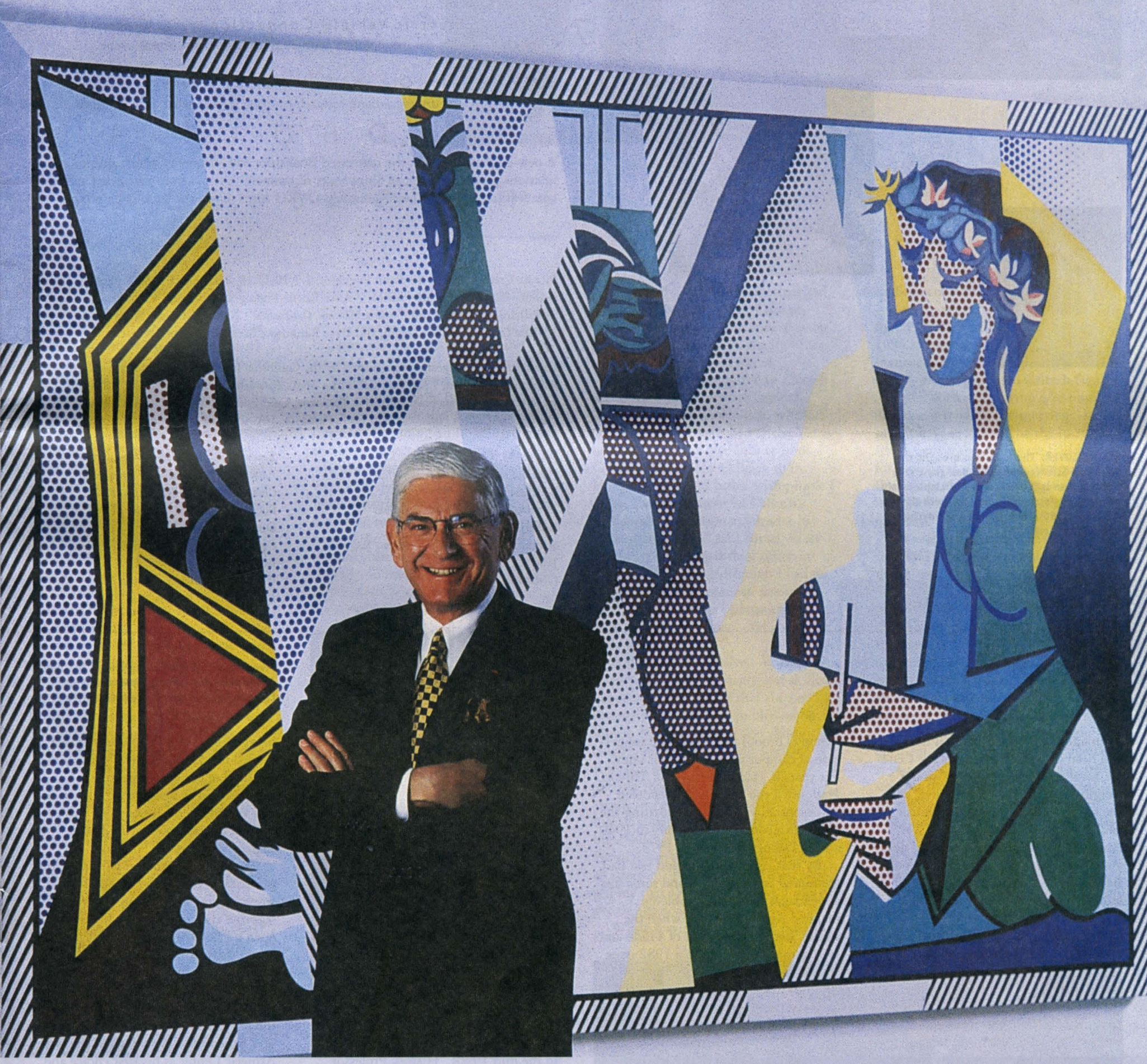
California Institute of Technology
Pasadena, California 91125

Change service requested

Caltech News

Volume 32, Number 3
1998

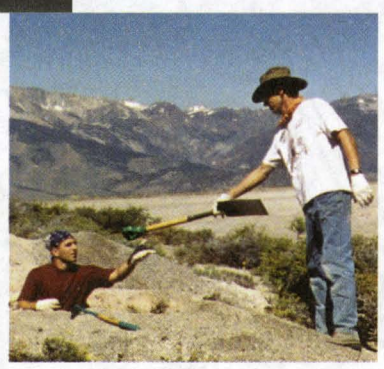


In This Issue

California Institute
of Technology

Volume 32, Number 3
1998

CaltechNews

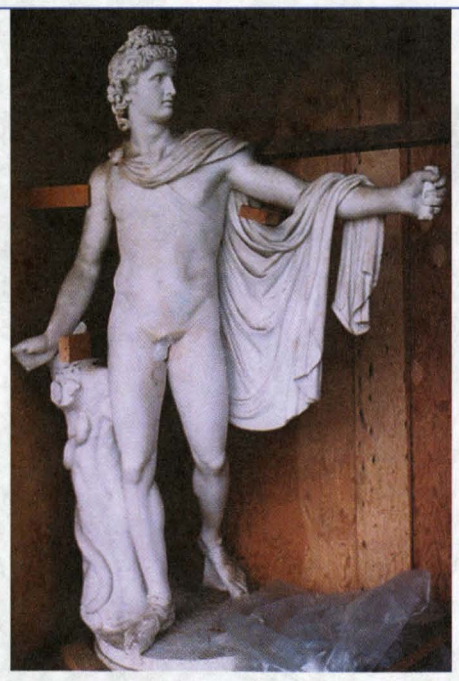


Picture Credits: 2,8,10-13-Ryan Poquette; 2-7,10,17,19-Robert Paz; 7-MIT photo; 8-Diane Binney and Cathy Miles; 9-Alice Koelle Photography, Aspen, Colorado; 9-Nathanson's Photography, Santa Monica, California; 12-Martin Lo and Shane Ross; 13-Ken Libbrecht, David Fang, and Dave Rahmlow; Back Cover-Jane Dietrich

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.

ON THE COVER: The man who brought the Biological Sciences Initiative one giant step forward stands in front of a Roy Lichtenstein painting, *Reflections on Interior with Girl Drawing* (1990), from the Eli and Edythe L. Broad collection.

Up Front



Stepping out: An "enduring image" for alums, Apollo Belvedere awaits his unveiling on February 1 after decades without a view.

Imagine how healthy you'll feel as you head into the Braun Athletic Center, aerobics music pounding away, weights clanking one floor above, and the god of sunlight, prophecy, music, and healing towering over you. Yes, Apollo is coming to a gymnasium near you. Caltech's long-sequestered Apollo Belvedere statue will be dedicated in a late-autumn ceremony open to the campus community.

The Institute's finest (and only) larger-than-life, full-figure statue comes complete with a marble pedestal and a Tech-tonic history. It begins in the fourth century when, it is said, the Athenian sculptor Leochares crafted a statue of Apollo, which was later copied by the Romans (eventually for the Vatican Museum), whose copy was later copied by some Caltech ME 72 students. Well, that last part is false, but it did make a long story short. Now back to the long version.

Someone made a copy of the Roman copy, which got into the hands of prominent Californian Louis Bradbury, who lent it to Caltech's precursor institution (Throop) in 1910 at the suggestion of campus architect Elmer Grey. For years it graced the foyer of Throop Hall, until the latter was remodeled and eventually demolished, exiling the statue to a connecting balcony in 1940 and to Dabney Gardens in 1973.

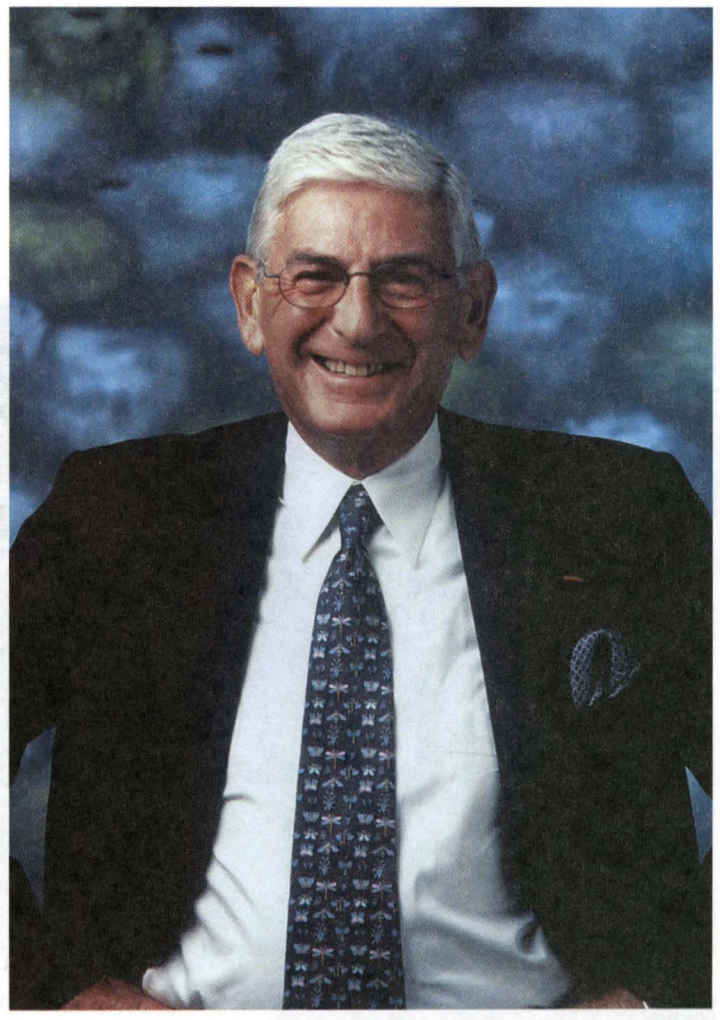
By that time, the wear and tear had amounted to weathering and some lost appendages, but more problems plagued Apollo by 1980, when the statue "became the brunt of a hide-and-seek game," according to a 1982 issue of *Around the Campus*. Its detours through steam plants and through the hands of people who fancied themselves artists took their toll. Determined to launch "an Apollo rescue mission" was a professor and chair of the Institute art committee, Nick Tschoegl, who is now professor of chemical engineering, emeritus, along with Rudi Molnar, then a member of the engineering and estimating staff at Physical Plant. Despite efforts to find a suitable location for Apollo, Tschoegl laments that "nobody wanted it." So once again the statue sank into oblivion.

The story resumes in a parking lot in the mid 1990s. History Professor Robert Rosenstone was walking along when his path was intercepted by Tom Lehman, then associate manager and head of technical operations for the Office of Public Events. Lehman, who retired this summer, had heard from Transportation Services employee Ernie Delgadillo that the Apollo statue was in a Caltech storage facility that was being cleared out. The statue might be headed for the dumpster. "Since you're the head of the art committee," Lehman said to Rosenstone, "what do you want to do?" Rosenstone was impressed that someone would care. "That's very Caltech," he says.

The professor worked with the campus committee to find a place for the statue, whose appellation "Belvedere" signifies that it should be situated in an open gallery with a view. Lost memos, found memos, and almost three years later, Rosenstone had some options for Apollo. Alumnus and Provost Steve Koonin offered to put it "in the yard of the provost's residence, if all else fails," says Rosenstone, who pegged the Braun Athletic Center as his first choice and the arcade adjoining Parsons-Gates as his second. The Braun location was secured with an enthusiastic response from Dan Bridges, who would subsequently leave his position as director of athletics.

Rosenstone will likely be joined at

Continued on page 6 . . .



The art connoisseur surrounds himself here with the vibrant colors of Ross Bleckner's *Map By Heart* (1996).

Eli Broad Takes the Initiative

BY MICHAEL ROGERS

Eli Broad has a habit of helping cultural and academic institutions realize their dreams. In September, it was Caltech's turn to benefit from Broad's resolve, when the Los Angeles businessman donated $18 million to create a new biological sciences center, the cornerstone of Caltech's $100 million Biological Sciences Initiative.

Broad (the pronunciation rhymes with "road") is the chairman and chief executive officer of SunAmerica Inc., a Los Angeles-based retirement savings company that earns fee or spread income on $110 billion of assets. A Caltech trustee since 1993, Broad said that he hoped his gift would enable Caltech scientists to achieve breakthroughs in the biological sciences in the next century.

"It's my belief that Caltech can make a dramatic contribution toward improving the human condition through the Biological Sciences Initiative," said Broad. "The biological sciences have the potential to impact the 21st century even more than computer science did in the 20th century."

Caltech President David Baltimore said that Broad's gift will create a center for the biological sciences that will drive technological and scientific innovation. Speaking at the September 15 press conference where Broad's gift was announced, Baltimore said, "Eli is known for his deep commitment to insuring that the greater Los Angeles area becomes the capital city of the 21st century. With this gift, he has taken us a step closer to that goal."

The Broad Center for the Biological Sciences will provide 100,000 square feet of space for 10 research groups that will be added as a result of an Institute fund-raising effort, "Beyond the Genome: The Biological Sciences Initiative at Caltech." The groups, which will be largely interdisciplinary in nature, will explore a wide variety of problems, including how to use the map of the human genetic code to design therapies against diseases. In particular, Caltech will concentrate on two areas of research: developmental biology and neurobiology. The Broad Center, located on the northwest side of campus, will cost $36 million and should be completed in the year 2001.

Besides laboratories and offices, the Broad Center for the Biological Sciences will include major new research facilities, including an Imaging Center and a Biomolecular Structures Lab. It will also include a lecture hall, a seminar room, compact libraries, and conference rooms. "The biological sciences are being touted as the economic engine of the 21st century," said Mel Simon, chair of the Caltech Division of Biology. "This gift will lead to significant contributions toward our country's economic well-being as well as improving the human condition."

Caltech is the first scientific institution that has benefited from Broad's support. The cofounder of Kaufman and Broad Home Corporation, one of the largest home builders in the United States and Europe, Broad has focused most of his philanthropic attention on a select group of cultural institutions and nonscience educational programs. Among his contributions to arts initiatives, he raised more than $180 million for the construction of the Walt Disney Concert Hall in Los Angeles, set to break ground in early 1999; founded The Museum of Contemporary Art (MOCA) in Los Angeles; and provided the funds for 30 new artists' studios for the California Institute of the Arts. He also donated to CalArts the 2.5 million frequent flier miles that he earned by buying a Roy Lichtenstein painting with his American Express card.

In the area of higher education, he endowed the Eli Broad College of Business and the Eli Broad Graduate School of Management at Michigan State University, from which he graduated cum laude in 1954. A trustee emeritus and former chairman of Pitzer College, Broad provided funds for construction of three of its buildings, among other gifts to the liberal arts school.

Broad became interested in Caltech about five years ago when Senior Trustee William Kieschnick, who succeeded Broad as chairman of the board of MOCA, encouraged him to join Caltech's board. "In addition to its being a prestigious board with people I knew, I also was aware of Caltech's worldwide reputation as a leader in scientific research," said Broad, in an interview in his 38th-floor office in Century City. "And although I had no background whatsoever in science, I thought it would be interesting to serve on Caltech's board and hopefully make a contribution."

Whatever he's involved in, Broad is known as a tough manager and skilled negotiator. In a profile that the *Los Angeles Times Magazine* published on him in 1997, his friend and skiing buddy, Los Angeles Mayor Richard Riordan, called Broad "a maniac for getting things done." And a recent article in *Fortune* magazine described him as a man who "gets his kicks from big challenges." Straight to the point, Broad doesn't deny his hard-driving reputation. "Every now and then people tell me that I'm a sore winner. I like to get things done."

While serving on Caltech's Biological Sciences Advisory Council (BSAC)—a group of trustees, alumni, and friends of the Institute organized in 1996 to provide guidance for the Institute's efforts in the biological sciences—Broad peppered Caltech faculty and staff with penetrating questions. To those attending the meetings, he might have seemed to be the least likely person to fund a new building for biological sciences on campus. But Broad says that his probing in no way indicated that he was skeptical of the program.

"It's not a question of being skeptical," said Broad. "I question everything, whether it's things going on in our company; whether there's a better way of doing things. I've always done that. As a child I did it. I drove my teachers crazy. Whenever they'd say something, I'd ask, 'Well, isn't there another point of view?' or 'Can't we think of it in a different way?' It's a matter of trying to understand.

"At all institutions, government agencies, or companies for that matter, if you ask those who are going to be the users of the facility what they need, they will often think of everything imaginable and can sometimes end up with a Rolls Royce when perhaps a Mercedes would do quite well," said Broad. "But the Biological Sciences Initiative was a learning experience for

Continued on page 9 . . .

At the press conference announcing Broad's gift, Biology Division Chair Mel Simon (left), Board of Trustees Chair Gordon Moore, Broad, and President Baltimore discuss the future of biological sciences at Caltech.

Campus Update

Fresh from the rigors of registration, Caltech's new frosh get ready to roll.

New Institute trustees include three alumni, one president emeritus

Three Institute alumni and one president emeritus have recently been elected to Caltech's Board of Trustees: They are Lounette Dyer, PhD '91, Alexander Lidow '75, Patrick Nettles, Jr., PhD '71, and Tom Everhart, Caltech's president from 1987 to 1997.

Dyer is cofounder and chief technical officer of Cogit Corporation, a San Francisco–based company that provides marketing automation software. A Caltech graduate in computer science, Dyer has worked at and consulted with a variety of Wall Street firms and Fortune 500 corporations in the transportation, manufacturing, pharmaceutical, and high-technology sectors and was a senior software developer and early employee of ParcPlace Systems, a pioneer in object-oriented technology.

Recently listed by the *San Francisco Business Times* as one of the "50 Most Influential Business Women of the Bay Area," Dyer has also appeared on the cover of *Forbes Magazine* as one of 20 leading women entrepreneurs in Silicon Valley. A music, math, and computer science student during her undergraduate years at Western Michigan University, Dyer is a prize-winning percussionist who has toured professionally.

Alexander Lidow is the chief executive officer of International Rectifier Corporation in El Segundo, California. Since joining the company in 1977 as a research and development engineer, he has served as vice president of research and development, executive vice president of manufacturing and technology, president of the electronic products division, and executive vice president of operations, before being named to his current position in 1995.

A coinventor of the HEXFET® power MOSFET (Metal Oxide Semiconductor Field Effect Transistor), Lidow holds nine patents on power semiconductor technology and has authored many publications on related subjects. With applied physics degrees from Caltech and Stanford, where he was a Hertz Foundation Fellow, Lidow is a member of the Institute of Electrical and Electronics Engineers, the Electrochemical Society, and Tau Beta Pi. The Hermosa Beach resident is married and has two children.

Patrick Nettles, Jr., a Caltech PhD in physics, is president and chief executive officer of CIENA Corporation, a manufacturer of high capacity fiber transmission equipment for long distance telephone carriers. He has worked in private industry in the field of communications and computer net-

Continued on page 6 . . .

Caltech welcomes largest class ever

The Institute greeted the largest entering class in its history this fall, as 256 students arrived on campus in September. The class is 19 percent larger than last fall's freshman group of 217. While the number of admissions was roughly the same as last year, 7 percent more students accepted offers of admission.

Of the incoming freshman class, 83, or 32 percent, are women, a 30 percent increase over last year. Minority representation has also increased significantly, with a total of 8 African Americans, a fourfold increase over last year, and 24 Latino/Hispanic students, three times as many as last year. Forty of the entering students are Asian, accounting for 16 percent of the class. The class's average SAT scores are 768 math and 715 verbal (national averages for 1997 were 511 math and 505 verbal).

Caltech's admissions officers sifted through the largest applicant pool to date—2,944 high school seniors, 23 percent more than last year—and sent admissions letters to 542 applicants, or 18.4 percent. (Typically, about 25 percent of Caltech's undergraduate applicants receive those telltale fat envelopes.) The applicants weed themselves out, says Charlene Liebau, Caltech's director of admissions.

"A quarter of the applicants scored 800 on the SAT math test," Liebau says, adding that high SAT scores do not ensure admission. "We look for creativity, a willingness to challenge oneself, and a demonstrated commitment to pursuing math and science in a research environment."

Demonstrating determination as well as creativity, one new freshman wrote an application essay inspired by Dante's *Inferno* and described getting into Caltech as "a journey through hell." Another won national kudos for designing and building an ocean probe that identified its location by computations based on the local sunrise and sunset. "Tinkering" might describe the activities of the freshman who developed an electric shoe to produce electricity from footsteps.

Not surprisingly, hobbies and extracurricular activities are legion among the newcomers. Many are veterans of high school debate clubs—professors beware—and playing a musical instrument is a common pastime and occasionally a serious interest. One student is a licensed glider pilot, another a certified volunteer emergency medical technician. At least two students are only 15 years old, but one of those is a black belt in karate. Several of the freshmen write poetry, and one uses his prize money from poetry contests to buy physics books. One young woman estimates she has cooked between one and two hundred thousand hot dogs for local fairs, and one young man was "Homecoming King."

California residents constitute 32 percent of the class; international students make up 8.8 percent, a slight increase over previous years. Besides the international students, many of the stateside residents speak a language other than English at home, making the class of 2002 as culturally diverse as it is intellectually gifted.

One, two, three, four, five, six, seven— The Institute's rankings are in *Science Watch* heaven

The magazine *Science Watch* periodically ranks universities by their scientific "impact," as measured by how often their papers are cited in other people's papers. In the most recent rankings, Caltech neuroscience was #1 in its field in the nation, chemistry and materials science were #2; economics #3; computer science, geo-sciences, and physics #4; astrophysics #5; biology/biochemistry and mathematics #6; and engineering #7.

Science Watch is published by the Institute for Scientific Information, which is headquartered in Philadelphia. According to editor Chris King, once the magazine determines the number of times each paper in a scientific field is cited by other papers in that field, it then compares these scores to a world average for papers in the same field for a quantification of "relative impact." These calculations "represent what scientists think is important in their field when they write papers," says King.

In the neurosciences, for example, *Science Watch* noted that Caltech neuroscientists published 395 papers between 1993 and 1997. Based on the number of times the papers were cited in other scientific papers—an average of 15.38 citations per paper, as compared to the world average of 6.54—the journal concluded that Caltech papers were the most influential.

It's not surprising that the physical sciences placed well, but the high rank for the economics program—in which the Institute ranked just behind the University of Chicago and MIT—is quite a tribute, considering that the program is less than 25 years old, and even today has only a dozen faculty members and a handful of graduate students and postdocs.

Caltech economist John Ledyard, chair of the Division of Humanities and Social Sciences, called the impact study a welcomed affirmation of the economics program's efforts.

"Given our relatively small size compared to the giants such as Chicago and MIT, this is an extraordinary ranking," said Ledyard. "Overall, this shows that quality does often win out over quantity. We are very pleased."

Paul Jennings named to head California Council on Science and Technology

Paul Jennings, professor of civil engineering and applied mechanics, Caltech's former provost, and current acting vice president for business and finance, recently took on one more new job. On October 20, Jennings, who is known for his research in the field of earthquake engineering, was officially inducted as the new chairman of the California Council on Science and Technology (CCST), a statewide group whose charge is to improve science and technology policy and applications in California.

Jennings has been a CCST member for three years, serving on CCST's Executive and Large Scientific Projects Committee. In that capacity, he has worked with other council members to support proposals to the Pacific Earthquake Engineering Research (PEER) Center and the UC San Diego Supercomputing Center (SDSC), both of which receive National Science Foundation funding. He is currently the chair of PEER's institutional board.

Paul Jennings

A nonprofit organization, CCST was established in 1988 at the request of the California state government. Its mandate in the science and technology policy realm is to propose programs, conduct analyses, and help the government implement policies and initiatives for a better economy and quality of life.

Browsing, surfing, shopping, schmoozing made easy as Winnett Center reopens

Come meet the new bookstore, which, along with the campus's renovated Winnett Center, is definitely not the same as the old. The Caltech Bookstore now fills the entire first floor of Winnett and includes a brand new computer store called Caltech Wired and a spiffed-up, expanded version of the Red Door Café.

