its alumni as well as its students and faculty. Accordingly, Caltech desires to

•Establish a lifelong relationship with its alumni

•Promote interaction with and among alumni

•Highlight the achievements of its alumni, and

•Provide alumni with rewarding opportunities to serve Caltech, its faculty, and its students.

The quality of alumni relations is a criterion by which success of the Institute is measured.

—Institute Philosophy Regarding Alumni, May 1998

Caltech's new president, David Baltimore, is the principal author of the Institute's *Statement of Philosophy Regarding Alumni*. This statement, which was recently adopted by the Caltech Board of Trustees, is significant. It represents recognition by the highest levels of the Institute that Caltech Alumni are important. The Caltech Alumni Association is one crucial organization that translates this statement into actions for the benefit of all alumni.

The Caltech Alumni Association, which will be referred to as the Association, is a nonprofit organization that is separate from the Institute and distinct from the fund-raising activities of the Alumni Fund. Our activities complement the Institute's *Philosophy Regarding Alumni*. I'll describe a few of the Association's activities in the following paragraphs.

The Association strengthens a lifelong relationship between alumni and Caltech. Communication is critical to this relationship. *Caltech News, Engineering & Science,* the *Alumni Directory*, and other publications are a few examples of how alumni maintain an awareness of current events on campus. Other forms of communication include the e-mail accounts that the Association provides, and our Web site. The Association also has an interest in establishing a relationship with its future alumni: Caltech's current graduate and undergraduate students. We do this by helping students. We sponsor social events and clubs and prepare students for life after Caltech with our support of career discussion panels with the Career Development Center. The lifelong relationship between alumni and the Association also strengthens the bond between Caltech and its alumni.

My lifelong friendships with classmates are what I treasure most from my days at Caltech. The Association encourages these relationships by strongly supporting and promoting interaction among alumni. Our largest event is Seminar Day, which brings hundreds of alumni back to campus. This highly successful annual event is coordinated with reunions, enabling friendships to be renewed. If you have lost contact with fellow classmates, the *Alumni Directory* is an excellent resource, and this year will bring us a new edition. The directory is a snapshot of the continually evolving alumni database, which is undergoing a major upgrade. The Association also has 13 alumni chapters located throughout the world.

Being part of the Caltech community is a special achievement in itself, and the Association is continuing to take steps to improve recognition of *all* alumni achievements. These are by no means confined to the worlds of engineering and scientific research—our fellow alums are making an impact in numerous areas, including business, government, and the arts. Personal and professional news and views are captured by the Class Notes and the Personals and reported in *Caltech News*. Special achievements are formally recognized by the Association and Institute with the Distinguished Alumni Awards.

The Association also provides alumni with rewarding opportunities. Besides Seminar Day, these include opportunities for continued intellectual growth through our travel/study programs and a new event, the Alumni College. (See UpFront, this issue.) The Association also provides volunteer opportunities that are centered on improving the life of current students. The Student-Faculty-Alumni Relations Committee provides financial support for undergraduate and graduate social activities, clubs, scholarships, and events. Other examples are the growing number of alumni who work with Caltech and the Association by interfacing with local high schools or by acting as mentors for current Caltech students. One program in particular, the Caltech Signature Award, has leveraged a modest investment into a substantial increase in applications to Caltech from targeted high schools.

This year will witness many changes as the Institute and Association work together toward the continued improvement of the Caltech community. The Alumni Association will continue to update and refine its programs to enrich the lives and opportunities of our alumni and will introduce new programs. As this process continues, I welcome any questions, comments, and suggestions. Please contact me through e-mail at wggoda@alumni.caltech.edu or through the Alumni Association.

At the Alumni Association's annual meeting in June, newly elected Association president, Warren Goda '86, was joined by fellow new Association officers. From left, vice president and president-elect Kent Frewing '61, member of the technical staff at JPL; Goda, senior consultant with Hesta Corporation in Norristown, Pennsylvania; past president Tom Tyson '54, PhD '67, chair-man of the board at Energy and Environmental Research Corporation in Irvine; secretary Robert (Ted) Jenkins '65, MS '66, vice president and director of corporate licensing at Intel in Santa Clara; and treasurer Blair Folsom, PhD '74, senior vice president at Energy and Environmental Research Corporation.

Billed as "An Evening with David Baltimore," the opportunity to meet and talk with Caltech's new president drew more than 200 alumni and friends to a New York City gathering this past spring. Above, two of the evening's Dinner Committee members, Alumni Association Board Member Roger Goodspeed '72 (left) and Caltech Trustee Phil Neches '73, PhD '83, chat with JoAnn Goodspeed; and, at right, Baltimore (second from left) joins Mary Young, Kay Sugahara '61, and Dinner Committee member John Young '56. The event was hosted by New York City resident and Vice Chair of the Caltech Trustees Ben Rosen '54.

Family Day debuts

"A day of family-oriented science and technology programming" comes to Beckman Mall and its environs on Saturday, October 3, from 10 a.m. to 2 p.m. Caltech Family Day welcomes Caltech and JPL families, Caltech friends, and alumni, including those who are attending the engineering and applied science division reunion the previous day (see announcement, facing page).

Representatives from Caltech and the community will exhibit math- and science-related projects, and local food vendors will be on site. For more information, contact Bettina Ozaki at 626/395-6232 or at bettina_ozaki@caltech.edu, or Helene Seibly at 626/395-6323 or at helene_seibly@caltech.edu.

Save the date for Chemistry Division Reunion

Friday & Saturday, March 19 & 20, 1999, the weekend before the ACS Meeting in Anaheim

- *Reconnect with fellow alumni and meet current faculty and graduate students*
- *Attend scientific presentations by Caltech faculty*
- *Take in a poster session by current graduate students*
- *Come to the Athenaeum for cocktails on Friday and dinner on Saturday*

For more information call 626/395-6045.

Caltech's Vice President for Institute Relations J. Ernest "Jerry" Nunnally listens as Tom Tyson announces his selection as the 1998 recipient of the Honorary Alumnus Award at the Association's annual dinner on June 12. Nunnally was honored for his active role in advocating alumni involvement in the life of the Institute, including his support of the Alumni Relations Task Force and the establishment of the Institute Relations and Alumni Relations committees of the Institute Board of Trustees.

Nearly 50 years after serving as Alumni Association president (in 1951), Robert Sharp (shown here at the Alumni Association's annual dinner in June) has gotten his title back.

Robert Sharp named Association's first president emeritus

In recognition of his many contributions to the Alumni Association, including 20 years as a leader of Association travel/study programs, and for his inspirational teaching to five decades of Institute students, Robert Sharp '34, MS '35, the Robert P. Sharp Professor Geology, Emeritus, has been named the first president emeritus of the Caltech Alumni Association. The lifetime title was conferred upon him at the Honorary Alumni Dinner on June 12. The Association also announced a gift of $5,000 in Sharp's honor to the Division of Geological and Planetary Sciences to support Sharp's innovative and popular Pahoehoe program, which offers Caltech undergraduates and graduates eight days of geology field exploration on the volcanic Big Island of Hawaii.

Have you ever received a German-American Fulbright?

The German-American Fulbright Commission is compiling a directory of its 28,000 former grant recipients. Those who have participated in this Fulbright program can contact James L. Hoppes by writing to the Fulbright Commission, Theaterplatz 1a, D-53177, Bonn, Germany. People can also call 49-228-93569-0 or send e-mail to fulkom@uni-bonn.de.

The main purpose of the directory, according to the commission, is to facilitate contact among former grantees and between former and current grantees. The commission is cooperating with the German Marshall Fund of the United States and the German Fulbright Alumni e.V. in this effort.

Calling all mentors!

While you were at Caltech, did you ever wish you could talk to someone who had "been there" and "done that"? Here's your chance to "be there" for today's Techers. The Alumni Association is looking for alumni who are willing to serve as mentors to Institute students. The program is designed to offer students the opportunity to talk to alumni about careers, insights on life at Caltech, and anything else that might be on their minds.

If you are interested in becoming a mentor, please visit the mentorship program Web site at http://www.ugcs.caltech.edu/~mentor/ and fill out the survey as completely as possible. If you would like to participate, but do not have Web access, please contact Kerry Etheridge at ketheridge@dar.caltech.edu or 626/395-6852 for a hard copy of the survey form.

We will begin advertising the program to the students when they return to Caltech this fall, so we ask that all alumni who are interested in becoming part of the database submit their information as soon as possible. (If you are concerned about the accessibility of your information on the Web, we have restricted access to the search script to those with a "caltech.edu" extension on their e-mail addresses.) Thanks in advance for doing your part in bringing Caltech students and alumni closer together!

And, to those of you who are already participating in the program, thank you! Based on feedback we have received from students who are beta testing the database, we have made improvements to the survey form. If you are still interested in being in the database, we would ask that you please look at the new form and resubmit your information so that even more students can benefit from your Caltech experience.

Don't forget . . .

Engineering & Applied Science Division Reunion

Friday, October 2, 1998

- **Hear** faculty presentations on current research
- **Enjoy** dinner with colleagues
- **Reconnect** with fellow alumni
- **Meet** current faculty and graduate students

For more information, visit the reunion Web site at http://www.its.caltech.edu/~alumni/easreunion.html or call 626/395-4102.

Alumni College . . . from page 2

choice—*Arabidopsis thaliana*—provides an excellent model for understanding the mechanisms by which a single cell develops into a complex organism.

Other biology faculty presenters included Paul Sternberg, who spoke on approaches to genome research, Ellen Rothenberg (the immune system and AIDS), Paul Patterson (the embryonic nervous system), and Richard Andersen (consciousness and perception in the visual system). Division Chair Mel Simon offered closing remarks and a video presentation on "Biology at Caltech in the 21st Century." Participants toured Andersen's visual neuroscience lab, Stephen Mayo's protein design lab, and the biological imaging labs of Scott Fraser and Russ Jacobs.

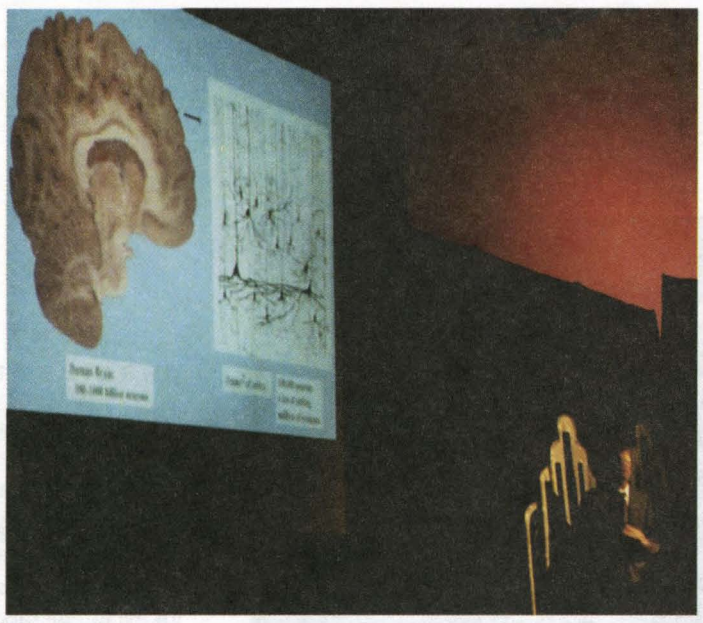
What more could anyone ask for? "More lectures." "Shorter breaks." "Longer lab tours." Handouts . . . advance reading lists . . . notes and slides on the web . . . reprints. The evaluations were revealing. They were also positive, save for a few complaints about the solidity of the chairs in Arms Lab and the caloric content of the food.

Norm Whiteley '68 was one of many who was "delighted and surprised to see high-school teachers" attending the program as guests of the Institute, all 11 coming from area high schools. After retiring from a company called Applied Biosystems, which provides automation for and otherwise facilitates molecular biological research, Whiteley is now president of the San Carlos elementary-school district board of education.

Debbie Stone of Alhambra High had spent two summers in a partnership program in the lab of Phoebe Dea '72, a professor at Occidental College who serves on the alumni continuing-education committee. "When we tell our students 'I visited Caltech' or 'I did research in a lab,' they get excited knowing their teacher is really into science," said Stone.

Dave Rossum '70 saw his return visit as a way to get back to his "first love" after 26 years of designing music synthesizers for his company, E–Mu Systems. "I'm looking at semiretiring and considering other things, maybe biology"—his major at Caltech.

The evaluations revealed a unanimous interest in future incarnations of the Alumni College. As one respondent put it, "I would like to come back for a similar injection of knowledge." And you can bet that it was a Techer who wrote, "Thanks for two days of enjoyment and relaxation." Until next summer. . . .



Scott Fraser, the Anna L. Rosen Professor of Biology, speaks his mind on the state of biological research, as Caltech announces its initiative to boost to new levels research and education in the increasingly interdisciplinary field.

Biological Sciences Initiative . . . from page 3

students in biology, now numbering 176 and 76, respectively, will ultimately increase by 20 percent. Most of them will occupy the new building. Many will be jointly mentored by biologists and scientists from other disciplines.

Although plans for a new biology building go back many years, the idea for the initiative, with its interdisciplinary focus, did not begin to gel until a few years ago. Steve Koonin '72, vice president and provost and professor of theoretical physics, said that six years ago a visiting committee of eminent scientists was invited to review Caltech's biology program. When the committee reported that Caltech was not investing sufficient resources to take advantage of new developments in that field, he and then-president Tom Everhart appointed a faculty committee to further study the issue. After soliciting input from faculty and others about the opportunities for Caltech in biology, the committee reported in September 1995 that the Institute could be one of the leaders in biology in the next century largely because of its interdisciplinary focus and its strengths in engineering, an area that has fueled advances in biotechnology. But Caltech would first need to recruit new faculty in the biological sciences, develop innovative facilities, and expand educational opportunities.

As a first step, Koonin initiated a lecture series in the spring of 1996, primarily involving the biology faculty, "to better expose the biologists to the rest of the Institute and vice versa. As faculty and the administration talked about it, the strategy began to emerge to capitalize on our already strong biology division and on Caltech's interdisciplinary atmosphere by involving other divisions.

"Caltech has always focused on the areas with the greatest payoff in science," added Koonin. "All you have to do is read the newspaper to see that biology has great vitality, is important to society, and is in the midst of a revolution. One aspect is that it's shifting from hypothesis-driven research to a data-intensive discipline." Research programs like the Human Genome Project, in which scientists are identifying all of the roughly 80,000 genes in human DNA and determining the sequences of the 3 billion chemical bases that make up human DNA, are giving researchers new insights into how to tackle diseases and genetic afflictions.

"As a result of the human genome project and other efforts," Koonin said, "we will have the ability to ask (and answer) questions based on large amounts of data. That's a mode of research common to other disciplines."

Koonin further noted that "Caltech's goal is to do eye-popping science and engineering and to educate people who will continue to do that. It's clear that the biological sciences are where a lot of the action will be in the coming years and that we need to be there with a greater presence."

Camilla Frost, cochair of the campaign, agreed that Caltech cannot afford to maintain the status quo. "To keep Caltech at the forefront of research in the biological sciences, we must invest in new resources," she said. "Caltech has the best people, but to keep them, we must give them the tools to carry out their research."

"We have physical chemists, biologists, physicists, engineers, and social scientists all getting together to answer fundamental biological questions."
—Mel Simon

Ben Rosen, campaign cochair and chairman of the Compaq Computer Corporation, said that he sees a parallel between today's investigations in biology and the burgeoning computer industry of a generation ago.

"A lot of the companies I've been involved in have emerged from the explosion of understanding of semiconductors and microprocessors that occurred in the 1950s, '60s, and '70s," Rosen said. "That technology went rather quickly from a research phase to commercial success. Today, we're at a similar stage where technology is making possible an explosion in knowledge and applications in biology. There's an opportunity through new discoveries and technology to create wonderful uses for mankind in terms of helping to cure diseases and accelerating other advances. The biological sciences will be the most exciting science and technology of the next few decades."

There are major mysteries waiting to be solved in biology, added Simon, and Caltech is pursuing many of them. These solutions will have a major impact on the treatment of cancer, Alzheimer's disease, and genetic disorders. "We have enormous amounts of data on biological systems, but the greater challenge is to put this information all together," he said. "We may have identified all of the genes in simple bacteria, but we don't know the function of 40 percent of them. And in humans, we don't know what more than 50 percent of the genes do. We can describe it and sequence it, but we don't know its function. We don't know how the brain works; how to describe what consciousness is or what feelings are in terms of their physical correlates. We've gotten people to live longer, but we still can't deal with Parkinson's or Alzheimer's diseases. Through the BSI, Caltech will investigate the biological bases of these problems."

As part of the BSI, Caltech has recently inaugurated two MD/PhD programs in affiliation with the UCLA and USC medical schools. The first students will be enrolled in the fall. Students will spend their first two years in medical school, taking preclinical courses, with summers spent at Caltech gaining exposure to the academic research environment. They will then come to Caltech for their PhDs, spending three-to-five years here before returning to medical school for their final two clinical years. At steady state, there will be approximately 16 students carrying out their PhD research at Caltech, and another 16 students doing their medical training in the joint program. Students will be able to do their PhD work with any member of the Caltech faculty.

Although a typical medical education and practice focuses on organs and relatively large systems of living beings, recent years have seen increasing activity in so-called molecular medicine, in which intervention is attempted on a molecular level—as in AIDS therapies, for example. This is an area in which Caltech can shine, says Simon, given its strengths in molecular biology and biochemistry. "We want our students to understand how organisms work in terms of how enzyme systems function and how gene action is coordinated and how complex molecules function in cells. We will understand physiological function in terms of molecular interaction.

"The challenges are fantastic, but Caltech has been at the forefront of the biological sciences for more than 50 years, developing molecular biology and bringing genetics to the fore," said Simon. "There's no reason why we shouldn't be at the forefront of this new search for knowledge. We have, and will continue to have, the best people, the best laboratories, and the best tools."

Parental longevity . . . from page 4

In fact, the Caltech hypothesis is not only that the caregiver who takes care of the offspring tends to outlive his or her mate, but also that the effect disappears when parents share in caregiving more or less equally.

Perhaps for this reason human males and females also have lifespans that are fairly similar in length. The current figure is about 8 percent, but does not take into consideration the fact that medical care has significantly reduced the death rate from childbirth. Swedish demographic data from the late 1700s, by contrast, show that females lived about 5 percent longer than their mates in those days, when childbirth was a leading cause of death in women.

The demographic data of the ten primate species show remarkable conformity to the hypothesis. In all of the primates studied in which females are the primary caregivers—spider monkeys, gibbons, orangutans, and gorillas—females live significantly longer than males. Human females live longer than males, but the difference is smaller than in these primates, and the male role is larger, although less than the female role in child-rearing.

In the two primates studied in which females and males share caregiving more or less equally, there is no difference between the survival rates of the sexes. In the two primate species in which males have a larger role in caring for offspring, the owl monkey and the titi monkey, males live longer than females. The effect is significant for the owl monkeys, but not for titi monkeys because of the smaller sample available for these animals.

Allman acknowledges that the results are somewhat counterintuitive: many people think that child raising is quite stressful and if anything should shorten the life of a harried parent. But just the opposite is true.

"There's probably not one single reason that the caregiver outlives the other parent," he says. "Risk taking in males and estrogen in females are probably factors, and there may even be a beneficial hormonal or chemical change that occurs through extending care to another.

"There's evidence that greater longevity can also coincide with the taking care of an elderly parent or even a pet," he concludes. "So it could be that taking care of others is just good for you."

The other authors of the paper are Andrea Hasenstaub—a junior in mathematics and engineering—and two former biology students: Aaron Rosin '97, and Roshan Kumar '96, who is now a researcher at the Scripps Research Institute in La Jolla.

Class Notes

1960

Peter Rony
1501 Highland Circle
Blacksburg, VA 24060
540/951-2805
rony@vt.edu

The class of '60, a class of surpassing modesty, is in transition: many of us either are preparing to retire, or have already retired. It has been 37 years—count 'em—since we left Caltech with freshly minted BS degrees. Our children have been raised, have gone to college, have even graduated, and now are working professionals who wonder why dad is so slow on the computer. Our homes, once full of the energy and laughter of children, now stand lonely. Also, it seems like it was only yesterday that Caltech students helped each other develop a sophisticated sense of humor, a quality that has served all of us well throughout professional careers in which our colleagues took themselves too seriously.

To quote Christopher Morley, "There is only one success—to be able to spend your life in your own way." It is my pleasure to introduce colleagues from the class of '60 who have spent their lives in their own way.

Tom Bjorklund (email him at tbjorklund@uh.edu) retired from Amoco a couple of years ago and is now working on a PhD at the University of Houston. "I am hoping to apply what I learned in the oil industry to understand better the earthquake hazards of the L.A. basin."

Pedro Bolsaitis (Irapeteris@aol.com) wrote that "I am now semiretired (still do some consulting) after a career in teaching and research, with an emphasis on material science, that took me through the University of Maryland, IVC in Venezuela, and MIT. I am now spending about half of my time in Latvia (my native country) engaged in various business activities. I am married, have two stepsons and three grandchildren."

James Farmer (Jlfarmer@byu.edu), though a professor of zoology at Brigham Young University, reports that "all I do is genetics. My applied genetics is excellent—all of my children turned out brighter and more accomplished than me. I have taught genetics to literally thousands of students. Retirement? 2003 for sure, 2000 if the stock market keeps surging forward."

Kent Frewing reports that he has "just celebrated 30 years at JPL working on Mariner, Voyager, and Magellan planetary spacecraft and on nonspace projects. My wife (Judy Pickering, Occidental '61) and I could not talk any of our kids into attending Caltech, so, between them and their spouses, we've got three lawyers and one pediatrician. Lots of my spare time is spent volunteering for the Alumni Fund and the Alumni Association."

Gary Goodman (g.goodman@compuserve.com) modestly reports that he has worked for the Computer Science Corporation in the defense area for the past 13 years. **Mel Holland** (hollandm@csus.edu) has retired from California State University, Sacramento, and is "trying to do some consulting in water resources/envir-onmental engineering."

For the past 17 years, **Ernest Isaacs** (Ernesti@pacdell.net) has been a psychotherapist in private practice in the East Bay area of San Francisco. He also teaches classes in meditation.

Ron Kunzelman (Ronkunz@netgate.net) reports that he retired in 1994 and is currently "windsurfing, sand railing, and traveling."

Man-of-all-seasons **Cameron Mosher** (cmosher@utah-inter.net) reports that "my life has gone in some incredibly interesting directions, away from the degree in geology I got at Caltech in 1960, and into some fascinating opportunities for growth and personal learning as well as varied paths for making a living." His "adventures range from graduate school (MS and PhD at the University of Wisconsin)—raising five kids, divorce, currently seven grandchildren—through several career changes." He is the founder of an outdoor experiential training company formerly called High Challenge Inc. "but now more broadly conceived as a training and consulting firm called simply Cam Mosher and Associates, Inc."

Fred Newman writes that "I was the overall winner—with a score of 23/25 3-point shots—of the 1997 International Shootout National Championship held in May at Las Vegas."

After a probable retirement in several years from his position as professor of chemical engineering at Virginia Polytechnic Institute and State University, **Peter Romy** (your class scribe) is contemplating a chain of fast-food restaurants called The House of Toroids, which will have the business slogan "Synergy between food and mathematics."

Tom Tebben (Ttebben@aol.com) reports that "on 8/31/97 I celebrated the third anniversary of my retirement. Still doing some consulting with Arthur Andersen. My main foci are travel and tennis. Linda and I have been married 34 years and recently shared the trauma of having our daughter turn 30. Our son will be 28 in October 1997."

Former CIT varsity diver **Robert C. Thompson** (rctbone@ipa.net) is still practicing orthopedic surgery, with special interest in spine problems. He flies often and is active in the Flying Physicians Association as well as barbershop and jazz vocal music. He professionally manages two large computer databases for organizations. Ham radio is on the back burner.

Lawrence Trafton (Lmt@astro.as.utexas.edu) is "a senior research scientist at the University of Texas at Austin, McDonald Observatory, and is involved in ground-based and Hubble Space Telescope astronomical research."