Upstairs, accessible by elevator, Winnett lounge appears in its new second-floor location alongside a kitchenette and a clubroom. The facade of the entire structure has been remodeled to harmonize with the previously renovated Chandler Dining Hall and the Mediterranean-style architecture along the Olive Walk. Across the way, in the Red Door's former location next to Chandler, is a convenience store that's open conveniently late for students.

The bookstore itself has expanded its offerings. A more extensive and diverse assortment of books is now stocked, says Dlorah Gonzales, deputy director of Campus Auxiliary and Business Services, resulting in a stronger assortment of technical books and additions to the fiction and nonfiction collections. Books by Caltech faculty enjoy more play, as do Institute-produced educational materials such as video series. A host of office and general supplies and Caltech memorabilia and clothing is sold as well. The layout, intended to encourage browsing and visiting, includes open spaces, couches, tables, chairs, and strategically located computer connections throughout the complex and outside.

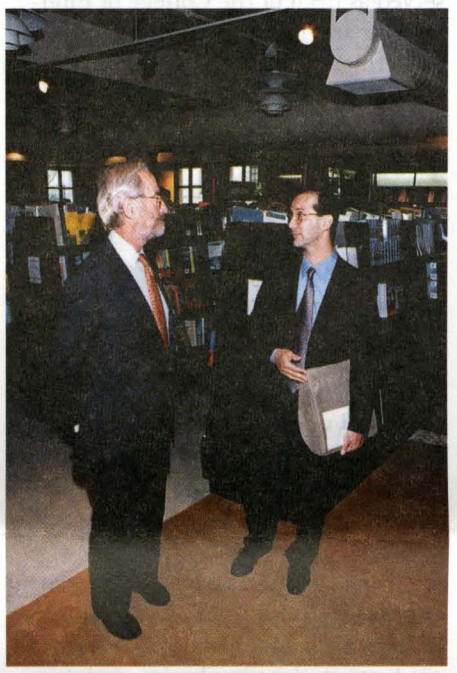
The impetus for the changes comes from a study by a faculty bookstore advisory committee, followed by an outline of new bookstore functions formulated by a faculty/student/staff committee last year.

In keeping with the onset of the Information Age, the computer store Caltech Wired offers a range of computers, peripherals, and accessories, stocked by manager Mindy Mallié. Computer servicing will be provided in partnership with Caltech's Information Technology Services (formerly known as CCO, the campus's traditional vendor of computer items).

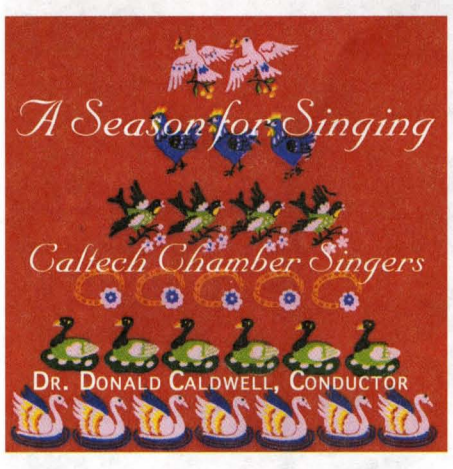
As people get acquainted with the new Winnett Center, they may notice some of the artistic touches, including the prominently displayed beaver sculpture above the bookstore entrance, at the east patio. This was carved by noted sculptor Albert Stewart in 1962 and had adorned the old Winnett Center in a less visible location on the building's west side.

Project architect Richard Thompson of A. C. Martin and Associates is responsible for the "special touches" such as the design of the tile floors and the color scheme, says Tom Mannion, director of Campus Auxiliary and Business Services. The columns in and around the bookstore were cast from originals located between the Ricketts and Fleming houses. Mannion adds that the granite counters and tabletops were late additions to the Red Door Café (which does have red doors).

A few things that people will not notice in Winnett are the offices of the Caltech Y, Residence Life, and the Women's Center. These have moved to Steele House on Holliston Avenue and await permanent relocation to Keck House.



Clockwise from top: The remodeled Winnett Center shows off its new look; trustees Ben Rosen '54 (left) and Bill Gross '81 check out the renovated bookstore; a sculpted beaver savors the opening day buildup from its perch atop the front of the facade; and the Red Door Café opens its now eponymous door.



Among the items currently in stock at the Caltech bookstore is a new CD featuring the Caltech Chamber Singers in a concert of holiday music. Under the direction of Donald Caldwell, who also directs the Caltech Men's Glee Club, the all-student ensemble performs throughout the year at on-and off-campus events. Their first CD, a collection of traditional Christmas carols, can be ordered through the Caltech bookstore, or by mail addressed to the Caltech Chamber Singers, mail-code 3-55, Pasadena, CA 91125, or by calling 626/395-3295. The cost is $10, plus $1.75 for shipping and handling.

Honors and awards

Thomas Ahrens, MS '58, the W. M. Keck Professor of Earth Sciences and professor of geophysics, has been selected as a Geochemistry Fellow for 1998 by the Geochemical Society and the European Association for Geochemistry, for his outstanding contributions to geochemistry.

Assistant Professor of Biology *José Alberola-Ila* has been named a 1998 Pew Scholar as part of the Pew Scholars Program in Biomedical Sciences. The four-year, $200,000 award will support Alberola-Ila's research into the human immune system. He joined the Caltech faculty in 1997.

Michael Alvarez, associate professor of political science, has been selected to serve as an executive council representative for the Western Political Science Association, 1998–2001.

Tom Apostol, professor of mathematics, emeritus, and director of Project MATHEMATICS!, has been named a recipient of the Trevor Evans award by the Mathematical Association of America, this in recognition of his article "What Is the Most Surprising Result in Mathematics? (Part II)," published in the February 1997 *Math Horizons*. The most surprising result in mathematics, according to his article, is the prime number theorem. "Apostol reminds us," says the award citation, "that deep ideas can always be made accessible to young minds—you just have to try hard enough."

Giuseppe Attardi, the Grace C. Steele Professor of Molecular Biology, has received a Gairdner Foundation International Award for Achievement in Medical Science. This "leading international award in biomedical science," which includes a prize of $30,000 Canadian, recognizes Attardi's "pioneering contribution to our understanding of the structure of the human mitochondrial genome and its role in human disease."

Jacqueline Barton, the Arthur and Marian Hanisch Memorial Professor and professor of chemistry, has received the 1998 Weizmann Women & Science Award from the American Committee for the Weizmann Institute of Science. The award "honors an outstanding woman scientist in the United States for significant contributions to science and for providing a strong role model for the next generation of young women scientists."

The 1997–98 teaching awards of the Associated Students of Caltech (ASCIT) have gone to Professor of Biology *Marianne Bronner-Fraser*, Professor of Applied Mathematics *Donald Cohen*, Professor of Physics *Andrew Lange*, Professor of Biology *Ellen Rothenberg*, and Mellon Visiting Professor of Humanities *John Miles*. Recipients of honorable mentions are Professor of

Continued on page 6 . . .

Trustees . . . from page 4

From left, the Institute's new trustees are Alexander Lidow, Tom Everhart, Lounette Dyer, and Patrick Nettles, Jr.

working for more than 20 years and in the last decade has focused primarily on smaller, venture-funded enterprises. Before joining CIENA in 1994, Nettles was executive vice president and chief operating officer of Blyth Holdings, a publicly held supplier of client/server software. He has also served as president and chief executive officer of Protocol Engines, Inc., an offshoot of Silicon Graphics, and as chief financial officer of Optilink.

Nettles's most recent achievement at CIENA was his 1997 stewardship of the largest venture-based initial public offering in the history of Wall Street, for which he received Ernst & Young's 1997 Entrepreneur of the Year Award in the Emerging Entrepreneur category. A member of the advisory board to the president of the Georgia Institute of Technology, where he received his BS degree, the new trustee and his wife live in Annapolis, Maryland.

As Caltech's president, Tom Everhart oversaw the construction of the Beckman Institute, the Keck Observatory, the Moore Laboratory of Engineering, Avery House, and the Fairchild Library, and the successful completion of the $350 million Campaign for Caltech. His many honors include election to the Council of the National Academy of Engineering in 1988. He was chairman of the Secretary of Energy Advisory Board from 1990 to 1993, and vice chairman of the Council on Competitiveness from 1990 to 1996, and continues to serve on its executive committee. He sits on the boards of several large corporations including General Motors, Hewlett-Packard, and Raytheon Company.

Everhart came to Caltech from the University of Illinois at Urbana-Champaign, where he was chancellor from 1984 to 1987. From 1979 to 1984 he served as dean of the College of Engineering and professor of Electrical Engineering at Cornell University. After earning his PhD in 1958, Everhart spent 20 years on the faculty at the University of California, Berkeley. He and his wife, Doris, currently live in Santa Barbara.

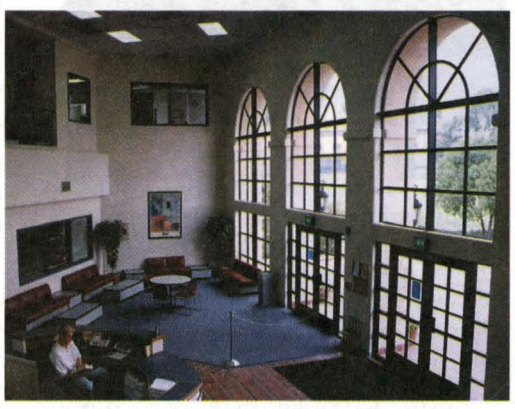
Honors . . . from page 5

Biology *James Bower*, Associate Professor of Physics *Emlyn Hughes*, Professor of Planetary Science and Geology *Bruce Murray*, Lecturer in Computer Science and Electrical Engineering *Glen George*, and Visiting Professor of History *Timothy Breen*. Named for teaching-assistant awards are *Travis Williams*, a senior in chemistry this year, and *Alexa Harter*, a graduate student in physics, and, for honorable mentions, *Michael Siu*, a graduate student in chemistry, and *Ben Miller*, who received his bachelor's degree in mathematics this past June.

Mary Stillman Harkness Professor of Social Science *Lance Davis* has been awarded the Alice Hanson Jones Prize in Economic History. He and his coauthors Robert Gallman and Karin Gleiter were honored for their book *In Search of the Leviathan: Technology, Labor, Productivity and Profits in American Whaling, 1816-1906*.

Apollo . . . from page 2

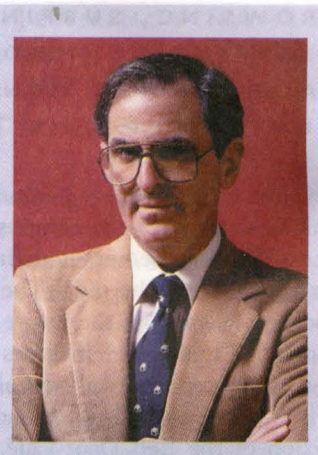
the dedication by Lehman, by alumni who have often asked about their beloved statue, and by a wide-ranging campus audience including President David Baltimore. The dedication will be held on Monday, February 1, at 4 p.m. in the Braun Athletic Center. Call Rosenstone at ext. 4069 for more information.



Fit for a god: Braun Athletic Center rolls out the blue carpet for Apollo, soon to join the gym.

Will people say "Why are they doing *that*?" when they see a 10-foot-tall Greek god restored and housed in the Braun Athletic Center lobby? They might, says Rosenstone, but he could give them a primer on art appreciation. Fine copies of statues, like the Apollo Belvedere, enjoyed a heyday in the late 19th and early 20th centuries. In those pre-television, pre-photo book, pre-air travel times, viewing copies of statues was "the way people became familiar with works of art," says Rosenstone. Meanwhile, apprentices learned sculpting by doing—by copying the masters.

This particular statue strikes a different chord for the alumni who passed it daily on their way to physics and math classes, says Koonin, a 1972 graduate of the Institute. "It is one of the enduring images of Caltech for alums of a certain vintage."



David Goodstein, professor of physics and applied physics, the Frank J. Gilloon Distinguished Teaching and Service Professor, and vice provost, has been selected as the 1998 Oersted Medalist by the American Association of Physics Teachers. The Oersted Medal, established in 1936, is the association's most prestigious award and recognizes a teacher for notable contributions to the teaching of physics. There are only two previous Caltech recipients: Robert A. Millikan, in 1940, and Richard Feynman, in 1972. Past medalists also include Carl Sagan, Exploratorium founder Frank Oppenheimer, and Nobel laureates Hans Bethe and I. I. Rabi. Goodstein will be presented with an inscribed medal, a monetary award of $5,000, and a certificate at the association's 1999 meeting in Anaheim, where he will also present the Oersted address as part of the meeting's Ceremonial Session.

Assistant Professor of Biology *Bruce Hay* has been named a 1998 Ellison Medical Scholar as part of the Ellison Medical Foundation New Scholars in Aging Program. The four-year, $200,000 award will support Hay's research into cell death in *Drosophila* (fruit flies). Hay joined the Caltech faculty in 1996.

David Ho '74, Caltech trustee and director of the Aaron Diamond AIDS Research Center, has been elected to membership in the Institute of Medicine of the National Academy of Sciences. The Institute is a unit of the National Academy but with separate membership; it is based in the biomedical sciences and health professions.

Yizhao Thomas Hou, professor of applied mathematics, has been awarded the 1998 Francois Frenkiel Award for best paper in *Physics of Fluids*. He shares the award with coauthors Michael Shelley of the Courant Institute and John Lowengrub of the University of Minnesota.

Alice Huang, senior councilor for external relations and faculty associate in biology, has been named to the board of trustees of the Keck Graduate Institute of Applied Life Sciences, the newest component of the Claremont Consortium of Colleges.

William Johnson, the Ruben and Donna Mettler Professor of Engineering and Applied Science, will receive the prestigious MRS Medal at the December meeting of the Materials Research Society. He is credited with "the development and fundamental understanding of bulk metallic glass-forming alloys," leading to a new class of structural materials for advanced engineering applications.

Richard Roberts, assistant professor of chemistry, has been named a Beckman Young Investigator by the Arnold and Mabel Beckman Foundation. He will receive $200,000 over the next two years for his work on the generation of molecules that can act as therapies against diseases.

Recipients of the 1997–98 Graduate Student Council Teaching and Mentoring Awards are, for classroom teaching, Professor of Aeronautics and Applied Mechanics *Ares Rosakis* and, for mentoring, Anna L. Rosen Professor of Biology *Scott Fraser*. Teaching-assistant awards have gone to *Zvonimir Bandic*, a graduate student in applied physics, and *Ayhan Irfanoglu*, a graduate student in civil engineering.

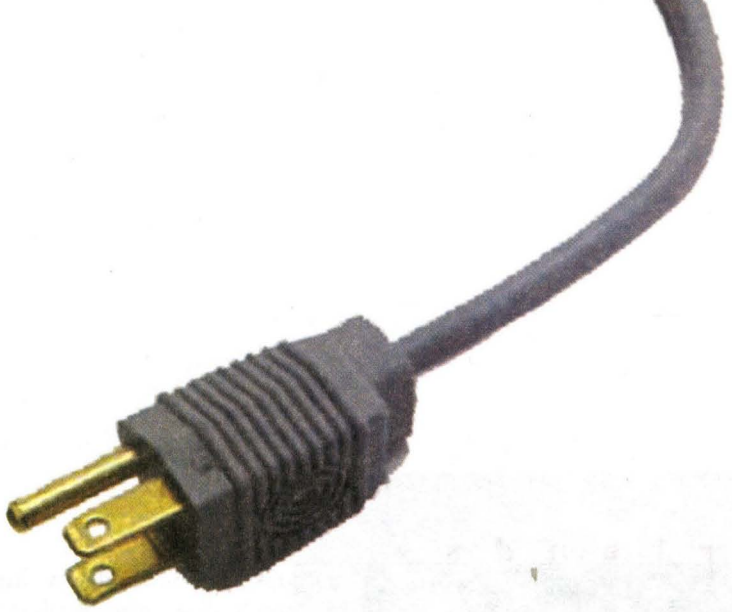
Peter Schröder, associate professor of computer science, is one of 24 "promising young scientific researchers" to be awarded a five-year fellowship from the David and Lucile Packard Foundation. Schröder will be granted a total of $625,000 to support his research, which involves "modeling, simulation, and visualization of large problem sizes on workstation class computers." The Princeton graduate joined Caltech's faculty in 1995.

Thayer Scudder, professor of anthropology, has been "unanimously selected" by the Society for Applied Anthropology to receive the 1999 Bronislaw Malinowski Award. This award "honors the career achievements of a prominent social scientist who is recognized for the application of the social sciences to contemporary issues." He has also been named the first recipient of the Lucy Mair Medal for Applied Anthropology, awarded by the Royal Anthropological Institute of Great Britain and Ireland "in recognition of his application of anthropology to the problems of sustainable economic development, especially those of resettlement after the construction of dams."

John Seinfeld, the Louis E. Nohl Professor and professor of chemical engineering, and chair of the Division of Engineering and Applied Science, received the Fuchs Award at the International Aerosol Conference in Edinburgh, Scotland, this past September. The "Nobel Prize of aerosols," the award is given every four years.

The organizers of the 15th International Conference on the Application of Accelerators in Research and Industry, held November 4–7 in Denton, Texas, dedicated the conference proceedings to *Thomas Tombrello*, the William R. Kenan, Jr., Professor and

Continued on page 8 . . .



Caltech's Electric Vehicle Connection: From History to Current Event

Back in 1968, groups of undergraduates from Caltech and MIT engaged in a grueling race, known as the Great Electric Car Race.

Thirty years later, on September 3, Caltech and the Institute of Electrical and Electronics Engineers (IEEE) commemorated this historic event. "Engineering the EV Future," a day-long conference on campus, highlighted current and future electric vehicle (EV) technologies, and gave members of the Caltech community the opportunity to meet representatives from the EV community.

In the morning, IEEE speakers discussed the title session, "Engineering the EV Future." The afternoon session, "Driving Across the Country in an EV: Then (1968), Now (1998), and Thirty Years From Now (2028)," featured a panel of Caltech speakers, headed by Paul MacCready MS '48, PhD '52, whose company, AeroVironment, played a part in developing the EV1, General Motors' first mass-produced electric car.

Event-goers also had the opportunity to test drive some of the dozen or so electric and hybrid electric vehicles on display. (A hybrid electric vehicle is one that incorporates both electric and gas technology in the powertrain, offering a compromise between the two types of vehicles.)

But, on this occasion, the test riders and drivers could take comfort in the fact that they didn't have to be familiar with the technology to drive the cars. Things were somewhat different 30 years ago.

In January 1968, Wally Rippel—a senior physics major, challenged MIT to race Rippel cross-country in his 1959 converted electric Volkswagen bus. Seven months later, the race got under way when Rippel and some of his classmates left Pasadena for Cambridge, Massachusetts, in the VW bus. Simultaneously, a group of MIT students left Cambridge and headed for southern California in their electrified 1968 Corvair.

Each group estimated that it would only take about five days or so to make their cross-country trips. Both groups were wrong.

On September 4, nine days after they left Pasadena, the Caltech group pulled into Cambridge, only to find out that the MIT drivers had beaten them to the finish line in Pasadena by approximately 36 hours. However, once all of the penalties were assessed for towing time, extra battery recharges, ice used to cool down overheated batteries, replaced motors, and other maladies that plagued both teams throughout their respective journeys, it turned out that the Caltech team had actually won—by a mere 30 minutes.

"My most memorable experiences are also the most painful," says Rippel, who today works at AeroVironment with MacCready.

"As in the space program, where we look at Apollo 13 as a high point, all of the problems that happened really made the EV race a good experience. We were out of the race for 23 hours and 30 minutes for our blown motor. If we had been out a couple of hours longer, there's no way we would have won. It was quite a testimony to good teamwork."

In hindsight, the race was more a test of endurance, strategy, and luck than of speed or performance. At one point early on, for example, the Caltech team's batteries were almost drained, and the bus had started to slow down. Then, they rode over the crest of a hill and hit a long, downhill grade that practically deposited them in front of their next recharging station.

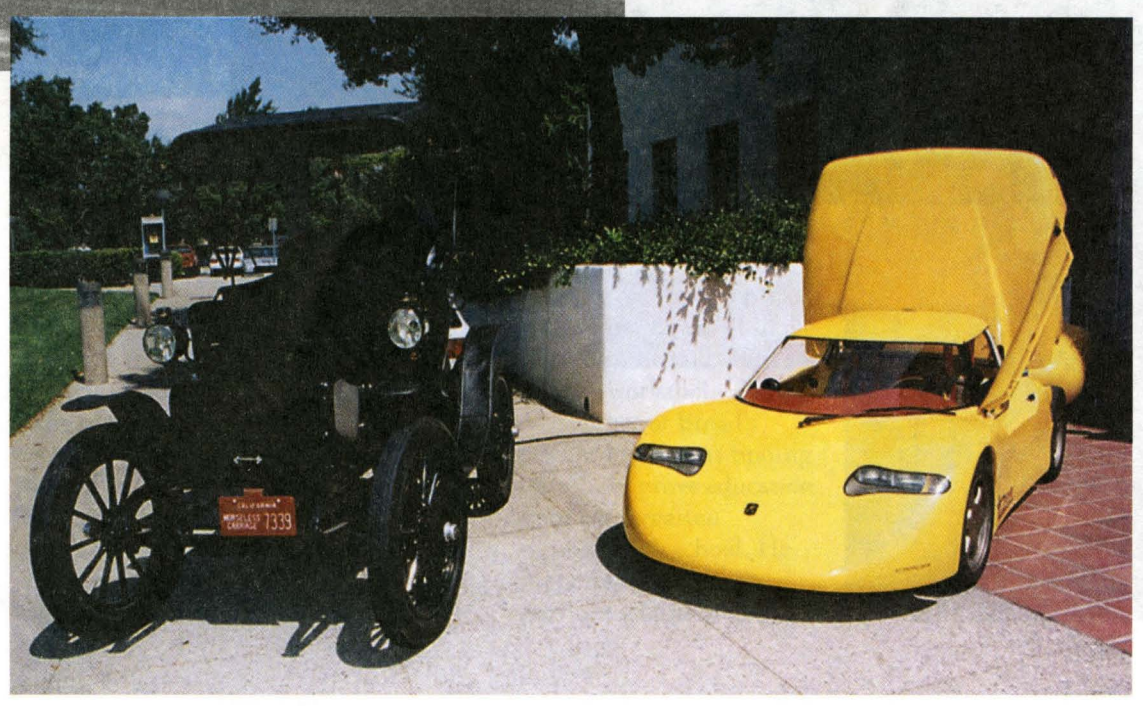
The Caltech and MIT EVs required a lot of nurturing to get through the race. For starters, organizers cooperated with local utility companies along the route to set up 54 specialized charging stations in advance of the race. And each electric vehicle had one or more "chase" cars that followed behind, carrying extra crew members, parts, and other roadside necessities.

Times have changed. Today, electric vehicles are virtually maintenance free, and can be recharged overnight at home, as well as at some public shopping centers, and even at some workplaces.

History does tend to repeat itself, however, and there was at least one similarity between the two EV events. Victor Wouk, PhD '42 (he's the brother of novelist Herman Wouk), who coordinated the post-race celebration dinner in New York 30 years ago, was also the driving force in bringing the commemorative EV event to campus last month. In addition, he served as master of ceremonies at the event.

Today, Wouk retains the EV connection in his daily life as an EV consultant, and volunteers his time as chairman or member of a number of EV standards-establishing groups. "Electric vehicles are the means to a cleaner future," says Wouk. Rippel agrees. "My vision is that within the confines of technology, vehicles like the EV1 will offer the advantages that traditional vehicles have, and still be priced competitively. Like all engineering things, it boils down to economics."

For more information about electric vehicles, check out the Web site of the Electric Vehicle Association of the Americas, at http:www.evaa.org/index.html.