1973

Stephanie Charles
217 Ada Avenue, Unit 4
Mountain View, CA 94043
650/969-3740
sjcharles@juno.com

John Belew writes that he is chief cook and bottle washer at Wizardry Inc., where he designs and manufactures special-purpose computers and software to control various (typically motor-driven) devices. Machines controlled by his computers currently manufacture about $1 billion per year of product. In 1987 John married Carol, a nurse, and inherited a prefabricated family of three teenagers (two sons and one daughter), who are all now living on their own. In 1996 they moved to Gardnerville, Nevada (half an hour from two ski areas), doubling their business space (and perhaps enhancing their recreation opportunities).

Dave Brin reports that he got a PhD in physics at the University of California in San Diego, but dropped out to become a full-time writer when his novels started paying a lot better than physics did. Dave's book *The Transparent Society* came out in May. Dave is married to **Cheryl Brigham,** PhD '90. They lived in Paris during her postdoc, then moved to San Diego to raise their three children (one girl and two boys). Dave's personal web page is http://www.kithrup.com/brin/

Deborah Chung got her PhD in materials science from MIT in '77. She is now a professor in the department of mechanical and aerospace engineering at SUNY Buffalo. She reports that news of her work can be found at http://www.msnbc.com under Technology and then under "Carbon fiber...," or on page 173 of the March 30, 1998, edition of *Business Week*, under "Developments to Watch."

Jerry Navratil writes that he got a PhD from the University of Wisconsin in plasma physics and joined the faculty at Columbia University in the department of applied physics in '77. He has served as department chairman since '88. His primary research field is plasma physics and fusion energy, and he runs a tokamak experimental facility at Columbia. He married Joan Etzweiler in '76 and now has three daughters and one cat. He reports that he is going to a negotiation session in Tokyo while many of the rest of us are at the reunion. He will be attending this meeting as a member of the five-person U.S. delegation negotiating with Europe, Japan, and Russia to set the technical requirements for the proposed $5–10 billion International Thermonuclear Engineering Reactor (ITER) project.

Bruce Eisenhart dropped into the Caltech Alumni House on a recent visit to campus and discovered that he was on our list of lost alumni. Now that he has resurfaced he reports that he married his college sweetheart shortly after graduating from Tech and that they will be celebrating their 25th anniversary later this year. He and his wife spent over a decade in Southern California before his work with IBM moved them east. They eventually settled in the Washington, D.C., area, then had a two-year assignment in Belgium, which they used as a base for extensive travels in Europe. Bruce now works for Lockheed Martin as a system engineer.

After graduating from Caltech, **Bruce Reznick** went to Stanford, then taught at Duke for two years (a washout, he reports, except that he met his future wife, Robin, there). After that, he did a postdoc at Berkeley and went to Urbana, Illinois, in '79, where he has been ever since. You can check out his webpage at http://www.math.uiuc.edu/~reznick for more on that. He says that, although his department is large, it is not bureaucratic, and he is pretty much left alone to do things the way he wants. He and Robin have been married for 21 years, but chose not to have children, so they didn't impact our son/daughter ratio in either direction. (For more on this, see below.)

Dan Reichel writes that he worked at IBM in Poughkeepsie, New York, from '73 to '76 on optical fibers and surface-acoustic-wave transducers before leaving for graduate school at the University of Michigan in Ann Arbor. He got his PhD in physics there in '82, with a thesis on statistical mechanics and the clustering of atoms. He taught for a year at College of the Holy Cross in Worcester, Massachusetts, then got married and moved to Columbia, Missouri, where he performed neutron-scattering studies from '83 to '88. His wife, Carol, a plastic surgeon, then got a job in Roanoke, Virginia. He found a job as a programmer/systems analyst with a small firm in town and has been with them ever since. One of his favorite hobbies is singing in the Roanoke Valley Choral Society.

This past December, **Bill Derrick** was appointed to the position of research director of the International Institute for Surface Transportation Policy Studies (IISTPS, also known as The Mineta Institute) in San Jose, California. He and his wife, Angie, moved to San Jose (just in time for the El Niño storms) from Kansas City, where he had been the Transportation Director of the Mid-America Regional Council for the past four years. In addition to his work at IISTPS, Bill is teaching a graduate-level course on "Transportation Systems Planning and Development" at San Jose State University.

Jim Bonomo writes that he married **Janet Wainwright** '74 and has worked at the RAND Corporation for a number of years. He is currently spending a year in the Pentagon working on arms control.

Paul Yancey reports a Web page on his deep-sea research: http://www.bmi.net/yancey/.

Steve Billester reports a planned trip to Cleveland to pick up a biplane. The plane has been partially rebuilt, including the engine, so he will test-fly it for a few days. Once he's sure

CLASS OF '89 LIGHTS ON FINE GIFT: The class of '89, after searching nine years for the best way to pay tribute to Richard Feynman through its class gift, has found its venue: it will contribute to the one-year-old Richard P. Feynman Prize in Theoretical Physics, allowing the prize to be endowed in perpetuity. The much revered professor and Nobel laureate died in 1988 but endures in the memories of many, including the eighty-niners and their class president, Tom Bewley. Bewley (second from left) represented the class when a three-volume set of Feynman's *Lectures on Physics* was presented to this year's Feynman Prize winner, Victoria Tanusheva '98. Taking part in the presentation were physics professors Ken Libbrecht '80 (left) and Charlie Peck, PhD '64 (right). Libbrecht nominated Tanusheva for the award and had served as her 1997 SURF advisor, and Peck chaired the Division of Physics, Mathematics and Astronomy for five years before stepping down at the end of June. Tanusheva, who graduated in mathematics, said she would apply the accompanying cash award toward moving expenses when she heads to MIT to study economics. "It's not very exciting," she said, "but it's useful. I have a lot of books."

Wanted: Class agents for the years '34, '36, '39, '40, '43, '46, '47, '50–'53, '65, '67–'69, '72, '84, '89, '90, '92, and '98. Graduating seniors of those years can call Karen Carlson at 626/395-6593, or e-mail kcarlson@dar.caltech.edu, to claim your reward!

it will stay safely airborne, he will fly it back to Pasadena.

Hal McGee and **Sharon Long** are spending the summer in France on sabbatical.

Ray Spears went to Curaçao to see the eclipse in February with 14 other Techers (classes of '70–'77) and four dozen of his closest friends and family. He and Howie **Marshall** '70 organized this trip "to the extent that cats may be herded."

After my previous report in these notes of a daughter deficit, a number of our classmates wrote to report on their children. **John Fraser** and **Paul Schluter** have two sons each. Dan Reichel has one daughter and one son, as do Hal McGee and Sharon Long. Dave Brin has one daughter and two sons. (Dave speculates that the daughter deficit might result from a sedentary lifestyle. He hears that Top Gun jet jockeys mostly have daughters.) However, **Phil Marcus** reports one daughter; Jim Bonomo reports two; and Jerry Navratil has three! To date there have been reports of 26 sons and 18 daughters. While still skewed, the numbers aren't as far from normal as they originally appeared. We will be doing further investigation into this matter. In the meantime, I leave you with Phil Marcus's words, "Put me into the very proud rank of daddies with a daughter. Girls are great; she's five, yet adds, subtracts, multiplies, divides, and has a good idea what exponentiation is all about. She can also tell you all about Jupiter and its Great Red Spot."

1980

Susan Fuhs
517 Loma Drive
Hermosa Beach, CA 90254-4649
fuhs@alumni.caltech.edu

Bill Clayton recently made his 1,600th free-fall skydive, and is on a team that is slated to compete in the 1997 U.S. National Skydiving Championships.

Jon Zingman has two little girls, Shira (6) and Naomi (3). He has been married for 12 years to Ann Daniels, who is executive director of a women's rights organization. He just joined a start-up in Emeryville, called Calimetrics. The company is developing technology to double the capacity of DVD discs. He is the director of electrical engineering there, helping with algorithm and product development.

Shal Farley writes that he and his wife, Annette, have purchased a vacant lot in Monrovia and are currently planning their dream home. The neighborhood will be great for their two boys, Daniel (4) and Kevin (2), to grow up in. He offers apologies to all for not holding any of his barbecue parties in the last few years, and muses that yet another summer has escaped him . . .

Victor Wickerhauser has just celebrated his sixth anniversary as a professor at Washington University and will soon celebrate five years in his house. He's been travelling a lot—300,000 miles on four frequent flyer programs this year. **Lisa Heinz** '78 visited him in April and May, staying in the "guest attic" with her dog, Maggie, en route between Washington, D.C. and San Diego. He saw **Dan Erwin** '81 and his wife, Celia, in Venice, California, in February. Victor will be on sabbatical from January to June, 1998, and plans to travel all over. [Editor's note: Using up those frequent flier miles, perhaps?]

David Ritchie is married to Dana (no kids yet), and just moved on July 1 to Los Gatos from Pasadena. He is a patent lawyer at D'Alessandro and Ritchie in San Jose, California, and is on the Alumni Association board.

Robby Butler's first daughter turned one year old on September 4. He is personnel director *and* director of computer services for a Christian ministry of far-reaching influence, founded 20 years ago by **Ralph Winter** '45, another Caltech alumnus.

Leslie Rusch is married to André Zaccarin. They have a daughter, Anne-Marie Zaccarin, born June 6, 1996. Leslie got her PhD in electrical engineering at Princeton in 1994, and is a professor of electrical engineering at Laval University in Québec City, *teaching in French*. [Editor's note: Oui, Madame, je parle français, un peu ...]

Jay Hellinger and Helene Sicherman were married on May 29, 1994. They moved to a new home in Newbury Park in June 1995, and had their first child, a baby girl named Alonna, on February 8, 1997 (5 pounds, 10 ounces, and 19.5 inches). Jay still works for Parsons in Pasadena. He's been there for more than 14 years, and is a principal process engineer. Helene works for a construction company in document control.

Kelly Roach is with the Maple Group at the University of Waterloo, working on computer algebra, particularly symbolic integration (computer calculus) and the Risch algorithm. The past two years he has successfully submitted papers on special functions to, and participated in, ISSAC conferences in Zurich, Switzerland, and Maui, Hawaii. [Editor's note: Why are *my* conferences in Cleveland and Detroit?]

Mark McHenry announces a new baby, Melissa BettyMae McHenry, born on January 23, 1997. He now has three children. The other two are Zachary Pope (in second grade), and Samuel Wyatt (three years old). Mark is working as a program manager for the Tactical Technology office at DARPA (Defense Advanced Research Projects Agency). He recently moved to Virginia for the DARPA job, and is enjoying Virginia and the Washington, D.C. area.

Forrest Brewer and **Kathy Doughty** '82 had a son, Forrest William, on April 19, 1997. He writes that boy, mother, and father have all recovered and are doing well.

Frank Bernstein is an intellectual property attorney (since 1984) and partner (since 1990) in the 70-lawyer firm of Sughrue, Mion, Zinn, Macpeak, and Seas PLLC in Washington, D.C. At the time of his letter, he expected to be opening his firm's first California office, in Menlo Park, on September 1, 1997. The Menlo Park office initially will have two resident attorneys and will offer a full range of intellectual property services, with particular emphasis on patent procurement, enforcement, and strategy.

1981

Eric Korevaar
517 Lodi Street
San Diego, CA 92117-1143
korevaar@astroterra.com

I would like to thank everyone who sent cards with their e-mail addresses and additional information. You can contact me at either of the addresses noted above. Since I received so much news this time, I'll present it as I got it:

John Faughnan, St. Paul, Minnesota (john@faughnan.com), "Doing medicine, computer stuff, skating, etc. All the news is at http://dragon.labmed.umn.edu/~john/."

Russell Reder, Glenview, Illinois (Russell.Reder@Abbott.com), "Sailing a 30-foot Catalina out of Waukegan, Illinois, harbor on Lake Michigan. Working at Abbott Labs for eight years." **Joel Ennis**, San Diego, CA (ENNIS@MAXWELL.COM), "My wife, Kristal (Texas Tech '82), son Cameron (4), and I are doing well. My company's name changed from Maxwell Laboratories to Maxwell Technologies, and the stock went up 450 percent in the last 18 months."