Electric Avenues: **Electric vehicles may well be the wave of the future, but they also made a ripple in Caltech's past. Thirty years ago, then-undergraduate Wally Rippel and fellow classmates drove Rippel's converted 1959 electric-propulsion Volkswagen bus to victory (top photo) in the Great Electric Car Race. Last month, to commemorate the 30th anniversary of the event, Caltech co-hosted "Engineering the EV Future," a day-long celebration of the electric vehicle. One attendee provided a ripe opportunity for comparison, by parking his slightly older model next to the T-Zero (right photo, left), a new prototype model from AC Propulsion, a company co-founded by Rippel and owned by Alan Cocconi '80.**

Caltech selected for Beckman Scholars Program award

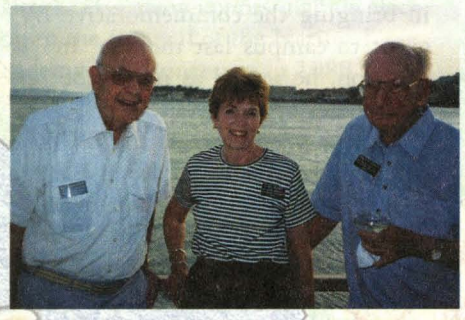
Caltech has been selected for a Beckman Scholars Program Award for the 1998-99 academic year by the Arnold and Mabel Beckman Foundation. The Institute has received four scholarships in the program, which is intended to provide unique opportunities for excellence through sustained, in-depth, faculty-mentored undergraduate laboratory research experiences, modeled after the existing SURF (Summer Undergraduate Research) program at Caltech. This new program complements the SURF program by extending the research opportunity to the academic year.

The purpose of the Beckman Scholars Program is to help stimulate, encourage, and support research activities by exceptionally talented undergraduate students who are pursuing their studies at accredited universities and four-year colleges located in the United States. These research activities shall be centered in chemistry, biochemistry, the biological and medical sciences, or some combination of these subjects.

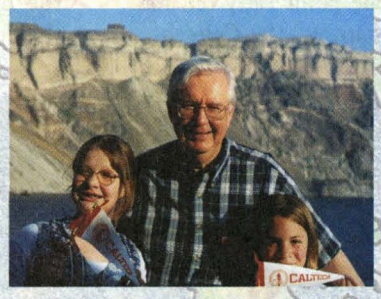
The Institute's 1998-99 Beckman Scholars are as follows: Candace Chang, a junior majoring in chemistry; Ming Chen, also a junior chemistry major; Brent Kous, a junior with a double major in biology and science ethics; and Daniel Levy, a sophomore majoring in biology.

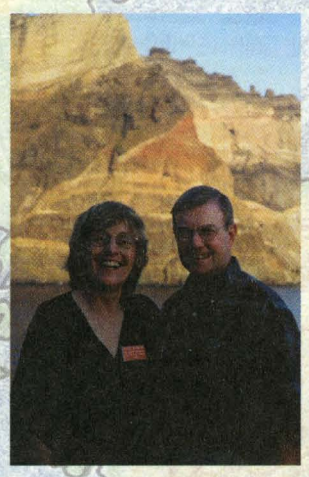
The scholars will also participate in the Beckman Scholars Annual Research Symposium, a three-day, two-evening event that will take place at the end of each summer, beginning in 1999.

Approximately 60 Beckman Scholars nationwide who have completed their academic year and summer undergraduate research activities will be invited to gather for the annual symposium at either the Beckman Center of the National Academies of Sciences and Engineering in Irvine, California, or at one of the five Beckman Research Institutes (Caltech, Pasadena, California; the City of Hope Medical Center, Duarte, California; Stanford University, Palo Alto, California; the University of California, Irvine, California; and the University of Illinois, Urbana-Champaign, Illinois).



EPIC JOURNEYS: Setting sail through the Adriatic and the Aegean Seas, the Caltech Associates embarked on an odyssey of their own this past summer. At left, Bob Anderson '42, Dian Bumb, and Ralph Jones '38 arrive at Port Venice at the conclusion of the 12 days that the Institute support group spent "Exploring the Dalmatian Coast: Shore of Enchantment," with Harkness Professor of Social Science Lance Davis as guest lecturer. Embarking from the Greek city of Corfu, the travelers stopped at such Dalmatian ports of call as Trogir, Vis, and Dubrovnik. In mid-July the Associates launched their 12-day "Voyage to the Land of Gods and Heroes," commencing with a visit to Istanbul and continuing on to numerous sites of classical antiquity, including Lesbos, Ephesus, Crete, Santorini, Mycenae, and Corinth. Bound for the Greek mainland after touring the island of Santorini, Carol and Bill Thomson (photo below, right) look ahead to their arrival in Athens, along with Doug Ritchie '57 and his granddaughters, Cassie Merry and Gabrielle Merry (photo below, left). Digging far deeper into time, the group also learned about the tumultuous geological history of the Aegean Basin from guest lecturer Edward Stolper, chair of Caltech's Division of Geological and Planetary Sciences.





Honors . . . from page 6

professor of physics, and chair of the Division of Physics, Mathematics and Astronomy, in recognition of his "vast number of contributions to the ion beam community."

Alexander Varshavsky, the Howard and Gwen Laurie Smits Professor of Cell Biology, has received the 1998 Novartis-Drew Award in Biomedical Science, "for his work on the ubiquitin system and intracellular protein degradation."

Paul Wennberg, associate professor of atmospheric chemistry and environmental engineering science, has been selected by the National Science and Technology Council to receive the Presidential Early Career Award for Scientists and Engineers. A new award, it recognizes up and coming scientists and engineers "who show exceptional potential for leadership at the frontiers of scientific knowledge." With a 1994 PhD from Harvard, Wennberg joined the Caltech faculty in 1998.

Amnon Yariv, the Martin and Eileen Summerfield Professor of Applied Physics, has received the Esther Hoffman Beller Award from the Optical Society of America, "for outstanding contributions to optical science and engineering education."

The Southern California Section of the American Chemical Society has awarded the 1997 Richard C. Tolman Medal to *Ahmed Zewail*, the Linus Pauling Professor of Chemical Physics and professor of physics, who "is considered a pioneer in developing femtochemistry." The field "involves the study of chemical reactions in real time. The femtosecond time scale conveys incredibly small intervals of time, one-quadrillionth of a second."

Associates Events

December 8, *Associates Luncheon and Program*, "History of the Future in Science and Technology: The Shape of Things that Came—and Didn't—and How They Illuminate What's to Come," with Daniel Kevles, the J.O. and Juliette Koepfli Professor of the Humanities

January 1, 1999, *Rose Parade Event.*

January 20, *Associates Board of Directors Meeting.*

February 23, *New Member/ Provost's Circle Dinner,* with President David Baltimore.

Eli Broad . . . from page 3

me, and as time went on, I became more impressed that the initiative had great potential to improve the physical condition of mankind."

The only child of Lithuanian immigrants, Broad was born in New York City and grew up in Detroit, where his father owned several dime stores. He majored in accounting at Michigan State University, graduating in three years. "I was the product of immigrant parents who believed that you needed a trade," he said. "I was young and in a big hurry and decided that I wanted to go out and work." But after two years as a practicing CPA, Broad became restless and noticed that some of his clients were making big bucks in the home-building business as the phenomenon of suburbanization began to explode. In 1957, Broad borrowed $25,000 from his in-laws and teamed up with his wife's cousin, Donald Kaufman, to form a home-building company that they named Kaufman and Broad. Their medium-priced homes were snapped up, and Broad became a millionaire before he was 30 years old, long before the explosive computer industry made that a mundane achievement. In 1963, they moved the business to Los Angeles, having noticed that the California housing market was taking off. The business grew rapidly, and is now the largest multinational home building corporation, with operations in the U.S., Canada, and France.

In 1971, as a hedge against real estate cycles, Kaufman and Broad bought a Baltimore-based insurance business founded in 1890, called Sun Life Insurance Company of America. It proved to be a farsighted strategy, since the baby boomers who had bought Kaufman and Broad homes were now aging, thinking about family security, and saving for retirement.

In 1989, Kaufman and Broad Home Corporation was spun off to shareholders and Broad created what is now SunAmerica by transforming Sun Life Insurance into a retirement savings powerhouse. The company's net income after taxes skyrocketed from $39 million in 1990 to $516 million in 1998, and its market capitalization grew from $184 million to over $17 billion. Its stock price soared as well, helping to make Broad one of the richest men in the United States. *Forbes* magazine recently listed Broad's wealth at $2.7 billion, ranking him the 55th richest person in the world.

So what does one do with that kind of wealth? In Broad's case, besides giving it away, which he has been doing in a big way since the early 1970s, he buys art. Broad became interested in art in 1969 through a close friend and experienced collector. He began collecting Postimpressionist art, changed his focus to early-20th-century pieces, and eventually became hooked on contemporary art, largely because the artists are still alive and he enjoys spending time with them. In 1984, he established The Eli Broad Family Foundation to promote the art of the last quarter of the 20th century. The foundation, based in Santa Monica, has amassed a collection of more than 600 works, lending out a third of its collection to museums and university galleries around the world at any one time. Broad also has private collections of art in his home, which was designed by world-renowned architect Frank Gehry, and at his corporate headquarters.

In 1979, Broad's interest in art inspired him to take on the job of getting Los Angeles a contemporary art museum. "I really used my entrepreneurial ability to say to [then Mayor Tom] Bradley, 'Look, you're requiring developers to spend 1.5 percent of development costs for art. All they do is buy a piece of sculpture or paintings for the lobby because they have to. If we could aggregate that money, we could end up with an institution.' And that's how it happened." The $22 million building on Bunker Hill, which opened in 1986, was paid for by developers, while Broad helped raise $14 million, including $1 million of his own money, for MOCA's endowment.

"If you're looking to make a difference and change things, you don't look back, you look forward in time."

Similarly, Broad got involved in the plans for the Disney Concert Hall in 1995 when the Los Angeles County Board of Supervisors shut down the project because of soaring cost estimates and lack of funds. "I thought it would be a tragedy for our city if this project died, so I jumped in," says Broad. With the help of Mayor Riordan, he led a campaign that raised more than $180 million in less than three years, including $5 million of his own money, rescuing the project.

Much of what motivates Broad's support of cultural and educational projects is his deep commitment to Los Angeles. "I can think of no other city where someone could come and, without being part of any prominent family or having the proper social pedigree, not only do well businesswise but also be accepted into the community. If you have the ability and energy to do things, you're allowed to do them," says Broad. "With the city's strength in manufacturing, in multimedia, entertainment, and communications, and with our trade with the Pacific Rim, Los Angeles is the city of the 21st century. I want to make it a better place when I leave it than when I arrived here. I like to give things back."

Given his interest in art and architecture, it is not surprising that Broad is taking an active role in choosing the architect for the Broad Center for the Biological Sciences. Broad said that he and David Baltimore have come up with a list of world-class architects for consideration. "The idea is to get a great piece of architecture that meshes aesthetically with the existing campus," Broad said. "It should end up being not only a functional building, but also one that people will feel good about."

Although Broad skis and plays tennis, he spends most of his free time reading business and art journals. While SunAmerica will soon be merged with New York-based American International Group, one of the largest and most profitable insurance companies in the world, Broad will continue to run SunAmerica and has no plans for slowing down. "I like working," he said. "I'm an eclectic workaholic."

Another of Broad's current interests is finding ways to improve education from kindergarten through high school. He supports a group that provides scholarships for talented students who lack the money to attend private school, and was recently named by California's newly elected governor, Gray Davis, to a 13-member panel to tackle education reform. "The future of K through 12 education is the biggest problem America has," says Broad. "If we don't do a better job educating our young people, we'll keep spending all the money we've been spending on prisons and welfare. Everyone has thrown a lot of money at education with very little success. I'm anxious to contribute to solving this problem."

A man of many interests: At left, heli-skiing in Gold Bridge, British Columbia; above, talking with California's newly elected governor, Gray Davis; and below, enjoying Aspen, Colorado, with his wife, Edye.

Whatever ideas he comes up with—and no doubt he will come up with ideas—it's a sure bet that it won't involve supporting the status quo. "If you're looking to make a difference and change things, you don't look back, you look forward in time," Broad says. "It's very satisfying to create something from nothing.

"And I think that in this gift to Caltech, I'm really looking forward in time to what will happen. This is an opportunity that has great promise."

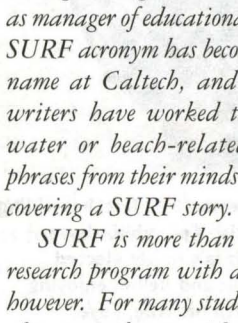
SURF

20 years old and

Most 20-year-olds cannot claim to have achieved the successes of the SURF (Summer Undergraduate Research Fellowship) program, which was founded in the summer of 1979 by Fred Shair, who was then professor of chemical engineering and now resides at JPL as manager of educational affairs. The SURF acronym has become a household name at Caltech, and most Caltech writers have worked to wring fresh water or beach-related themes and phrases from their minds in the course of covering a SURF story.

SURF is more than just a summer research program with a cool acronym, however. For many students, it is a rite of passage that provides the necessary, foot-in-the-door research opportunity to both explore and define their educational interests, and to distinguish themselves from other qualified applicants on grad-school and job applications.

SURF has grown in the past two decades. From an original group of 18 students, it now encompasses almost 300 students each summer—some of whom have the opportunity to SURF at JPL, LIGO, local businesses, and other off-campus academic, research, and industrial locations, both in the United States and overseas. (Each year—through publication, presentations at conferences, or contributions to reports to agencies or other organizations—approximately 17 percent of these students help add to the body of scientific knowledge.) And SURF has expanded from a single program to a total of five programs—SURF, Frosh SURF, MURF (Minority Undergraduate Research Fellowships), TIDE (Teaching and Interdisciplinary Education), and JPLUS (Jet Propulsion Laboratory Undergraduate Scholars).



Carolyn Merkel

The SURF office itself has also changed. When Fred Shair left the Institute for a dean's position at Cal State Long Beach, Carolyn Merkel—who had worked with Shair in the SURF office from the beginning—stepped up to assume the role of director. And since the SURF office has evolved to include so many corollary programs, this year it officially changed its name to the Office of Student-Faculty programs—which rules out the possibility of a water-related acronym, but nevertheless is a more accurate description for an office that will support both current programs and those that may be added in the future.

To mark SURF's 20th anniversary, Caltech News *is highlighting four 1998 projects—a small but representative sample from SURF's 20-year wave of research, which has produced some exciting swells, yet shows no signs of crashing.*

SURFing Atop a Crater: Against the backdrop of the Sierra Nevada (above), SURFers Aron Meltzner (left), Matt Dawson (middle), and Professor of Geology Kerry Sieh have been investigating layers of volcanic ash and other debris by digging pits and recording the stratigraphic information. Like any good team they occasionally switch roles (especially when it comes to the digging, of which they all get their fair share).

Volcanism: It's the Pits

—Featuring Matt Dawson, Aron Meltzner, and Kerry Sieh

As he walks through volcanic "sand," a mixture of ash and rock so fine that it fills your boots, and stings your eyes and throat when the wind blows, Aron Meltzner, a junior geology major, describes the geological history of the region, pointing out various features, some apparent, some hidden. He's already well on his way to developing "the magic eyes of a geologist," as one of Caltech professor of geology Kerry Sieh's colleagues puts it.

But Meltzner is not here to enjoy the scenery, as much as that's a welcome by-product of fieldwork in the Mono Craters, a series of volcanic craters and domes located just north of Mammoth Lakes, California, where the eastern face of the Sierra Nevada mountain range provides a scenic backdrop. He's here—along with his partners in grime, Matt Dawson, a senior geology major, and Sieh, their mentor—to dig pits.

The pits form the basis of their project, which is an attempt to update current contour maps that describe what happened during the eruption of the southern portion of the craters in A.D. 610. Meltzner and Dawson's work is part of an ongoing study that Sieh is conducting of the Mono Craters and the surrounding area. "We're working out a sequence for the eruptions, which will help us to get a history, and we're trying to figure out where future eruptions will take place," says Sieh. "It's kind of like fingerprinting. You wouldn't ask the FBI to identify somebody based only on one line of their fingerprint pattern. The same thing is true here. You need to examine different places to be able to identify what really happened."

In theory, the process sounds relatively simple. The three of them scout out a site, dig a pit approximately two meters in depth, scrape one wall smooth, and then log what they see. But Dawson, for one, can attest to the fact that it's tougher than it looks on paper. "Data doesn't come cheap. You have to work *so* hard to get it right."

The logging process itself is painstakingly slow, and attention to detail is crucial. After preparing the pit—by stringing a tape measure from the top of the pit to the bottom, and taking photographs for reference—Sieh hunkers down in the bottom of the pit and examines the individual layers, calling out measurements and descriptions while either Dawson or Meltzner sits outside and takes notes. "The object is to find the matching stratigraphic levels in relation to other pits that have been dug," explains Sieh. After "correlating" the pits in this way, the SURFers enter the information into their custom-designed database. Then they use one of the many geology software applications to link the layers in the pits together, and to create the contour maps for each layer of volcanic material.

Choosing the locations of the pits themselves is an in-depth process. Since it takes a while to hand-dig and log just one pit, the team uses the lay of the land and their existing knowledge from other pits, as well as topographical maps, to figure out where the best spots are to dig. This usually means climbing to the top of one of the many crater mounds, since the mounds provide the widest range of stratigraphy. And even though climbing to approximately 9,000 feet may not sound that tough to a seasoned summiteer, it makes all the difference when you're burdened by both a digging shovel and the realization that you have to use it when you reach the top.

So how does Sieh find students who have the mettle and desire to do this kind of work? "Frankly," says the geologist, "I rarely end up using SURF students, because it's hard to find one who's got the skills. I need to have either a senior who's had most of the geology classes, or a younger student who can pick up on things quickly." This time, he lucked out and got both.

Both Meltzner and Dawson have known Sieh for a while. Meltzner first met Sieh as a freshman on a Geology 1 field trip, then met up with him again that summer, when he sought Sieh's advice for another project he was working on. Dawson, who has Sieh as his option advisor, was also a work-study student for him last academic year.

Still, Dawson doesn't think he'll be a field geologist. His aspirations lie more in the area of law or education, although he hasn't ruled out other areas of geology. "When I was growing up in New Jersey, I felt so closed in, and I knew I would study either astronomy or geology. When I got to California, I decided geology was definitely the way to go. Now I'm thinking I might try planetary geology." The perfect matching of two interests.

One of the lessons that both Dawson and Meltzner have had to learn this summer is that schedules change, and that going with the flow (in the human as well as the geological sense) comes with the territory. "If there's one thing that I'm taking away from this SURF," says Dawson, "it's learning how to deal with things in the project that don't work out."

As for Meltzner, a SURF summer of paleovolcanism has left him all fired up about his future. "It has confirmed my intentions to pursue geology, and inspired me to do even more." A good attitude to have, especially when getting ready to lift that next shovelful of sand.

Both Meltzner and Dawson received funds from named fellowships to support their SURF research. Dawson was awarded a Mr. and Mrs. Richard M. Rosenberg SURF Fellowship, while Meltzner was a Dr. and Mrs. George N. Boone SURF Fellow.

still making waves

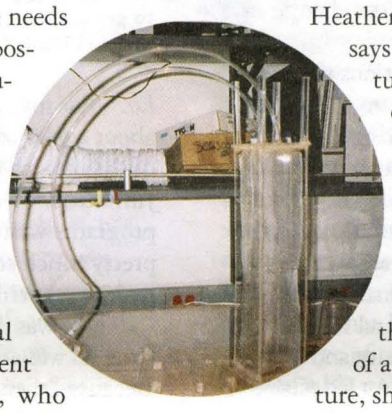
BY RYAN POQUETTE

Thinking Out of the Box: An Engineer Goes Buggy

—Featuring Heather Dean and Alex Bäcker

"I had the opportunity to work in the same lab as last year; more money, a window office," says Heather Dean, a senior electrical engineering major. "Instead, I chose to work with locusts in the basement." Now this may not sound all that glamorous, but in Dean's case it was just what she was looking for.

Dean's project, a series of behavioral experiments that test how locusts respond to certain odors, is giving her the biology lab experience she needs to prepare for one of her possible future options—pursuing an MS/BS in Computation and Neural Systems (CNS) at Caltech. Her collaborators and mentors are Gilles Laurent, associate professor of biology and computational and neural systems; and graduate student in biology Alex Bäcker, who worked with Dean on a daily basis during the SURF.



"This is real science," says Dean. "It can get tedious and boring sometimes, and you have to learn how to problem solve. That's one thing I've definitely learned."

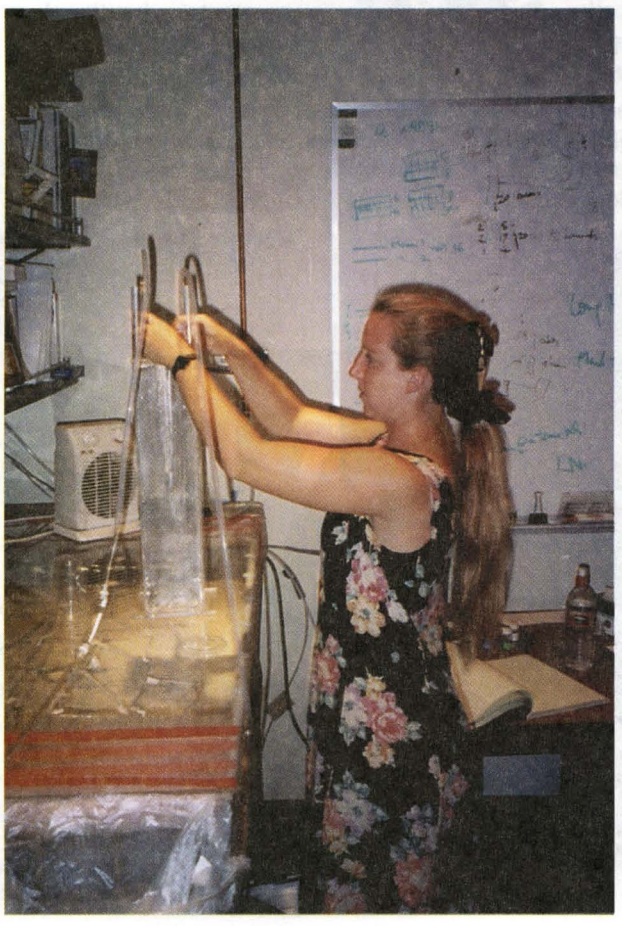
Dean and her behavioral experiments are both new additions to Laurent's lab, and they will remain there throughout the 1998–99 academic year. "I'm happy, because they give me the opportunity to try new things in my experiments," says Dean. She got her first opportunity during the first week of her SURF, when she realized that some of the lab's equipment wasn't working very efficiently.

The original wind tunnel for the locusts—a large, stationary enclosure that could accommodate a number of locusts and odors at a time—was modeled after similar designs in the existing literature. "The problem is that locusts are communal; they tend to follow each other," says Dean. This is not good if you're trying to gauge individual olfactory response to a specific odor. The original design also gave the locusts a lot of room to mill around, making it tough to determine whether or not the insects' movements were in response to specific odors or to something else.

So Dean asked for the opinions and suggestions of her colleagues in the lab and did some independent research. She read about ideas for a new type of wind tunnel, and when she couldn't find a model for anything like it in the literature, she built one of her own.

"Several key features make Heather's model work better," says Bäcker. Dean's wind tunnel is smaller than the original, and it offers more options. It uses a Plexiglas box, and features a divider that bisects the top half, creating two chambers at the top and giving the box the overall shape of a Y. Within this structure, she placed metal screen that conformed to the shape of the Y, and once again created two separate, screened chambers. "The screen was added because it gives the locusts something to grip onto," says Dean.

The stars of this one-ring, scientific circus are kept in a posh storage setting, with a big wheatgrass plant to gnaw and climb on between their trials. "The stuff grows very fast," Dean explains, "and the locusts seem to love it, so it's easier to collect them; they tend to hang around the plant." At the start of the day, Dean grabs a group of six locusts, each in its own separate cup (presumably so they don't try to share notes before the test). Then, while the sixth one is performing its experimental duty, Heather swaps the other five locusts for fresh recruits. Occasionally, one of the locusts gets out, but it is generally not gone for long—as soon as it gets hungry, it comes hopping back, looking for that wheatgrass fix.



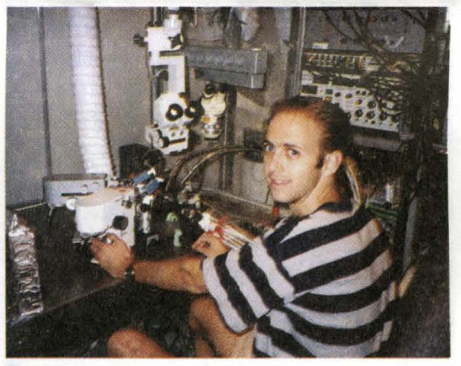
Dean admits that it took her a while to figure out the best way to run trials with these unique subjects, but the learning curve was worth it. "In the beginning, I spent a long time with the first odor— wheatgrass— just figuring out how to best conduct the experiments. It was a lot of trial and error. Now, the trials are going much faster. I've learned a lot."

And Dean has definitely figured out a few tricks. She has added a new element to the process by testing to see if certain odors are repulsive to the locusts. By adding four Plexiglas legs to the top of the Y, she now has the ability to flip the box over and start a locust out in the chamber that contains the experimental odor. If the locust beats feet (or limbs, rather) up and out of the experimental chamber, then it could be a sign that it doesn't like the odor. The only way to tell for sure? You guessed it. More trials.

And since some of the odors—such as pentanol—are repulsive to Dean as well, she made the decision early on to make the box airtight—thereby saving her own olfactory system from the test that is meant for the locusts.

Other innovations that Dean has introduced include frequently switching the control and experimental tubes between experiments to prevent the locusts from getting fixated on climbing into one chamber; and tilting the box at different angles to try to account for the fact that locusts tend to climb both up and toward light sources. Using these approaches, Dean can better tell whether or not the locust really wants to go where it's going, and is not simply out for a stroll. "Whatever seems to work, I'll try it," Dean says.

While Dean's project is an important part of the lab's research, it comprises only one step of the process. Bäcker takes the data from Dean and analyzes it, then performs the physiological side of the research, inserting electrodes into areas of the locust's brain while the same odors that Dean tested are blown onto the locust's antennae. This way, the researchers can test the physiological response in the brain patterns, and match this data with Dean's observations in an effort to explain the locusts' behavior in terms of brain activity. And since the anatomical design of the olfactory system is similar in all animals, studies like these could eventually help explain the neurological basis of human behavior.



Alex Bäcker

But why study locusts? Why not some other animal? The answer is simple, literally. "Invertebrates have the most basic olfactory system, so we start with them," says Bäcker. "It's just like when chemists want to study different, complex molecules. They start out by studying the basic molecules that make up the complex molecules." Ah, but in the case of the chemist, the molecules usually don't jump in the researcher's hair, a side effect of locust research that one has to get used to relatively quickly.

Dean received funds from the Mr. and Mrs. Robert L. Noland SURF Fellowship to support her summer research.

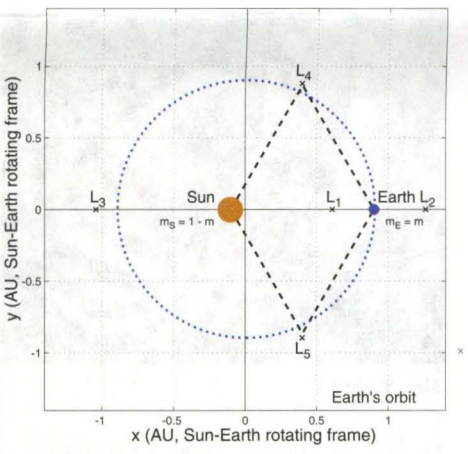
A Day in the Life of a Locust: Being a locust in the lab is a bit like being a movie star. Counter-clockwise from top right: Dean collects the jumpy performers at the beginning of the day (as in Hollywood, some of the talent is more willing to work, while others prefer to stay in their quarters and eat); the custom-built, Y-shaped wind tunnel waits for its next performance; and Dean, the director of the show, observing one of the players as it decides whether or not it likes the odor that is being pumped into one of the chambers.

Charting the Solar System Highway

—Featuring Jim Turpin and Martin Lo

With all of the attention lately focused on Earth-colliding asteroids and comets, it's nice to know that a SURF student is helping to work out a possible solution to the problem.

Actually, that's not the main goal of Jim Turpin's SURF project. Turpin, a sophomore who is planning on going into "some area of physics," is working in a relatively new area of asteroid study that involves mapping the near-Earth asteroid resonances (periodic orbits relative to Earth) influenced by Lagrange points. Wherever you have two heavy bodies, such as Earth and the sun, there exist five Lagrange points (see schematic diagram, below), theoretical points that act as gatekeepers for wandering comets and asteroids. Lagrange points appear to be the seeds of solar system dynamics, providing a complex network of planetary highways that asteroids, comets, and other objects travel along.



Turpin's SURF research involves calculating the unstable, chaotic orbits between L_1 and L_2. To do this, he relies on dynamical systems theory, a relatively new area of study to which he's getting some rewarding exposure. "I probably wouldn't have touched dynamical systems theory until grad school," he says. "This has been a pretty valuable experience."

So how do you pin down a chaotic orbit? "Chaos is not random," says Martin Lo '75, Jim's mentor at JPL, who has been studying the effects of Lagrange points on spacecraft trajectories for the last decade. "Chaotic orbits are at work here, and they do form in random patterns. But they are similar to ocean currents in that they are predictable."

To visualize these unusual orbits, Lo's team is collaborating with Professor of Computer Science Alan Barr of the Caltech Computer Graphics Group and using the group's Responsive Workbench—an instrument that provides a virtual-reality environment for the orbit design work.

After the orbits have been mapped, the possibilities open up. "By mapping the dynamical channels that the asteroids follow," says Lo, "it's as if you had a Thomas Brothers guide for the near-Earth environment."

And this takes us back to near-Earth asteroids. The transition orbits, or the points where the orbits shift to a new heading, may explain the temporary-capture phenomenon that causes some asteroids to get caught in a near-Earth orbit. "It's a zero-energy capture," Lo explains. "The asteroid comes from outside and gets ensnared in the orbit network." So from a doomsday-scenario standpoint, near-Earth asteroids on a direct collision course with Earth could possibly be deflected to the next-closest orbit, allowing the asteroid to whiz harmlessly by. It's not unlike changing the course of a train by switching the rails.

Other applications for using the orbits include the possibility of maneuvering an asteroid into orbit around Earth, for use as a mining resource or space station.

The orbits will be used for a much different application in the near future, however. "If we understood more about how this network of orbit transition occurs," starts Lo, "it would facilitate mission design," concludes Turpin, finishing Lo's sentence with a smile.

It is this kind of integrated thinking that may well revolutionize the way some space missions are conducted. The first such mission to incorporate dynamical systems theory and the use of orbital pathways will be JPL's Genesis mission, for which Lo is the mission design engineer.

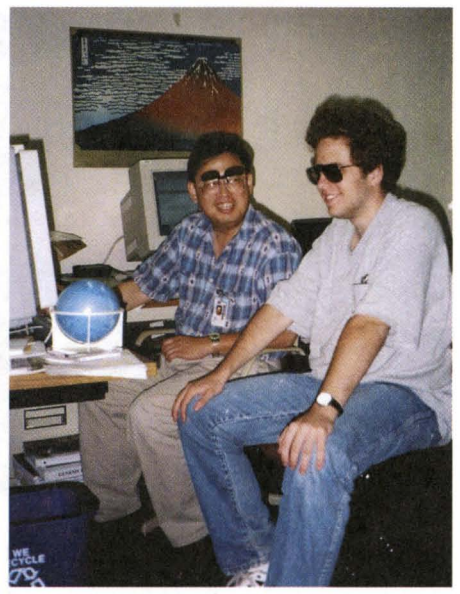
The Genesis mission, planned for January 2001, will attempt to return solar wind samples, which are believed to contain clues to the birth of our solar system. After launch, the Genesis spacecraft will proceed to the L_1 region and park in an unstable orbit around L_1. After collecting samples near L_1 for about two years, Genesis will return to Earth by utilizing one of the low-energy dynamical channels that link L_1 and L_2.

In other words, instead of relying on massive amounts of fuel to maneuver and direct the spacecraft, the Genesis mission team will utilize the natural, low-energy orbits as a planetary highway, only using fuel when it is necessary to merge onto, exit off of, or change lanes on the highway.

And Turpin's contributions will definitely help the Genesis team. "Jim's the one who's actually generating data to help us understand the theoretical foundations of the Genesis orbit," says Lo. "My part is more in coming up with the key problems for the Lagrange group to work on." The international group includes members from several institutions, including Purdue University and The University of Barcelona. At JPL/Caltech, the group is headed by Lo and Jerry Marsden, Caltech professor of control and dynamical systems. Other members include Wang Sang Koon—a Caltech postdoc and Jim's other mentor—who is working on the theoretical side of dynamical systems theory; and Shane Ross '98, a former SURFer who was the first person to join Lo in his quest to map the near-Earth Lagrange resonances.

"I'm so grateful to the SURF program," says Lo. "Working with SURF students was the match that lit the fire, because when I started this project I had zero funding, and I wouldn't have had the time to do all of this on my own."

The experience is also a good opportunity for Turpin, who plans on working with Lo for a while. "I use the SURF program as a way to look for someone to work with on a long-term basis," says Lo. "For my work, it generally takes about a year to get a student prepared, but it's worth it in the long run. In Jim's case, we already had some of the programs written, and everything was pretty much set up; he's already been making contributions."



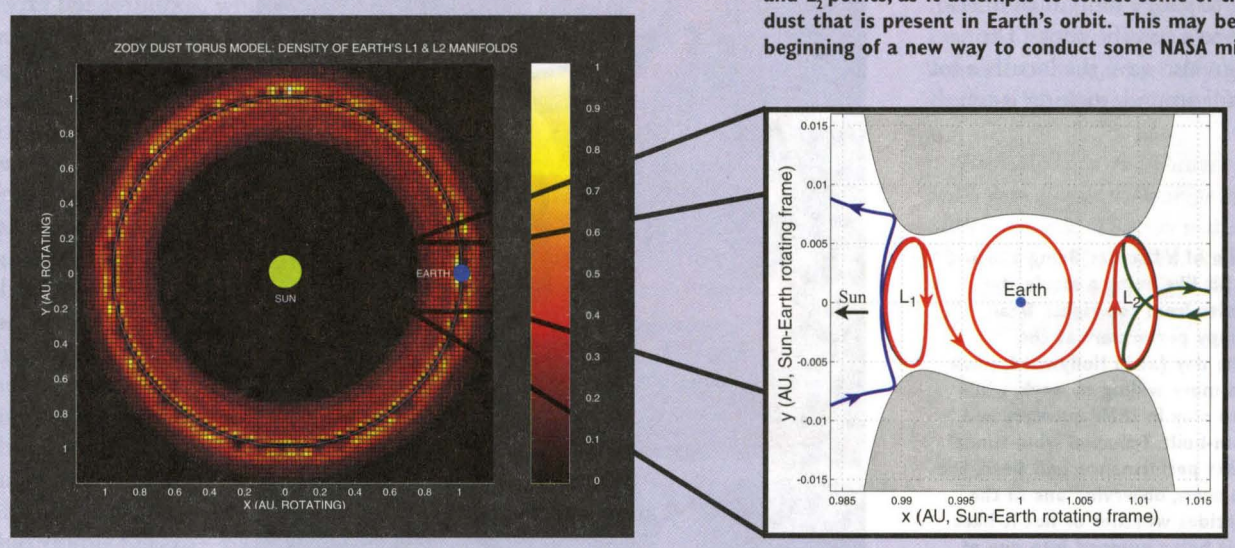
Eyes on the Skies: JPL's Martin Lo (left) and SURF student Jim Turpin don special glasses to get a 3D look at one of Earth's L_1-L_2 orbits that Jim has helped to calculate.

There was no SURF program at the time Lo was an undergrad at Caltech. Because "they had very limited funds in the math department," he found summer jobs at places like FermiLab, Rockefeller University, and Columbia University's atomic physics lab. Although these were all great experiences, there's a part of him that wishes he could have spent at least some of that time working at Caltech. "The way I did it, it was sort of disconnected," Lo says.

Lo is definitely staying connected with Caltech these days, and with the research he and his team are working on there's a good chance that those other connections—the invisible ones that make up the solar highway—will also be utilized in the future.

Genesis: A New Era in Mission Design?

JPL's Genesis mission—set to launch in January 2001—will use the natural chaotic orbits that exist between Earth's L_1 and L_2 points, as it attempts to collect some of the solar dust that is present in Earth's orbit. This may be the beginning of a new way to conduct some NASA missions.

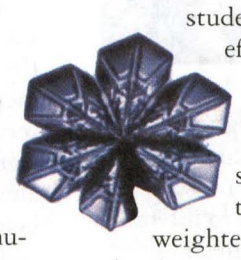


Electricity Is in the Air

—Featuring David Fang, Dave Rahmlow, and Ken Libbrecht

There's nothing quite like the first snowfall of the year (for those areas that *get* snowfall, that is). Atmospheric temperatures drop to the point where nature's machinery goes into action. A little water vapor here, a little electricity there, and voila! Wait—electricity?

That's right. Call it snow-making for the new millennium. Sophomore David Fang and freshman Dave Rahmlow (one of the first group of entering students to do a frosh SURF the summer after high school, as an added incentive for choosing Caltech) have joined with Professor of Physics Ken Libbrecht '80, to stimulate and manipulate the growth of snow crystals by using electricity.



"This is a side project of mine," explains Libbrecht. "It's not your bread-and-butter stuff, where there's a huge team of researchers, and everybody has meetings. This type of project gives SURF students the chance to work on something more individual, and try different things." (For more on Libbrecht's involvement with the SURF program, see the sidebar at the right-hand side of the page.)

The main apparatus that Libbrecht, Fang, and Rahmlow use in their research is the water-vapor diffusion chamber, which is temperature-controlled by two plates, one each at the top and bottom of the chamber. By regulating the top plate (warm or hot) and the bottom plate (cool or cold), the group grows ice crystals at varying temperatures, to test different effects.

Depending upon the type of experiment the team wants to do, the chamber is set up in one of two ways. If they are growing a single, isolated snowflake at a specific temperature, Libbrecht and company prepare the chamber by inserting a tungsten wire with seeded ice crystals (basically, slightly frozen water vapor from the chamber that collects at the tip) into the chamber, at the same time connecting the wire to an outside power source.

They then grow an ice needle from the tip of the wire. The electricity—which inhibits dendrite (treelike branching) growth but stimulates needle growth—is used for this purpose. When the tip of the needle has reached the appropriate height/temperature zone, the experimenters turn off the juice and let the ice crystals grow naturally.

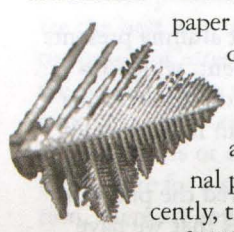
But not all experiments are on single snowflakes. Libbrecht and his students are also observing the effects of crystal growth across a wide range of temperatures. The Caltech team does this by simply hanging from the top of the chamber a weighted piece of fishing wire, so that it extends through the full range of temperatures and gives the ice crystals a base to form on.

Using these two methods, Fang, Rahmlow, and Libbrecht have produced several different types of growth that occur at various temperatures and heights within the chamber—a frosty taxonomy that Rahmlow, in particular, is in charge of recording. The most recognizable type of growths are dendritic stars, which grow perpendicular to the needle, using the tip of the needle as a center axis from which the hexagon-shaped ice crystal radiates outward. These are the "snowflakes" that most people associate with the word. But nature has more than one trick when it comes to fabricating these exquisite ice sculptures. Other growth forms include hollow columns, sectored plates, and collections of long needle crystals.

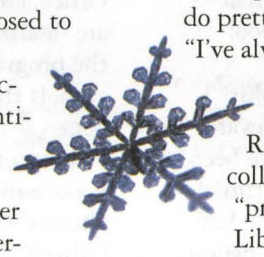
At least that's how it's supposed to work. When the investigators encountered problems reproducing the same results under identical test conditions, they concluded that the variations were most likely due to chamber contamination—since the water-vapor chamber is not airtight. For Fang, this idea opened a whole new line of investigation: testing the effects of chemical vapors on dendritic growth. In particular, he has found that introducing isobutyl alcohol into the chamber results in a total suppression of dendritic growth, instead yielding the formation of hollow ice prisms along the entire length of fishing wire.

It is these types of chemical experiments that are generating more interest in ice crystal studies, especially as they apply to such current issues as global warming and acid snow. "It becomes a question of chemistry," says Libbrecht, "specifically the surface chemistry of ice." The structure of ice is definitely curious enough to warrant study. The top few molecular layers of ice form what's known as a quasi-liquid layer, which may be an important factor in the formation of acid snow and similar meteorological effects.

Libbrecht's group is not the first to get charged up about studying ice crystals. The fascination dates back to at least the 1500s, when Johannes Kepler—the famous German mathematician and astronomer—wrote the first documented paper on snowflake growth, deducing correctly that water molecules in ice are arranged in a hexagonal pattern. More recently, there was the strange case of Wilson A. Bentley, a Vermont farmer who in 1885 started sitting out in the snow and photographing what he saw through his microscope—a hobby that he spent a good portion of his life on, and which culminated in the publication of a collection of his snowflake images.

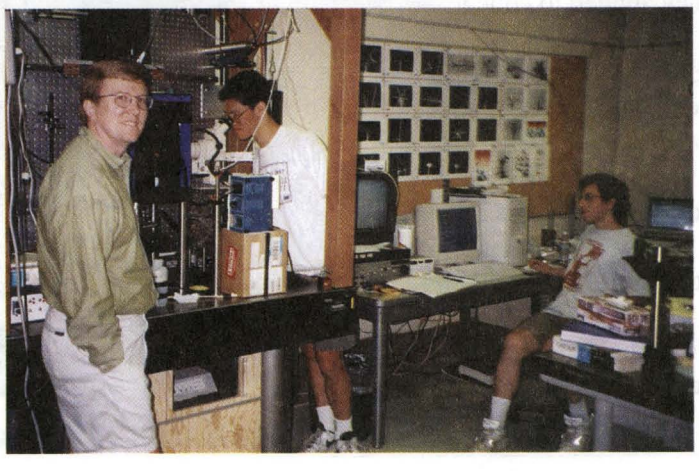


Like Bentley, Libbrecht's passion for ice crystals lies as much in the images as in the science. "The thing that drew me to this project was the opportunity to do pretty pictures," Libbrecht says. "I've always had a little bit of the artist in me." Using special computer software, Fang, Rahmlow, and Libbrecht have collected more than 2,000 of these "pretty pictures." Ultimately, Libbrecht would like to compile them into time-lapse animations of snowflake growth. "I discovered that nobody has done quality time-lapse photography of growing snowflakes, so I'd like to do that," Libbrecht says.



As for Fang, this is not his first foray into the field of water physics. For a high school science project, he measured the successive time intervals between water drops from a pipette. "It was sort of an investigation into chaos," says Fang, who eventually hopes to design computer chips or electronic devices—a somewhat more orderly ambition.

Both Fang and Rahmlow received funds to support their SURF research. Fang was awarded a Richter Scholarship, while Rahmlow was a Caltech Merit Scholar.



The Icemen Cometh: From left, photo right, Ken Libbrecht and SURFers David Fang and Dave Rahmlow have been using electricity to aid in the growth of ice crystals. The samples of their work, sprinkled above, include, clockwise from the top: a dendritic star, a collection of dendrites, another dendritic star, and a collection of hollow prisms grown along a string.

Deep Thoughts from SURF's Big Kahuna

SURF student, mentor, volunteer, and resource—when it comes to the SURF program, Ken Libbrecht has done it all. As one of the first SURF students in 1979, he was also the first SURFer to publish the results of his research (a nuclear physics project mentored by none other than Caltech's current provost, Steve Koonin '72). Since returning to Caltech in 1984, Libbrecht has consistently offered his services as a mentor, sometimes overseeing many students at once. He has also served on the AdComm, SURF's administrative committee, and offers his services to help read through SURF proposals. Here are some of Libbrecht's thoughts on the program.

On SURF:

"It is a nice success story for Caltech. Everybody thinks we're just a research institution, but it's nice to see that we do some excellent educational things."

On Mentoring:

"The main thing I try to do is come up with decent projects. I tend not to hire people that I just throw into a group or to be bottle-washers or anything like that. I try to find a piece of research that I can break off and give to the student, if I can."

On Reading Proposals:

"I like reading proposals, to see what people are up to. It's amazingly difficult to know what your neighbors are doing. You're hiding in your office and they're hiding in their offices, so it's kind of nice to see what they're up to down the hall."

On Research:

"Three things have always amazed me about science. 1) Papers have been published on everything you've ever imagined. 2) Even though this is true, nobody's looked that deeply into any one topic. 3) A large amount of effort goes into anything you do, large or small. If you don't put that amount of effort in, you get nothing."

On the Frosh SURF program:

"It's a dead-on winner. If you can take high school students, and give them the opportunity to come and get acclimated a summer ahead of time, that's a very attractive offer. Especially since they get to do research. I would bet that a few years from now, other institutions will catch on and mimic Caltech's example."

Alumni Update

A word from Warren on Signature Awards

The Caltech Signature Award is a highly successful program created by the Alumni Association, the Undergraduate Admissions Office, and a nationwide network of several hundred Caltech alumni volunteers. It represents only one of many Alumni Association programs that serve the Institute community and provide volunteer opportunities for alumni, but in typical Caltech fashion, it is making an impact disproportionate to its size.

Ponzy Lu '64 suggested the initial concept for the Caltech Signature Award. Ponzy, who volunteers as a liaison between Philadelphia-area high schools and Caltech, noted that the Institute lacked recognition among the area's high school students and the high school counselors and teachers. As a result, the top students in the district would be less likely to receive recommendations to consider Caltech from the counselors and teachers and would choose to attend other universities. But why, some may ask, does Caltech need to so proactively recruit potential students, especially since each class of entering freshmen seems to maintain the Institute's reputation? The answer is that we cannot complacently rely on the status quo. All of the top schools are competing against us for a shrinking pool of applicants. Furthermore, our small size makes for a relatively small alumni base. This means that we must compensate with strong programs specifically designed to attract the attention of high school students, counselors, and teachers who would otherwise be unaware of Caltech.

The Signature Award program aims to do just that. The program is targeted to high-potential juniors at specific high schools. We ask the chair of the math or science department to select a junior with the following qualities:

From left, Association President Warren Goda '86 visits with student Edward Preisler, Pedro Pizarro, PhD '94, and potential Techer Alana Pizarro at the New Grad Student BBQ.

- Innovative and creative thinking or problem solving
- The dedication to go beyond what is required or expected
- Curiosity and the joy of discovery in mathematics, in the sciences, or in fields with foundations built on those disciplines

A local alumnus or alumna presents the award to the student, which includes a certificate and a book with a bookplate signed by an Institute faculty member.

Since we inaugurated the program in 1995, the responses that we have received have been universally positive and heartwarming, and a qualitative illustration of the achievement of the award's three goals. The goals include 1) increasing Caltech's visibility at selected high schools; 2) identifying and targeting high potential juniors; and 3) developing and cultivating relationships with high schools. Award recipient Paul Di Capua from Pine Crest School in Fort Lauderdale said, "The pride and sense of accomplishment of being honored with a book award is indescribable." Grant Kristofek from Evanston Township High School, who received his award from Stan Cohn '79, writes, "I've been in touch with Dr. Cohn several times since the award ceremony, and he has been very helpful in giving me insight into what it would be like to be a Caltech student." Alumnus Clifford Cummings '44 of Oakton, Virginia, says, "The strongest impact of the award seems to be on the high school member who has the opportunity to prepare the recommendation. With that opportunity, they seem to intensify their identification with Caltech—which will translate to additional positive recommendations to potential applicants."