Mark Saffman, Hellerup, Denmark (mark.saffman@risoe.dk), "Since getting my PhD in physics in 1994 from the University of Colorado at Boulder, I have been working at the Riso National Lab in Denmark as a senior staff scientist."

Bruce Martin, Winfield, Kansas (DrBDMartin@aol.com), "After several years in industry, I have taken a position as visiting assistant professor of chemistry at Southwestern College in Winfield, Kansas. Southwestern was recently rated 36th out of 1115 colleges in terms of value for students by *Money* magazine. Of course, Caltech is number 1. While my PhD is in organometallics, I'm currently teaching organic and biophysical chemistry."

Chris Kingsley, San Jose, California (KINGSLEY@XILINX.COM), "I got married a while ago and now have a three-and-a-half-year-old son. Susan and Jacob are the light of my life. I wish you had given me your e-mail address. Now let's see, do I have any postcard stamps. . . ?" **Michael E. Lucero**, Woodinville, Washington (mikelu@iName.com), "I just retired after nine years at Microsoft. Please send me some e-mail."

Jim Angel, Arlington, Virginia (angelj@gunet.georgetown.edu), "All is quiet on the Potomac." **Bob Goodrich**, Kamuela, Hawaii (rgoodrich@keck.hawaii.edu), "I'm newly married to a wonderful lady, Petra, since 9/17/96. I've been in Hawaii for a year and a half, working at the W. M. Keck Observatory, and searching for the best snorkeling site around."

Ken Campos, San Diego, California (kencampos@mem.po.com), "I've been living and working in San Diego for these past four years in clinical psychiatry, doing general adult locked-ward inpatient care. Currently, I'm president of a plant club: Bromeliad Study Group of Balboa Park."

Mark Sheldon, Huntington Beach, California (sheldon@alumni.caltech.edu), "No news right now; by the way, it would be easier to submit news if you would give us your e-mail address!" **John Whitehead**, Davis, California (JCW@LLNL.GOV), "Still dividing my time between LLNL [Lawrence Livermore National Lab] and independent projects. The former includes a loose collaboration with Carl Guernsey MS '83 (at JPL) regarding the very tough rocketry problem of returning from Mars on a very small scale (i.e., affordable missions). Privately, I'm prosecuting a patent application for my 'Gravity siphon solar water heater,' which I think is a breakthrough in efficiency and hopefully cost as well."

Thomas McCabe, San Marino, California (tom_mccabe@parsons.com), "My wife, Lorraina, and I have six children, ages 12 and under. I'm working in Pasadena for Parsons Engineering. I'm the project manager for a U.S. program to build a chemical weapons destruction facility in Russia to dispose of the nerve gas stockpile of the former Soviet Union."

Neil Barabas, Chatsworth, California (barabasn@std.teradyne.com), "I'm continuing to do consulting in power electronics. I have power converters about to launch on Cassini and next year on the Mars Microlander. Also I'm working with Intel and Teradyne to power and test the next-generation microprocessors."

Jamie Abbott, San Diego, California (jabbott@coi-world.com), "After graduation from Caltech, I went to work for Hughes Aircraft Company. With the help of a Hughes Fellowship, I received my MS in mechanical engineering from Cal State Fullerton. In late 1985, I went to work for Rohr in Chula Vista, where I stayed for 10 years. In 1996, I went to work for Composite Optics, Inc., where I work on satellite thermal management. I have been married since 1986 to the former Jordis Rabenberg, and we have lived in San Carlos for 11 years. We have two boys ages 4 and 6."

That's it for this time; but even as I wrap up these Notes, more are coming in. Please stay tuned for the next installment.

1987

John Beck
4004 Briarglen Drive
San Jose, CA 95118-1803
408/265-8447
john@beck.org

It's been 11 years since we graduated, and happily even the most intense of us have discovered that life is more interesting than just our high-tech work.

I went on to get an MS in computer science from UC Santa Barbara in '89. I worked for Hewlett-Packard for 6-plus years, tried an Internet start-up, then have been at Sun since December '96. Basically they pay me to play with e-mail all day. Married (wife Peggy) in July '92; daughter Charis born in February '98. We also have two dogs. More at http://www.beck.org/john/

Two days after our reunion in '97 we visited **Pamela (Feldman) Cosman** and her family in La Jolla. She writes, "We had our third son, Gilead Anza Cosman, in March '97. I (Pam) continue to work at UC San Diego as an assistant professor in electrical and computer engineering."

Nancy (Drehwing) Edwards visited us in August '96. She reports, "Worked for two years in California before heading east to get an MS at Harvard in '90. Moved to the D.C. area and married Jody Edwards (hydrogeologist) in '91. Relocated to West Chester (near Philadelphia) in February '96, had daughter Kylie in December '96. Am working from home about 1–2 days a week, but basically doing the stay-at-home mom gig. Kylie is now 16 months old and truly a wonder. Motherhood is great!"

I used to run into **Tom Nolan** on the ultimate Frisbee fields at Stanford. His note: "Hitachi, Japan, was nice. Komag, California, is nicer. Vacation in Hawaii will be nicest."

Darin Acosta came to South Dakota to be in our wedding. He is an assistant professor in high-energy physics at the University of Florida in Gainesville. He and Janis have been married for eight years now; their daughter, Angela, will be three this summer, and we just got news of son Alex's birth in April.

Gabrielle (Gordon) Adelman writes: "Married to Kenneth Adelman 11 years. Former flight instructor and current aircraft owner and manager, flight school. Fly helicopters for fun. I have three cats and a two-year-old nephew."

Vineer Bhansali reports, "After Caltech, I did my PhD in theoretical physics at Harvard (1992) and then switched to trading. I was VP (derivatives trading) at Citibank till 1997, and then joined Salomon Brothers Proprietary Trading. I have a two-year-old son, and a four-year-old golden retriever. My wife, Kate, is an anthropologist, and we live in a 266-year-old farmhouse 25 miles north of New York City."

Nhi (Hua) Casey and **Edward Casey** '85 wrote, "I (Nhi) am having fun working at Walt Disney Feature Animation. Ed's at the Aerospace Corporation. We have two boys, Ryan (5) and Kevin (4)." **Cathy Chang** and **James Roberts** '88 told us, "After Caltech, I (Cathy) got my PhD in molecular and cellular biology at Arizona State University and was a postdoc at the Scripps Research Institute. I am now a staff scientist at Stratagene, San Diego. Jim works for a small software company, MacSourcery. We have two dogs."

Olivier Cojot-Goldberg let us know that he is the "father of two girls, Lea and Coralie—five and three. Married for five years. Moved out of Manhattan, after six years of work as a mortgage trader at Kidder Peabody, to Westport. Started

Joan Marie Gimbel '94 has been elected to the Association board of directors. Here (center), she shares her not-too-distant memories of her student days as she chats with graduating seniors at the Senior Barbecue, held in the backyard of the Alumni House this past spring.

a hedge fund, called Ellington Capital Management, with six other partners."

Jarita Holbrook tells us, "After getting a PhD in astronomy and astrophysics (UC Santa Cruz '97), I became a cultural astronomer focusing on Africa. I'm currently a lecturer at UCLA." **Christie (Cooper) Jensen** and **Rob Jensen** '88 report, "Rob is working on his master's degree in EE when he's not at Motorola. I've turned in my corporate ladder for full-time motherhood. Our daughter, Kendra, proves that somewhere in our past we did something very right to deserve her and we are hoping for more children."

Liu-Yen Kramer writes, "**James Ibbetson** '90 and I had a baby son, Thomas, last November. We've recently bought a house near UC Santa Barbara, where we both work. I help run education programs for two science research centers at UCSB. James just finished his PhD this spring and is continuing to work as a postdoc."

Thomas Rathjen reports, "I've been working for NASA at the Johnson Space Center on flight crew equipment since graduating from Caltech. My wife, Cindy, and I are expecting our fourth child in September. Amanda, our oldest daughter, is in kindergarten. Kristina, daughter number two, is about to turn five. Stephanie, the 'baby' until September, is 16 months. (By the way, the fourth one looks like a girl, too!) I recently learned to fly and am the proud owner of a 1952 Piper Pacer. I still love Porsches, and play lead guitar in my fourth rock band since moving to Houston. Just started working on a master's in human factors; it will probably take a while."

Ray Trent wrote, "Married to Theresa (Shannah) Miller for five years. Our second son, Christopher, was born in August. Two-year-old Kenneth is doing well. I've worked for a Bay Area company named Synaptics that seems to be a Techer vortex (something like two-thirds of the engineering staff of 20 or so)."

Timothy (Tuyen) Pham wrote, "Life has been good, both at home and work. Blessed with two daughters—a great joy in our life. Managed to get together with **Chris Hougen** and Ichiro a few weeks ago, which would not have happened had our spouses not been keeping in touch. As for work, been at JPL since graduation, working with the Deep Space Network."

1994

Won Bang
1028 Lancer Drive
San Jose, CA 95129-2935
408/983-5868
wonbang@alumni.caltech.edu

Yes, it took a while for me to get my rear in gear and compile these messages from you. To get myself in the right state of mind, I visited Caltech a few weeks before I put this together. I was amazed by all the new buildings that have been built and the landscape improvements that have been made, making our school even more beautiful than before. However, even with these changes, the feeling of homecoming to a place where we matured from teens to young adults made me nostalgic. I received quite a few replies from all of you; about half of you only wrote back your e-mail and address. The gist of what the other half wrote is written below. (I might have misplaced two of the replies when I moved. Sorry!)

Jeff Barker writes that he and his wife, Abby, are at the University of Minnesota, working on their degrees. Jeff is hoping to finish up his PhD in control science in the next few years. **Brian McAllister** writes that he has been trading options on the Philadelphia Stock Exchange for the past four years. He has also exercised his "option" to marry. **Jonah Harley's** mother writes that Jonah is working toward a doctorate in mechanical engineering at Stanford. (She also mentioned that Jonah is a very nice boy, but should call home more often). I actually ran into Jonah several months ago, and he was relaxed and in good spirits. **Wurzel Keir** writes that he is very grateful to Caltech for "helping" him graduate in six years. He earned his Private Pilot Certificate flying with the Aero Association of Caltech and hopes to see us in the sky.

Ali Alagheband writes that after graduation from MIT with an MS in mechanical engineering, he moved to Portland, Oregon, and is now working at a start-up. He is now married, and his wife works as a lawyer. **Julian Jamison** writes that he is making progress on his PhD in economics at MIT. He has also been traveling through Iceland, Russia, and Sweden. (Are Volvos any cheaper there?) He reiterates his allegiance to the true beavers of Pasadena. **Keith Schneider** writes that he is a third-year graduate student in the University of Rochester's brain and cognitive sciences department. Edray **Goins** is actively involved in the underrepresented college community at Stanford, where he is a resident associate. He will be graduating with a PhD in mathematics in the near future. **Jason Lee** is in his last year of medical school at UC San Diego. He will be a resident in general surgery on the West Coast, hopefully.

Joan Marie Gimbel took a year's sabbatical to traverse through 32 countries. Some of the highlights of her trip were a camel safari in the deserts of India and chasing after cheetahs on foot in Botswana. (No, she didn't catch one). During the trip, she lost her passport and had to be smuggled over the border into Zambia. She is currently working at Hughes. (Smuggling, satellites . . . Joan Marie, what are you re*ally* doing?) **Jeff Martin** writes that he worked for 2.5 years at a software firm and then opted for a sabbatical in the mountains of Colorado. After a year of adventures in the Rockies and trekking 1,200 miles on the Pacific Crest Trail, he will go back to school.

I've heard through the grapevine that **Bryce Elliott**, the Texan, is happily married in Texas. **Nicole Cherry Olsen** writes that she is a grad student at Washington State University. She married Jamie Olsen in 1997. **Rebecca Green** writes that she is currently a grad student in the joint program between MIT and Woods Hole Oceanographic Institution doing research in bio-optics. She loves it there, but misses the West Coast.