The Caltech Signature Award has also been a quantitative success. The program got under way intially at 39 high schools. One year later, in 1996, applications to Caltech from these 39 schools had increased by 44 percent, which was substantially above the 20 percent overall increase in applications nationwide. In 1996, the program was expanded to 70 high schools, leading to 179 applications from those schools. For the same 70 high schools in 1997, the number of applications rose to 225, of which 63 students were admitted. These statistics are summarized in the table below.

Today, the Alumni Association, the Caltech Undergraduate Admissions Office, and the Caltech administration are finalizing the details on expanding the program to several hundred high schools throughout the nation. What began as an idea by a single alumnus is now becoming a program that will make a difference for Caltech, for alumni volunteers, and for future Caltech students.

Warren G. Goda

Year	Number of High Schools	Applicants	Notes
1995	39	N/A	•Since the program targets high school juniors, no impact was seen until '96, when they applied to college
1996	70	179	•39 high schools from '95 had a 44% increase in the number of applications versus a 20% overall increase •There was an increased admit rate of 44% from 40.6%, versus a norm of 22.6%
1997	70	225	•63 out of the 225 students were admitted
1998	Several hundred	TBD	•Details are being finalized by the Alumni Association, Undergraduate Admissions, and the Caltech administration

Committee reports on the state of alumni relations

Two years after the Institute's Alumni Relations Task Force reported that Caltech's relationship with its alumni could be improved, a status report indicates that the Institute has made substantial progress to strengthen alumni relations. The recent report by the Alumni Relations Committee of the Board of Trustees shows that numerous programs have been implemented and others are under way, designed to better serve and recognize alumni, and to better utilize alumni to help the Institute.

Besides the specific new programs, however, several members of the committee said that the most important development is a renewed appreciation by Caltech for its alumni. This was embodied in a declaration regarding alumni that was adopted by the Board of Trustees earlier this year. It said, "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."

Caltech Trustee Ron Linde MS '62, PhD '64, who headed the Alumni Relations Task Force (ARTF) and chairs the Alumni Relations Committee (ARC), said that the new philosophy is an important symbol of the increased appreciation by the Institute for its alumni and "is more than mere window dressing. The statement of philosophy sets the framework for improved relations," Linde said. Since the ARTF report was issued, "a tremendous amount has been accomplished in terms of awareness of how alumni and the Institute can work together to their mutual benefit. I'm very grateful for the degree of support that the administration has provided and for the priority that David Baltimore and Vice President for Institute Relations Jerry Nunnally have placed on alumni relations. Their direct involvement as members of the committee has been extremely helpful in getting things done and in coming up with good ideas."

Nunnally noted that improving alumni relations is now among the Institute's highest priorities. "In the past, the Institute may not have paid enough attention to the needs of our alumni or relied on them enough for counsel and service," he said. "We now believe that our alumni are among the

Continued on page 16 . . .

Would you recommend Caltech?

By Madeline Shea '77

Would you encourage qualified students to compete for openings in the next frosh class of more than 200 students? Caltech seeks a diverse group of students who will thrive and benefit from its unique undergraduate experience and make a valuable contribution to it. Charlene Liebau, director of undergraduate admissions, and members of the admissions staff are already seeking the students who will be in the class of 2003.

"Caltech, despite its reputation among professionals in fields of science and engineering, is still not a household word in the minds of high school juniors," says Liebau. "One of our challenges is to seek out prospective students and to inform them and their teachers and parents about the quality and value of an Institute education, so that we can attract and educate the most highly qualified students." The steps in the process are

- identifying qualified students;
- encouraging them to apply;
- selecting a subset;
- persuading them to matriculate (and become prealumni); and
- retaining them at Caltech to graduate and become alums.

The composition of each pool and the yield at each step will make a big difference in the lives of the individual students involved and to Caltech as an institution. Alumni have an investment in this, regardless of their involvement. They benefit from the continued high standards for selectively admitting the students who will ultimately join them in positions of leadership in their professional communities.

While Caltech has an excellent reputation and will always have a good supply of students, the Institute competes with other outstanding universities for these gifted individuals. Prospective students are concerned about the outcome of their education, prompting some colleges to offer job guarantees and other contracts to students who will graduate.

"Qualified students from underrepresented backgrounds are swamped by the strong efforts of the many schools that would like to attract them," says Dina Figueroa, assistant director of admissions. "All qualified prospective students have many excellent options and generally investigate them carefully. Our job is to make sure they understand what is really special about Caltech, to help them decide whether the fit is going to be rewarding for them."

Alumni can make a unique contribution to the admissions process at every step of the way. Their input is credible because it is from the perspective of having "been there and done that." Prospective students want to know how other scientifically gifted individuals chose between college X and Y, and Techers can tell them.

Alumni also provide role models of how Caltech prepares individuals for many professional pursuits. As illustrated in the Alumni Album (*Caltech News*, no. 2, 1997), the Institute provides rigorous scientific training that has launched leaders in business, government, and the arts, as well as science and engineering.

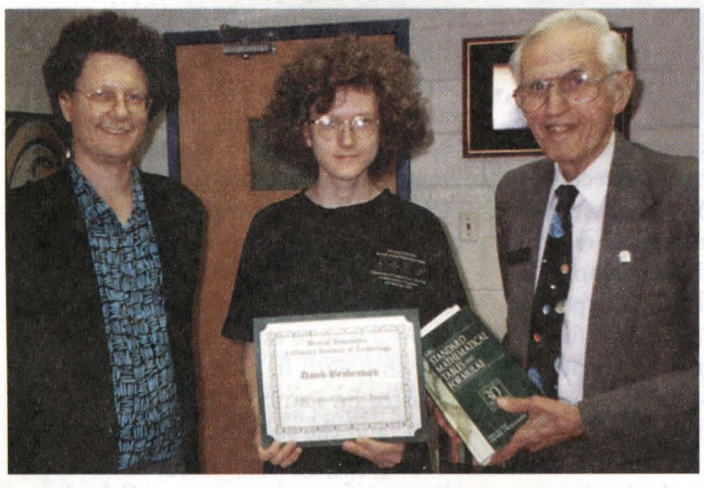
Sincere personal recommendations are the best way to encourage students to consider Caltech, whether that means talking to students you meet in your neighborhood or through community activities or to one whom you might hire for a summer job. In addition, there are several ongoing programs that would welcome your efforts. One is the Undergraduate Admissions Support (UAS) program, which is jointly managed by the Undergraduate Admissions Office and the Alumni Association. Karen Carlson, the program's director, says, "We find that alumni are especially effective at reaching out to potential applicants and their parents. They've experienced a Caltech education and can attest to its unique joys as well as to its challenges." Alumni often contact prospective students by phone or e-mail, attend a College Fair, or visit local high schools.

The Caltech Signature Award, a program initiated by the Alumni Association and supported by the admissions office, allows the Institute to recognize highly accomplished high school students by giving them a copy of the CRC *Standard Mathematical Tables and Formulae*, signed by a member of the Caltech faculty. Warren Goda '86, the Alumni Association president, notes "a dramatic increase in people's awareness of Caltech at the high schools we've targeted for the Signature Award. The number of applications from those schools has skyrocketed." (See Goda's article on the facing page.) If you know of a high school where you believe the Signature Award would be welcome, drop a line to Charlene Liebau or Karen Carlson.

All alumni are encouraged to participate in efforts to attract the best and brightest students to Caltech. You can help without leaving your chair. If you are willing to talk to prospective students, please let us add your name to the list of alumni admissions representatives. Let Karen Carlson know if you are interested. Alumni who graduated within the last 10 years are especially needed because of their timely campus perspective.

Although some of the programs are managed by staff of the Alumni Association, Association membership is not a prerequisite. In fact, this is a significant opportunity to assist the Institute without writing a check. If you're interested in helping with this effort, if you'd like some brochures to share with neighbors or colleagues, or if you'd like to make suggestions about any aspect of the admissions process, please contact either Charlene Liebau (liebau@admissions.caltech.edu, 626/395-6341) or Karen Carlson (karen@alumni.caltech.edu, 626/395-6593).

Madeline Shea is an alumni admissions representative in Iowa City along with her husband, fellow alumnus Marc Wold '79. She served on the Alumni Relations Task Force and is now on both the Alumni Relations Committee of the board of trustees and, as a member of the association's board of directors, the Undergraduate Admissions Support Committee.



Cliff Cummings '44 presents a Caltech Signature Award to David Benbennick for his accomplishments as a student at Thomas Jefferson High School for Science and Technology. They are joined by Benbennick's physics teacher, Dr. John Dell (left).

At a regional College Fair, Brian Lau '84, MS '88, (left) and undergrad Cindy Chen talk Tech with a potential applicant.

Alumni Activities

January 1, 1999
Tournament of Roses Parade event. Includes reserved seating for viewing the parade, reserved parking, and lunch at the Athenaeum.

January 15–16
Board of Directors and Committee meetings.

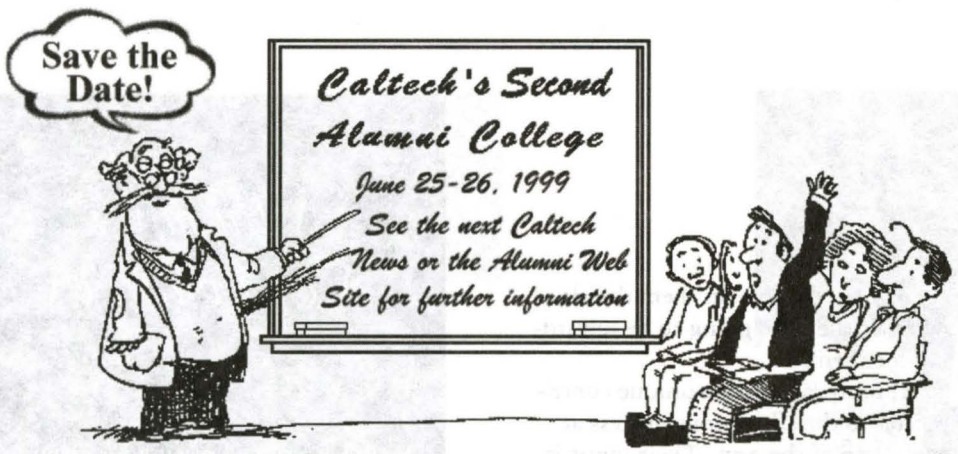
March 19–20
Board of Directors and Committee meetings.

May 13
Alumni reunions for classes of '34, '39, '44, '49.

May 14
Alumni reunions for classes of '54, '59, '64, '69, '74, '79, '84, '89, '94.

May 15
Alumni Association's 62nd annual Seminar Day. Alumni reunion for class of '74.

June 25–26
Alumni College on the Caltech campus. The topic of this second annual event will be astronomy.



Request for Alumni College Information

If you are interested in receiving detailed program and registration information for the second annual Caltech Alumni College, please enter your name and address below and mail this form to Caltech Alumni Association, 1-97, Pasadena, California 91125

Name_____

Address_____

City_____ State____ Zip Code_____

The time is drawing near to make nominations for Caltech's year 2000 Distinguished Alumni Award. If you are interested in receiving nomination materials, please send your name, address, and class year to

E-mail: arlana@alumni.caltech.edu

Mail: Distinguished Alumni Award
Caltech Alumni Association
Mail Code 1-97
Pasadena, CA 91125

Task force . . . from page 14

Institute's greatest assets. They are also important resources to the Institute when it comes to student recruiting, career guidance, and other programs that benefit students and faculty. We are committed to building a stronger relationship with our alumni."

The new alumni programs that have started or are in the planning stages are partly a result of the Alumni Relations Task Force. Former President Tom Everhart formed the task force in 1995 to assess the relationship between the Institute and its alumni. ARTF issued a report in 1997 recommending many new programs to strengthen alumni relations. When ARTF disbanded in 1997, the Institute adopted an ARTF recommendation to establish an Alumni Relations Committee at the Board of Trustees level to address the subject of alumni relations on a continuing basis.

The Alumni Relations Committee (ARC) includes representatives from the Institute's administration and faculty, the Board of Trustees, the Alumni Association, the Alumni Fund, and the Associates of Caltech. "Besides providing a way for the Institute to recognize and show its appreciation for alumni, ARC is a mechanism for alumni to participate in, interact with, and influence the highest workings of Caltech," said Warren Goda, Alumni Association president. The committee's recommendations are considered for implementation by the Institute, the Alumni Association, and other groups.

The ARC status report, called a "10,000-mile checkup" of the ARTF recommendations, concluded that "the Task Force report has been embraced enthusiastically by a breadth of constituencies within the Caltech community and has helped create a major change in attitudes. Implementation of Task Force recommendations, while far from complete, has been addressed quickly and reflects a commitment to change by the leaderships of the Institute and the alumni organizations."

One of the most recent programs put in place as a result of the ARTF recommendations is the Alumni College. The Alumni Association hosted its first Alumni College in June 1998, and 60 alumni participated in the event, which consisted of a two-day "short course" on topics in biology. Next year's Alumni College is scheduled for June 25 and 26 and will focus on astronomy. Said Tom Tyson '54, PhD '67, a member of ARC and past president of the Alumni Association, "The Alumni College was a great success on many fronts. Besides the benefit to alums, the inclusion of 10 high school science teachers as guests of the Alumni Association tied into our need to bolster the image of Caltech on the high school level so that we can continue to attract the best students."

Among other ARTF recommendations fully or partially addressed to date are the following:

•The "Young Alumni Trustee" category has been modified to include a five-year term and allow consideration of alumni irrespective of age.

•The Alumni Association has approved granting free Association membership to new graduates for the first five years after graduation. This was instituted for the class that graduated in June 1998.

•Institute Relations computers have been upgraded throughout Caltech and new servers installed. A major conversion is under way to a new fund-raising information system called Millennium. The new system will provide the power and flexibility of the Internet for fund-raising operations and management. An electronic version of the alumni directory is also in the final stages of preparation.

•The Association and the Institute have funded the redesign of *Caltech News* into a four-color publication, which now includes an undergraduate class notes section highlighting news and views from alumni all over. Thus far, the Association has recruited agents from 48 classes.

•To further promote communication with alumni, division newsletters have been established for the divisions of biology, geological and planetary sciences, physics, mathematics and astronomy, and engineering and applied science. A chemical engineering newsletter will soon be published.

•To strengthen bonds between alumni and students, the Association is initiating a program for alumni to attend dinners at student houses and is developing a Web-based student-mentoring program. This program, called Connect@Caltech, has more than 150 alumni signed up to serve as volunteers. Other groups that are participating include the Career Development Center, the International Programs Office, the Minority Student Affairs Office, the Ombuds Office, the Parents Program, and the Women's Center.

To further act on the ARTF recommendations and develop other ideas for alumni/Institute programs, the Alumni Relations Committee formed several subgroups earlier this year, including a Subgroup on Priority Focus Issues. This subgroup, chaired by Madeline Shea '77, was organized to address the long-term goal of improving alumni relations at Caltech and to formulate a short list of issues that could be prioritized by ARC.

"We have developed four issues to focus on, patterned after the new Institute statement of philosophy regarding alumni relations," said Shea. "Each item has a working group, and we are moving along quite well."

The issues include establishing a lifelong relationship with alumni; promoting interaction with and among alumni; highlighting the achievements of alumni; and providing alumni with rewarding opportunities to serve Caltech, its faculty, and its students. "We're looking for achievable goals that will have a measurable impact," said Shea.

As a way to establish a lifelong relationship with its alumni, Caltech Trustee Ed Lambert '82, a member of ARC and the subgroup on priorities, is responsible for developing a plan to better inform alumni about Caltech. "We want to make sure that all alumni know what Caltech is doing for society, and to help illuminate ways for alumni

Continued on page 23 . . .

Coincidence?: Alums stand at right, students at left in this lineup of fall photos. From left, daughter Christina joins students as they mingle with her father, Blair Folsom, PhD '74, at the New Grad Student BBQ. Across the yard, students meet Debbie Dison Hall '74. And at a pizza party, new freshmen hear Joe Rhodes '69 tell it like it was.

Personals

1930
JACK STURGESS and his wife, Mary-Jane, celebrated their 50th anniversary on July 10 with family and friends at the Athenaeum, at a celebration hosted by the couple's children and grandchildren. The event featured a late-afternoon reception followed by a formal dinner and a personal-history tribute, with background music provided by a string quartet and solo piano. Forty-year residents of Altadena, California, the couple have four children: Jane Morris, John, Carol, and Eric, as well as seven grandchildren and one great-grandchild. A former mechanical engineer for Unocal and Parsons, Jack Sturgess is an active alumnus. He and his wife have been active in local community, church, and civic organizations and were members of the Altadena Town and Country Club, where he served as club president and a board member.

1939
TYLER R. MATTHEW writes that he is "just enjoying life, having fun, and goofing off." He travels a lot, recent itineraries including Norway and London, and in August he joined the President's Circle–sponsored trip to Puget Sound and the North Cascades. "In September," he writes, "a lady and I will cruise the Greek Islands in the southern Aegean Sea. She does *not* want to share a stateroom; just as well, as I need all the bathroom counter space for my pills, lotions, and ointments. Besides, I snore!"

1946
SHERMAN STEIN, recently retired from the faculty of UC Davis, was the corecipient of the Beckenbach Book Prize in January 1998 at the Joint Mathematics Meeting in Baltimore. Sponsored by the Mathematical Association of America (MAA), the prize is named for Edwin Beckenbach, a leader in the MAA's publications program and a professor of mathematics at UCLA, and "is awarded for distinguished, innovative books published by the Association." Stein is receiving the award along with Sándor Szabó of the University of Bahrain for their book *Algebra and Tiling—Homomorphisms in the Service of Geometry*, which was published by the MAA as a Carus Mathematical Monograph in 1994.

1955
RAY HEFFERLIN, PhD, has received the George B. Pegram Award, given by the southeastern section of the American Physical Society as its highest honor for excellence in the teaching of physics, in recognition not only of Hefferlin's teaching, but of his distinguished service award and endowed chair in physics at Southern Adventist University, his international collaborations, his years of consulting, and his "sharing with students the preparation of more than sixty reports and one textbook" as well as "his recognition for distinguished service and teaching excellence as the recipient of the National Zaparra Award and that of the Carnegie Foundation for the Advancement of Teaching."

1960
GILBERT A. HEGEMIER, MS, PhD '64, a professor of applied mechanics at UC San Diego, has been named a Fellow of the ASME International (The American Society of Mechanical Engineers). "The Fellow grade is conferred upon a member with at least 10 years active engineering practice who has made significant contributions to the field." He is a resident of La Jolla, California.

1967
MARSHALL HALL III writes that he is currently living with his wife and two daughters, 18 and 9, in Redding, California, "a mid-sized town about 150 miles north of Sacramento." He is a physician in private practice and is currently chief of the department of surgery at Redding Medical Center.

LOREN D. LUTES, PhD, has been named an inaugural A. P. and Florence Wiley Professor in Civil Engineering at Texas A&M University, where he has been professor of civil engineering since 1988. He has also served on the faculties of Auburn University, Rice University, the University of Waterloo (Canada), and the University of Chile. A fellow of the American Society of Civil Engineers (ASCE), and a member of the Society of Engineering Science, the International Association for Structural Safety and Reliability, and the American Association for Wind Engineering, he is a recipient of ASCE's State-of-the-Art Award and the American Concrete Institute's Wason Research Medal. He has also been a graduate fellow of the National Science Foundation.

1972
CHARLES B. THOELE, until recently vice president of finance for Uni-Star Industries, Inc., in South Pasadena, and currently director of general accounting for Ducommun Incorporated, in Carson, California, married the former Catalina D. Yap on May 31, 1997, at Our Mother of Good Counsel Church, in Los Angeles. Approximately 300 guests, friends, and relatives attended the wedding and the reception at the MGM Banquet Hall, in Glendale. His bride, a sales representative for Midwest Wholesale Lighting, in Los Angeles, received her BA in economics at the Far Eastern University, Manila, the Philippines, and was an assistant manager and officer in the Development Bank of the Philippines before emigrating to the United States.

1976
STELIOS KYRIAKIDES, MS, PhD '80, Hayden Head professor of engineering at the University of Texas, Austin, has been named a Fellow of the ASME International (The American Society of Mechanical Engineers). "The Fellow grade is conferred upon a member with at least 10 years active engineering practice who has made significant contributions to the field." He is a resident of Austin.

1978
TOM PETERSON, PhD, has been named dean of engineering at the University of Arizona. He has been head of the chemical and environmental engineering department for the past eight years.

1979
CAROL R. JENSEN, PhD, writes: "We've moved! After spending my entire career associated with a laboratory, I decided to take the leap into general management." After being with 3M for eight years (after 11-plus years with IBM) and technical director for its electronics products laboratory for the past six (until July 1), she has accepted the position of managing director of 3M Denmark. She, her husband, and her son have just arrived and are so far "loving it! Would love to hear from any alumni friends, or any Techies in Copenhagen."

1983
CHRISTOPHER L. BARRETT, MS, PhD '86, Susan, and their two daughters, Sophia and Louisa, are living for a year in Sweden as he spends his 10th year at Los Alamos on sabbatical at the Royal Institute of Technology in Stockholm.

1985
SHAMIM A. RAHMAN, MS, a propulsion engineer working in the field of rocket propulsion at the TRW Propulsion and Combustion Center, has completed his PhD studies in mechanical engineering at Penn State University. His second daughter was born in December 1996 and is doing well, and his first daughter has just started kindergarten.

1986
DALE R. WARREN, PhD, is a research engineer at Amoco Polymers, Inc.

1992
JUMI A. SHIN, PhD, assistant professor of chemistry at the University of Pittsburgh, where she has been a faculty member since 1995, has received a five-year, $450,000 grant from the National Science Foundation. "The Faculty Early Development (CAREER) grant provides support for new faculty. NSF is supporting my research project involving prediction and design of protein-DNA interactions. Specifically, we are using an interdisciplinary approach toward quantitative characterization of how proteins recognize specific sequences of DNA."

ANDREW J. STEVENS received his PhD in chemical physics from Harvard in June. He is currently working as a strategy consultant for Dean & Company, Washington, D.C.

Shop of Recognition

Although we're always in the market for reader response, *Caltech News* had never received a communication quite like the one we got in September after our last issue, bearing the cover photo shown at right, came out. "I picked up the paper and said to my husband, David, 'Look, that's our shopping cart,' " said our caller, Barbara Groce of La Jolla, California. More precisely, the shopping cart was manufactured by Precision Wire Products, a Los Angeles company owned by Barbara's family and currently run by her mother and brother, Edith and John Ondrasik. "I recognized it immediately," said Barbara. "Our shopping cart is very characteristic because it has two parallel wires at the top, and most shopping carts have only one." Barbara's husband, the aptly named David Groce, received his Caltech BS in 1958 and PhD in 1963 for physics research that—need we add?—he carried out in Kellogg.

KEEP US INFORMED THROUGH THE CALTECH PERSONALS!

Keep us informed so that 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, a new job, promotions, 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 _____

_____

_____

_____

_____

Class Notes

Class agents are needed for the following years: 1936, '39, '40, '43, '46, '47, '50, '51, '52, '53, '65, '67, '68, '69, '84, '92.

1941

John Deniston
19300 Farview Drive
Bend, OR 97701
541/388-2400
DenistonJJ@aol.com

In the process of trying to be helpful to the Alumni Association, I have ended up becoming class agent for the class of 1941!

I am one of those folks whose undergraduate work at CIT was in parts. I have been in two class years, and so when the matter of being a class agent came up, I had a choice between 1947 (which was the class year in which I actually graduated) and 1941 (which would have been my graduating class year had a number of events not intervened, including World War II). But I know my classmates from '37–'39, when I was a freshman and a sophomore, somewhat better than I do the group from '46–'47, when I was a junior and senior.