Thomas Leung is pursing his PhD in EE at UC Berkeley. **Gregory G. Howes** writes that he is a grad student at UCLA, having completed grad school at Victoria University of Wellington in geophysics as a Rotary Ambassadorial Scholar. He will work in plasma physics, researching ways to mitigate ozone depletion. **Nina Cardoza Krowas**'s husband, **John Krowas** '93, writes that Nina finished her master's at Brown and now works at Dana-Farber Cancer Institute doing research and grant administration. They live in Brookline, Massachusetts, and are busy chasing their son, Harrison Casey. He also writes that Nina married a real cool guy. (Okay, he didn't write that). **Dave Krum** writes that he is working on his MS in EE and working at Motorola in Alabama. **Marcus Chen** just got into an internal-medicine residency program at the University of Colorado. He plans to go into cardiology.

I ran into **Nhat Nguyen** here in Silicon Valley. When he is not being the master of ceremonies at the Stanford Vietnamese Students Association, he is working toward his PhD in mathematics. I also saw **Henry Choi** recently. He spent two years at MIT getting his MS in mechanical engineering, then went to Korea for a couple of years of work experience. **Maha Zewail Foote** married **Garritt Foote** '92 a few years back. She is getting her PhD in chemistry at the University of Texas at Austin. **John Parks** works as an engineer at Applied Materials, a real cool company. **Shreyas Vasanawala** is doing an MD/PhD at Stanford. I ran into **Aron Rempel** on the airport shuttle last year. He is working at Intel.

Judging from the early responses, it looks like taking sabbaticals and getting married seem to be the activities of choice for the class of '94. As for me, I am working at Applied Materials in Santa Clara, designing semiconductor fabricating equipment. In my spare time, I sit around and wait for replies from the class of '94. We would like to hear how everyone is doing. Please drop me a line via e-mail or mail (both addresses above) and let us know how you have spent the past four years—even if all you have done is not miss an episode of *ER*. Otherwise, I'm going to fill the next column with how my golf game is progressing. Well, I hope to hear from many more of you. Write!

1995

Tobé Corazzini
Post Office Box 14528
Stanford, CA 94309
tobe@sun-valley.stanford.edu

Okay, guys, so some of you seem to be *seriously* missing the point of the little white cards that were sent to you. It really isn't very exciting for me to receive a blank postcard with your name on it, and even less exciting for the rest of you reading the class notes. But, since this seems to be the preferred method of communication for our class, I am happy to announce that **Kurt Revis, Shiyin Siou, Michelin Aldridge Sloneker, Serge Belongie, Ewald Hueffmeier, Farid Ahmed Khan, Richard Liu, Frances Chance, Baoquoc N. Pham,** and **Rajan Ranga** appear to be alive.

Now, a few people actually told me a little bit about what they're up to, so . . . **Kristin Polito** graduated from Georgia Tech with an MS in management. She spent two months exploring Europe this summer, including taking a business class in Koblenz, Germany, and traveling through Italy, Greece, and Turkey.

Bridget Mattingly started school at Georgia Tech this fall. **Joe Lee** is in medical school at Washington University in St. Louis, along with **Eddy Vataru, Pat Yue, and Gina Serraiocco** '97. Joe seems a little less than thrilled about the whole Midwest scene.

Zackary Berger is in his second year of medical school at NYU's MD/PhD program. Over in New Hampshire, **Flora Ho** has finished her surgery rotation at Dartmouth and is now doing outpatient medicine. Flora and **Brian Brewington** were married in August 1996.

Mark Nelson is a PhD student at New Mexico State University. He is giving a talk in November at the national meeting of the American Institute of Chemical Engineers. **Matt Metz** is halfway to getting his PhD from the plant biology department at UC Berkeley. He confesses to being truly selfless, as he still throws parties to keep up the morale of his peers. **Virginie Leenknecht** is deciding between pursuing her PhD in toxicology or working for an engineering company in Pasadena.

I'm afraid **Virginia Garcia** falls into the same category as the rest of you who sent me a card with no news about yourself. But since I see her all the time, I'm happy to spread some rumors. Ginger finished her MS degree in aerospace engineering at Stanford, and is now working for a computer company in the bay area. **Dean Haritos** is on leave from the PhD program in EE at Stanford, and is working at Hewlett Packard Labs. He wants everyone to know that he does not have a dog. (Well, in that case, I had better add that Ginger has a cat!)

Moving beyond the postcard responses, **Schuyler Cullen** and **Jason Kumar** are both at Stanford, in the PhD program in Physics. I've also seen Gypsy Achong running around the Stanford campus. **Jasmine** and **Chris Bryant** are married and living in Seattle, Washington, as are **Magnus Hedlund** and **Heather Gibble**.

A bunch of people are down in Southern California, including **Greg Davis** and **Tom Zavisca**, who are working at Green Hills Software. **Imran Khan** is in the EE department at UC Santa Barbara, and **Grant Templin** is also at UCSB. **Scott van Essen** is in the APh department at Caltech; **Joyce Wong** is in the EE department at Caltech; and **Jerry Shan** is in Caltech's aero department. **Andrew Maskiell** is working at Northrop Grumman as well as working part time toward a graduate degree.

Berkeley is also a popular spot these days. **James Holton** is in the biology department; **Jun Yang** is in the chemical engineering department; and **Mike Debar** is in mechanical engineering. At the other end of the United States, **Amit Mehra** is in the aero department at MIT. **Geoff Smith** is also at MIT.

Anthony Gonzalez is at UC Santa Cruz studying astronomy, and **Mike Jarvis** is at the University of Michigan, also in astronomy. Mike suffered a tragic loss with the death of his wife, Maggie Jarvis. I invite you all to visit the web site he set up in her honor (http://www.astro.lsa.umich.edu/users/jarvis).

Christian Waite is studying physics in Cambridge, while his brother **Chuck Waite** is pursuing an art career. He has an on-line portfolio at http://bond.caltech.edu/~chuwai.

I'm working on my PhD in the Aerospace Robotics Lab at Stanford and recently headed to the East Coast for some serious relaxation. Then, back to research with free-floating robots and indoor GPS pseudolites. So, it looks like I'll be stuck here for another three years or so, which means I have a fairly permanent e-mail address for you guys to send me lots of info, throughout the year. I have also set up a web page, on which I will post the information that people send me. The address is http://sun-valley.stanford.edu/users/tobe/alumni95.html. Take care, all!

Personals

1943
LLOYD C. PRAY, MS, PhD '52, has been named a recipient of the Distinguished Educator Award by the American Association of Petroleum Geologists (AAPG). A professor at the University of Wisconsin, Pray has been recognized "for his distinguished and outstanding contributions to geological education." He has been an AAPG member since 1948 and has worked as a consultant for several oil companies.

1956
JACK L. KERREBROCK, PhD, professor of aeronautics and astronautics at MIT, has been elected to the grade of Honorary Fellow in the American Institute of Aeronautics and Astronautics; this is the highest honor awarded by the AIAA, and recipients are elected yearly for "their outstanding contributions to the industry." Kerrebrock "was responsible for the conception of several new fundamental concepts related to nuclear rockets, MHD power generation and compressors for gas turbine engines" and "is being honored for decades of leadership and dedication to aerospace engineering education and for innovative research contributions in aerospace propulsion."

1960
WILLIAM G. SCHEERER, MS, of Morganville, New Jersey, has joined Kalman Saffran Associates (KSA) as special advisor to the president "on matters of global expansion and business development"; KSA develops "state-of-the-art products for the data communications, telecommunications and interactive/CATV industries." Formerly a vice president for Lucent Technologies, Scheerer was with AT&T (now Lucent) Bell Laboratories for more than 30 years. He also serves on the boards of directors of LeCroy Corporation and GenRad Inc.

1963
CHANG-CHYI TSUEI, MS, PhD '66, a scientist in the physical sciences department at IBM's T. J. Watson Research Center since 1973, has been selected by the American Physical Society to receive the Oliver E. Buckley Condensed Matter Physics Prize. He is being recognized for his "groundbreaking work in the field of high-temperature superconductivity."

1965
SCOTT W. BECKWITH, MS, has been appointed to "an unprecedented third 4-year term on the Department of Commerce Materials Technical Advisory Committee (MTAC)." The president of Beckwith Technology Group, an international consulting company specializing in composite and plastic design and manufacturing technology, Beckwith was first appointed to the committee in 1989. The MTCA assesses foreign technologies and recommends export control and licensing procedures for critical U.S. technology.

1966
JOHN T. COOKSON, JR., PhD, has been appointed vice president and corporate principal–environmental at Sverdrup Civil, Inc., and will be based in the Falls Church, Virginia, office. He joined Sverdrup in 1996, following a 31-year career in environmental consulting, research, and policy development, and he currently serves as an advisor to foreign governments, the World Bank, and U.S. federal agencies. In 1973 he founded JTC Environmental Consultants, Inc. When the firm was acquired by General Physics in 1989, he served as GP vice president of environmental services. He was president of the International Network for Environmental Training, Inc., from 1991 to 1996. The founder of the University of Maryland's Environmental Health Science and Engineering Program, he currently serves as an adjunct professor with Johns Hopkins University. He is also the author of *Bioremediation Engineering: Design and Application*, which is used by numerous universities. In 1997 Washington University awarded him its Engineering Alumni Achievement Award.

HENRY G. SCHWARTZ, JR., PhD, president of Sverdrup Civil, Inc., has been awarded the Orchard Medal by the Water Environment Federation, one of only 12 Orchard Medals bestowed since 1961. For more than 20 years he has served in leadership positions for the federation and for the Missouri Water Environment Association, and the award recognizes his "commitment, dedication, integrity, and years of service." He is a member of the National Academy of Engineering and is currently vice president of the American Society of Civil Engineers. Sverdrup Civil is the environmental, water resources, and transportation subsidiary of Sverdrup Corporation, an international engineering, architecture, and construction firm.

JERRY YUDELSON, of Portland, Oregon, joined Glumac International Consulting Engineers in June 1997 as corporate marketing manager for five West Coast offices. He is based in the Portland office.

1968
A. DEWEY STRUBLE III, MS, owner/broker of Trident Real Estate in Reno, Nevada, has been elected the 1998 national president of the Commercial Investment Real Estate Institute, Chicago. A 20-year real estate veteran, Struble specializes primarily in site selection, brokerage, and redevelopment assignments for hotel and motel clientele. As a decorated officer in the U.S. Navy, he served as an aerospace engineer, and he was also a nominee to the Space Shuttle program as a mission specialist.

ERIC WICKSTROM, of Philadelphia, Pennsylvania, reports that Marcel Dekker, Inc., is publishing his new book, *Clinical Trials of Genetic Therapy with Antisense DNA and DNA Vectors*. In family matters, his wife, Lois, runs Gripper, her own computer-support business, and his younger daughter, Eileen (Emory '93), is a Democracy Officer for the United States Agency for International Development, in Almaty, Kazakhstan. His older daughter, Erica (MIT '90), is a microchip designer for Quantum Effect Design in Mountain View, California, and in May married Adam Brand, an electrical engineer at Intel and a fellow MIT alumnus. Wickstrom invites fellow Techers to check out his Web page at http://asterix.jci.tju.edu/wickstrom/wickstrom.html.

1970
PHILIP CASSADY, PhD, has been named a Technical Fellow of the Boeing Company "in recognition of his exceptional professional expertise and performance as an outstanding member of the national and international engineering and scientific community. The Technical Fellowship is a group of thirty-eight individual executives selected from the entire Boeing Company who demonstrate exceptional judgement and competence in their discipline. . . . Dr. Cassady is nationally and internationally recognized as an authority in the diverse fields of high power lasers, aero-optics, laser radar, remote sensing and hypersonic flow diagnostics." In addition, he and his wife, Katherine, live on Stillwater Farm in Snoqualmie, Washington, where they keep Arabian horses. Their sons, Sean and Edward, are both engineers. Cassady enjoys horseback riding, competitive rifle shooting, deer and elk hunting, and trout and steelhead fishing.