Vernie and I were married during the war, and when I returned, we lived off-campus. For those of you who have lost touch, I worked for the Bell System for 41 years and retired in 1982. Vernie and I have three married daughters and four granddaughters, scattered from Arizona to Louisiana to Connecticut.

In reviewing the responses to the cards sent out, I see that a number of you have been or are private pilots. For my part, I have been a private pilot since I was 51 (in 1971) and have enjoyed the hobby immensely: taking the kids on vacation, visiting spots like Glacier, Jackson Hole, Mesa Verde, the Carlsbad Caverns, and the Grand Canyon (before they restricted most of its airspace), etc. About a year ago, it was discovered that I have a heart problem, which, although now under control with medication, disqualifies me for my FAA medical certificate, and hence the privileges of my private pilot's license. It's too bad too, because I love flying; this is beautiful country for it, and I was counting on a few more years of it. Well . . . it's been fun, and at 78 I can't squawk too much! We still have the snow-covered Cascades, clean air and water, and good fishing, hiking, and boating.

From Pasadena, **Sid Gally** writes that he and his wife are having an active retirement. His note: "Helen and I are well-retired, she from teaching, and I from an engineering job with the Gas Company. I edit a quarterly newsletter for Gasco retirees, so I still have some connections with my old company. We have had a busy summer. Had two grandchildren from Berkeley for a couple of weeks, and spent most of the time at Catalina. Then our son and family came from Japan for two weeks with our other two grandchildren, girls 7 and 9. Meanwhile, our teacher daughter, who had to leave Indonesia early because of the riots, was here but is now back in Jakarta. Now we will be leaving on a trip to England and northern Italy, so life is busy for us."

Roy Acker, living in L.A., is proud of his long service with TRW. He says, "I retired from TRW in 1992 with the lowest outstanding badge number (127), after 38 years of ballistic missile and spacecraft design, including the configuration of the original Minuteman missile. At age 55, I learned to fly and bought a Piper Comanche, which we used for 18 years to travel to the East Coast, to Canada, and into Mexico as far south as the Yucatán peninsula."

Edwin Wald in Alhambra has a question. He is doing some work in biochemistry and asks, "Does anyone know the location of one or two laboratories that regularly do complex biochemical analysis for nutrients and toxins in roots, stems, flowers, leaves, nuts, etc., of common food plants?" He is particularly interested in data indicating which toxins in small amounts are "medicinal." If you have information to pass on, please do so directly. Wald can be reached at 626/281-6533. His address is 230 N. Valencia, Alhambra, CA 91801.

Wayne G. (Gordon) Abraham, now living in Los Altos Hills, California, updates us with the latest on his family: "Having retired from Varian after a career in microwave technology, my wonderful wife and I are enjoying our four kids and almost nine grandchildren." Gordon, keep us posted. **John Small** sends his note from Douglas City, California. He says that he is working on a sequel to *Meteor*, but can't divulge more details without giving away the plot.

Joan La Bombard, wife of **Emerson La Bombard**, writes: "Since 1946, Emerson has been ill with Lou Gehrig's disease. He retired after 45 years of work at McDonnell-Douglas. Until he became ill, he was director of the Solar Sail Project for the World Space Foundation. He is unable to communicate directly, because he is on a ventilator with a device through his throat. He would love to hear, by mail or a visit, from Caltech classmates." Their address is 814 Teakwood Road, Los Angeles, CA 90049.

Fred Thiele, formerly regional chair of the Caltech Alumni Fund for the Northwest Region, writes from Edmonds, Washington, "For the last ten years I have been retired. I keep busy as a condominium association president, keeping the books and managing the units."

Bruce Lawrence writes from his home in Pacific Palisades that "since retirement, my wife and I have had the good fortune to complete three round-the-world trips on the *Rotterdam* (V & VI), which adds up to 100,000 nautical miles and 300 days at sea." He adds that they both are fans of the Internet, programming, and e-mail. Write them at BLaw1920@aol.com.

Speaking of e-mail, **Alfred Schaff**, in Playa del Rey, California, can be reached at aschaff@earthlink.net. **Miyoshi Ikawa** has a new e-mail address on the University of New Hampshire server: mi@cisunix.unh.edu. **K. B. Howard**, in Boise, Idaho, is also up and running at kbhoward@micron.net.

C. Victor Sturdevant in Hawaii updates us with his electronic address: wcivw@webtv.net. **Donald E. (Don) Dawson** checks in from Palos Verdes Estates with a new e-mail address: flymandon@aol.com.

Robert G. Bowlus drops us a line from his location in Ashland, Oregon. "Gerry and I continue to enjoy life here. We do a lot of seasonal skiing and sailing, and exploring the Oregon coast."

1942

John F. McClain, Jr.
550 Kentwood Drive
Oxnard, CA 93030

First and foremost I want to thank all of you who returned your postcards. As of July 1, I have received 51 (49 percent of those sent out). Keep them coming, because this is the basic way I will be able to get enough news for a column in the alumni news.

Al Albrecht is in Bellingham, Washington, but still commutes to D.C. for part-time consulting. **Fred Felberg** retired from JPL in 1987 and from the B.O.D. of Parsons in '96—keeps busy playing golf twice a week. **Warren Gillette** is retired in Longmont, Colorado. Squeak practiced medicine until 1985 and did two volunteer stints—one in Vietnam in '66 and one in Ghana in '74.

Elden Geib is in Largo, Florida, and has been a paraplegic since July 1993 for reasons unknown. He does have an e-mail address, and I'm sure he'd like to hear from any of you other hackers at sweiss1@aol.com. **Roy Weller** had two rather serious operations earlier in the year, which forced the cancellation of a trip to Europe. The last time I talked to him he was well on the mend, and he and Sylvia were planning their next trip.

It was great to see Betty and **Roy Van Orden** at the Half Century luncheon. They are enjoying their family and boating at Newport Harbor. **Wayne MacRostie's** comment regarding the 1998 Seminar Day says it all and bears repeating. "Those of you who missed the 1998 Seminar Day were greatly deprived! Hope to see you next year." I can second that and add, "Well said and 'nuff said."

Art Schneider is still running (remember he was the one and two miler on the championship track team of the '42 season). He was on his way to a vacation in Turkey and then back to work at Raytheon. Some guys never quit.

George Sutton asked what percentage of the class was alive today. According to the information I received from the Alumni Association, we graduated 154 guys and there are 105 still alive today, 44 deceased, three who asked for removal from the rolls for personal reasons, and two who are lost. That's 67 percent on my calculator. Incidentally the two who are lost are **Frank Given** and Dr. **Richard Latter**. If anyone knows of their whereabouts, please let me or the Alumni Association know.

Prize comment to date goes to **John Miles**, whose "age-adjusted health" is satisfactory, and that's something all of us can commiserate with. Along those lines, **George Almassy** reported that his sister-in-law had given him some golf balls and wanted to know how he was doing. He told her that he was still hitting them out with the 50-year-olds, to which she replied, "But how are you doing with the 30-year-olds?" Pretty typical sister-in-law remark, George.

Ralph Willits reports from Medford, Oregon, that he is still golfing, fishing, and working on Undergraduate Admissions Support for Caltech at local high schools. I'm sure the Alumni Association appreciates your efforts, Ralph, and incidentally, for the rest of you guys—volunteering not only keeps you in touch with what's going on at Tech, it backs up the great staff we are so fortunate to have in both the Alumni Association and the Alumni Fund Office.

I know that I've missed some of you who wrote, but I don't know how much space '42 is going to get, so I guess I'd better knock off the personal items and get to a couple of general items that need attention.

First, I want to thank all of you who gave to the Alumni Fund for our 55th reunion in 1997. We had 78.7 percent participation. This year we had 73.5 percent participation. The solid financial support of the alumni is one of the items that keeps CIT in the position it enjoys as a top educational value, so your continued support is really appreciated. If you are not doing anything for Tech now, GET INVOLVED!

Secondly, Torrie Kirkham, the Alumni Fund director, is making a list of all the class gifts to CIT. When she asked me what the class of '42 gift was, I drew a complete blank as did a couple of other guys I talked to. Do any of you remember what it was? If so, please let me or Torrie know and we'll print it in our next column.

Have a great winter! Thaaaaaaaat's all folks.

1944

Paul Winter
859 S. Orange Grove Blvd.
Pasadena, CA 91105-1738
626/799-7604

Leonard Abrams has kept busy since his retirement from Lockheed and has published two papers proving that most black holes do not exist. See *Physica A*, vol. 227 (1996), and the *International Journal of Theoretical Physics*, vol. 35 (1996). **Phillip Adams** "had the big 75th birthday with 21 combined children, spouses, and grandchildren." His activities include tennis, golf, and fishing, as well as trying to stay current on the theories of the origin of the universe and life, and the relationship of science and religion. **Frank Barnes** writes that since retirement he has been taking some graduate courses at Gordon-Conwell Theological Seminary in connection with the New England Church Partnership Program.

Willis Bussard and his wife have recently moved into the Kimball Farms Community and are enjoying the many activities available in the Berkshires in Massachusetts. Tanglewood is a mile away, and Willis has audited a course at Williams College, and is still playing tennis. **Herbert Cabral** retired in 1987 as general manager of the Western Marine Division after 16 years with Westinghouse Electric. He has been married for 50 years, and has four children and eight grandchildren. He and his wife live in Los Altos Hills, California, and are active in volunteer work.

Howard H. C. Chang writes that he retired in 1984 and that his hobbies are the interpretation of quantum mechanics, the quantum measurement problem, evolutionary psychology, molecular biology, linguistics, and French. He is interested in cosmology, which he considers similar to a religion, and observes that cosmologists are often wrong but seldom in doubt. He expects to be going to Chinghua University in Beijing to teach a course in quantum field theory.

Bill Davis has had an active life following retirement from Lockheed in 1989. His main interest of calling square dances has taken him as far away as New Zealand and Australia, where he has taught callers. He was awarded the two highest awards of the International Association of Square Dance Callers. In 1995 he suffered a stroke, which paralyzed his right arm and limits his speech, but he maintains an active schedule of therapy and exercise. **John Gardner** retired in 1985 after a career in petroleum engineering. This began after his release from the Navy and took him to Saudi Arabia and then Bakersfield. His last work was with the State Lands Commission in Long Beach, and he now lives in San Pedro.

Since retiring from the research staff of Argonne National Laboratory in 1987, **Tom Gilbert** has been teaching science to seminary students and coordinating an annual lecture series on the "Epic of Creation." He is currently working on a book based on this series, which will include contributions from 19 scientists, 3 biblical scholars, and 5 theologians. **Bert Golding** says that he is now fully retired in Houston but keeps busy in volunteer work for nonprofit groups. **William Hamilton** is still working as president of a restaurant and a nautical museum and asks to be checked out at his two websites: www.newportbeach.com/cannery or www.newportbeach.com/riverboat.

Garman Harbottle remains active as a senior scientist in the chemistry department at the Brookhaven National Laboratory. **William Harland** has no intention of leaving his Vancouver, B.C., civil engineering firm, where

ontact Patsy Gougeon at 626/395-8366, patsy@alumni.caltech.edu, to sign up.

Paul Winter '44 (left), a structural engineer in Caltech's Physical Plant department, talks with Jerry Burk of the provost's office during a tour of the renovated bookstore.

he manages the design and construction of small hydro projects in Canada and Southeast Asia.

Since retiring from Hughes, **Horace Higgins** has been traveling, playing tennis, and doing volunteer work, including the Alumni Fund drive. Lately, he has been helping his mother with her book of memoirs, which was recently published. Along with three other Boeing engineers, **Kenneth Holtby** recently received the Francois-Xavier Bagnoud Aerospace prize of $250,000 for the design and development of the Boeing 747. The award was made in Sion, Switzerland in June 1997.

Thomas Hudson lost his wife of 43 years in 1996. In his retirement, he is working with middle school students in math, science, and computing. He is also active in the AIAA and the SAE. **Winfield Hughes** says he is still doing some income-tax work, but is spending most of his time with his three daughters and four grandchildren in the Sebastopol, California, area.

David Jones writes that he and his wife, Roberta, recently celebrated their 53rd wedding anniversary in Fiji. They have 6 children, 13 grandchildren, and 2 great-grandchildren and have been living on Maui for 10 years, but are planning to move back to Northern California within the year. **Fred Karstedt** is enjoying retirement along with his wife in the "high desert country" of Central Oregon, and his only complaint is that there are not many Caltech alumni in the area.

Alfred Knudson has enjoyed his career in the biomedical sciences and works at the Fox Chase Cancer Center and part-time at the National Cancer Institute, helping to develop new programs in cancer genetics. In 1997 he was honored as a recipient of a Gairdner Foundation International Award and with an Award of Merit from the Princess Takematsu Cancer Research Fund.

Retirement for **Francis MacDonald** means spending winters golfing in La Quinta, California, and summers at the home he shares with his wife in northwest Montana on Swan Lake. He and his wife also enjoy traveling in their motor home, which allows them to visit eight grandchildren.

Robert McAnlis and his wife are enjoying life in San Diego after retiring in 1989. Their four grandchildren are close, and the oldest just entered San Diego State University. They have enjoyed recent alumni trips to Texas and Russia and are active members of their church choir. **George McDonald** retired from the Navy as a lieutenant commander with the United States Naval Reserve, from Hall-Mack Corporation, Textron, and finally from the Marjo Machine Corporation (which he owned). He and his wife have 10 children and 17 grandchildren and live in San Marino, CA

Dale Meier is still active as professor and distinguished research fellow at the Michigan Molecular Institute. Last year a paper he published on the theory of block copolymers was selected for an award as one of the 12 most significant papers published by the *Journal of Polymer Science* in 50 years.

After retiring as a vice president from Santa Fe Pacific Pipelines in 1986, **Charles Miller** has become very active in community affairs in the Idyllwild, California, area. Among his responsibilities, he is now serving on the board of the Idyllwild Water District along with **Harry Sigworth** '44. He has a wife, four daughters, and five grandchildren. **John Nelson** is retired and living in San Rafael, California, He and his wife took part in the alumni tour last year to Rio Grande del Norte in New Mexico, and he was also part of a study group learning about the White Mountain Apaches in western Arizona.

Carl Olson is an amateur radio enthusiast and is still flying the Cessna 140 that he has owned since 1970. He claims it is a contest to see whether he or the plane lasts the longest. Not ready for retirement yet, **George Osgood** is president of Technical Marketing Associates in Portland, Oregon. He sees fellow alum **Dean Johnson**, and recently played golf with **George Wilhelm** '45.

Joseph Phelps avoids the need for retirement by owning and operating the Rancho del Cielo Golf Course in Temecula, California. From Santa Barbara, **Bruno Pilorz** writes that his only significant accomplishment since our 50th reunion has been a two-stroke increase in his handicap. After retiring from Lockheed in 1985, **Eugene Pischel** built a home in Sedona, Arizona. His wife died five years ago, but he is still enjoying flying, tennis, hiking, shooting, and some hunting and fishing. Son Ken '72 practices medicine at the Scripps Clinic in La Jolla.

Robert Randall retired in 1987 and after a stint of consulting moved to Issaquah, Washington, to be near his grandchildren. Now fully retired, he can't figure out how he ever had time to work.

Maurice Rattray, Jr., writes that from April through September 1997, he and his wife sailed their 42-foot sloop from Turkey, visiting sites in Cyprus, Syria, Lebanon, and Israel. They also traveled by bus to Egypt.

The Reverend **Raymond Saplis** reports that his 18 years as priest/pastor of St. Euphrasia in Granada Hills, California, recently came to an end, as he retired this past February.

After 40 years as partner in Eckels-Spaulding, **Albert (Tony) Spaulding** is reluctantly entering the computer age. His computer is capable of e-mail, and he hopes to be online with an e-mail address in the near future. **Cornelius Steelink** is now professor emeritus of chemistry after serving as chairman of the faculty at the University of Arizona. At the 1997 annual meeting of the American Association of University Professors, he was presented with an award for 50 years of service.

Floyd Weaver has closed his structural engineering office and now spends his time playing golf at the Santa Ana Country Club, visiting grandchildren, and traveling. **Paul Wolf** is retired and now puts in full time as an amateur radio operator (W6RLP) and a member of the Masons, Elks, and the American Association of Retired Persons.

1954

Roland Miller
575 Rivergate Way
Sacramento, CA 95831

As I start to write this first column as class agent, I give thanks to Mansuper (professor of literature, emeritus, Kent Clark), without whose guidance and encouragement I probably would never have been able to write anything intelligible. It is too bad that Caltech limited the size of the section he taught in our freshman year or I might have received more responses to the post cards that were so diligently sent out by the Alumni Association. Here are the statistics. Out of 90 cards, 23 were returned or e-mail messages sent in lieu. Of those, seven had nothing more to say than to check the box that said "No Change." Since none of the rest are listed as deceased, I have to infer that this combined group of 74 never learned to write. However, I have become known as an incessant nagger in my later years, and I will be contacting you again to try to gain a few morsels of information on your activities so that they can be enjoyed by the rest of your classmates. Those who did respond have provided some very interesting tidbits that I will share with you in this article. Because we are limited to approximately 1,000 words, I have left some of the responses for my next column. So, if you don't see your name here, look for it there.

Since I am writing this as class agent, I will start with myself and explain how I received this distinction. After working for 42 years in five different countries since leaving Tech, I decided to retire (almost). What I told my employer at the time was that "I want to do what I want to do when I want to do it, instead of what I had to do when someone else wants me to do it." So there I was last September, on the island of Guam, trying to figure out how I wanted to spend my time, when I received *Caltech News* and noticed, while reading an article on the new class agents network, that there was no agent for the great class of '54. I thought that this would be a great way to spend some of my time, and voila, I am now the class agent! So, I am now back in Sacramento, where I am enjoying retirement and spending my time—in order of priority—golfing, serving as chairman of the House Committee of 103-year-old Elks Lodge #6 and as a member of the Rotary Club of Sacramento, doing some consulting, and of course, serving as class agent.

My first respondent was **Sam** (he used to be **Bill**) **Autrey**. Hey, I thought, this is great. People are responding alphabetically! Bill writes that he and his wife, Sylvia, have both been retired for about eight years and are currently working as volunteers for the Fullerton, California, Police Department, with uniforms and badges, but no weapons " 'cuz we're not sworn." He also is a member of the Orange County Sheriff's Aerosquadron. On this job, he *is* a sworn officer and transports prisoners in his own airplane.

The next reply came from **Weldon Jackson**, and I quickly deduced that they weren't coming in alphabetically. Weldon writes that he retired from Hewlett-Packard in March 1990, lives in Santa Rosa, California, and is enjoying his retirement very much.

Ben Rosen writes that the last year has been eventful. His brother **Harold**, PhD '51, and he closed down Rosen Motors in November 1997 after four years of developing a hybrid-electric, flywheel-turbine power train for passenger cars. Ben says that it was an artistic success (lean, green, and mean), but a commercial failure. They couldn't convince any of the world's major auto companies to adopt and invest in the technology. He still continues as (nonexecutive) chairman of Compaq Computer Corporation and says, "Though I am no longer a partner of the Sevin Rosen venture funds, I do continue to invest personally in technology start-ups (but no more cars!)."

I received a very sad note from the wife of **Neil Sundt**, Pauline, who wrote, "I am writing to inform you and Caltech of the death of my husband, Neil, on May 28, 1998. Following graduation, Neil came to Connecticut, where he worked for Pratt & Whitney Division of United Technologies for 37 years, retiring as senior development engineer in 1991. Survivors include his wife of 41 years, Pauline, three children and their spouses, and three grandchildren." Please accept our heartfelt condolences, Pauline.

Earl Evleth sent me an e-mail all the way from France. He reports that he is still French, having become so 10 years ago, but retired from the Center for National Research Science in August of '97. He has been married for more than 40 years to Donna, who he met at a Fleming House mixer dance in 1952. They spend most of their traveling time in Europe, but do occasionally get back to the USA to see what it is like, and they made it to the class reunion a few years back.

Speaking of class reunions, **Lee (Moose) Henderson** wrote that **Sam Vodopia** is our class-reunion chairman at Seminar Day 1999. He is looking for new ideas to make the session more fun, original, and full of class members. If you would like to send me your ideas, I will devote some of the next class notes to presenting them for comments. Now all we need is some information on what Moose has been up to.

Well, that's the news for this issue. I encourage those of you who did not respond this time to do so. I will be sending more post cards, but you can also e-mail me at rolmil@sprintmail.com. Speaking of e-mail, I am compiling a database of e-mail addresses of class members and will be glad to share it with anyone who asks. And please plan to attend our 45th reunion in 1999!

1955

John Andelin
129 North Irving Street
Arlington, VA 22201
703/243–7181
jandelin@cais.com

Different. The class of '55. A new selection process, and a less predictable outcome. And so it was. More option switching than average; far more who left along the way. Forty-several years later, about half of us report that we are retired. (There is clearly some underreporting here; I also note that "retired" is a fuzzy word, giving few hints as to its real meaning.) Many classmates, even among the retirees, continue to work or consult; and most of us seem to enjoy whatever we're up to.

Chalon Carnahan and his wife, Mardel, both took early retirement from Lawrence Berkeley Laboratory and report that they are having a great time (exclamation point); **Marty Vogel**, who retired two years ago from Rohm and Haas, reports the same (but reserves the exclamation point for his grandchildren); **John Wolfe**, after retiring in 1994 from the Navy Personnel Research and Development Center in San Diego, published some of his research in a special issue of *Military Psychology* and did three chapters in the book *Computerized Adaptive Testing*; **Bob Christian** said good-bye to work a couple of years ago and now lives in Florida.

Alfred Goldman and his wife of 22 years, Maria Lucia, have been living in Olney, Maryland, for 15 years. Alfred left COMSAT in 1996, and Lucia left IBM last February. Their daughter, Christianne Marie, is at the University of Richmond. **Bill Creighton** and his wife, Pam, split their time between Costa Mesa, near Downey, where Bill consults with Primex Technologies, and Big Bear, where he is chaplain

of the Big Bear Masonic Lodge, vice president of the High Twelve Club, and secretary-treasurer of the Big Bear Shrine Club. Both, too, are active members of Kiwanis. **Carl Johnson** moved to Pismo Beach, California, after leaving JPL in 1990.

Since retiring, **Roger Lagerquist** plays tourist in and around Santa Barbara, and continues his mountain biking experience. He checks in now and then with Sandy and **Joe Graetch**, who live nearby in Isla Vista. **Al Lieber** and his wife, Marilyn, live in Del Mar. Al has recently completed a limited-edition book on the history of Scottsdale, Arizona, where he grew up. **John Honsaker**, also retired, recently went on historical trips to Russia and the Baltic States; at home, he makes Renaissance and medieval music with friends. Marg and **Stan Manatt** checked out Ecuador and the Galapagos this summer, giving Stan a break from teaching biochem (which he never took himself) at Cal State L.A. Otherwise, their lives are full with music, tennis, hiking, and family.

Eight years ago, **Bernie Schweitzer** moved from Hughes (the Raytheon part now) to RAND; he has just moved back to what's left of Hughes (consulting mode). His wife (40 years already), Masha, is still a practicing artist and art teacher. They have two daughters, one an engineer in Portland, Oregon; the other completing an MBA at UCLA. Bernie reminded me of Throop's Interhouse Dance Eiffel Tower (which, you may not know, we sold to a Renault dealer as an advertising display). I, too, am "retired" (from the Office of Technology Assessment a year before Congress decided not to fund it anymore). I've tried to keep up with routine maintenance activities (family and friends, house and garden, physical and emotional well-being), have continued some minor professional ones (reviewing others' work, mostly), and, with my wife, Virginia Geoffrey, have actively worked with refugee, immigrant, and other low-income kids and their families.