1978
AJIT P. YOGANATHAN, PhD, has received the H. R. Lissner Award from the American Society of Mechanical Engineers (ASME), for leadership in bioengineering; the society's "most prestigious award given in the field of bioengineering," it was presented at the ASME's winter annual meeting in Dallas, Texas, in November 1997. A member of the Georgia Institute of Technology's faculty for 18 years, Yoganathan is associate director of the Parker H. Petit Institute for Bioengineering and Bioscience, director of the Bioengineering Center, and Regents' Professor of Chemical Engineering. A recipient of the Sigma Xi Research Award, he has published more than 135 refereed publications as well as 27 book chapters, and has coedited two books. He is a founding fellow of the American Institute of Medical and Biological Engineering and will serve as the conference cochair for the 1999 International EMBS/BMES conference in Atlanta.

1979
NADER ENGHETA, MS, PhD '82, professor of electrical engineering at the University of Pennsylvania's Moore School of Electrical Engineering, writes: "I have been selected for the Fulbright Naples Chair award in Italy during the 1997–98 academic year. This award, which allows me to visit and lecture at the University of Naples for three months, is through the Distinguished Chairs program of the Fulbright."

1981
WILLIAM P. ROGERSON, PhD, currently professor of economics and chair of the economics department at Northwestern University, has been named the Federal Communications Commission's chief economist. "His research and teaching interests include incentives and information in markets and organizations, the economics of defense procurement, industrial organization, regulation, health care and cost accounting," and he has been a consultant to, among others, the Federal Trade Commission, the Institute for Defense Analysis, and the RAND Corporation.

1985
BRIAN H. DAVISON, PhD, of Knoxville, Tennessee, won a Research & Development 100 award in 1997 for the "Production of Chemicals from Biologically Derived Succinic Acid." He led a team of researchers from Oak Ridge National Lab and a number of other organizations in developing and testing "an economic process to produce succinic acid from renewable corn sugars as a new platform chemical." Davison continues as the biochemical engineering research group leader at Oak Ridge and is currently chairing the 20th Symposium on Biotechnology for Fuels and Chemicals.

1988
ERIC G. SCHARIN writes: "I moved from Boston to Research Triangle Park, North Carolina, in 1996 after accepting a position as Formulation Scientist at Covance Biotechnology Services, a start-up company which provides

KEEP US INFORMED THROUGH THE CALTECH PERSONALS!

Keep us informed so we can keep your fellow alums informed! If you're a Caltech graduate who received your MS or PhD from the Institute, or an undergrad alum who doesn't yet have a Class Notes agent, the *Personals* is the place to let us know what you've been doing. Please send us news about you and your family, about a new job, promotion, awards—anything you'd like to see printed in the *Personals* section of *Caltech News*. Return this coupon and any additional materials to *Caltech News*, 1-71, Pasadena, CA 91125.

Name_____

Degree(s) and year(s) granted_____

Address_____

_____

Is this a new address? _____ Day phone _____

Occupation_____

NEWS_____

Obituaries

contract process development and manufacturing of biopharmaceuticals. I am currently in charge of Program Management for the Process Development group there."

1989
CAROL CHOY and PHILIP LEE write that they "had the cutest baby boy in December '97. Baby Andrew and parents are all doing fine. . . . Carol is a software engineer for Walt Disney Feature Animation, and Phil is a ride engineering manager for Universal Studios, Islands of Adventure." Pictures of Andrew can be seen at their Web page, http://www.alumni.caltech.edu/~phl.

RICHARD C. HSU, after three years as a patent lawyer with Lyon & Lyon, in Los Angeles, has become director of intellectual property and licensing at Cyrano Sciences Inc., a Pasadena-based Caltech spin-off that's developing an "electronic nose" for detecting and identifying odors. As part of the management team, he attends all board meetings and spends considerable time on valuations for venture-capital financing and, down the road, a public stock offering.

1990
ASIM MUGHAL, founder and editor of the Pakistan News Service, was invited to give a talk on the Pakistan economy to American business investors at the Emerging Markets Conference, held at Stanford University May 8 and 9. A vice president at Bay Systems Consulting, Inc., a Silicon Valley information-technology consulting firm with branches in Pakistan, Mughal is currently managing several offshore development projects in Pakistan and providing consulting services for redesigning and privatizing its national telecom infrastructure. The Pakistan News Service, founded by Pakistani computer scientists and journalists, has been on the Internet since 1991, providing daily news and information about Pakistan. Prior to joining Bay Systems Consulting, Mughal was an engineer at JPL for more than five years, where he worked on telecom subsystems for several of NASA's deep-space missions.

1992
GARRETT E. REISMAN, MS, PhD '97, of Manhattan Beach, California, has been selected by NASA for its next astronaut candidate class. He will be one of 25 candidates, chosen from around the nation, to begin a year-long training and evaluation program in August at the Johnson Space Center in Houston. He is currently a spacecraft guidance, navigation, and control engineer in TRW's Space & Electronics Group, and is the first TRW employee selected for the NASA training program.

1996
JULIE JEANNINE (NORRIS) NAZARETH, MS, of Anaheim, California, reports that she married Sean F. Nazareth on February 14. He is a senior design engineer at Broadcom Corporation, in Irvine, California, while she continues as a graduate student at Caltech, working on her PhD in geophysics.

1923
ELMER L. SMITH, who had lived in Pasadena longer than any other resident, on October 27, 1997; he was 100. He worked for Pasadena's water department for more than 38 years, retiring in 1961 as assistant chief engineer, and during World War II he served as an instructor at Caltech in highway engineering and plane-table topography. Organizations of which he was a member included Sigma Xi, the Caltech Alumni Association, and the Pasadena Historical Association, and he was a founder of the Pasadena Federal Credit Union. He had moved to Pasadena with his parents in 1903, and during the city's centennial in 1987 was honored for having lived in Pasadena longer than anyone else. He was predeceased by his wife, Matilda, who died last year, and by his son, Robert, killed in World War II.

1924
FREDERICK J. GROAT, of Carmichael, California, on March 8; he was 96. He retired from the California State Department of Water Resources in 1972. He was a Gnome. He is survived by his wife of 66 years, Peg, daughter of Professor Royal Sorensen, founder of Caltech's department of electrical engineering; a son, Fred Jr.; a daughter, Virginia Starr; and four grandchildren and nine great-grandchildren.

1929
FRED A. WHEELER, of Los Angeles, on January 17; he was 89. He served as an officer in the Army and then the Navy, rising in the latter to the rank of captain. He was chief engineering officer on the light carrier *Princeton* when it was bombed and sunk October 24, 1944, and received the Silver Star and the Purple Heart for his role in the fight to save her. After the war he worked for Norris Industries, specializing in the design and production of military products. He also served as the commanding officer of the Naval Reserve School at USC. Predeceased by his wife, Arminta, he is survived by a son, Dennis; a daughter, Diana; and four grandchildren.

1930
JOSEPH FOLADARE, of Santa Barbara, California, on April 10, 1997; he was 87. After graduating from Caltech with his BS in physics, he received an MA in English from Claremont in 1931, and a PhD in English from Yale in 1936. After several years of teaching English at Iowa State College, he began a long career as professor of English at Santa Barbara State College, now UC Santa Barbara, taking a long leave during World War II to supervise the editorial section of the Caltech rocket project, receiving a Presidential Certificate of Merit for his work. After the war he returned to Santa Barbara, where he became chairman of the English department; he retired in 1974. Predeceased in 1996 by his wife of 61 years, Mabel, he is survived by his daughter, Elise.

RAYMOND W. HOEPPEL, MS '31, of Ojai, California, on July 14, 1997; he was 88. After working as a soil technologist for the USDA, research chemist for the Baroid Corporation, and director of research for the Ken Corporation, he owned and managed Sespe Laboratories, a chemical research and consulting firm, for 40 years. His interest in electronics led to the creation of a research business for developing electronic organs and magnetic field detectors; he held more than 30 patents in the petroleum and electronics fields, and an audio compass invention won the IR100 award in 1977. An avid organist, he was a member of the American Theater Organ Enthusiasts Society. Predeceased by his wife of 59 years, Norma, he is survived by a son, Ron; a daughter, Barbara Jones; two grandsons; a brother, Charles; and a sister, Mildred Ruddick.

1931
HERBERT E. HAYMAKER, Ex, of Fortuna, California, on February 12, 1997. He is survived by his wife.

1932
C. J. BREITWIESER, MS, of La Jolla, California, on March 13, 1997.

GUY WADDINGTON, PhD, of Victoria, British Columbia, on March 18, 1996. He is survived by his wife, Winifred.

1933
R. SCHUHMANN JR., Ex, of West Lafayette, Indiana, on July 7, 1996.

1934
EDWARD B. DOLL, MS '35, PhD '38, of Santa Barbara, California, on February 17; he was 85. During World War II he worked in Los Alamos for Phillips, and he worked for the Stanford Research Institute. Joining TRW, he worked with NASA and on the Atlas and Titan missile programs, retiring as executive vice president in 1977. He is survived by his wife of 34 years, Adrienne; his son, Edward Jr.; his daughter, Susan Perry; and five grandchildren and a niece. A memorial fund has been established at Caltech. Those wishing to contribute should write to the Edward B. Doll Memorial Fund, Caltech, 1201 East California Boulevard, 105-40, Pasadena CA 91125.

LEWIS FORT ETTER, MS '35, of Pasadena, California, on July 13, 1997; he was 84. Formerly a vice president of Pacific Railroad Equipment Corporation, he was president of Welles Railroad Equipment Corporation at the time of his death. He was a member of the American Society of Mechanical Engineers. Predeceased by his wife of more than 60 years, Patricia, he is survived by two daughters, Lynn McNairy and Michele Hansen; a son, Michael; and four grandchildren. A memorial fund has been established at Caltech. Those wishing to contribute should write to the Lewis Fort Etter Memorial Fund, Caltech, 1201 East California Boulevard, 105-40, Pasadena CA 91125.

1935
F. LAMAR McMILLIN, SR., MS, on October 8, 1997; he was 90. He received his MD from the University of Tennessee in Memphis and did his postgraduate medical training at the University of Arkansas Medical Center in Little Rock. He practiced family medicine in Little Rock for 37 years, where he was also a member of the Little Rock Symphony. Prior to his medical career, he taught math and physics at Carr Central High School in Vicksburg, Mississippi. Predeceased by his wife, Claudia, he is survived by his son, F. Lamar, Jr., and by three grandchildren.

CHARLES W. PATRICK, of San Diego, California, on August 23, 1997; he was 83. After graduating from Caltech he operated his own chemical lab and assay office until his equipment was stolen in 1937. He then worked as a high school vocational instructor in Monterey, California. He moved into the field of training vocational teachers, first at the University of California School of Education and then, during World War II, with the federal government, supervising manpower training. After the war he served as assistant state supervisor of trade and industrial education, and in 1949 he was selected as director of vocational education for the city schools of San Diego. In 1955 he joined the San Diego Community College District as deputy superintendent, later becoming chancellor, and retiring in 1974. He also served on several state and federal commissions concerned with vocational education. Following retirement he worked as an educational consultant. He was also a member of a number of yachting, fishing, and marine conservation organizations. He is survived by his wife of 58 years, Alice; his son, James; and a brother, Lawrence.

KENNETH S. PITZER, of Kensington, California, on December 26, 1997; he was 83. The only child of Pitzer College founding trustee and primary benefactor Russell K. Pitzer, Kenneth Pitzer had been a Pitzer trustee since 1966 and had donated funds to the college for an archeology lab and a scholarship fund as well as several professorships. A scientist nationally known for his work in physical and theoretical chemistry, Pitzer had received his advanced degrees at UC Berkeley and Wesleyan University. During World War II he was technical director of the Maryland Research Laboratory, and from 1949 to 1951 he directed research at the Atomic Energy Commission. Returning to academia, he served as president of Rice University from 1961 to 1968 and Stanford from 1968 to 1971, then returned to UC Berkeley to teach. His awards included the American Chemical Society's Priestly Medal and the National Medal of Science. He is survived by his wife, Jean; a daughter, Ann; two sons, Russell and John; and five grandchildren.

HERBERT L. WOODBURY, of Glendale, California, on April 23, 1997. An employee of the city of Glendale, he retired as chief electrical engineer in 1984. He was active in the Power Marketing Association and as a life member of IEEE, and had received numerous awards. He is survived by his wife of 58 years, Nadine; a daughter, Cheryl; two sons, Royce and Louis; and seven grandchildren.