Dick Nielson, among many others, doesn't use the R-word. He still routinely traipses to South America to check out mining properties for clients. **Ed Seidman** says that the project he's on at Abbott Labs should give him a couple more years of job security. Not that he needs it to keep busy—he's been a village trustee for Deerfield, Illinois, for 24 years (and is planning to run again in 1999), and is now chair of the Solid Waste Agency of Lake County and president of the local Optimists. Ed and his wife, Judie, are also involved with family (six grandchildren) and traveling (Santa Fe, New Mexico, most recently). Similarly persistent about working, **Curt Michel** is still at Rice University (when he's not on sabbatical in Europe or giving seminars on astrophysics at a vacation paradise somewhere in the world). He and his wife, Bonnie Hausman, have just celebrated their fifth wedding anniversary.

Paul Shumate (aka Farley) consults for Sundstrand Corporation on gas turbines and fans, and reminisces about days when his golf handicap was much lower. **Ken Ziedman** moved from human factors research and application (aerospace and traffic safety) to accident analysis and expert witness work, which he's been doing for the last 15 years. He is cutting back some to leave time for travel and "fountain building." For the last eight years, **Bill Lindley** has been associate editor of *Truth Seeker*, a free-thought journal that was first published in 1873. Before that, Bill did computer programming for physics and other applications, and worked on the 1990 census.

A few members of the class of '55 have recently added excitement to their lives. **Al Barrios**, already the inventor of the Stress Control Card and president of his own company, got married for the first time. As he puts it, "The lucky bride is Inna Galerkina . . . a recent graduate of the University of Moscow." **Fred Martin** became an AAAS/IEEE Congressional Fellow, and will work for a year in the Congressional Research Service, helping to sort out issues for our national legislators. And **Harvey Frey**, already MD and PhD, is about to finish law school. He's put together a web page (www.harp.org) on the reform of managed healthcare organizations, his "current obsession."

They may have been right when they thought we were different.

1962

Bruce Abell
7 Morning Glory Circle
Santa Fe, NM 87501
505/986-9039
bruce@santafe-strategy.com

It's getting to be that time of life; we get up during the night, and our classmates are starting to retire. The rest of us are trying to figure out how they managed to do it. **Bill Hassenzahl** retired as a triple threat from the UC System (Los Alamos, Lawrence Berkeley, and Lawrence Livermore Labs) in 1993 and now has a consulting company, Advanced Energy Analysis, working on electric utility issues of energy storage and stability. He manages to find time not only for skiing and biking, and a new granddaughter, but also to dabble in a winery, Rosenblum Cellars in Alameda, that he owns part of. Yes, they specialize in red wines. **John Crossman**, another retiree, has designed and is building a new home in Breckenridge, Colorado, and hopes to spend a part of each year on a small island in the Inland Sea of Japan.

Another retiree, **Jim Davis**, keeps his hand in by operating a consulting business with clients in Japan and Europe. He retired from Lawrence Livermore, where he was Director for Lasers. **Lowell Hill** (Ex) retired from Hughes Aircraft and is using his new-found freedom to study Italian and architecture. As he tries to get organized as a retiree, he would be happy to hear from former classmates. **John Newmeyer** isn't retired, but like Bill H. is vintning. He's making premium (of course) chardonnay and pinot noir at his Napa vineyard, and spending his indoor time writing. You can find his essays at www.newmeyer.com. John has two 1990s children, Elizabeth, born in 1992, and John, born in 1997.

Bob Rouda writes that his career has included chemist, computer geek, chemical engineer, pulp and paper engineer, university professor, organization development consultant, and instructional system designer, and now he is the technical training manager for H. B. Fuller Company. **Frank Ridolphi,** who has put in 32 years at TRW, is now Director, Technology, for TRW Systems and Information Technology Group in Fairfax, Va. He has been married for 31 years, and the oldest of his three children was married last August.

Dick Hess, an unreformed tennis addict since undergraduate days and now retired from Logicon, managed to take in the Australian, French, and US Opens, and Wimbledon, in 1998. **Stan Flatte** is a professor of physics at UC Santa Cruz and was department chair in 1986-88. He started in particle physics and changed 20 years ago to geophysics. He and his wife Renelde have a son, Michael, who is a professor of physics at the University of Iowa, and a daughter, Anne, who is a producer/director of documentary films at Stanford.

Mike Townsend and his wife, Mary, live in the Oregon mountains between Portland and the coast. They headed there eight years ago when he left Rockwell Communications Systems as VP for strategic planning. Since then he has consulted on strategic planning for high-technology companies, and he is currently writing a book on that topic. His daughters are, respectively, a CPA in Orange County, California, and a social worker in Eureka.

Art Ludwig is fulfilling a lifelong dream of designing and building a dedicated music-listening room and monster sound system. Anyone interested can see the results, along with lots of measurements and other technical stuff, at http://www.silcom.com/~aludwig. He is currently wrapped up in the creation of sound demo files, using the head-related transfer functions measured at MIT, and other processing. If anyone knows about other folks doing this (besides the ones he referenced in his Web site), Art would love to hear about it. **Al Whittelsey** went up the road to JPL after graduation and hasn't seen any need to go elsewhere. He's working in electromagnetic compatibility, which means "how do we keep stray EM fields of all the parts crammed together in a small spacecraft from interfering with each other?" Since graduation he has kept up with **Karvel Thornber** ('63 Blacker, and subsequent PhD at Caltech), a friend from Portland, Oregon. His daughter has just graduated from USC with a master's in geology, and becomes self-supporting momentarily.

Doug Smith, a professor of geology at the University of Texas at Austin, is spending the summer in Durango, Colorado, where he is studying mantle fragments erupted onto and near the Colorado Plateau. He and Jean have two sons—one a professional mountain bike racer, and the other working for VISTA in California. He reminded me of the six weeks we spent, along with **Ron Gebhardt** (the three of us comprising that year's geology class), at summer field camp, and says he and Jean stopped recently for a Basque dinner at the same hotel we used to get to every couple of weeks when we escaped into town and running water.

Roger Noll is a professor of economics at Stanford. His wife, Robyn, has retired from nursing, and daughter Kim is a marketing/PR specialist in Silicon Valley. Since being "rightsized" by Kodak in 1989, **John Golden** has been consulting in computer systems, pleasantly dividing his time between Rochester, New York, and Boothbay Harbor, Maine. Both sons are out of college and married. John started at RCA's Sarnoff Research Center, then spent 10 years at Xerox, then seven at Kodak, where he was one of the first "experienced professionals" hired in a company that had traditionally taken new grads and kept them until retirement. John has been a Caltech Alumni Fund area chair and is now the western New York area coordinator for Caltech's Undergraduate Admissions Support.

Finally, my wife, Nancy, and I have been in Santa Fe, New Mexico, since 1991, after two decades in Washington, D.C. After six years as vice president of the Santa Fe Institute, a nonprofit research organization, I left to form a small company that consults in the area of strategic processes, building on recent research in the sciences of complexity. Our daughter Julie is an archaeologist in northern Virginia (working for a Pasadena-headquartered engineering company), and daughter Robin is a conservation biologist with the World Wildlife Fund in Washington, D.C. Both grew up in the area and went away to college with no intention of returning to that boring place. They're back. And I return to Pasadena four times a year as a member of the board of directors of the Caltech Alumni Association. Yes, you can go home again. Send news.

1995

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

Well, once again, very few people have actually sent me any news. Anything I *have* received has been put on my Web page. And, just to confuse you all, I've changed the address of the web page slightly: http://sun-valley.stanford.edu/~tobe/alumni95.html. The old link should still work, although I couldn't quite remember what it was, after changing to the new one. Sooo . . . you're better off going with the new one!

Anyway, until you guys send me stuff, you'll have to read about my life. I'm still submerged in the PhD program at Stanford, with absolutely no end in sight. I did take a trip to lovely Nashville, the site of the 1998 ION meeting (GPS conference). So, for any of you who are dying to read my latest paper on spacecraft formation flying, let me know, and I'll send you a copy.

Now, here's what I've received lately:

Steven Jilcott, a master's student in statistics, received Virginia Tech's highly competitive Cunningham Fellowship, which recognizes students' outstanding credentials and potential as doctoral degree candidates. He was among 10 students receiving the fellowship.

Brian Cooper is working at Applied Materials as a process engineer in the Epitaxy Division. He's been working there for about three years. He's living with **Steve Greenberg** and **Chris Buchner** as well as '94 grad **Forrest Long**. **Matt Clapp** has also been living in the Bay area, working in San Jose at Synaptics for about two years. Unlike those of us stuck in grad school, he's actually designed REAL products, and reports that his initials are on about 600,000 pieces of silicon. Starting this fall he began attending Johns Hopkins University for graduate school in EE (uh-oh. . . return to vaporware). He'll be studying analog chip design.

Grant Templin is at Santa Barbara, working on his PhD in chemical engineering. (Gee, Grant. Lots to say, huh??) **Mike Jarvis** e-mailed me from Chile, where he has been trying to collect data for his thesis. (He's in the astronomy department at the University of Michigan.) Apparently the weather has been a little less than cooperative.

Hootan Hidaji got married in 1997 to his high-school sweetheart, Monica. He's been working in Memphis since April 1996 as a process engineer for ICI Acrylics and reports that he's happy as a clam!

Nicky Impert is working at Boeing in Seattle, and for a while he was working with **Nathan Scandella** '96 on reengineering the AWACS software. In his spare time (yikes! what exactly is THAT??!) he's learning Mandarin and running an Amway business. He plans to move to Taiwan this fall.

Sarah Neugebauer has started grad school. She is working on her MBA and is also working in a gene-therapy lab. She's currently living in San Diego. **Monica** and **Charles Sharman** are in the Bay Area. Monica is working at Gemfire Corporation in Palo Alto, while Charles is at Synergy Semiconductor in Santa Clara. Monica gave birth to Derek Noah Sharman on May 7. Mom and baby are reported to be doing well.

After three years freezing in Boston at the "Caltech of the East," **Rohit Khare** is back in SoCal pursuing a PhD in Web protocol design at UC Irvine. He worked on Web standards and other research at the World Wide Web Consortium, and later at MCI Internet Architecture. In addition to grad school and consulting, he's been editing the *World Wide Web*

Journal. To catch up on his travels and other adventures, check out his on-line diary and cocktail party, Friends of Rohit Khare, at http://xent.ics.uci.edu/FoRK.

Joey Beheler has graduated with an MS in computer science from Stanford and is working at Sun Microsystems. **Serge Belongie** reports, "I'm in my third year of grad school in EECS at Berkeley, and I just received my MS at the end of last semester. I also spend part of each week working at a start-up company named Digital Persona, Inc., for which **Vance Bjorn** '95 and I were cofounders. We have a Web site at www.digitalpersona.com that has some pictures and information on the fingerprint recognition peripheral we are developing. Last month, I got to go to Bombay, India, for a conference with a few other people from my group at Berkeley. While at the conference, I bumped into an old TA of mine from CS/EE4! (His name is **Subrata Rakshit**, MS '89—perhaps that will ring a bell with some of the other EE/CS folks.)"

Sonny Arcilla is working as a network services manager at Team One Advertising. (He also adds that they do the Lexus advertisements.) For all those of you who would like to call him but have been too cheap to fork over the money, his 800 number is 1-800-272-4552.

Craig Tibbets sends this news: "The bare-bones information is that I am now married and living in Tokyo, working on a master's degree in ME at the Tokyo Institute of Technology. The story of how I ended up here is that during my senior year at Caltech, I was dating Sachiko, a Japanese exchange student attending a small community college in Upland. After graduating, I wanted a break from academia, and in the end I decided to come to Japan for a year to teach English at a Christian church near Tokyo. I had a great experience serving as a teacher/missionary in this church, although it was difficult being so far from Sachiko since she was still finishing up her last year of college. My one-year term of service with the church finished at just the time that she came back to Japan. I didn't want us to be separated by an ocean again, and I also wanted to spend more time in Japan, so I applied to the international program at the Tokyo Institute of Technology. After my first year, Sachiko and I got married near her hometown of Osaka. It was a very small but pleasant wedding, and my parents and grandmother were able to make the trip to Japan to attend. Now she is working as a secretary at a small engineering company while I finish up my last year. I'm planning to graduate in September— after that, who knows. We're really struggling to decide whether we should stay in Japan or move back to the U.S. Although Tokyo is too crowded for me, I've enjoyed my time in Japan. It's really been a good experience for me and has definitely deepened my understanding and appreciation of my wife's home country. I've been able to learn quite a bit of conversational Japanese, but I'm still basically illiterate, and technical language is mostly incomprehensible to me. Fortunately, students in the international course here are allowed to complete most of their coursework in English, so I should be able to graduate."

SEE?!! Now you guys all need to take some serious hints from Craig as to the length of your correspondence with me!! WELL, that's all the news I've received. I'd be happy to spread gossip about the people I've seen recently, but I suppose I'll give you all a chance to write me officially before I resort to that.

FOR THE RECORD: Bruce Reznick '73 writes to correct the class notes from the previous issue: "Robin Sahner and I have been a couple since 1976, however, we are not married, we've never been married, and we have never intended to present ourselves to the world as married."

Obituaries

1922

CHARLES J. BIDDLE, of Ketchum, Idaho, on July 17, 1997; he was 99. He is survived by his wife, Freda.

BRYANT ESSICK, Ex, on October 26, 1997.

1923

JOSEPH R. ALCOCK, of Chula Vista, California, on January 11; he was 97. After graduating from Caltech he went to work for the Riverside Cement Company as a mix chemist, then joined the Owl Fumigating Corporation the following year. He spent much of his career in private industry with American Cyanamid, where he worked as a plant and production engineer. In 1955 he joined the Los Angeles County Air Pollution Control District, and later did chemical analysis for the California State Air Resources Board. He enjoyed traveling, and at the age of 89 he took up crocheting. He was predeceased in 1980 by his first wife, Dorothea, after 52 years of marriage, and in 1996 by his second wife, Louise, after 12 years. He is survived by two daughters, Barbara Bell and Glenyth Turner, and by four grandchildren.

1925

LEROY NEWCOMB, of Seal Beach, California, on January 24, 1998; he was 96. He is survived by his wife, Eugenia, and a daughter and son.

1926

ROBERT B. BOWMAN, of Orinda, California, in June. After graduating with dual bachelor's degrees in physics and chemistry, he went to work for the oil industry and was continuously employed by Chevron and predecessor companies until 1968, rising to middle management, principally in oil field research. A life member of the Alumni Association and a 50-year contributor to the Annual Fund, he helped organize the Bay Area chapter in the mid-1930s; he and his wife were known for the alumni swimming parties they hosted. After retiring he traveled extensively and engaged in public service. He is survived by his wife, Betty; a son, Kirk; and two granddaughters.

1928

RALPH C. WEBER, MS '34, of San Bernardino, California, on July 8, 1997. He is survived by his wife, Lillian.

1929

EDSON C. LEE, of Poway, California, in March 1996.

1933

JOHN A. RANDALL, Ex, of Walnut Creek, California, on May 7; he was 93. He was involved over the years with a variety of construction projects, including the Los Angeles Aqueduct; Kerr Dam, in Montana; and Disneyland. He was then a civil engineer with Southern California Edison for 14 years, retiring in 1969. He and his wife traveled extensively, especially after his retirement, and he enjoyed woodworking and gardening. He was a member of the Walnut Creek Presbyterian Church, the Rossmoor Railroad Society, and the Rossmoor Engineer's Club. Predeceased in January by his wife of 57 years, Marjorie, he is survived by his sons, Hugh, Jim, and Nick; a sister, Mary Grace Manning; and five grandchildren.

1934

DUNCAN A. MCNAUGHTON, MS, of Austin, Texas, on January 15, 1998.

J. ALBERT ROMOLI, of Los Angeles, on April 4; he was 84. Involved for many years in the manufacturing end of the motion picture industry, he after retirement became active in the Los Feliz Improvement Association, where he was a member of the board; he received a distinguished service award in 1997. He is survived by three sons, Douglas, Philip, and Rian, and by four grandchildren.

A. E. "TOMMY" THOMPSON, of Corona Del Mar, California, on January 2, 1998. He had retired in 1973 after 39 years with Mobil Oil Corporation, first as a chemist and later as a refinery manager, managing refineries at Torrance, California; Augusta, Kansas; Mersin, Turkey; and Amsterdam, Holland. For many years he was active in fund-raising for the Alumni Association. He is survived by his wife, Marion Ruth, and by three children.

1935

ROBERT G. JONES, of Albany, Oregon, on February 16; he was 86. He worked for Wah Chang, first in Glen Cove, New York, and then in Albany, retiring in 1976. He belonged to the American Chemical Society and the American Institute of Mechanical Engineers, and he served two terms on the Albany city council. He is survived by his wife, Theo; a brother, John; and a sister, Nolys Hooker.

1937

H. VICTOR CHURCH, MS, of Bakersfield, California, on May 30, 1997. After earning his doctorate in geology at the University of Chicago, he spent several years teaching, then worked for Shell Oil Company for six years. In 1951 he became chief geologist for a small but expanding company, Oceanic Oil, in Bakersfield, which led to his forming a partnership, Beach, Church, and Bell, with Jack Beach and Ainslie Bell. In 1961 he moved into independent consulting. During the 1970s he was also associated with Ed Green and Max Eastman in G.E.C. Oil and Gas Operations. He served as president of the San Joaquin Geological Society in 1951, and was on a number of American Association of Petroleum Geologists (AAPG) committees. He was an honorary member of the Pacific Section and in 1987 was elected honorary member of the AAPG. He served on the association's advisory council from 1983 to 1986 and was a member of the trustee associates. A musician, he played with the Bakersfield Symphony for seven years and also served as Community Concerts president. He is survived by his wife of 57 years, Virginia, and by his daughter, Charlo Stuart.

ALAN JOHN GROBECKER, MS '41, of Lake Forest, California, on July 1; he was 82. After graduating from Caltech, he bicycled alone across Europe and the Alps, then served in the Atlantic, Mediterranean, and Pacific theaters as a Navy lieutenant during World War II, receiving the Silver Star, for bravery at Anzio Beach. He earned an MS in electrical engineering at USC and an MS in physics and PhD in planetary and space physics at UCLA, and he served as a scholar-in-residence at UCLA and a visiting professor at UC Irvine. He was a technical program manager at North American Aviation, worked at the Institute for Defense Analysis at the Department of Defense, was head of the Atmospheric Sciences Division of the NSF, and was project manager for the Climatic Impact Assessment Program of the Department of Transportation. On January 23, 1999, at the Alumni Fund Council Meeting, his family will accept the fund's Staff Appreciation Award for outstanding service and dedication to Caltech through volunteer work with his classmates. He is survived by his wife Elizabeth, whom he had married at Pasadena's Chapel of the Roses in 1940, and by two children and five grandchildren.

1938

ROBERT B. CARR, of Walnut Creek, California, on March 29. A geophysicist, he worked for Chevron and Aramco for many years. He is survived by his wife, Roberta; a son, Robert; and three grandchildren and two great-grandchildren.

JOHN J. LENTZ, MS '39, of Chappaqua, New York, in June 1997. While working at IBM, he was responsible for a number of advances in computer technology, including the IBM 610 Autopoint Computer—"the first 'personal computer'"—and the cursor, which "has become such a natural part of the computer interface that its existence is taken for granted." He is survived by his wife, Alice.

1939

BYRON F. BEANFIELD, MS, of Port Hueneme, California, on November 29, 1997; he was 85. He served five years with the Navy during World War II, thereafter remaining in the reserves and retiring with the rank of commander. He worked at the Naval Construction Battalion Center in Port Hueneme for three years, then transferred to Point Mugu, where he retired after 22 years. He helped organizations such as the Red Cross and Children's Hospital, as well as veterans' organizations. He was known as an accomplished ballroom dancer.

1940

WALLACE M. MACKAY, JR., on July 22, 1997. He is survived by his wife, Vi.

1941

JOHN W. GILLINGS, of Garden Grove, California, in March 1994. He is survived by his wife, Mary.

CALVIN W. LONG, of Rancho Palos Verdes, California, on February 3, 1997. He is survived by his wife.

AUSTIN L. WAHRHAFTIG, PhD, of Salt Lake City, on November 11, 1997. He is survived by his wife, Ruby.

1942

CHARLES B. METZ, PhD, of Homestead, Florida, on January 14, 1997; he was 80. A renowned investigator in the field of fertilization, he was associated throughout his career with the Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts, serving as a member of the MBL Corporation, as an MBL trustee, and as editor (1980–1989) of the MBL's international journal, *The Biological Bulletin*, and from 1962 to 1974 he directed the Fertilization and Gamete Physiology (FERGAP) Program at the MBL. After receiving his doctorate from Caltech, he held assistant or associate professorships at Wesleyan, Yale, UC Berkeley, the University of North Carolina, and Florida State University, where he became full professor in 1957 and directed the Alligator Harbor Marine Laboratory from 1958 to 1962. From 1964 until 1986 he was professor of zoology at the University of Miami, where he cofounded the Institute of Molecular and Cellular Evolution in 1964. In collaboration with associates he published more than 120 research papers, and he coedited *Fertilization* (two volumes, published 1967–1969) and *Biology of Fertilization* (three volumes, published in 1985). Predeceased in 1984 by his first wife, Ethel, he is survived by his wife, Grace, and by two children, Rinda and Richard.

Continued . . .

RICHARD M. NOYES, PhD, of Eugene, Oregon, on November 25, 1997. He is survived by his wife, Patricia.

1943

JOHN H. LAWS, MS, of Larkspur, Colorado, on May 19, 1997. He is survived by his wife, Marjorie.

ANDREW J. MACMILLAN, JR., MS, of Glendale, California, on July 4, 1997. He is survived by his wife, Janice.

1944

JACK C. KERN, MS, of Austin, Texas, on July 12, 1997.

1945

THOMAS F. DIXON, MS, of Hayes, Virginia, on January 3, 1998; he was 81. During World War II he served as an officer in the U.S. Navy's department of rocket weapons, and he retired in 1946 with the rank of lieutenant commander. He began working on ballistic and space weaponry at North American Aviation, rising to vice president of research and engineering, then served as deputy associate administrator for NASA from 1961 to 1963. He later became vice president for marketing at North American/Rockwell, and then president and chairman of Airtronics Inc., which manufactured classified electronic systems. Finally, he served as executive vice president and later president of Teledyne McCormick/Selph, a pyrotechnic company in Hollister, California. At the time of his death, he was an advisor at the College of William and Mary. His honors include the Robert H. Goddard Memorial Award from the American Rocket Society, and the Lewis W. Hill Space Transportation Award from the Institute of the Space Services. He is survived by Margaret Ann, his wife of 54 years; two daughters, Nancy Hall and Jane Berger; two sons, Thomas and Neil; four grandchildren; and three great-grandchildren.

1946

CALVIN E. KEMPTON, of Laguna Hills, California, on December 23, 1997. After graduating from Caltech, he received his advanced degree from the USC School of Engineering in 1948, then for most of his career worked at Parker Hannifin Corporation, where he designed a circuit used to stop fires in airplanes. He is survived by his wife, Irene; a son, Stuart; and a daughter, Diane.

HARRY M. STEELE, JR., of Tucson, Arizona, on March 2; he was 76. He held a variety of technical, engineering, and management positions at Guggenheim Aeronautical Laboratory, Hughes Aircraft, and American Electronics, among others. A Navy veteran and holder of several patents, he founded American Gyro Company, Whirlajet, Inc., Tylan Corporation, and Arizona Instrument Company. He also did pioneering work on the Hughes Flying Boat and the Caltech wind tunnel. After retiring he took flying lessons and built his own airplane. He is survived by Margaret, his wife of 55 years; a daughter, Carol Buss; a son, John; and two grandchildren.

1947

JAMES H. BEDDOW, MS, of Walla Walla, Washington, on December 11, 1996.