1936
WILLIAM E. BINGHAM, of Westminster, California, on August 25, 1997. After graduating from Caltech he received a teaching credential from Redlands University in 1938 and a PhD in psychology from USC in 1952. He worked with troubled youth at Mendocino State Hospital, then returned to Southern California to begin work as a clinical psychologist at Metropolitan State Hospital. In the mid 1960s he established the counseling program for the Lutheran Social Services of Orange County, serving as area director until 1979 and continuing as a part-time counselor until 1984. Predeceased by his first wife, Betty, he is survived by his wife, Adeline; Betty's and his children, Ruth and Bob; Adeline's and his children, Katherine and Steve; and 10 grandchildren.

LEON W. JOHNSON, MS, of McLean, Virginia, on November 10, 1997; he was 93. A retired U.S. Air Force general, he received the Medal of Honor during World War II for leading a low-level attack during an all-out bombardment of Romania's oil fields in 1943. During the raid, 20 B-24 Liberator bombers were shot down, and many more crashed or made emergency landings in enemy or neutral territory. The group of six B-24s led by Johnson, then a colonel, was separated from the main force and missed the target on the first run, but he headed his planes into the flames and explosions of the already burning refinery in an attempt to finish the job. Only he and his own crew survived. Afterward, promoted to brigadier general, he organized the 14th Combat Wing, heading it until the end of the war in Europe. Postwar assignments included numerous command positions, in both the United States and Europe. He retired in 1961, but was recalled to active duty to direct a military evaluation panel of the National Security

Council. He was predeceased by his wife of 54 years, Lucille, and is survived by two daughters, Sue Vandenberg and Sarah Abbott.

HERBERT B. SHAPIRO, MS '37, MS '39, of Encino, California, in late 1996. He is survived by his wife, Sarah.

1937

ELDON E. WRIGHT, of Los Angeles, in October 1996. He is survived by his wife, Beulah.

1938

HARRY B. BOLLER, of South Pasadena, California, on September 1, 1997. After graduating from Caltech, he worked for C F Braun in Alhambra and later for Byron Jackson in Los Angeles. He spent World War II at Caltech, in the Hydro Lab working on military projects. After the war he and CLYDE CHIVENS '35 formed Boller and Chivens, Inc. Under the slogan "Where Precision Is a Way of Life" they produced a variety of instruments, their first telescopes being two 36-inch instruments, one for the University of Wisconsin, the other for the University of Texas. In the '50s they started work on 12 Baker-Nunn satellite-tracking cameras for the Smithsonian Institution's astrophysical laboratory, and the first one completed was able to track and photograph Sputnik I. He is survived by Gertrude, his wife of 57 years; a daughter, Mary; two sons, Carl and William; and five grandchildren.

1939

JAMES W. "BILL" BRAITHWAITE, BS '40, of Tustin, California, on July 8, 1997. After receiving his BSs in mechanical engineering and aeronautical engineering, he made his career in the field of aeronautics, designing a Mach 7 wind tunnel while a professor at the University of Minnesota. He also worked for many years at Marquart, in Van Nuys, California, and was a systems analyst at SPS, in Orange County, California. He is survived by his wife, Lee; three sons, Jim, Rick, and Gary; and six grandchildren.

RONALD B. CONNELLY, of McLean, Virginia, on June 3, 1997. He was the recipient of two BSs, one in electrical and the other in mechanical engineering. He is survived by his wife, Barbara.

JAMES H. DeLONG, MS, of Kenner, Louisiana, on January 18, 1997.

GEORGE M. HOTZ, of Altadena, California, in February 1997. During World War II he worked for the U.S. Navy Bureau of Ships, in Washington, D.C., and after the war he went to work for JPL, where he remained until 1983. Specializing in the area of designing, developing, and fabricating mechanisms and mechanical instruments, his assignments at JPL and the Caltech hydrodynamics lab included the design and development of a self-propelled scale-model submarine, the design and fabrication of a low-turbulence water tunnel, and the design and fabrication of a complete hypersonic wind tunnel. He is survived by his wife, Elizabeth; a daughter, Caroline; and a son, James.

WILLIAM S. STEWART, PhD, of Santa Barbara, California, on August 14, 1997; he was 82. An internationally recognized botanist, he served for five years as president of the Santa Barbara Botanic Garden's board of trustees. He started his career as a research scientist with the U.S. Department of Agriculture, and during World War II was assigned to the emergency rubber project, performing cooperative studies with the agricultural department of Mexico. Later, as head of UC Riverside's horticulture department, his work on citrus led to more than 100 scientific publications and worldwide speaking invitations. He also worked with the Pineapple Research Institute, in Hawaii. In 1955 he was appointed director of the Los Angeles County Department of Arboreta and Botanic Gardens, and in 1969 was named founding director of the Pacific Tropical Botanic Garden, with headquarters at Lawai, Kauai. After retiring, he joined the board of the Santa Barbara Botanic Garden. He is survived by his wife, Maria; his son, David; his two daughters, Mary Lee Ledbetter and Carol Stewart; and four grandchildren.

1940

ERIK V. HEEGAARD, MS, PhD '42, of Hendersonville, North Carolina, on December 6, 1995; he was 83. He had emigrated from Denmark in 1937. After receiving his doctorate, he performed blood plasma research at Stanford, and then worked for the International Minerals and Chemicals Corporation. He later joined Abbott Laboratories. A longtime resident of Ladera, in the Palo Alto region of California, he was a founding member of the Peninsula Housing Association. After retiring, he grew avocados and almonds in the Algarve region of Portugal. He is survived by his wife of 54 years, Lilli; three children, Flemming, Ingrid Pifer, and Carl; and nine grandchildren.

HENRY G. HOHWIESNER, of Laguna Hills, California, on June 4, 1997. He is survived by his wife, Betty; a son, William; a daughter, Anne; and one granddaughter.

1941

ALFRED J. BERSBACH, of Moorpark, California, on August 17, 1997; he was 78. He worked as an engineer at General Electric, where he designed manufacturing systems that increased production and lowered energy use during World War II. From 1951 until his retirement in 1981 he was an electrical engineer, then a project manager for the Hughes Aircraft Company, in Culver City, Tucson (1953–1966), and Canoga Park. He was involved in the design and testing of the Falcon, Phoenix, and TOW missiles, and laser-guided weapons. Always active in his community, he helped organize the construction in Tucson of one of the nation's first community pools, and he served for many years on the vestry of that city's St. Michael and All Angels Episcopal Church. After retiring, he was an active member and vestryman of the Trinity Episcopal Church in Fillmore, California, organizing a food pantry for the needy as well as "life line" systems for the elderly through Simi Valley Adventist Hospital. For 24 years he and his wife of 53 years, Ruth, tended their Moorpark avocado orchard, giving nearly all its fruit to Food Share. "Al had a great and precise intelligence that was exceeded only by his patience and kindliness." He is survived by his wife; four sons, Alfred, Robert, Peter, and Richard; and six grandchildren.

1942

PHILIP B. LUTZ, of Longview, Washington, on September 27, 1997; he was 76. He is survived by his wife, Shirley, and by three sons, Peter, Gregory, and Mark.

1943

HERBERT A. LASSEN, MS '47, PhD '51, of Pacific Grove, California, on May 31; he was 77. He served as an ensign in the U.S. Navy's submarine service, in the South Pacific. After receiving his doctorate, he worked at Hughes Aircraft and then moved on to STL and TRW. He retired from TRW in 1984. While there, he conceived of a revolutionary design for spacecraft using the craft's spin as the means of stabilization; this concept formed the design foundation for Pioneer 10, the first space probe to leave the solar system. Known as the Father of Pioneer, Lassen received the American Institute of Aeronautics and Astronautics' 1974 Spacecraft Design Award. Devoted to his family, and an active volunteer, he served his church, the Camp Fire Girls, community concerts, and the Lick Observatory Lab at UC Santa Cruz. He enjoyed wood sculpting, sailing, and science fiction. He is survived by his wife of 48 years, Joanne; three daughters, Chris Lassen-Shore, Lynn Darnton, and Joan Lassen; five grandchildren; and a sister, Ruth King.

EDWARD C. McEOWEN, MS, of Fort Worth, Texas, on October 31, 1996. He is survived by his wife, Lilalee.

1944

HARRY DOUGLAS ALMY, CAVU, in November 1997. He was one of a group of students during World War II who received certification after completing an accelerated training program in meteorology, and who referred to themselves as Ceiling and Visibility Unlimited.

DANIEL F. BOTKIN, MS, in San Diego, California, on October 13, 1997; he was 79. He was involved in rocket-propellant research at Caltech and, after graduation, at the Naval Ordnance Test Station at China Lake. After some time at Pennsylvania State College, he in 1949 joined the Kodak Park Division of the Eastman Kodak Company, in Rochester, New York, where he worked as a chemical engineer and patent coordinator. He retired in 1974. He is survived by his wife, Patricia; two sons, Henry and Daniel; three grandsons; and a brother, Charles.

FRANK W. LEHAN, of Montecito, California, on December 4, 1997; he was 74. He served in the U.S. Army Signal Corps during World War II, and then during his career was head of JPL's electronics research section, associate director of the electronics research and development staff at Ramo-Woolridge, cofounder and president of Space General Corporation, vice president of Aerojet-General Corporation, and U.S. Department of Transportation assistant secretary for research and technology. A member of numerous boards and advisory panels and committees, he was a fellow of the IEEE and a member of the National Academy of Engineering. He also served on a variety of local community organizations in Montecito and Santa Barbara. He is survived by his wife, Nellie Mae; a daughter, Susan DeNatale; and two granddaughters.

ALFRED D. ROBINSON, of Rancho Mirage, California, on August 9, 1997; he was 73. A professional engineer for 46 years, his contributions to technological advancement were many. He was predeceased in 1978 by his first wife, Nancy, with whom he raised seven children. He is survived by his wife, Joan, with whom he shared projects, travel, and socializing with friends and family; by his children; and by 12 grandchildren.

1945

JOHN S. JACKSON, JR., MS '54, of Santa Monica, California, on June 24, 1997; he was 74. He taught science at Campbellsville College, then joined the electrical engineering department of the University of Kentucky, retiring in 1990. A member of the IEEE and active in conference organization, he received the IEEE's Centennial Medal in 1984. Predeceased in 1978 by his first wife, Carolyn, he is survived by his wife, Ann; two daughters, Jane Robertson and Peggy Jackson; and three grandchildren.

1946

R. BRUCE FOSTER, MS, on April 27, 1994.

TERRELL C. MYERS, MS, of Chicago, Illinois, on August 6, 1997; he was 77. A professor of biochemistry at the University of Illinois at Chicago for 34 years, and the recipient of several teaching awards, he was the author of at least 100 papers and the coauthor of a medical textbook, *Chemistry of Amino Acids, Peptides, and Proteins*, published in 1968. He received his doctorate in chemistry from the University of Michigan in 1951. After serving for several years as a research associate at the University of Chicago, he joined the University of Illinois in 1954, where he remained until his retirement in 1988. He was perhaps best known for his use of nuclear magnetic resonance to examine phosphorus compounds in biological tissues, which led to his creation of a new class of synthetic compounds important for research into the metabolism of cells. He is survived by his wife, Diana; two sons, Philip and David; a daughter, Linnet; a brother, Worth; and two sisters, Carolyn Lieu and Rosemary Humes.

JOHN O. NIGRA, MS, of Los Angeles, on January 10, 1997. He is survived by his wife, Helena.