KENNETH N. TRUEBLOOD, PhD, of Los Angeles, on May 7; he was 78. Starting at UCLA in 1949 as a temporary instructor, he rose to chair of chemistry (1965–70, 1990–91) and dean of the College of Letters and Science (1971–74), all the while continuing classroom teaching and his research using X-ray diffraction to investigate the three-dimensional structures of molecules. A pioneer in the use of computers to determine structures, his work contributed to the Nobel Prize discoveries of several others, including his long-term collaborators Dorothy Hodgkin, of Oxford, and Donald Cram, of UCLA. He remained active in research after retiring from teaching, completing the final of 140 research papers just days before his death. The coauthor of *Crystal Structure Analysis: A Primer* (1972) and editor of *Dorothy Hodgkin and Linus Pauling—A Tribute* (1995), his honors included Fulbright and Guggenheim Fellowships (1956–57 and 1976–77, respectively), the first UCLA Distinguished Teaching Award (1961), the Manufacturing Chemists Association's National Award for Excellence in Teaching (1978), and the Fankuchen Memorial Award of the American Crystallographic Association (1995). He is survived by his wife, Jean, and his brothers, Alan and Howard.

1948

RUPERT M. BAYLEY, of Pasadena, California, on January 10, 1998; he was 87. During his 39 years as an electrical engineer with the Los Angeles Department of Water and Power, he also taught engineering at USC and UCLA. He earned two graduate degrees at USC, and his organizational memberships included the IEEE, Eta Kappa Nu, the Electric Club of Greater Los Angeles, the Adventurer's Club, and the Caltech Alumni Association. He is survived by his wife.

ROGER E. MATZDORFF, MS '49, Eng '50, of Los Altos, California, on April 23; he was 77. A decorated veteran of World War II, he had been a pathfinder, a troop-carrier pilot trained to drop commandos and help pave the way for advanced operations; his decorations included the Air Medal with oak leaf cluster and the Distinguished Flying Cross, and he retired with the rank of colonel. During his career he worked for General Dynamics, Marquardt Aircraft, Boeing, and Lockheed, where he remained for more than 25 years. He enjoyed sports, food, dogs, and intellectually stimulating games. "A very kind, thoughtful, and loving man," he is survived by Vesta, his wife of 53 years; two sons, Malcom and Rodney; a daughter, Shawn Laree Tarp; four grandchildren; four great-grandchildren; and three brothers, Richard, Ordell, and Edward.

1949

EDWIN J. DOLAN, on November 29, 1997.

MERLE L. MORGAN, MS '50, PhD '54, of Portland, Oregon, on December 13, 1997; he was 78. He is survived by two sons, Dave and Steve.

1950

GEOFFREY B. HOLMES, MS, of Sunnyvale, California, on August 12, 1997. He is survived by his wife, Sylvia, and two daughters, Valerie and Melody.

HAROLD LURIE, PhD, who spent 18 years on the Caltech faculty, died on February 10; he was 78. "An aeronautical/nuclear engineer, lawyer, pilot, adventurer [and] mentor," Lurie joined the Caltech faculty as an assistant professor in 1953 and rose to professor of engineering science in 1964. While at the Institute he organized its graduate nuclear energy program. He was appointed assistant dean of graduate studies in 1964 and associate dean in 1966. In 1971 he left Caltech to become director of research and development for the New England Electric System; in 1979 he became dean of engineering at Brooklyn's Polytechnic University; and in 1981 he became dean of the college of engineering at Northeastern University. In 1990 he joined the University of Washington School of Law as associate director of the Center for Law, Science and Technology. In 1992 he became associate director of the California Council on Science and Technology, serving as acting executive director from 1994 to 1995. In 1997, he returned to Caltech as professor of engineering science, emeritus, and joined the Institute's Industrial Relations Center as executive director of its program for Technical Workshops with Industry. He is survived by his children, Diana and David, and his companion of many years, Bobbie Altman.

HAROLD A. STREAKER, of Houston, Texas, on October 18, 1997. He is survived by his wife.

1951

THOMAS W. CONNOLLY, MS '52, of Littleton, Colorado, on March 27, 1997; he was 71. He was a member of the Montana Veterans of Foreign Wars and the Society for the Preservation and Encouragement of Barber Shop Quartet Singing in America. He is survived by his wife, Joann, and two sons, Thomas and Steve.

1952

EDWARD R. ROBERTSON, MS '52, on November 4, 1997. He is survived by his wife, Ricky.

JAMES C. SHEPPARD III, MS, of Newport Beach, California, on July 3; he was 68. An oil-company executive and a yachtsman, he spent nearly 25 years with Signal Oil and Gas Company, rising to the position of senior vice president, international production. He then joined the firm of Babson and Byrns (later Babson and Sheppard), where he specialized in petroleum consulting. His organizational involvements included the R. M. Pyles Boys Camp, the Newport Harbor Yacht Club, the Petroleum Club of Los Angeles, the Society of Petroleum Engineers, and the Southern California Chapter of the Antique and Classic Boat Society. He is survived by Frankie, his wife of 41 years; his son, James IV; his daughter, Melissa; and his brother, Thomas.

1953

DANIEL E. APPLEMAN, of Bloomfield Hills, Michigan, on January 2, 1998. After graduating from Caltech, he received his master's and doctoral degrees from Johns Hopkins University. Director of the Cranbrook Institute of Science and vice president of the Cranbrook Educational Community since July 1993, he previously had served for 19 years as a research geologist and had risen to associate director of the Smithsonian Institution's National Museum of Natural History in Washington, D.C. He also was a research geologist for the United States Geological Survey for 18 years, an adjunct professor at George Washington University, and a visiting professor at Princeton University, and during his career he published approximately 80 research papers. He was an accomplished violist, hiker, and runner. He is survived by Peggy, his wife of 30 years; his daughter, Rebecca; and two brothers.

ALFRED A. KRAUS, JR., PhD, of Albuquerque, New Mexico, on March 16; he was 72. He is survived by Barbara, his wife of 48 years; two sons, Alfred III and Timothy; two daughters, Deborah Dudley and Sharon Kraus; and three grandchildren.

THOMAS R. SLODOWSKI, on May 10, 1997.

1957

MILTON KAMINS, Eng, of Pacific Palisades, California, on June 1, 1996. He joined the RAND Corporation's Logistics Department (later HMRP) in 1957 and spent two years (1973–75) in the then Washington Air Force Department. Among the many specialties he applied at RAND was his expertise in reliability issues. He retired in 1992 and continued as a consultant in HMRP. His interests included art, the history of East European peoples, genealogy, and any automotive issue—he had once been an automotive engineer for Studebaker. He was head of RAND's Auto Repair Club and a member of its Art Club. He is survived by Helen, his wife of 38 years, and by his sons, David (a 1982 Caltech graduate) and Philip.

JOHN W. PROSS, JR., of Newfoundland, New Jersey, on June 30. He spent over 40 years as an aerospace computer-design engineer, retiring two years ago as the senior member of the technical staff at GEC-Marconi. He is survived by his wife of 48 years, by five children, and by 13 grandchildren.

ROBERT L. WILDEY, MS '58, PhD '62, of Flagstaff, Arizona, on January 4, 1998; he was 63. A professor of astrophysics at Northern Arizona University since 1972, he was a research fellow in astronomy and geology at the Mount Wilson and Palomar observatories and an astrophysicist at the U.S. Geological Survey Center of Astrogeology in Flagstaff. He was a member of the American Astronomical Society, American Geophysicists Union, Royal Astronomical Society, International Astronomical Union, Geological Society of America, and Explorers Club, as well as Sigma Xi. His work ranged from research into stellar and galactic evolution to developing techniques for measuring thermal radiation from bodies in the solar system as cold as Jupiter and as hot as Venus. He is survived by his wife, Diane; two sons, Herbert and Robert; a daughter, Wendy Carol; a grandson, Christian; a sister, Gwen Gussman; and a brother, Charles.

1960

HENRY H. HILTON, PhD, of Los Angeles, on February 19; he was 67. After two years at Electro-Optical Systems, he joined the Aerospace Corporation in 1962, where he became a senior scientist in the mathematics and analysis department of the Space Systems Laboratory, specializing in space physics. After 1988 he became a database consultant for a variety of groups, including Earth Services, the Easter Island Foundation, the Los Angeles Conservancy, and the Mountain Restoration Trust. He also developed software, including the Mac version of "The Tax Advantage." During the past decade he became involved in real estate and increased his skill at bridge and tennis, as well as continuing his hobbies of bicycling, worldwide trekking and hiking, and traveling. His memberships included Sigma Xi, the American Geophysical Union, the American Physical Society, and the American Contract Bridge League. Predeceased in 1985 by his wife, Jacqueline, he is survived by a sister, Ann Wilson Porteus; and a brother, James.

1963

THOMAS A. COLE, PhD, of Crawfordsville, Indiana, on April 9; he was 62. A Wabash College biology professor who taught there for 35 years, he, with several colleagues, wrote the column "Science Notebook," which appeared in

The Indianapolis News and other newspapers for more than 10 years. He also wrote six textbooks on biology and zoology and lectured throughout the United States as well as in England, Norway, and Japan. The Wabash biology chairman from 1968 to 1979, he was president of the Indiana College Biology Teachers Association and was a fellow with the Indiana and New York academies of science. He also served on committees of the American Society of Microbiology and was a visiting professor at the California Institute of Technology. Survivors include five children.

1965

DONALD W. GREEN, of South Orange, New Jersey, on May 9. After graduating from Caltech he received his BA in economics from King's College, Cambridge, in 1967, and his PhD in economics from UC Berkeley in 1972. He was a professor of economics at the University of Pennsylvania (1970–76), visiting senior fellow at the Russian Institute of Columbia University (1976–77), vice president of Chase Manhattan Bank (1977–88), executive vice president of the Mercator Corporation (1988–91), and chief financial officer of PlanEcon (1992–98). He was the author of *Sovmod I: A Macroeconometric Model of the Soviet Union* (1977) and a contributing editor to *Soviet Economy* (1984–91). He enjoyed many working trips to Russia and elsewhere in eastern Europe, a number in the company of his wife, Cynthia, who is also a financial executive. In addition to his wife, he is survived by his parents, Donald and Marion Green; a daughter, Katrina Bardecker; a son, Conan; two sisters, Lori Ascani and Connie Carruthers; and three grandchildren.

1966

RICHARD C. NIELSEN, MS '67, PhD '71, on May 23. He was employed by J. T. Thorpe until 1993, when he was no longer able to work because of multiple sclerosis. He is survived by his son, Wesley; his daughter, Joy Sandy; a grandson, Izack Sandy; his father and stepmother, Donald and Sandra; two brothers, Eric and Mark; and a sister, Kristine.

Task force . . . from page 16

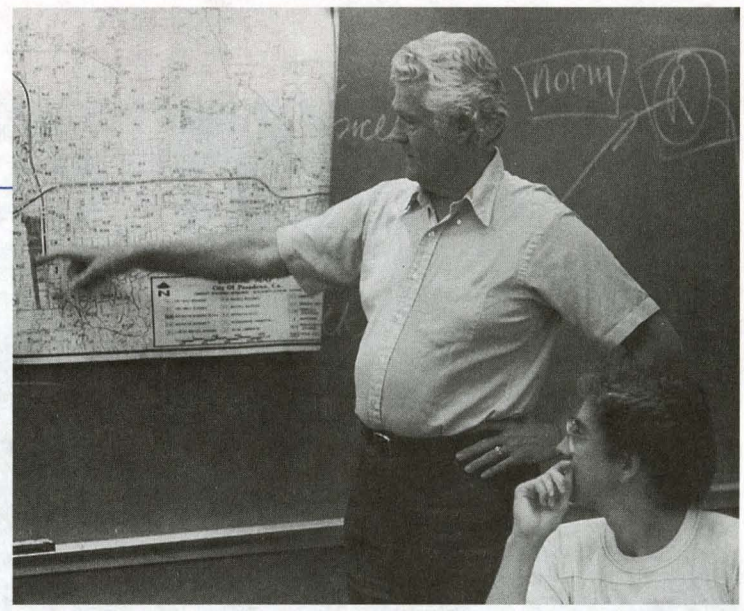
to get involved with the Institute," he said. Lambert—along with Caltech Trustee and ARC member Bill Gross '81—has also offered to help fund an economic and social impact study for Caltech. The study will be conducted by Michael Alvarez, associate professor of political science at Caltech.

In the next few months, Nunnally and Lambert also will be studying the costs involved in implementing the alumni programs recommended by ARTF that have not yet been established. Said Linde, "The remaining items now are being assessed as to the costs; the ARC will be looking at what should be implemented, modified, or not implemented." And when that is completed, he said, ARC will still have work to do. "Priorities change over time and new ideas come in," he said. "When we feel we've done all we can, then we've stopped being imaginative. If we ever feel our work is fully done, then we will not have done our jobs."

Robert Oliver 1922–1998

Robert W. Oliver, professor emeritus of economics at Caltech, died July 17 of a heart attack in Pasadena. He was 75. A native of Los Angeles, Oliver earned his bachelor's degree in international relations and economics from the University of Southern California in 1943. He then focused his attention solely on economics, earning his master's in that subject in 1948, also from USC. For his doctorate, he again concentrated on economics, in 1957 earning his degree from Princeton University, where he wrote a 600-page dissertation.

His academic career was spread over several institutions. Before coming to Caltech, he was a teaching assistant at USC 1946–47, an instructor of economics at Princeton in 1948, an assistant professor at USC 1952–56, and a research economist at the Stanford Research Institute 1956–59.



Bob Oliver in 1982.

He became an assistant professor of economics at Caltech in 1959 and a full professor in 1974. While at Caltech, he was also an economist at the World Bank and a consultant to the Brookings Institution and to the Organization for Economic Cooperation and Development in Paris. At Caltech he also served as master of student houses 1987–88 and chaired the convocations committee as well as serving on several other Institute committees.

He held fellowships at the London School of Economics and the Rockefeller Foundation. He was a member of several professional associations, including the Royal Economic Society, the American Economic Association, and the International Institute for Strategic Studies.

Oliver also served in several positions with the city of Pasadena, including the Pasadena Citizens Downtown Improvement Board, the Pasadena Board of Directors (the Pasadena City Council), the Planning Commission, and the Future Land Use Committee. He was a member of the Pasadena Utility Advisory Committee.

William T. Jones 1910–1998

William T. Jones, professor of philosophy at Caltech from 1973 until he retired and became professor emeritus in 1986, died September 30 at his home in Claremont. He was 88.

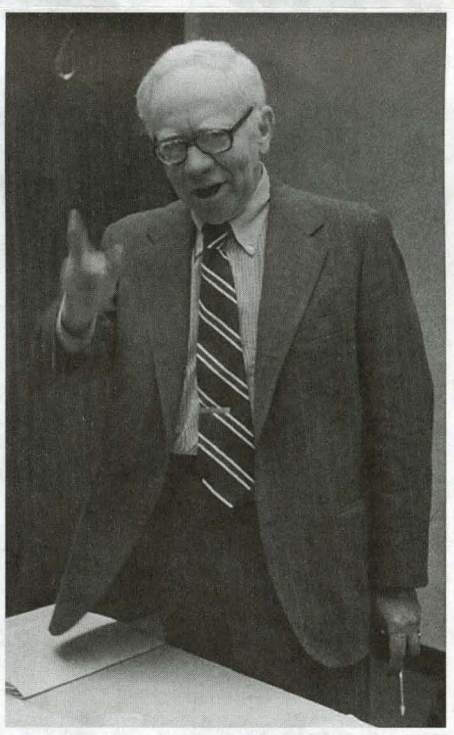
A native of Natchez, Mississippi, Jones was educated at Swarthmore College, Oxford University, and Princeton University. After earning his doctorate at Princeton, he joined the faculty of Pomona College. After a three-year break during World War II, he returned to Pomona as an associate professor in 1945 and remained there until 1972.

He first came to Caltech in 1972 as a visiting professor. He served as the Andrew W. Mellon Professor 1972–73, and was appointed professor in 1973.

Jones was a specialist in ethics and the works of Immanuel Kant. His books included *Morality and Freedom in the Philosophy of Kant* (1940), *Masters of Political Thought: Machiavelli to Bentham* (1947), *A History of Western Philosophy* (1952), *Facts and Values* (1961), *Approaches to Ethics* (1961), *The Romantic Syndrome: Toward a New Method in Cultural Anthropology and the History of Ideas* (1961), and *The Sciences and the Humanities* (1965).

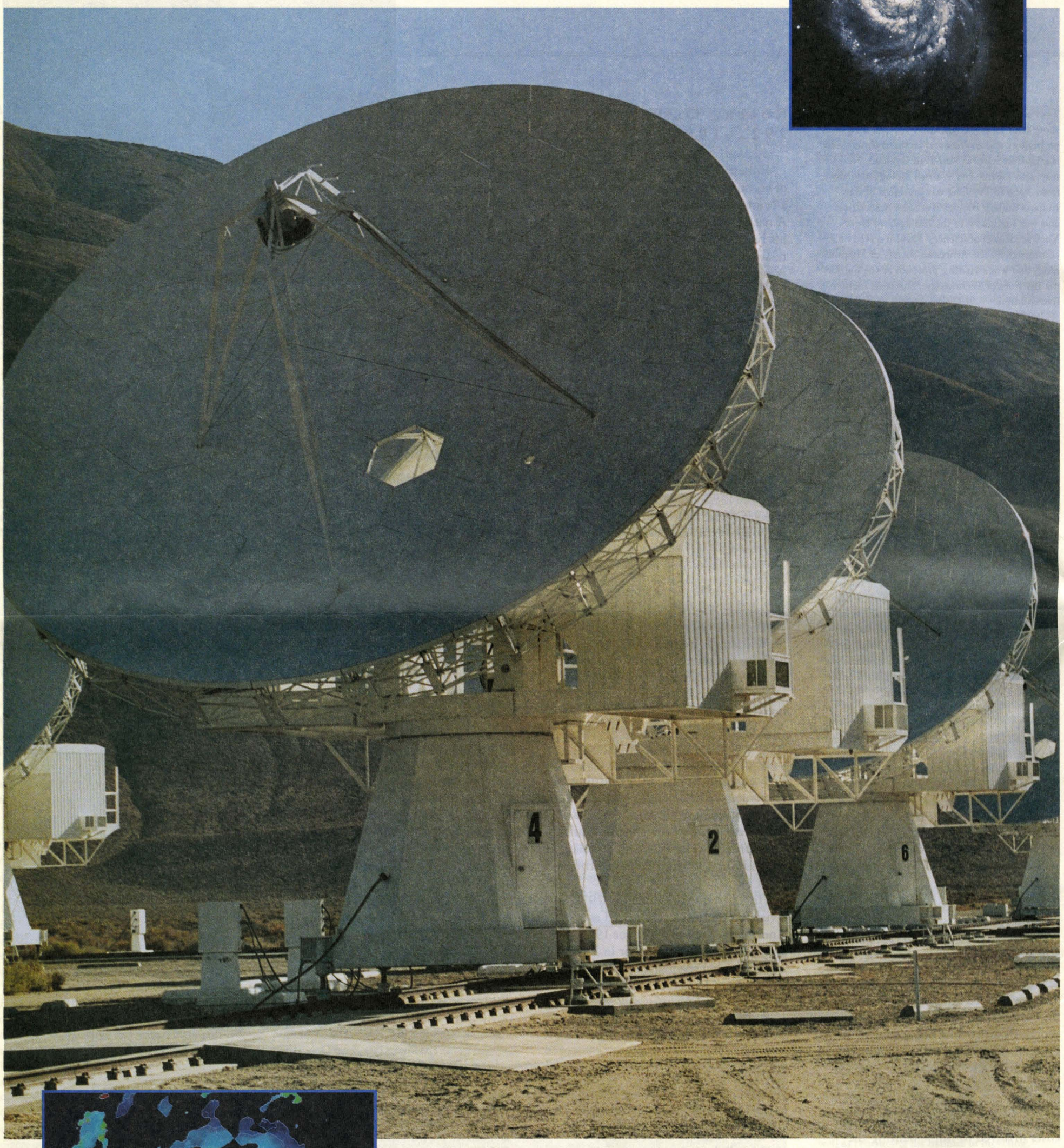
Jones was president of the American Philosophical Association Pacific Division 1969–70 and a member of the Pomona College board of trustees for many years. His awards and fellowships included the Rhodes Scholarship, the Nimitz Professorship of Social and Political Philosophy at the U.S. Navy War College, and the Guggenheim Fellowship.

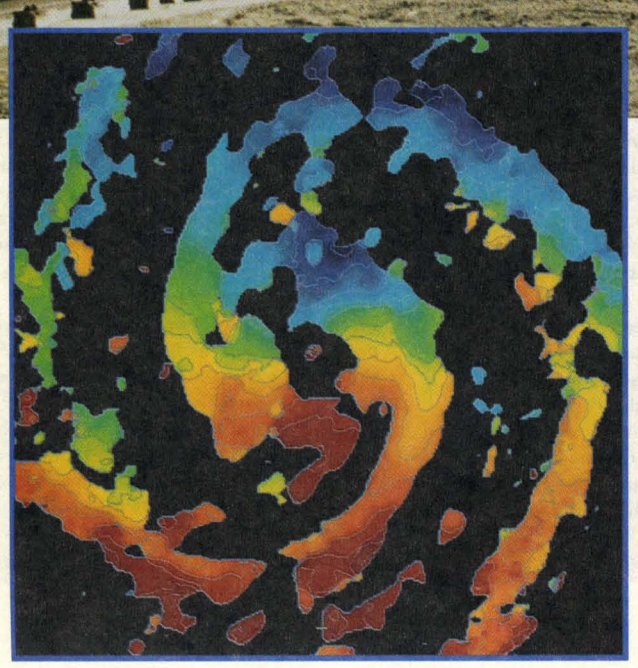
He is survived by his wife, Molly Mason Jones of Claremont; two sons, Gregory and Jeffrey; and four grandchildren.



Bill Jones in 1976.

RADIO DAYS: The golden age of radio may have been over, but the golden era of radio astronomy had barely begun when Caltech acquired land in California's Owens Valley to create a new observatory. This past October, Owens Valley Radio Observatory (OVRO), currently under the direction of Professor of Astronomy Anneila Sargent, PhD '77, marked its 40th anniversary, celebrating four decades of pioneering galactic and extragalactic astronomy, as well as solar studies and investigations into the cosmic background radiation, the afterglow of the Big Bang. Our back-page poster displays what is today OVRO's premier working instrument—the six-dish millimeter-wave interferometer, which since its dedication (as a three-dish array) in 1985 has carried out landmark studies of cosmic objects as distant as 10 billion light-years. Using the array, whose dishes of extraordinary surface accuracy were designed by the late Caltech physicist Robert Leighton '41, PhD '47, astronomers have mapped the spiral structures of galaxies, investigated colliding galaxies and galactic nuclei, studied the interstellar clouds that fuel star formation, and imaged the circumstellar disks around nearby stars that may be planetary systems in the process of formation. Here, the interferometer is flanked by two views of one its frequent subjects—Galaxy M51, also known as the Whirlpool Galaxy. The galaxy's brilliantly lit spiral arms—which are clearly delineated in the inset right-hand optical image, taken with the Hale Telescope at Palomar—testify to the high rate of star formation in M51, fueled by in part its interaction with the smaller companion galaxy shown at the top of the photo. At left, an image of interferometer observations at carbon monoxide wavelengths illuminates the dynamics that underlie the Whirlpool's striking appearance, mapping the dense molecular gas clouds from which M51's luminous stars are born and tracing their association with the galaxy's spiral structure. The image, obtained by a team led by Moseley Professor of Astronomy Nick Scoville (who preceded Sargent as OVRO's director), shows the gas's velocity (red receding, and blue approaching) as derived from the Doppler shift of the CO emission line. The overall rotation of M51's galactic disk can be seen, as well as the streaming motions associated with the spiral arms.





Turned On and Tuned In

All lit up, the Whirlpool Galaxy (top photo) is a hotbed not only of newborn stars but also of star-forming regions, whose abundant radiation at millimeter wavelengths is picked up by the six-dish array at Caltech's Owens Valley Radio Observatory (center) and translated into images like the contour map at left, which shows the velocity fields of the dense molecular gas clouds that collapse to form these luminous young stars.