1948

GRIFFITH C. BARLOW, of Glendale, California, on July 19, 1997; he was 78. During World War II he was a chief tool and die engineer for Lockheed in its "Skunk Works" division. After earning his BS in biology from Caltech, he received his MD from USC in 1952, entering general practice in 1954. He was on

REBECCA ROTHENBERG 1948–1998

On April 14, *Caltech News* writer Rebecca Rothenberg died at the age of 50 of a brain tumor, with which she had lived for 12 years. A 1970 graduate of Swarthmore, who held an MS in public health from UCLA, Becky had joined Caltech Public Relations in 1996. She worked part-time for us; in her other life she was a mystery novelist, having published three "botanical mysteries" featuring a female scientist-sleuth working in California's San Joaquin valley. The talent she brought to her writing was no mystery: a fluid style, a wry wit and wide-ranging intellect, and a born storyteller's gift for narrative. A few months before her death, she had written the cover stories for both *Caltech News* and *Engineering & Science*; her many other contributions to *Caltech News* included one-half of the authorship of the "Alumni Album," published last summer as part of the Alumni Centennial Issue. In March of this year, Becky accompanied the Alumni Association on its trip to Anza Borrego, with plans to write an article on the experience. She did not live to complete it; the article that begins on page 12 and includes her pictures and recorded impressions has been expanded on and finished by her colleague Hillary Bhaskaran.

As much as we miss Becky the writer; we miss her more as a friend and colleague—her warmth, humor, insight, and unfailing originality and, in the weeks before her death, her courage will remain as indelible for us as her published writings. To paraphrase the writer E. B. White's conclusion to *Charlotte's Web*: It is not often that someone comes along who is a true friend and a good writer. Becky was both.

—HEIDI ASPATURIAN

the staff at Glendale Memorial Hospital for 37 years, retiring in 1991. He was active in a variety of local community and medical organizations. He is survived by his wife, Mary Jane; two daughters, Linda Rittenhouse and Nancy Barlow; two sons, Donald and Steven; six grandchildren; and 15 great-grandchildren.

CAMERON D. LEAVENWORTH, of Anaheim, California, on December 8, 1997; he was 74. He is survived by his wife, Jane.

1949
ANDREW V. HARRIS, of Medina, Washington, on January 3; he was 69. After receiving an additional degree from Stanford, he joined Boeing, where he worked for 42 years. He is survived by his wife, Kathleen; two sons, Andrew and Thomas; two grandchildren; and his sister, Mary Franks.

GEORGE T. SKINNER, MS, Eng '51, PhD '55, of Tullahoma, Tennessee, on February 2; he was 74. A native of Scotland, where he was a figure skater and the recipient of several photography awards, he served in the Royal Navy as a fighter pilot during World War II. After earning his doctorate, he joined the technical staff of the aerodynamic research department of Cornell Aeronautical Laboratory, now Calspan Corporation. Transferring to the Tullahoma Division in 1983, he operated the U.S. Air Force's Arnold Engineering Development Center. After retiring in 1988 he taught at Canisius College (Buffalo, New York). He was best known for developing measuring devices that proved central to the creation of spacecraft materials capable of withstanding the heat of atmospheric reentry. The author of more than 50 reports and articles, he was a member of the American Physical Society, the American Society of Mechanical Engineers, and Sigma Xi. He is survived by his wife, Julia; two daughters, Kathleen Tiranno and Deborah Skinner-Perez; his former wife, Joan; and three grandchildren.

1951
RICHARD S. SHARP, MS '52, on February 20, 1997. He is survived by his wife, Joanne.

PAUL E. SKOGLUND, of Phoenix, Arizona, on November 30, 1997. In Phoenix, he worked as general foreman and acting superintendent for the Reynolds Aluminum Extrusion Plant and later as a project manager at the Military Electronics Division of Motorola for more than 20 years. He earned his MBA at Arizona State in 1975. After retirement he was active with his malacologist wife, Carol, in dredging for seashells, and invented several of the small-boat procedures now in use. This dredging produced many molluscan species new to science, one of which is being named in his honor. Besides his wife, he is survived by a son, Stanley Paul; a daughter, Christine Aye; and four grandchildren.

1952
RICHARD GAIBLER, Eng, of Claremont, California, on July 13, 1997; he was 75. A graduate of the Naval Academy and the U.S. Naval Post Graduate School before studying aeronautical engineering at Caltech, he retired from the Navy with the rank of commander in 1969, after 29 years of active service. He worked as an aeronautical engineer for Lockheed until his retirement in 1980. He is survived by two daughters, Frances Yearyean and Nancy Herrman; two grandchildren; and a brother, Walter.

HARRY C. HOYT, PhD, of Los Alamos, New Mexico, on July 9, 1997. He is survived by his wife, Martha.

RICHARD L. KINNEY, MS, of Sierra Vista, Arizona, on February 8; he was 75. He was a retired Lockheed Martin Corporation engineer. He is survived by his wife, Florence; a son, Michael; two daughters, Kathy, and Nancy Perry; eight grandchildren; two great-grandchildren; and two sisters, Norma Landon and Marilyn Wynd.

1953
THEODORE EINWOHNER, in Berkeley, California, on October 9, 1997. He was retired from the Lawrence Livermore National Laboratory. He is survived by his wife of 34 years, Alisa; four children; and two grandchildren.

1956
MYRON W. BLACK, MS '57, of Ann Arbor, Michigan, on October 19, 1996. Active in promoting the use of cement kilns for hazardous-waste disposal, he spent his career helping the cement industry respond to environmental demands. Managing his investments was a major interest; he received an MBA with highest honors from the University of Michigan and assumed leadership roles in the local chapter of the American Association of Individual Investors. He was a Gnome at Caltech. He is survived by his wife, Barbara; two sons, Alan and Dale; a daughter, Cecilia; and six grandchildren.

1957
FRANK J. KOFSKY, of Benicia, California, on November 19, 1997; he was 62. A professor of history at Cal State Sacramento, he combined a critical interest in U.S. Cold War policy with a passion for jazz. After graduating from Caltech in physics, he switched to history, receiving his MA from Cal State L.A. in 1964 and his PhD at the University of Pittsburgh in 1973. At Sacramento he taught African American history, family history, and U.S. international relations and was appreciated by numerous students for his demanding yet participatory teaching methods. An accomplished jazz musician himself, he made an early connection between African American cultural expression and the 1960s revival of black nationalism, publishing *Black Nationalism and the Revolution in Music* in 1970. In the 1980s he turned his attention to the origins of the Cold War, and in 1994 published *Harry S. Truman and the War Scare of 1948: A Successful Campaign to Deceive the Nation*. At the time of his death, he was working on a revisionist history of the Korean War. He is survived by his wife, Bonnie; a stepdaughter, Barbara Burkhalter; a stepson, Todd Aitken; one grandson; a brother, David; and an aunt, Esther Carash.

WILLIAM J. TAKEI, PhD, of Pittsburgh, on September 7, 1997. He is survived by his wife, Mary, and by a son, Brian.

1964
THOMAS H. CROCKER, of Del Mar, California, on June 16, 1997; he was 54. A mathematician at Naval Research and Development, San Diego, California, for 27 years, he had received his doctorate in math at UC San Diego. He was an avid sportsman, having lettered in swimming and water polo at Caltech, and he competed in ocean swims and loved taking long walks with his wife of 18 years, Janice. Besides his wife, he is survived by his children, Charlie, Andy, George, Amy, and Arial.

1968
JAMES C. HUNTER, of Elyria, Ohio, on June 27, 1995.

RICHARD S. ROSE, MS, of Schenectady, New York, on November 5, 1997.

1971
DAVID N. SCHRAMM, PhD, of Chicago, on December 19, 1997; he was 52. He died when the twin-engine plane he was piloting crashed in a field about 40 miles east of Denver. He was alone at the time. An eminent astrophysicist, he was a Louis Block Distinguished Service Professor and the vice president for research at the University of Chicago, where he had taught since 1974. He came to cosmology by way of particle physics, where perhaps his most basic contribution was the correct forecast by him and his coworkers that but one additional elementary-particle family would be discovered, when only two were known at the time. He had been a driving force in recent years in combining the fields of astrophysics, nuclear physics, and particle physics in research about the early universe. He was a member of the National Academy of Sciences, a fellow of the American Academy of Arts and Sciences, and on the board of the Fermi National Accelerator Laboratory. He received the Julius Edgar Lilienfeld Prize from the American Physical Society in 1993 and the Helen B. Warner Prize from the American Astronomical Society in 1978. His marriage to his first wife, Melinda, ended in divorce in 1979. He is survived by his wife, Judith; two sons, D. Brett and D. Cary; three stepdaughters, Tegan Ward, Laura Zielinski, and Amanda Zielinski; a stepson, Eric Ward; his mother, Betty; and brothers, Daniel and Wayne.

1972
CARY LU, PhD, of Kirkland, Washington, on September 23, 1997; he was 51. A scientist, author, and filmmaker, he was noted for his ability to explain science and technology, to children as well as adults. He worked for NBC and CBS News, developed short films for *Sesame Street* and other PBS children's programs, contributed to the PBS series *Nova*, and was science and technology editor for the Children's Television Workshop. He also worked with the governments of Australia, Kenya, and Algeria on science-education projects. His numerous writings included *The Apple Macintosh Book*, columns and articles in *Macworld* magazine, and a column on future technology for *Inc.* magazine, of which he was the technology editor; he was also the founding managing editor of *High Technology* magazine. At the time of his death from cancer, he was completing a book on the future of digital communications, *The Race for Bandwidth*. He was a member of the American Academy for the Advancement of Science's Committee on Public Understanding of Science. He is survived by his wife, Ellen; two children, Meredith and Nathaniel; a brother, Ponzy; and his father, Abraham. "Remembrances, which are being collected for a (paper) scrapbook for the children when they are grown, may be sent by e-mail to carylu-remembered@tidbits.com. They are being posted by friends at http://www.tidbits.com/carylu/."

1981
HERBERT KAY, of Palo Alto, California, on June 13, 1997; he was 38. A NASA computer scientist who had recently moved to Palo Alto, he was slain during an attempted robbery while he was out for an evening stroll. Since joining the NASA Ames Research Center in Mountain View, he had been working on the development of autonomous spacecraft that would be able to operate without guidance from Earth. Previously he had worked for Hewlett-Packard. Besides his work, he enjoyed crossword puzzles, cooking, taking "thinking walks," and Scotch whisky. He is survived by his wife, Meg, and their twin daughters, Sonia and Nina.

1991
LOUIS J. BOSCHELLI, MS, of Altadena, California, on January 14, 1991.

STARRY NIGHT: Palomar Observatory and the 200-inch Hale Telescope turned 50 in June, and what better way to celebrate the event than with a display of the celestial fireworks that the Hale has so vividly captured during its five decades of operation. Our back-page poster shows the Hale's real-color image of one of the most beautiful objects in the night sky: the Eagle Nebula in the constellation Serpens, about 7,000 light years from Earth. Palomar staff photographer Bill Miller photographed this luminous star-forming region in the 1950s, as part of a series of spectacular sky images taken expressly to give the public a sense of the power and beauty of the cosmos studied by the Palomar telescopes. The nebula takes its name from the dark dust-lane in the center, which has the appearance of an eagle about to land. The eagle's "talons" are actually a series of dense columns of interstellar molecular gas—the stuff of which new stars are made. In 1995, the Hubble Space Telescope took a series of much-publicized pictures of this central region, which showed newborn stars emerging from their pillar-like cocoons of gas and dust, shedding new light on the conditions that govern the earliest stages of star formation.

But the Hale Telescope, like the Hubble, is primarily a working instrument whose ability to illuminate the artistry of the cosmos is secondary to its record of scientific discovery. It was with the Hale that astronomer Allan Sandage, PhD '53, carried out definitive studies of the age and size of the cosmos; and that Caltech astronomer Maarten Schmidt determined that quasars were incredibly energetic objects at the edge of the observable universe, opening a new window onto our understanding of early cosmic history. As the Hale turns its eagle-eyed gaze toward the new century, it is increasingly being used in tandem with the W. M. Keck Observatory on Mauna Kea to identify and study extremely distant cosmic objects whose spectra can then be taken at the Keck. Caltech astronomer Chuck Steidel, PhD '90, has used the Hale and Keck in this way to study protogalaxies in the early universe and to map their distribution; his Institute colleagues Shri Kulkarni and George Djorgovski have used the two telescopes to finally pin down the nature of gamma-ray bursters, revealing that these highly energetic objects are located at cosmological distances, billions of light years beyond the Milky Way. Other recent discoveries with the 200-inch include the first sighting of a brown dwarf (a star that has insufficient mass to ignite), two new moons of Uranus, and glimpses of black holes devouring matter inside the Milky Way.

Caltech News